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EDITORIAL

Where Are We Now?

There is such a great difference in where we were, say in 1910, in leprosy relief and where we are now, that it will be worth while to make some sort of a review of the present situation. The greatest change that has taken place has been the humanising of the approach to the leprosy patient, and the reception of him and his disease back into the main stream of human misfortunes for which we can set out to do something practical and satisfactory, so giving up our previous tendency to leave it all to a few devotees and saints. This change has been due to the discovery at Carville, U.S.A. in 1943 of an effective drug for leprosy and the development thereafter of modifications and variants on that drug. It is wonderful how the possession of an effective treatment for leprosy soon destroys superstition and lethargy in the patient and in the doctor, and alters the whole attitude to the disease. It is no surprise therefore that there has been a rapid growth in the number of scientific societies, research organisations, and charitable bodies who are willing to tackle the leprosy problem and it should not be forgotten that we also owe a debt to the interest and hard work of the great drug companies who have continued the search for even better drugs for leprosy. Another great change has been the interest of the orthopaedic surgeons in preventing and correcting the typical deformities of leprosy. Their work is quite epoch-making and revolutionary and in addition to their devising of many surgical procedures and guiding physiotherapy and rehabilitation they have had an enormous effect on the psychological aspect of the disease. In addition to looking forward to medical or bacteriological cure the patient can now look forward to reconstruction of facial and other deformities and to becoming in many cases not only a useful citizen again but also even a handsome one. In places where such double help is provided the morale of the patient rises high and stays high.

As regards research into the pathology and bacteriology of leprosy there has also been a determined attack in many places in the world. We still cannot cultivate the leprosy germ *in vitro* but tissue culture has been fairly successful and transmission of the leprosy germ has been partially successful. We still do not have an absolutely effective inoculation to prevent leprosy but are using BCG for a certain amount of help which it seems to give in raising the resistance of a contact to leprosy. In the matter of leprosy campaigns we have certainly moved outside the leprosarium to bring treatment to patients in district clinics or in their own homes and so have brought large numbers of patients under treatment, but in this perhaps we are allowing ourselves to get too fond of a somewhat rigid system in which we use "pills and land rovers", and in which we tend to use a drug

because it is the cheapest. We might do well to remember that leprosy is a difficult disease, and always has been, and we should keep our campaigns flexible and should not hesitate to use a new and proved drug and new and proved methods even if it happens to cost more. We should also continue active trial of new and hopeful drugs in the hope of finding a drug or combination of drugs which could deal with the bacterial side of leprosy in a few weeks or months rather than a few years.

With the resources now available in knowledge and money, all round the world we are making a lively attack on leprosy wherever we find it but even with all our efforts it is doubtful if we have under care more than 2 million leprosy patients in the world out of an estimated total number of 15 million. Another point of worry at the present time is caused by the rapid changes in political status of many countries where leprosy is endemic. Will such countries continue their leprosy relief campaigns? The answer is yes. But there is obvious scope for help from the other nations of the world in finance and personnel and advice. One particular form of help which would go furthest and deepest would be help in training of nationals of these countries in the various practical aspects of leprosy relief.

There is then, great activity in present day leprosy relief. WHO, The Mission to Lepers, The Order of Charity, American Leprosy Mission, International Leprosy Association, BELRA, etc. are all working hard to tackle the leprosy task. We think the time has come to *devise some form of co-ordination*. We mean that the world should try to tackle this task *as a whole* and to aim at complete success in a decade or two. The International Leprosy Association in conjunction with the Government of Brazil will be holding the 8th International Leprosy Congress in Rio de Janeiro towards the end of 1963. Perhaps this matter could be discussed at the Congress?

EAST AFRICAN COMMON SERVICES ORGANISATION

Director required for the East African Leprosy Research Centre at Alupe on the Kenya/Uganda border. Duties include the continuation of drug trials now in progress and the planning and conduct of new trials. There are laboratory facilities and opportunities for research.

Candidates must possess medical qualifications registrable in Great Britain and have experience in the field of leprosy.

Appointment on contract for one tour of 24 months in the first instance.

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GENETICS AND THE EPIDEMIOLOGY OF LEPROSY

II. The Form of Leprosy

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Introduction

Leprosy is made manifest in a variety of forms and the classification and relationships of these forms are matters of controversy. There is, however, wide agreement that communities vary in the relative frequencies of the different forms of the disease and, furthermore, it is accepted that the symptoms within a particular form of the disease may vary in different populations.

It has been shown in an earlier paper, SPICKETT (1962); that there is a very great weight of evidence to support the hypothesis that susceptibility to some form of leprosy is controlled by a single irregularly dominant gene. However in view of the characteristic forms of leprosy found in different populations it seems possible that there might be a genetic control over the form of the disease. This paper is an attempt to see whether published records can support this possibility.

Data concerning the incidence of forms of the disease have been published by several authors using a variety of methods and terminology of classification. Since the relative validities of the different schemes does not affect the present argument the terms used by the original authors have been used, rather than attempt to reclassify the data according to one system.

Variations between the form of leprosy in different populations

Differences in the manifestations of leprosy between the constituent races of a multiracial society were first noted by COCHRANE (1935). He pointed out that Africans living in the West Indies showed those forms of the disease characteristic of Africans living in their native land. Similarly Indians and Chinese showed forms of leprosy found in the native populations of India and China. LOWE (1938) has also pointed out that in a multiracial society the different races may differ in the relative frequencies of the different forms of leprosy. Comparison was made between Burmese and Indians living in Assam. A random selection of 100 patients of each race was taken from an outpatients clinic and from a leprosarium; the data of incidence of the different forms of the disease are given in Table 1.

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TABLE 1

Incidence of the different forms of leprosy amongst Indians and Burmese in Leprosaria and at leprosy clinics in Assam

		Lepromatous	*Tuberculoid*
Leprosaria	Burmese	75	25
	Indians	39	61
Clinics	Burmese	56	44
	Indians	31	69

There are significantly more lepromatous cases amongst the Burmese than the Indians both in the clinic ($\chi^2_{(1)} = 12{\cdot}714$; $p < {\cdot}001$) and in the hospital ($\chi^2_{(1)} = 26{\cdot}160$; $p < {\cdot}001$).

Variation in the relative frequencies of lepromatous and tuberculoid leprosy in Central African populations have been reported by MUIR (1940 a, b, c). These data are given in Table 2. They are not suitable for statistical analysis, but it is quite clear that there are striking differences between the populations.

TABLE 2

Incidence of certain forms of leprosy from different populations in Africa

Form of leprosy	*Population*			
	Barotseland	*Belgian Congo*	*Central and Eastern Rhodesia*	*Nyasaland*
Tuberculoid	60%	36%	22%	12%
Severe Lepromatous	11%	22%	28%	35%

MUIR (1940 d) also found that of the 102 patients of a South African leprosarium there were 92 Bantu of whom 23 were lepromatous and 12 Europeans all of whom were lepromatous. The high incidence of lepromatous leprosy amongst Europeans was again noted by MUIR (1940 e) who reported that the lepromatous rate in Cyprus was 98%. Although the actual data upon which this percentage is based are not given it is clear from other data in the same report that the sample could not have been smaller than 200.

Although the differences between the incidence of different forms of leprosy in various populations are obvious it may be argued that environmental differences between populations may be sufficient of an explanation.

BECHELLI and ROTBERG (1956) have published data from which it is possible to make a comparison between native Brazilians and the

children of the predominantly European immigrants. There is a significant difference between the two populations ($\chi^2_{(2)} = 24{\cdot}0153$; $p < {\cdot}001$). These data are given in Tagle 3.

TABLE 3

Incidence of the different forms of leprosy in Native Brazilians and in Brazilians of foreign extraction
(After ROTBERG and BECHELLI)

Population	*Form of Leprosy*			*Total*
	Lepromatous	*Indeterminate*	*Tuberculoid*	
Brazilians	3431	1958	935	6324
Brazilians of foreign extraction	2090	946	497	3533
Total	5521	2904	1432	9857

AZAVEDO (1936) has made a similar study to that of Bechelli and Rotberg, also comparing Brazilians with the children of immigrants, but using a different system of classification. The analysis of his data reveals no significant difference between the two populations ($\chi^2_{(2)} = 1{\cdot}4608$; $p < 0{\cdot}7 > 0{\cdot}5$). The data are quoted in Table 4. The inconsistency between the results of these two investigations emphasises the difficulties raised by the use of different systems of classification.

TABLE 4

Incidence of the different forms of leprosy in Native Brazilians and in Brazilians of foreign extraction
(After AZAVEDO)

Form of Leprosy	*Population*		*Total*
	Native Brazilians	*Children of Immigrants*	
Mixed	2117	1318	3435
Nervosa	2085	1350	3435
Tuberosa	490	337	827
Tuberculosa	9	2	11
Total	4701	3007	7708

Much data concerning the incidence of the different types of leprosy to be found in individual populations has been published, e.g. LITTAN (1953) from Spain; BJARNHEDDINSON (1909) from Iceland; MOISER (1934) from Southern Rhodesia; CONVIT, GONZALES and RASSI (1952) from Venezuela; LEIKER and SLOAN (1954) from New Guinea; HUMPHREY (1952) from Australia; and MAXWELL and KAO (1952) from Eastern China; however for the reasons stated comparisons between these data are unlikely to be useful.

It has been noted by RYRIE (1948) that in Malaya one third of the cases of leprosy occurring amongst Chinese are tuberculoid whereas three quarters are tuberculoid amongst Indians. Malays have a tuberculoid leprosy rate approximately midway between that in Chinese and Indians. Furthermore, it has been found that the symptoms relating to any particular form of the disease vary between the different races. For example, severe lepromatous reactions are much more common amongst the Chinese than amongst the other races.

Variation in the symptoms associated with particular forms of leprosy have been described by ROSS (1948). He found that in Gambia the lesions were more extreme in both tuberculoid and lepromatous forms of the disease than in Nigeria; he also found other differences that need not be elaborated here.

The population of the Fiji Islands is multiracial. AUSTIN (1948) made comparisons in the lepromatous rates between the Indian and Melanesian populations and found a significantly higher lepromatous rate in Indians than in Melanesians ($\chi^2_{(1)} = 131{\cdot}390$; $p \ll {\cdot}001$). The data is given in Table 5. Austin also found that although the Indian populations had the higher lepromatous rate the prognosis was more hopeful amongst lepromatous Indians than amongst lepromatous Melanesians.

TABLE 5

Relative frequency of lepromatous and non-lepromatous leprosy in Indians and Melanesians

	Form of Leprosy		
Population	*Lepromatous*	*Non-lepromatous*	*Total*
Melanesians	181	148	329
Indians	168	72	240
Total	349	220	569

In addition to the published data there are many reports by authorities who have stated on the basis of wide experience, that different forms of leprosy predominate in different races. For example, COCHRANE (1947) states that Europeans and Mongoloids are more likely to contract the lepromatous form of the disease than are Indians or Africans.

There is no clear understanding of the relationship between the results of the lepromin test on healthy subjects and the form of leprosy to which they are liable. However, it is agreed that variation in the results of the lepromin test is indicative of potential variation in the reaction of the body to invasion by *M. leprae*. Variation in the distribution in the results of the lepromin test between populations are, therefore, indicative of variations in the incidence of the different forms of leprosy between those populations.

GEHR and MUNDAR (1954) have given data of the results of the lepromin test as applied to several populations, of these two had had no contact with the disease; the data relating to these two populations are given in Table 6. There is a significant difference in the proportion of positives between the two populations; in total ($\chi^2_{(1)} = 38{\cdot}223$; $p < {\cdot}001$) and in adults ($\chi^2_{(1)} = 8{\cdot}920$; $p < {\cdot}01 > {\cdot}001$) and in children ($\chi^2_{(1)} = 16{\cdot}193$; $p < {\cdot}001$).

TABLE 6

Results of lepromin test on Hindu and Bushman populations

Population		*Results of lepromin tests*				
		—	±	+	++	+++
Adult males	Hindus	9	8	8	1	—
	Bushmen	13	5	46	22	11
Adult females	Hindus	10	4	14	1	—
	Bushmen	17	39	36	32	5
Male children	Hindus	34	5	7	—	—
	Bushmen	6	12	25	6	1
Female children	Hindus	27	4	12	3	—
	Bushmen	17	24	16	13	1

It has been suggested by FERNANDEZ (1943) that the capacity to give a positive lepromin reaction needs to be evoked by prior contact with antigens derived from *M. leprae*. While this cannot hold absolutely, since Gehr and Mundar have demonstrated positive reactions in populations that have not been exposed to leprosy (it is probable that related organisms can bring about the effect), there is no doubt that the reaction does become stronger after repeated tests. There is variation in the development of the reaction in different individuals. IGNACIO, PALAFOX and JOSÉ (1953) subjected 47 children who had been separated from their parents (at least one of whom had had leprosy) at birth. Of these children 74% were positive at the second test. Fernandez found that 73% of the children of affected parents gave a positive reaction at the first test. LARA (1940) also found that 73% of the children of parents with leprosy gave a positive reaction at the first test. Fernandez found that those who did not give a positive reaction at the first test gave only a feeble reaction after six tests, whereas those that gave a positive reaction at the first test gave a very strong reaction by the sixth test. These observations suggest that there is a polymorphism within populations with regard to reactions to lepromin, and this reaction may indicate a type of allergic response that determines the form that the disease will take.

Variations in the form of leprosy within families

At the family level there is very little evidence indeed applicable to the problem of genetic variation affecting the form that leprosy will develop if contracted. The few published pedigrees in which the form of the disease is detailed have usually been selected to illustrate a particular point of view and as such do not form a representative sample, so that they are of little value. However they do show that within a family there may be wide variations in the form of the disease although more commonly the disease takes a similar form within a family. Differences within a family indicate that variation in form of the disease is not principally due to variation in the bacilli since the cases within a family may be assumed to be epidemiologically related and derived from the same strain of bacilli.

DANIELLSEN and BOECK in this classical study of leprosy in Norway, found that of the 68 people who had had anaesthetic leprosy and had been patients in the hospital of St. George, Bergen, 58 bore relationships with others suffering from the same form of the disease, and of the 145 who had had tuberculoid leprosy 127 had relatives suffering from this form of the disease. This evidence suggests that the form of leprosy is under the influence of some genetic system of the host.

KEIL (1939) and KINNEAR BROWN and STONE (1958) have published some observations on leprosy in twins. These and other accounts provide the source of the data in Table 7. Although these data are too few to enable a test of significance to be made, the degree of concordance between identical twins as compared with that between fraternal twins is highly suggestive of a genetic influence on the form of the disease.

TABLE 7

Similarities and dissimilarities in the form of leprosy in identical and fraternal twins

	Similar	*Dissimilar*	*Total*
Identical twins	6	0	6
Fraternal twins	4	3	7

Discussion

The evidence for the existence of a genetic system controlling the form of leprosy is suggestive but not conclusive. Differences in the forms of leprosy prevailing in different races might be due to environmental variation, but the existence of such differences even in well integrated multiracial communities indicates that environmental variables are not the most important factors involved.

Genetic variability in *Mycobacterium leprae* could be responsible

for part of the variation between forms of leprosy. If this were so it might be expected that there would be a higher degree of concordance between contacts than the random expectation. Unfortunately there are no data available that relate to this.

It is probable that any genetic influence of man upon the forms that leprosy may take will be multifactorial. The different factors may exert their effects upon different aspects of host immunity and function. Alternatively there may be a complex of genes of similar effect so that it is the relative frequency of the two alleles that influences the predisposition of the individual to particular types of leprosy. It is, however, difficult to regard the variation in leprosy as a simple continuous variation, which is what such a theory implies, and moreover, it would not be possible to explain satisfactorily why some populations have symptoms of leprosy unique to them. If however there are many factors of different effect fixation of one allele of one locus in a population will cause the spectrum of forms of the disease in that population to differ from that in a population where the alternative allele is fixed. It follows from this that there may be genetic explanations for the fact that different systems of classification are appropriate for different populations.

The data discussed here have referred to a variety of systems of classification. The different systems used by AZAVEDO on the one hand and BECHELLI and ROTBERG on the other have yielded contradictory results. It is not relevant to enter into any discussion of the relative validities of particular systems of classification in this paper, but it is clear that the forms of leprosy described by one system may be better phenotypic descriptions than the forms described by another system. It is possible that a system of classification based on the phenotypes of different genes whilst not superseding other systems may provide a means of reference whereby the relationships of these systems may be more clearly understood.

Similar considerations may apply to the genetic variation in *M. leprae*, so that the wide variation in the manifestations of leprosy could be due in large measure to the interaction between genetically different types of human individual and genetically different types of bacilli.

It is clear that the investigation of genetic variability in man and in *M. leprae* is a task of great importance, it is equally clear that it will be a task of great complexity. However it is probable that there is sufficient recorded information for many of these problems to be solved if it were made available.

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Summary

1. Expatriate races show forms of leprosy more similar to those prevailing in their native lands than those amongst the natives of the land in which they live.

2. Different groups in multiracial societies vary in the ratios of the different forms of leprosy and in their detailed manifestation.

3. Quantitative comparisons between populations of the frequency of different forms of leprosy varies according to the methods of classification used.

4. Populations are polymorphic with regard to their reactions to lepromin; this may indicate genetic variation.

5. Affected individuals within families tend to suffer from similar forms of leprosy.

6. The evidence suggests that there is a genetic system in man which affects the form that leprosy might take.

7. There is a possibility that genetic variability in the *M. leprae* influences the manifestation of leprosy.

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"B 663" IN THE TREATMENT OF LEPROSY

SUPPLEMENTARY REPORT OF THE PILOT TRIAL

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The report of the interim findings in a pilot trial of "B 663" (GEIGY S.A.) in this Unit (BROWNE and HOGERZEIL, 1962 (*a*)) is now completed by this supplementary report, which concerns the 16 patients who formed the subject of the previous communication, together with 12 patients who joined the trial subsequently. Dosage scales for the newly-admitted patients, all unselected and untreated, were of the same order as previously indicated; similar laboratory investigations were carried out on all patients.

Treatment

The groups referred to in the former report continued treatment as follows:

Group 1: The 3 patients, having received B 663 and standard doses of dapsone for 6 months, continued to receive dapsone alone. They were joined by seven additional patients, who followed the same régime.

Group 2: The first 3 patients, having received B 663 alone for six months, received thereafter standard doses of dapsone. The remaining 5 patients of this group, having received B 663 alone for 6 months, continued to receive B 663 alone for a further 6 months; they thereafter received standard doses of dapsone alone. Five additional patients joined the first 3 of this group, receiving B 663 alone for 6 months, and then dapsone alone.

Group 3: The 5 patients of this group, having received B 663 for 6 months, and ditophal ("Etisul" I.C.I.) for the first 3 months, received thereafter standard doses of dapsone.

Clinical findings

All the 12 patients newly admitted to treatment with B 663 for 6 months, either alone (5 patients) or with standard doses of dapsone (7 patients), made clinical progress similar to that of the patients in Groups 1 and 2 of the preliminary report. It is not possible to detect any definite differences in so short a time between those who had dapsone in addition to B 663 and those who did not.

The 5 patients who, having had 6 months' treatment with B 663

alone, received the drug alone for a further 6 months, all continued to improve clinically, though somewhat slower than at first, there being a considerable volume of lepromatous infiltration to be absorbed.

No novel clinical observations were made during this further investigation, except that the ruddiness of the uninfiltrated and non-lepromatous skin appeared less intense than in the early months of the trial: this ruddiness, it may be surmised, might militate against the use of B 663 in lighter-skinned patients. No signs of toxicity developed.

Bacteriological findings

The average reductions in the Bacterial Index in the various Groups are summarized as follows:

Group 1 (standard dapsone, with B 663 for the first 6 months):
- All 10 patients: 44%
- The 3 patients in the original Group, who have now received dapsone alone for 12 months:
- After 6 months of dapsone alone: 50%
- After 12 months of dapsone alone: 80%

Group 2 (B 663 alone for 6 months):
- All 13 patients: 37%
- Three of the patients in the original Group, have now received dapsone alone for 12 months:
- After 6 months of dapsone alone: 58%
- After 12 months of dapsone alone: 83%
- The remaining 5 patients of the original Group, have now received B 663 alone for a further 6 months (making 12 months in all):
- After 6 months (of B 663 alone): 58%
- After 12 months (of B 663 alone): 66%

Group 3 (B 663 for 6 months, with ditophal in addition for the first 3 months, followed by standard dapsone alone):
- After 6 months: 27%
- After 12 months (i.e. 6 months of dapsone alone): 37%

The quasi-complete disappearance of morphologically normal forms of *M. leprae*, and the increase in the proportion of acid-fast debris not identifiable as bacilli, occurred rather more rapidly in patients receiving dapsone and B 663.

Apparent resistance

The 5 patients who were receiving B 663 alone suddenly showed, towards the end of the 12 months course, a sudden increase in the Bacterial Index and a reappearance of morphologically normal bacilli. Details will be found in the accompanying paper (BROWNE and HOGERZEIL, 1962 (*b*)).

Summary

The tentative opinions expressed in the preliminary report are confirmed: B 663 has a definite action in lepromatous leprosy, inducing clinical and bacteriological improvement.

Given alone for 12 months, B 663 appears to cause a form of drug resistance in *M. leprae.*

Acknowledgements

Our thanks are due to Messrs. J. R. Geigy, S.A. (of Basel) for continued supplies of B 663, and to Dr. S. E. Onwu, M.V.O., O.B.E., Director of Medical Services and Permanent Secretary, Ministry of Health, Eastern Nigeria, for permission to publish this article.

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N.B. In view of the high cost of manufacture (inherent in the complex chemical structure of the compound, the difficulty of separation of isomers, and the technical processes of micronization of the product) it is unlikely that the drug could ever be a serious rival to dapsone. It would appear, however, that B 663 could be of value as a second line of defence and for use in patients who for some reason cannot tolerate dapsone. Further research in this promising line of compounds is therefore indicated.

APPARENT RESISTANCE OF *M. LEPRAE* TO "B 663"

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One incidental and unexpected finding during our treatment of five cases of severe lepromatous leprosy for twelve months with B 663 (J. R. GEIGY S.A.) alone (BROWNE and HOGERZEIL, 1962 (*a*) and (*b*)), appears to shed some light on the controversial question of drug resistance in leprosy.

Following our preliminary report in this pilot trial (BROWNE and HOGERZEIL, 1962 (*a*)), *clinical* progress (marked in some and moderate in others) continued to be satisfactory in all 5 patients for the whole period of twelve months during which B 663 was given alone, and for the three months subsequently, when standard dapsone treatment was given. (BROWNE and HOGERZEIL, 1962 (*b*)).

Bacteriological improvement continued to be satisfactory, as shown by progressive reduction in the Bacterial Index calculated from smears taken every fortnight from eight comparable sites (four from skin; two from ear lobes; two from nasal mucosa). The degeneration of the individual *M. leprae* was also satisfactorily progressive, normal forms having almost completely disappeared from all eight sites in all five patients: only five sites showed a few (about 10%) of normal bacilli in the 24th and 25th series of smears (i.e., a total of 80 sites) made towards the close of the trial period on 5th and 19th January, 1962.

The features of bacteriological relapse during treatment with B 663

With no clinical indication that anything untoward had occurred, however, in the next series of smears taken a fortnight later, viz., on 2nd February, all patients showed a raised Bacterial Index, the rise being attributable to an increase in the Index at the majority of the sites smeared in each patient. The last dose of B 663 was due to be given, and was actually given, on 8th February. Thereafter, dapsone was given according to the following dosage scale: 100 mgm. twice weekly for two weeks; 200 mgm. twice weekly for four weeks; and 300 mgm. twice weekly subsequently.

Similarly, in the same smears (taken on 2nd February) normal bacilli reappeared in all the patients; of the total of 40 sites smeared (i.e., eight in each of the five patients), 31 contained normal bacilli The number of sites showing normal bacilli at successive subsequent

BACTERIAL INDEX :

Serial No.	*Initial Index*	*Index at end of:*					12*th month*		13*th month*		14*th month*		15*th month*	
		2nd month	*4th month*	*6th month*	*8th month*	*10th month*	*25th smears*	*26th smears*	*27th smears*	*28th smears*	*29th smears*	*30th smears*	*31st smears*	*32nd smears*
7	4·0	3·4	3·1	2·9	2·8	2·7	2·6	3·1	3·1	3·1	2·75	2·9	2·7	2·25
8	3·1	2·5	2·25	2·1	2·1	1·6	1·4	2·2	2·1	2·25	2·25	2·25	1·9	1·5
9	3·2	2·25	2·5	2·25	1·4	2·0	1·6	2·1	1·9	1·75	2·0	1·9	1·4	1·2
10	3·2	2·6	2·1	1·9	2·0	1·9	2·1	2·3	2·0	1·6	2·0	1·9	1·6	1·3
11	3·5	3·25	3·1	2·9	2·6	2·5	2·0	2·4	2·4	2·6	2·6	2·4	2·25	2·5
Aver-age	3·4	2·80	2·61	2·41	2·18	2·14	1·94	2·42	2·30	2·26	2·32	2·27	1·97	1·75

fortnightly examinations was: 26, 27, 34, 24, 30 and 22 (out of a total of 40 sites).

Four of the five patients were affected to a similar degree, having a large proportion of sites containing normal bacilli; thus, patient No. 7 had 50 sites with normal bacilli (out of 56 sites smeared); No. 8 had 46; No. 9 had 39; No. 10 had 19; and No. 11 had 45. No explanation is offered for the fact that the smears of patient No. 10 had a low proportion of normal bacilli.

All sites smeared were affected at some time, but not indiscriminately. Thus, the ear-lobes contained normal bacilli 55 times out of 70, the skin (obviously lepromatous skin, and apparently normal skin in equal proportions) 114 times out of 140, and nasal mucosa 37 times out of 70.

The proportion of bacilli that were judged to be morphologically normal in each successive fortnightly series of smears was as follows: 16%, 15%, 21%, 14%, 13%, 13% and 4%.

After twelve weeks' treatment with dapsone, the temporarily raised B.I. (i.e. the average of the five patients) returned to the level it had fallen to at the beginning of the twelfth month of B 663 treatment.

To complete the picture, it should be added that apparent resistance did not occur in the 10 patients who received dapsone together with B663, nor in the three patients who received dapsone after taking B 663 alone for 6 months. However, in three of five patients who had received B 663 for 6 months and ditophal for the first three months in addition (and standard dapsone alone after six months) (BROWNE and HOGERZEIL, 1962 (*a*)), normal bacilli appeared in the smears; and in two of them the Bacterial Index rose—both phenomena occurring at the same time as in the group who had received B 663 alone for twelve months. The magnitude of the rise in B.I. and the proportion of normal bacilli appearing in the smears, were correlated. These three patients were those whose clinical and bacteriological states showed improvement at the end of the first six months of treatment and subsequently while receiving dapsone alone.

Discussion

The findings are not in dispute, for circumstances exclude the explanations that might ordinarily be invoked, viz., the technical hazards of smearing, staining and microscopic examination; observer error; different technicians or different techniques; climatic or other extraneous factors.

The bacteriological relapse here recorded occurred when the patients were all under the full therapeutic influence of B 663; the prescribed doses of B 663 had been regularly taken, and, to judge from the degree of ruddiness of the soft tissues and the excretion of red pigment in the urine, absorption from the gut was proceeding as

before. In view of the long generation time of *M. leprae*, it is permissible to suppose that the factor determining the appearance of morphologically normal forms in all patients at the same time, had been operative for some weeks before the cessation of B 663 therapy.

The occurrence of this "resistance" may be associated with the likelihood that B 663 exerts a true bactericidal action on *M. leprae*.

It would seem that the majority of "resistant" bacilli, presumably mutants, were sensitive to dapsone (in the sense of "sensitivity" usually accepted when discussing drug therapy in leprosy), since they became progressively fewer, both proportionately and absolutely, in the fortnightly smears during the three months after dapsone treatment was begun.

It would thus seem legitimate to conclude that the phenomenon observed indicates either the development of resistance in the bacteriological sense, or the action of some undisclosed factor that stimulates multiplication of morphologically normal forms of *M. leprae*.

In this connection, it is interesting to note that in a recent report by D'ARCY HART *et al.* (1962), a similar phenomenon developed in mice treated for prolonged periods with Isoniazid after infection with *M. lepraemurium*. The proportion of degenerate bacilli recovered from the livers of such mice decreased progressively with the duration of treatment.

Summary

All five patients who had made satisfactory clinical and bacteriological progress while receiving B 663 (J. R. GEIGY S.A.) alone and uninterruptedly, suddenly showed a raised Bacterial Index in the fortnightly smears made six days before the end of the twelfth month of B 663 therapy. In the same smears, normal bacilli reappeared at the majority of sites smeared in skin, ear lobes and nasal mucosa. At the end of the full twelve months of the trial with B 663 alone, dapsone was substituted, and by the time the patients had been receiving dapsone for three months, the Bacterial Index returned to the level previous to the sudden rise, but a reduced proportion of morphologically normal bacilli persisted in the majority of the sites smeared in all the five patients.

It is considered that the most probable explanation is that resistance to B 663 had developed.

Acknowledgements

Our thanks are due to Messrs. J. R. Geigy S.A. (Basel), for generous supplies of B 663; to Dr. R. J. W. Rees, of the Medical Research Council, London, for helpful criticism; and to Dr. S. E. Onwu, M.V.O., O.B.E., Director of Medical Services and Permanent Secretary, Ministry of Health, Eastern Nigeria, for permission to publish this article.

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METHIMAZOLE IN THE TREATMENT OF LEPROSY

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Methimazole (Tapazole, Lilly) has been used in the treatment of leprosy by ARTURO O'BYRNE GONZÁLEZ (1960; *Leprosy Rev.*, 1961). This report concerns five adult patients who received the drug over a period of nine months at the Uzuakoli Settlement, Eastern Nigeria. The patients were unselected; all were suffering from severe lepromatous leprosy of two years' duration, two of them being relapsed cases.

Previous treatment

Before the beginning of the trial, four of the patients received small doses of dapsone for short periods (totals of 0·7 to 3·0 gr. in 5 to 10 weeks).

Dosage

All the patients received 5 mgm. of Tapazole orally three times a day, no other drug being given at the time. The average weight was 133 lbs. (60·5 kg.), varying from 120 lbs. (54·5 kg.) to 140 lbs. (63·6 kg.).

Side effects

Because of more or less severe side-effects, none of the patients was able to take the drug without interruption over the whole period of nine months during which the trial lasted. The average total interruption of treatment was six weeks.

The following complaints were noted: headache, general malaise, abdominal discomfort, nausea, generalized pruritus, restlessness, insomnia, vomiting, arthralgia, pain in metatarsals.

In view of the known toxic effects of methimazole and chemically related anti-thyroid compounds on the bone marrow (IRWIN *et al.* 1952; MCGAVACK *et al.*, 1954; CHEVALLEY *et al.*, 1954; *British Med. J.*, 1961), especially the risk of neutropenia and even agranulocytosis, total leucocyte counts and differential counts were made regularly (at first, every other day, and subsequently every week), the danger signals being a total leucocyte count below 3,000 per c.mm., or a percentage of polymorphonuclear cells below 30.

At no examination was a severe degree of neutropenia observed, but on 36 occasions the percentage of granular cells was below 30

(each of the five patients exhibiting this condition), and in one patient the total white cell count remained between 3,000 and 3,500 cells per c.mm. for several weeks. There was no observable effect on the erythrocytes or on the haemoglobin values. The Arneth count made from time to time showed no obvious deviation. No signs of hypothyroidism became apparent during the trial.

Clinical results

Two patients improved during the course of treatment, one of them markedly so; the lepromatous condition in the latter was complicated by borderline elements. Three patients were unimproved, one of them becoming definitely worse, with appearance of many new lesions and exacerbation of existing lesions.

Bacteriological findings

Examination of material obtained by the slit-smear method was made at fortnightly intervals from eight sites.

It will be noted that bacteriological improvement in patients numbers 1 and 4 did not run parallel with clinical improvement.

	Bacterial Index					
Serial No.	*Before trial*	*After 2 months*	*After 4 months*	*After 6 months*	*After 8 months*	*After 10 months*
1.	1·95	1·7	1·0	1·2	1·1	1·2
2.	3·0	2·8	2·4	2·8	3·0	3·0
3.	3·6	3·75	3·2	3·0	2·9	3·25
4.	2·75	2·35	0·8	0·75	1·0	0·6
5.	3·5	3·4	3·4	3·5	3·5	3·6

The changes in bacterial morphology ran more or less *pari passu* with the Bacterial Index.

			Bacterial Morphology			
			Normal forms		*Acid-fast debris*	
Serial No.	*Lepromin reaction*	*Clinical assessment*	*Before trial*	*After 10 months*	*Before trial*	*After 10 months*
1.	Doubtful	Markedly improved	35%	30%	6%	20%
2.	Doubtful	Stationary	30%	0%	7%	40%
3.	Negative	Stationary	65%	35%	7%	25%
4.	Negative	Slightly improved	35%	0%	6%	50%
5.	Negative	Worse	50%	50%	15%	10%

Erythema nodosum leprosum

Patient No. 5 had a persistent attack of erythema nodosum leprosum, which began after six months of treatment with the drug.

The erythrocyte sedimentation rate was in the main indicative of

the observed clinical activity of the disease in the individual patient, declining consistently only in the Patient No. 1. There was a general slight fall in the E.S.R. during the first two months of treatment, followed by a gradual rise to the initial values and above.

Conclusions

On the clinical and bacteriological findings in this small series of cases treated for nine months with Methimazole, it is not considered that trials on a larger scale are indicated.

Acknowledgements

Our thanks are due to the World Health Organization, at whose suggestion the trial was conducted, to Messrs. Eli Lilly Research Laboratories for adequate supplies of Tapazole (their brand of Methimazole); and to Dr. S. E. Onwu, M.V.O., O.B.E., Director of Medical Services and Permanent Secretary, Ministry of Health, Eastern Nigeria, for permission to publish this article.

Summary

In Uzuakoli the authors made trial of Methimazole for 9 months on oral dosage of 5 mgm. t.d.s. with 5 adult patients with severe lepromatous leprosy of 2 years' duration. Severe side effects occurred and no patient could take the drug without interruption, the average total period of interruption being 6 weeks. Because of the known dangers of toxic effects on the bone-marrow, the authors made regular total leucocyte counts and differential counts. Severe neutropenia was not found, but on 36 occasions the percentage of granular cells was below 30, and this occurred in each of the 5 patients. The *Clinical Results* were: improvement in 2 patients, marked in 1 of these. There was no improvement in 3 patients, and 1 of these became definitely worse.

The Bacterial Index improved in 2 cases but not in others, and there were changes in the bacterial morphology. Erythema nodosum leprosum occurred persistently in 1 patient. The E.S.R. declined consistently in 1 patient only.

The authors do not think that trials on a larger scale are indicated.

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STUDIES IN PLANTAR ULCER

VII. The Results of Treatment of Plantar Ulcer

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In March/April 1962, the leprosarium at Oji River, Eastern Nigeria was revisited by me in order to assess the value of the curative and preventive measures for plantar ulcer begun in 1938, and described in *Lep. Rev.* (1960) 31, 159.

Briefly, this consisted in the healing of ulcers, following a stated classification, by bed-rest or walking-plaster splint; and an endeavour to prevent recurrence by the provision of rigid-soled footwear. At the same time, regular foot-inspection was undertaken in order to recognise the pre-ulcerative state and in particular the necrosis blister, and to treat these by appropriate measures.

It was found that, during the past four years, treatment and prophylaxis have been carried out, with varying intensity, but with fair persistence in the circumstances (common to such leprosaria) of changing medical and assistant staff. The quantities of plaster used and footwear provided annually show that a considerable amount of standard treatment has been carried out. The records of clinical findings were also pursued and enable the natural history to be followed during the period, except for 1960 when unfortunately notes were scanty.

No other treatment was consistently employed so that such results as were obtained are likely to be due to these methods.

Of 100 fully-documented cases seen in 1958, 45 have been traced and re-examined, and this is considered satisfactory in the circumstances of village life in rural Africa; for many had left the leprosarium either as arrested cases, or to continue care under the rural Leprosy Inspector.

The selection of cases covered a wide range, and included early ulceration, ulceration of short duration (6 months to a year) or of long duration (5-10 years), as well as cases known to have complications such as thrombo-phlebitis, infective disorganisation of the foot, osteoarthritic change, or foot drop. The clinical history since 1958 also varied widely—some remain in the leprosarium, others were discharged from leprosy treatment ulcer-free or with a small ulcer, with or without rigid-soled wear, and some were old patients with advanced mutilations in whom the leprosy dated back before existing records.

There are not sufficient records in any one category to make valid numerical comparisons, and it has been thought best to present the

over-all effect of the measures taken on the ulcer-situation in the leprosarium, and then to give details of typical cases.

The *organisation of leprosy treatment in the region* is such that treatment is given either at rural clinics or at the leprosarium where patients are in residence. The present policy is to reserve admission to the leprosarium to lepromatous cases, and to those with lesions due to nerve involvement.

In 1958, there were 6,372 patients under treatment, of whom 560 were in the leprosarium; in 1961 (December) there were 4,530, of whom 439 were in the leprosarium.

The decrease in total leprosy population under treatment does not affect materially the incidence of plantar ulcer at the moment, because of the number of cases found among those who are "arrested cases" and who would not therefore figure in the count of those under treatment. There are 26,000 discharged cases in the region, at present.

Ulcer-situation in the Leprosarium 1958-1962

Plantar ulcer is controlled in the leprosarium by an ulcer-shed and by an ulcer-ward; in addition there is an "infirmary" for the care of derelict cases.

In rural areas, ulcers are dressed by the local Inspector at his regular visits and he sends in to the leprosarium patients who he considers need special care.

Ulcer-situation in 1958

A survey at the beginning of the present management of ulcers in early 1958 showed that 150 of 560 patients had ulcers of which 122 were plantar.

The *ulcer-shed* treated 119 of these, as well as those in the "infirmary" and some ex-patients who had encamped nearby on discharge. Treatment was by frequent eusol dressings, and two nursing attendants were employed full-time for this purpose.

The *ulcer-ward*, of 35 beds, was reserved for those whose ulceration was aggravated by complications, or by patients who were thereby unable to look after themselves. During 1958, 553 ulcer-patients were warded, of whom 318 were leprosarium patients, many spending more than one period in hospital. In the later part of the year, some were warded for the pre-ulcerative state.

Ulcer-situation in 1962

The situation was reviewed in April 1962 and it was found that on the day of survey, 38 of 439 patients in the leprosarium had ulcers of various types of which 19 were plantar ulcers; a further 22 were wearing walking-plasters for the same lesion.

The *ulcer-shed* had been closed for three years. The dressing of cases that needed it was done outside the plaster-room and occupied

part of the time of the plaster-room staff. The plantar ulcers not in plaster were in patients who were unsuited for plaster treatment because of psychosis, skin sensitive to plaster, or refusal to accept plaster.

The most obvious difference in the *ulcer-ward* is the absence of the strong smell on first entering, an absence which indicates the low incidence of bone infection. In 1961, 350 patients were admitted of whom 200 were leprosarium cases, but on the day of survey only 8 of the beds were occupied by leprosarium patients. Admissions included those with the pre-ulcerative state.

The Sister-in-charge, who was also in charge in 1958, states that the reduction in hospitalised cases is greater than the figures indicate, because patients are now admitted with lesions that would not have been considered serious enough then; also a longer time is now allowed before discharge for healing to consolidate. The fall in leprosarium cases in the wards was off-set by the admission of more from rural clinics, or ex-patients.

The cost of Treatment

An analysis has been made of the cost of achieving this improvement by examining receipts for plaster-of-paris, felt, etc. since the initiation of treatment. This also includes paster used for other purposes such as post-operative care of hands and feet, and some treatment of factures in healthy villagers nearby. With this proviso, the total cost of treatment over four years was £1,110 for plaster-of-paris, £105 for felt, but this includes material used in a general dispensary treating 60-70 new cases a day, including fractures. As much was used in the first six months, as was used in each year subsequently. Against this cost will be put the amount saved in daily dressings (bandages, wool, etc.).

During the same period, the work-shop produced 575 pairs of rigid-soled footwear, mainly wooden-soled sandals. For deformed feet, these were carved to the shape of a cast of the foot. Experience suggests that the latex boot if used with toes completely covered is not as satisfactory in Africa as Ross found it to be in India.

Effect of Plaster and Rigid-soled Wear on Plantar Ulcer

	1958	1962
No. of patients in the leprosarium ..	560	439
Patients with ulcers (all types) on day of survey	150	39
Plantar ulcers on day of survey.. ..	122	41
Leprosarium admissions to the ulcer-ward	318	200 (1961)

Comments on the above Table

This shows the effect of treatment pursued with varying persistence for four years. The reduction in total ulcers is partly due to therapy and partly to foot-inspection. Not all admissions to the ulcer ward had ulcers; some were admitted for the pre-ulcerative state (see text).

Summary of Results

The statistics indicate that a reduction of plantar ulcer of more than half has occurred during the period under study. It is the general opinion of the staff and patients that such ulceration as does occur is of small size; there are no longer the large, acute smelly feet with which they were familiar. The "foot-inspector" has been the same individual throughout the period. He does not have exact numbers of his weekly findings, but he states that whereas his weekly examination of the whole leprosarium yielded from 30-40 cases of all types of foot-damage in 1958, his present findings vary from 5-10 per week.

It is concluded that the methods of management practised during this period have contributed to a reduction of more than a half in the incidence and also in the gravity of plantar ulcer.

Ulcer-situation in Rural Areas

No attempt has been made to treat ulcers in rural areas other than by dressings, but a random sample was made during the visit.

A rural leprosy clinic had been examined in 1958, when it was found that of 71 patients seen, 9 patients had 18 plantar ulcers among them. In the present survey, 37 patients were seen, of whom 10 had 17 plantar ulcers. The observation underlines the magnitude of the rural problem, at present untouched, where there are 4,500 patients in treatment and 26,000 ex-patients; many of whom have permanent neuropathy of the feet.

The Long-Term History of Plantar Ulcers

The study of the clinical history of various types of plantar ulcer during the past four years has revealed interesting features of the lesion.

Some of these are presented in the following type-cases. Certain tests used in the final assessment in 1962 were not available in 1958, including the dynamic footprint (DFP) and the "mis-localisation" test (MLT).

The following cases are described:

A. Simple plantar ulcer healed by the primary use of rigid-soled wear.

B. The uncontrolled plantar ulcer.

C. Control of ulceration in anaesthetic feet by intelligent patient.

D. Control of recurrence by rigid-soled wear.

E. Avoidance of recurrence by recognition of the pre-ulcerative state.

F. Ulcers complicated by thrombo-phlebitis of lower leg.

G. The value of care in derelict cases.

H. The unexplained success and the unexplained failure.

Finally, reference is made to two unsolved problems in leprosy—the discharged patient with permanent neuropathic feet, and the derelict cases for whom amputation is the only hope of rehabilitation.

Case A

Simple Plantar Ulcer healed by primary use of rigid-soled footwear

O.S. No. Z2696—Male—*Tuberculoid leprosy* since 1952

23.6.58 RMH_5 2 cms of 4 months' duration. Treated by simple dressing and rigid-soled wear.
2.7.58 1·5 cm.
12.7.58 1 cm.
21.7.58 0·5 cm.
11.8.58 "only a pin-hole remains". Rigid-soled wear continues.

Comment: Several patients have shown that simple cases of ulcer will heal in this way, provided that the patient is sufficiently co-operative not to walk at any time without wearing the sandals.

Case B

The uncontrolled Plantar Ulcer

E.N. No. Z2642 An old *dimorphous* case, discharged as arrested in 1952, but relapsed in 1956. The patient steadily refused help by plaster or footwear.

The following resume includes the lesions as they occurred:
1957 Rt 3rd and 4th MT heads removed for chronic ulcers.
1958 Ulcers at RPPH, RmidMH, RMH_5, LPPH.
1959 RPPH, RmidMH persist.
1960 RPPH and LMH_1.
1961 RMH_1 RMH_4 LMH_1 LPPH.
28.3.62 LMH_1 1 cm; RPPH 1 cm; RmidMH 1 cm.
Left sole completely anaesthetic.
Right forefoot is anaesthetic, but right heel displays MLT.

Comment: This patient is probably an example of the "leprosarium complex". Healing of the ulcers would entail the risk of discharge, and return to village life from which he had been separated for some years. It serves to enable us to observe the natural history of untreated ulcers, and presents a lesson to be learnt.

Case C

Control of Ulcer in anaesthetic feet by intelligent patient

B.E. Z2465—Male—discharged as arrested case of *dimorphous leprosy* in December, 1958. An intelligent, co-operative hospital attendant.

8.58 RMH_1 inspite of previous removal of metatarsal head. Healed after 3 months in walking plaster. Rigid-soled wear.
1959 No ulcer.
1960 No ulcer.
1961 No ulcer.
27.3.62 No ulcers.
Right foot: complete anaesthesia.
Left foot: MLT.
He now wears ordinary sandals, but keeps rigid-soled wear with him for the times when "he feels he needs them".

Comment: This case demonstrates the recognised fact that the outcome of treatment depends on the intelligence of the patient. For this reason, comparative figures of cases are apt to be misleading.

Case D

Control of recurrence by Rigid-soled Wear

F.E. Z93—Male—who was considered as an arrested case of leprosy before the records which go back to 1950.

3.58 LHL ulcer, present for 5 years without healing. Walking plaster. The leg is swollen from old thrombo-phlebitis.
8.58 Plaster off; ulcer healed. Elastoplast stocking applied. Rigid-soled wear.
1959 No ulcer.
1960 No ulcer, but began to abandon rigid-soled wear.
3.61 Lmid-sole ulcer and LHL. Walking plaster 3 months. Both ulcers then healed. Rigid-wear renewed.
1.62 No ulcers.
5.4.62 No ulcers, but he has a necrosis blister of LMH_1 on medial border of foot. Bed-rest.
Left sole: complete anaesthesia.
Right sole: complete anaesthesia.

Comment: It is not always possible to discover whether or not patients really use their footwear. However, the ready response to rigid-soled wear (plaster or sandal) shows that in this case control is related to the use of it.

Case E

Avoidance of recurrence by recognition of pre-ulcerative state

O.O. Z5246—Female—*lepromatous leprosy* since 1942 at age 12. No record of feet before 1958.

5.58 Ulcers RMH_1 RmidMH, LMH_1 LMH_2 Bilateral walking plaster for four months. All ulcers healed.
10.58 LMH_1 LMH_2 Refuses rigid-soled wear.
11.58 Necrosis blister medial side RMH_1. Bed-rest for 20 days. Blister absorbed, all ulcers healed. Still refuses footwear.
1.59 Necrosis blister: medial side LMH_1. Bed-rest 10 days; blister subsided.
2.59 Necrosis blister LmidMH. Bed-rest 20 days. Blister subsided.
3.59 Infected LMH_4. Bed, penicillin the plaster for 4 months. All ulcers healed.
7.59 RMH_1 and RMH_2 ulcers. Plaster 12 weeks. All ulcers healed.
12.59 Necrosis blister RmidMH. Bed-rest. Blister subsided in 8 days. (1960: scanty notes.)
2.61 Ulcers LMH_1 LMH_2 RMH_1 RMH_4. Plaster for 4 months. All healed except RMH_4 0·25 cm. rigid-soled sandals accepted.
9.61 No ulcers.
12.61 No ulcers.
4.4.62 All scars dry except LMH_1 scar which seems precarious.
Right sole: MLT all over.
Left sole: Anaesthesia of forefoot, elsewhere MLT.

Comment: This interesting case shows the fight between the foot-inspector and the tendency to ulceration, which at times breaks through the inspector's net. The success of rigid-soled wear is obvious.

Case F

Ulcers complicated by Thrombo-phlebitis

G.M. No. Z5038—Female with *lepromatous leprosy* since 1944 at age 9.
(No record of feet before 1957.)

4.57 "Thrombo-phlebitis of right leg". No record of ulcer. Hospitalised.
12.57 "Ulcer left foot (sic) for six months".
1.58 LMH_3 and swollen left lower leg. Bed, antibiotics, then elastoplast stocking.
3.58 LMH_3 persists, walking plaster for 8 weeks. Healed. Rigid-soled wear.
5.58 Swollen ankles, but no ulcers.
6.58 Necrosis blister RMH_1. Bed, then elastoplast stocking. Blister subsided.
7.58 No ulcers. Tender RPPH and tender LMH_3 scar.
9.58 RPPH "nearly an ulcer". Bed.
10.58 Ulcer of both tendo achilles due to straps. Bed till healed.
12.58 RPPH ulcer with oedema of foot. Bed, then walking cast 6 weeks. Healed.
1.59 Ulcers healed.
8.59 Left tendo achillis again ulcerates. Viscopaste dressing. Bed.

11.59 No ulcers.
(1960 no notes.)
3.61 Ulcers at RPPH, LPPH and LMH_5.
4.61 RMH_5. Left foot healed. Rigid-soled wear.
12.61 Relapse of RPPH. Walking plaster.
29.3.62 No ulcer on either foot, both lower legs swollen.
Left sole: slow MLT. Right sole: slow MLT medial half, anaesthesia lateral side.

Comment: The occurrence of thrombo-phlebitis is a major set-back, and every effort should be made to control early infection of the foot. The ease with which the foot ulcerates after thrombo-phlebitis is well illustrated above.

Case G

The value of care in derelict cases

A.U. No. Z1091—*Tuberculoid leprosy* since 1944 at age 12.

5.52 "Still has ulcers of feet". Hospitalised for four months.
6.53 "Still has ulcers".
4.54 Hospital for ulcers. "Dead bone removed". Ulcer healed.
8.54 Right 3rd MT head removed.
12.55 Hospital with ulcers both feet.
3.56 "Dead bone removed to try and heal ulcer".
1.57 "More dead bone removed from ulcers. Eventually healed".
3.57 Still ulcers both feet.
8.57 "Dead bone removed".
10.57 "Ulcer of both feet still in spite of all treatment."
2.58 Bilateral walking plasters applied for left mid-medial and RMH_1 RmidMH ulcers.
17.4.58 Plasters off. Both feet healed.
30.5.58 MH_1 and Lmid-med recur. Plaster 3 months. All healed. Rigid-soled wear.
10.9.58 Necrosis blister RMH_1. Bed-rest. Blister absorbed in 10 days.
10.58 Left mid-sole breaking down. Plaster cast till 2.59. Ulcer then a slit.
9.59 Lmid-sole a dry slit; LMH_3 LMH_4 ulcers. Rmid-sole ulcer. Refuses plaster cast.
(1960 no notes.)
1.61 RMH_1 RMH_2 RMH_3 RMH_4 Lmid-sole ulcers. Plaster cast for 3 months. All right foot healed. Left mid-sole a slit.
11.61 Large ulcers both feet. Plaster cast three months. All ulcers healed.
27.3.62 Both feet badly deformed, but no ulcers except two small raw spots on left sole. Complete anaesthesia of both feet. Is wearing tyre-sole sandals, which "suit him better" than rigid-soled wear.

Comment: It appears that further deterioration of the feet is being avoided. But it is problematic whether a more practical result would not be to amputate if adequate prostheses were available. Note that rigid-soled wear is not indicated for feet that are rigid from chronic infection, damage, arthritis, or other cause. It is not yet certain whether sandals with moulded soles (to distribute the weight) or simple soft-soled protective sandals are best for this type of case. Unfortunately, every leprosy settlement has only too many of them.

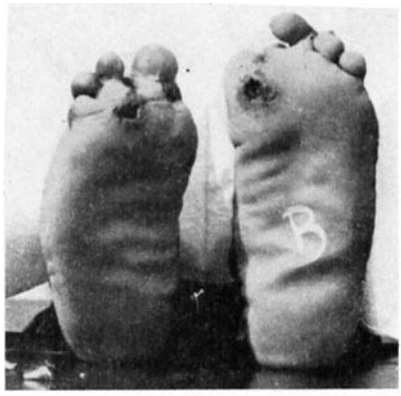
Case H

The unexplained success and the unexplained failure

G.N. Z2479—a male case of *lepromatous leprosy*, in treatment since 1957.

1957 Right 5th MT head excised for chronic ulcer.
1958 No ulcers, but LMH_1 and LMH_5 have tender callosities.
4.59 RMH_5 necrosis blister. Bed. Subsided after 15 days. Rigid-soled wear.
1.60 Necrosis blister of left foot (? site). Bed; subsided in 6 days.
(No further notes in 1960.)
6.61 RMH_5 ulcer, treated with dressings. Patient not wearing rigid-soled wear.
1.62 RMH_5 still present. Patient reluctant to accept plaster cast.
1.4.62 RMH_5 1 cm. Right sole: complete anaesthesia.
Left sole: complete anaesthesia, except for MLT at heel.

Comment: The failure of excision of the metatarsal head is a common observation. It is puzzling to understand why in two feet of similar sensory loss, one foot should continually ulcerate and the other never—though ulceration was



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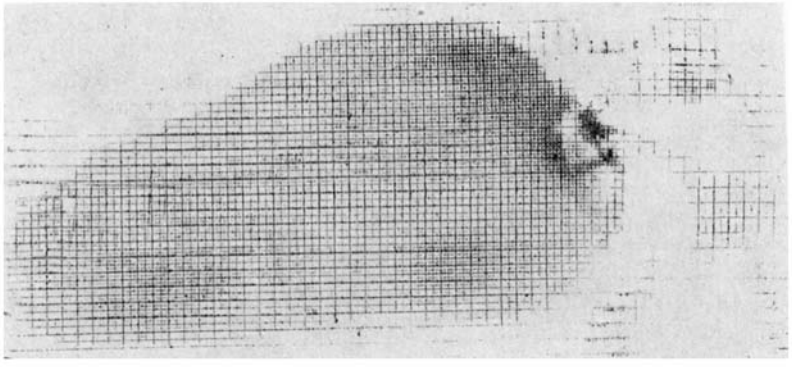

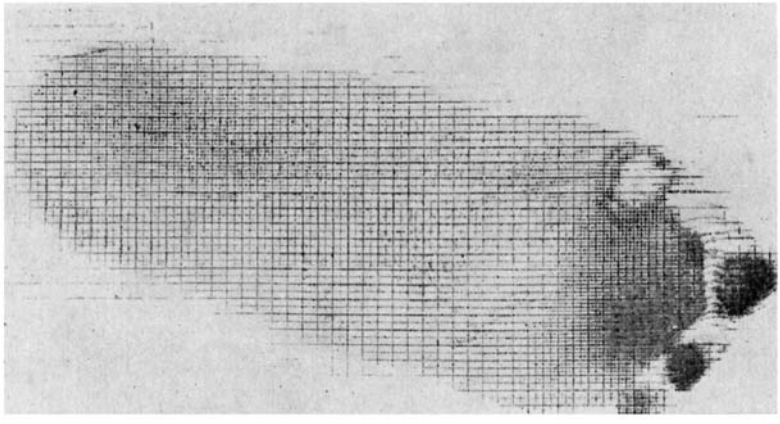

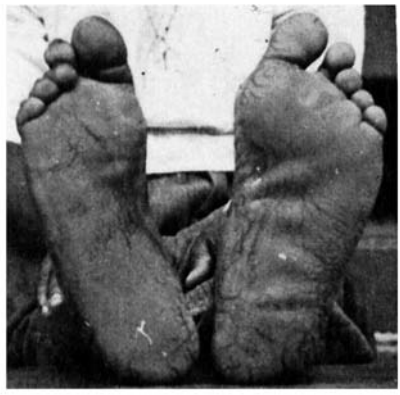

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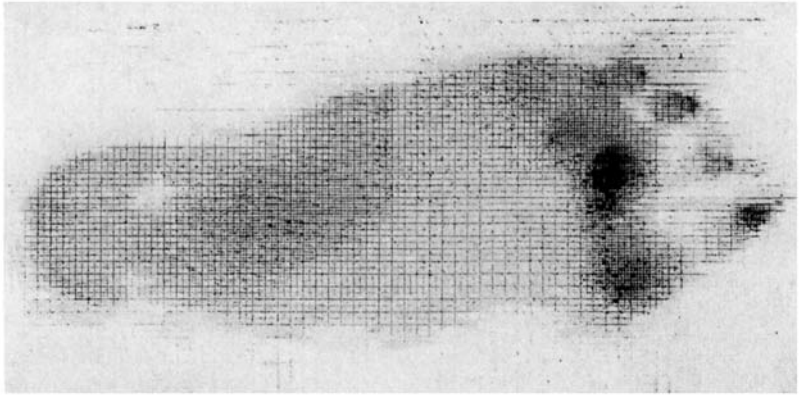

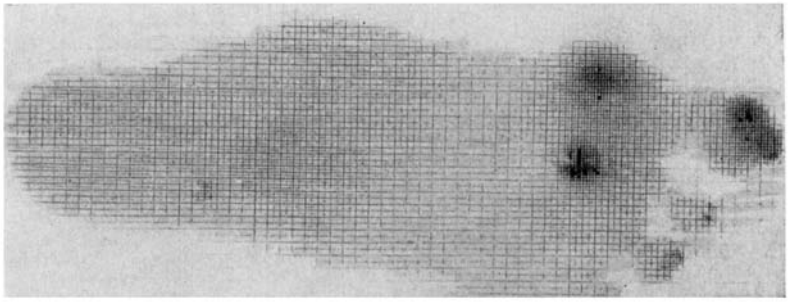

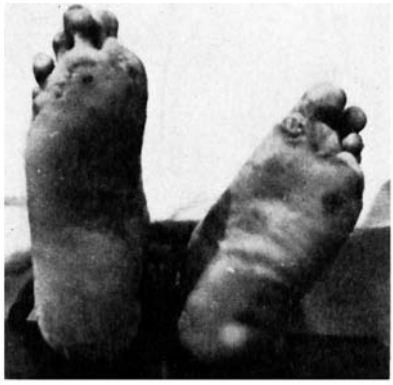

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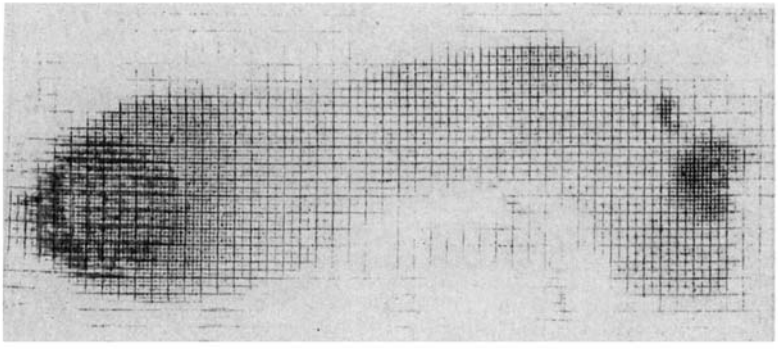
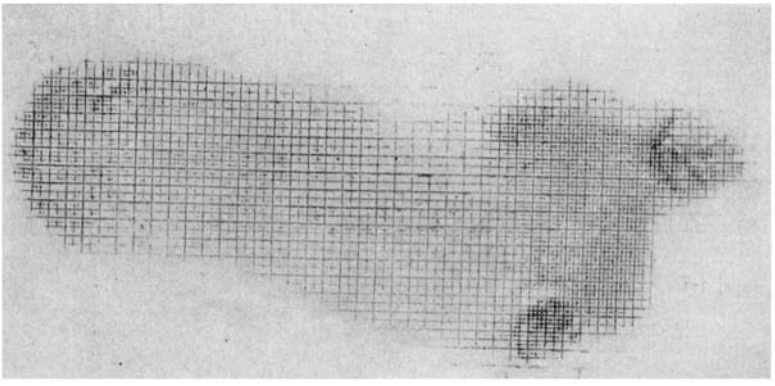
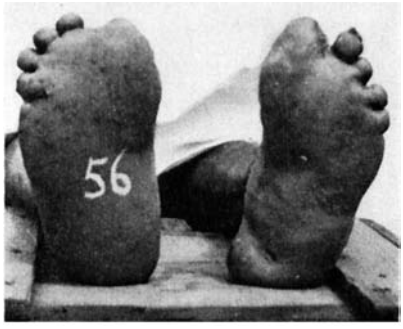
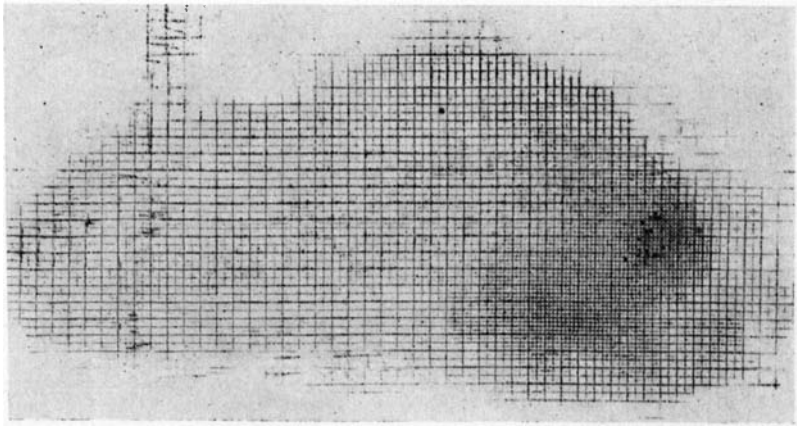
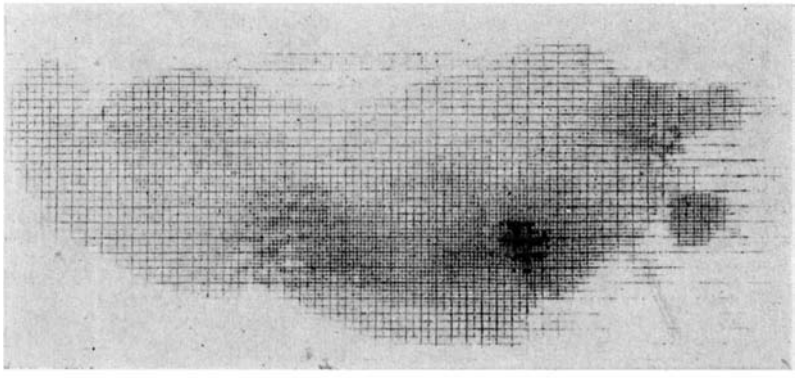


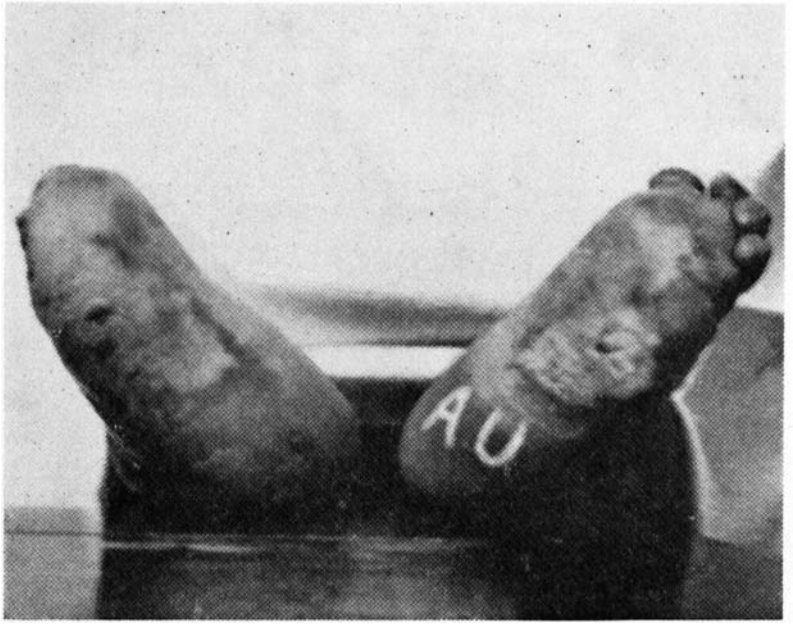




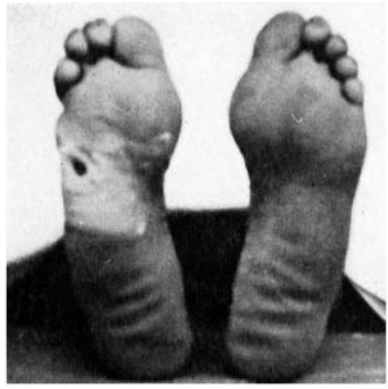
CASE F



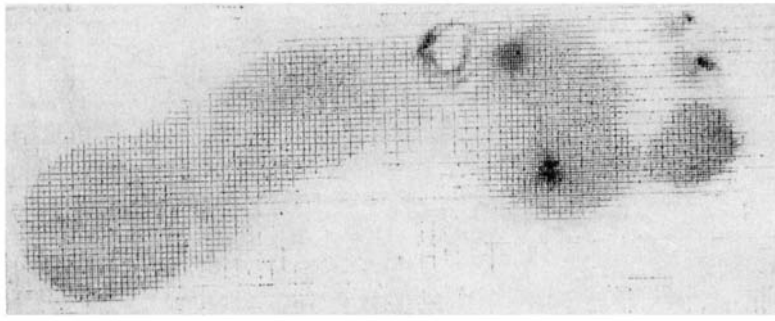


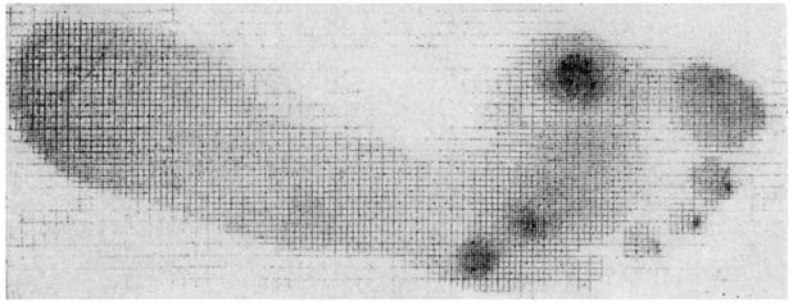


CASE G



CASE H





once avoided by recognition of the pre-ulcerative state. The first ulcer should be avoided at all costs . . . and this can only be ensured by regular foot-inspection.

The Discharged Patient

There is a tendency in leprosy statistics to present only cases that are under treatment, and not those who have been discharged; alternatively, no distinction is made between the discharged case without serious neuropathy and the case with a permanent neural loss. General medical services in many leprosy areas are scanty, and those that exist are often inexperienced in the care of neuropathic limbs. It is likely that "arrested" cases who are exposed to the hazards of permanent sensory and motor loss will need continual care. This work, unfortunately, increases the calls on the already over-burdened leprosy services, but the fact remains that for many thousands the cessation of bacterial activity is in no way an indication of the end of their troubles.

The Derelict Case

The future for cases of advanced foot damage lies in the provision of cheap and satisfactory prostheses for use after amputation of foot or lower leg. This problem remains to be solved though there is promise in the use of polyester resins; a solution is a pressing need if advanced cases are to be rehabilitated.

Summary

1. A survey of the results of treatment in Oji River Leprosarium of plantar ulcer by plaster and rigid-soled wear has been made after four years.

2. In a situation with varying medical staff but with no other method used, there is a reduction of more than half in the incidence of the lesion in leprosarium patients, and a notable diminution in the gravity of those cases that remain.

3. In all existing cases, a reason for persistence of the ulcer is apparent and includes lack of patient co-operation or the presence of a known complication such as irreversible venous blockade.

4. The natural history is given of eight types of cases treated during the period under review.

5. The problems of the discharged patient and the case of advanced foot-damage are underlined.

Acknowledgements.

Grateful acknowledgement is made to the British Leprosy Relief Association by whose generosity the visit was made possible; to the Director of Medical Services, Eastern Nigeria, for permission to visit the leprosarium; and to the Nigerian and ex-patriate staff whose

patience and skill has achieved the results described. The Settlement is under the direction of Dr. W. F. Ross. I am particularly indebted to Dr. W. F. Ross and Dr. Fern who continued the methods of treatment initiated in 1958 up to the present day.

FOOTWEAR AND THE PREVENTION OF ULCERS IN LEPROSY

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Area Superintendent, Onitsha Leprosy Control Area, Oji River, Eastern Nigeria

The footwear to be described in this paper has been developed at Oji River during the past four years. It is the result of pooling of ideas and experience from many different sources including Mr. Paul W. Brand's Institute in Karigiri where the author was privileged to hold a WHO Fellowship in 1960.

The paper is divided into three parts. Section I describes the general characteristics and construction of (a) the sole of the shoe and (b) the upper. Section II describes the indications at present being used for prescribing different types of footwear and Section III gives details of sources of supply of materials.

The sole of the shoe

The trauma of walking, which is the immediate precipitating factor in almost all cases of plantar ulceration in leprosy patients, can be resolved into three components: friction, flexion and impact.

(*i*) *Friction.* Friction acts between the sole of the foot and the walking surface at all stages of walking roll. It is reduced to an acceptable minimum by any type of well made and well fitted footwear. The principal features to look for are:

(*a*) A snug fit in the heel and across the forefoot to prevent chafing inside the shoe.

(*b*) A free space of approximately half an inch between the tip of the toes and the end of the shoe. However well made the upper, during walking the foot oscillates backwards and forwards inside the shoe.

(*c*) Complete absence of rough stitching, nails and other irregularities inside the shoe.

(*ii*) *Flexion.* Flexion acts almost entirely at the metatarsophalangeal joints (PRICE, 1959) and is responsible for a high proportion of plantar ulcers. It can be controlled absolutely by means of a rigid sole and nothing better has yet been suggested for this than the clog sole (PRICE, 1960).

The essential features of the clog sole are illustrated in Fig. 1. To be comfortable and effective it is essential for the clog sole to fit the foot accurately and this is so even though the majority of our clogs now have a resilient insole.

The insole cast must not be so great as to produce excessive dorsiflexion of the toes. This is of great importance in cases where the toes are deformed or where there is any tendency of rigidity at the metatarsal phalangeal joint.

Bridging of the foot in the shoe (Fig. 2) is the result of too much insole cast and will cause ulcers at the tips of the toes.

There must be an effective arch support incorporated in the sole or added later as part of the insole (TURNER, 1961). In a properly made hand carved Lancashire clog much of the weight of the body is borne on the instep and the wearer rocks forwards on to his metatarsal heads only during walking.

The clog soles are carved for us here by a self-taught wood carver (Fig. 3), using traditional and locally made tools and traditional wood—*Rauwolfia macrophylla*. The traditional wood used for clogs in Britain is *Alder*, but most modern clog soles are made of *Beech* and any type of timber which is reasonably light and durable and well seasoned, is suitable.

Clog soles can be purchased ready made, but, though we have found them a little less costly to use than hand made clogs, we prefer hand made clogs principally because it is easier to get a good fit with the hand made sole. The carver should never make a sole without seeing the patient and in many cases a plaster-of-paris cast of the foot is taken to guide him throughout the carving process (Fig. 4). The clog sole can be shod either with split pieces of motor tyre or special clog irons. If it is desired to simplify the clog sole, the heel shank can be left out, but the cast is absolutely essential and should approximate to the standard dimension for Lancashire clogs. For size 8 clogs this is one and a half inches, other sizes in proportion (Fig. 5). Certain categories of patients do not need or will not accept such absolute rigidity as the clog sole provides; for them, we use a simple sandal with microcellular rubber insole; it does not completely eliminate flexion but somewhat reduces it (Fig. 6).

(*iii*) *Impact*. The trauma of impact may be reduced by means of a resilient insole. We have experimented with a number of different materials and have concluded that microcellular rubber of approximately 15 to 20 degrees shore, as recommended by Mr. Paul Brand, is the best general purpose material (ANDERSEN, 1961).

As an insole material for clogs, industrial grade "Rubazote" of half an inch thickness is proving satisfactory here in a pilot trial. We are also experimenting with a sponge rubber insole which can be cold cast to fit the most badly deformed foot accurately. This is an Imperial Chemical Industries product known as 'Silcoset' Foam Rubber.

The Upper

We find the open type sandal upper (Fig. 7a) most satisfactory as it

requires very little skill to make it and is quite cheap and easy to repair.

The clog uppers must be fixed to the sole with braised nails as ordinary nails rust too quickly. We have also found button clasps (Fig. 7b) a useful substitute for buckles for patients whose hands are too badly deformed to be able to use the buckle fitting.

Indications for Footwear

(a) *The foot with no previous ulceration.* This is the most important foot to care for. Fortunately it is not necessary to provide all leprosy patients with protective footwear. Although it is not possible to be dogmatic, the following indications have proved of practical value:

(i) Feet showing misreference (WEDDELL, G.) of more than 2 cm. (Fig. 8).

(ii) Feet with oedema and tenderness over the metatarsal heads (PRICE 1959).

(iii) Feet with atrophy of the skin associated with lepromatous leprosy.

The great majority of feet in the above categories can be protected from ulceration by a pair of microcellular rubber slippers. A few feet in category (ii) may need rigid sole shoes. The patients are on the whole rather resistant to wearing the rigid sole shoes and, as these shoes are considerably more costly to make than the simple micro-cellular rubber sandal, our policy is to issue these patients with the simple sandal. After the initial treatment by bed rest, we watch them carefully at weekly intervals. Later, clogs are made if necessary.

The microcellular sandal consists of exactly the same material as the insole material described in Section I (a) (iii) (Fig. 6).

(b) *The Rigid Foot.* Flexion is no longer a problem in this type of foot and re-ulceration can, in most cases, be controlled by simple micro-cellular sandals (Fig. 9). If the plantar surface of the foot is so grossly scarred and so deformed that weight is borne on one or two prominent points (Fig. 10), then, rigid footwear with a soft insole accurately filled to the contour of the foot is essential.

Formal surgical correction is not often possible in these feet, but "tidying up operations", for example, the removal of the deformed and twisted toes are well worthwhile if the patients can be persuaded to accept them.

(c) *The Scarred but still Mobile Foot.* Even following the surgical correction of paralytic deformities, this type of foot must be shod with rigid sole shoes preferably with a soft insole, even if the patient has had only one ulcer. This statement holds good for the first two years after the ulcers heal. After that, if the patient has learned to care for his foot, he may then be able to remain ulcer-free using microcellular rubber sandals.

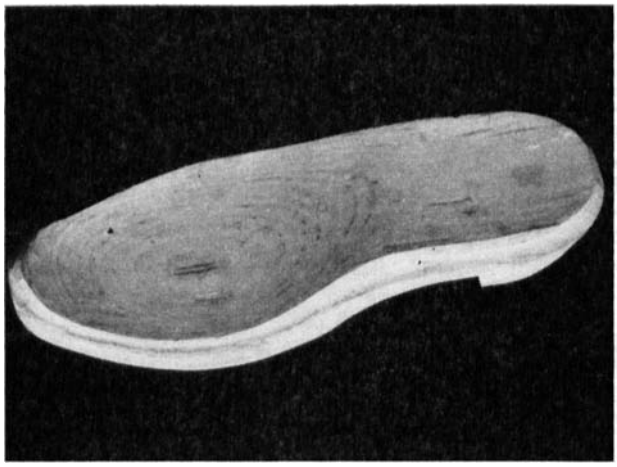

FIG. 1. Photograph of Lancashire clog. Sole made by R. Turner of Clitheroe. The cast, i.e., the amount of turn up of the toe is 1½ inches. The upper surface is slightly concave from side to side and there is a carved in arch support. The groove round the upper edge of the sole is called the "grip" and is only required if a boot type upper with a waterproof joint is needed.

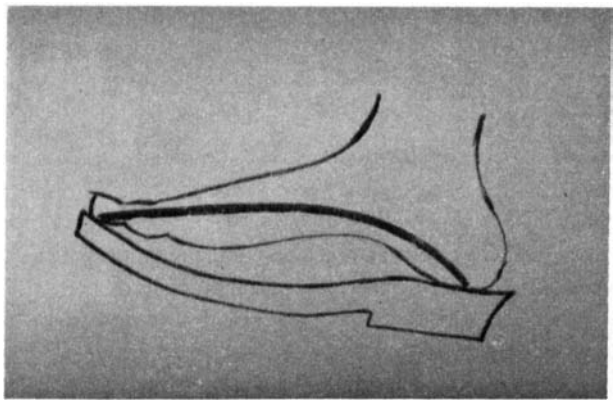

FIG. 2. Diagram to illustrate "bridging". This occurs if too steep an insole cast is used with a rigid or deformed foot.

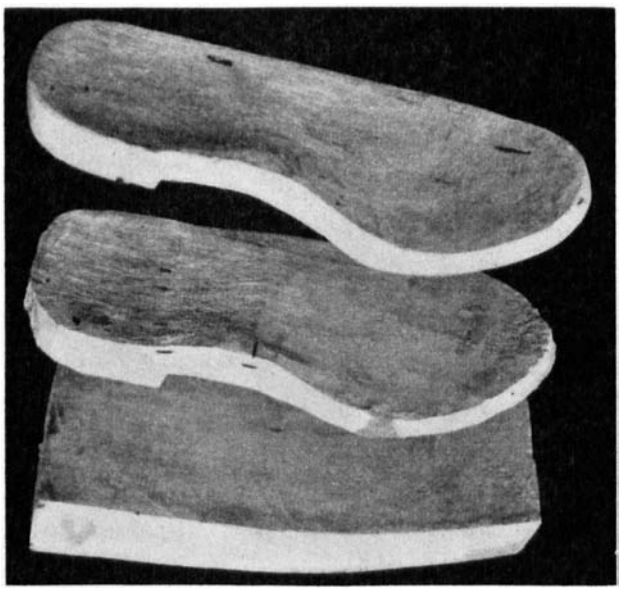

FIG. 3. Photograph to show three successive stages of clog making:
i. The wooden block. ii. The rough carved sole. iii. Finished sole.

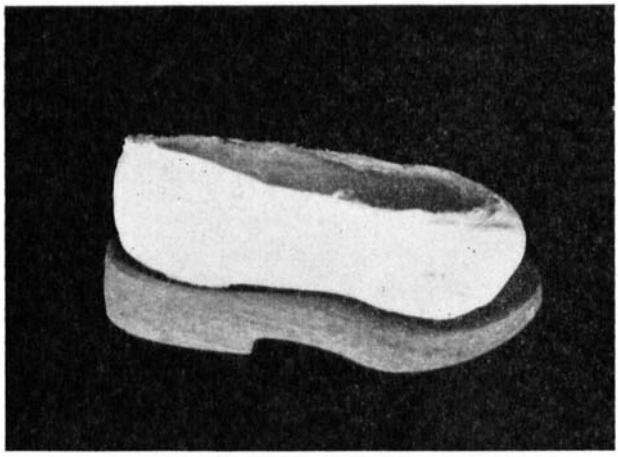

FIG. 4. Photograph to show Plaster-of-Paris cast used to guide the carver in making a special carved clog for a deformed foot (PRICE 1959).

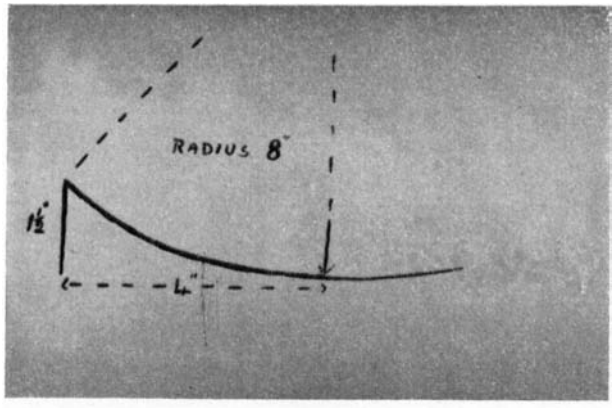

FIG. 5. Diagram to show the cast. The under sole curves smoothly upwards from the mid-sole to the tip of the clog.

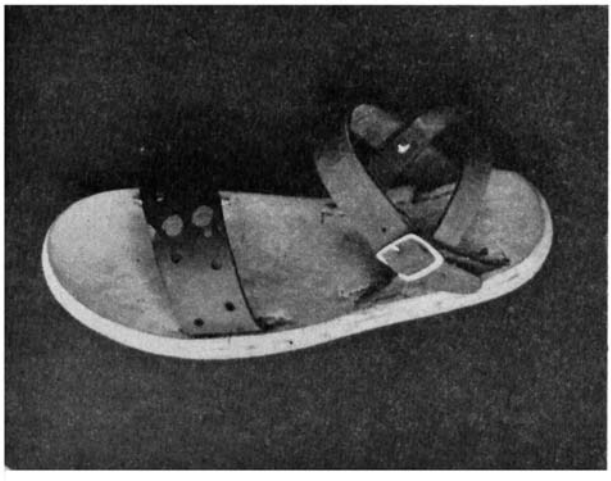

FIG. 6. Photograph of the microcellular rubber sandal. In this case the upper is made of rubber (strips cut from inner tubes). Leather or canvas strips can also be used.

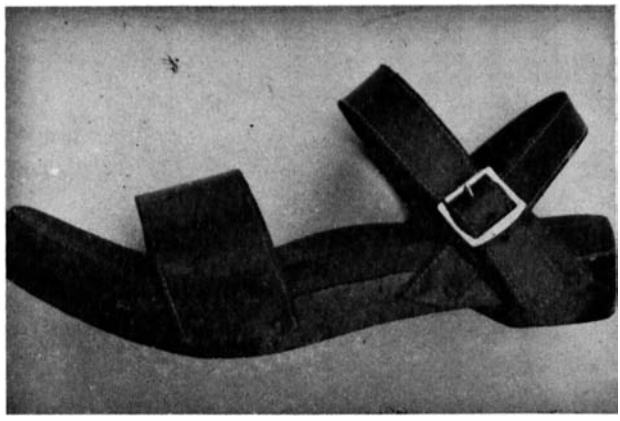

FIG. 7A. The clog. This clog has a "Rubazote" insole. The upper is of leather.

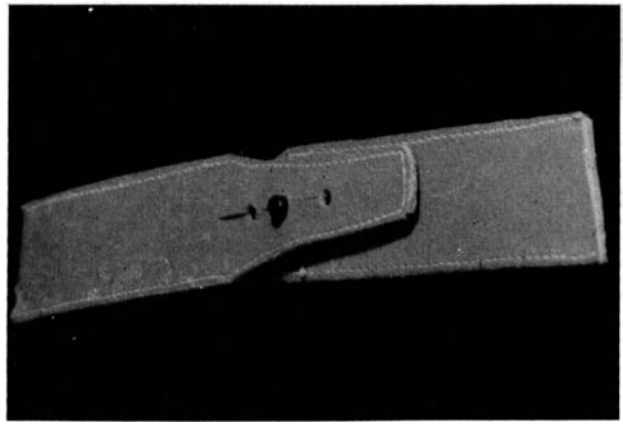

FIG. 7B. The button clasp. A simple studlike device which can be manipulated by badly deformed hands.

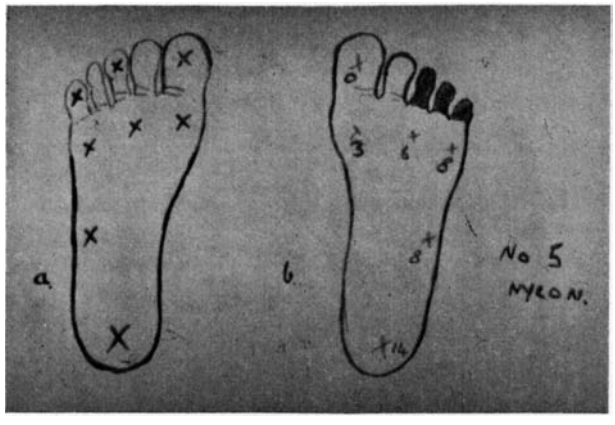

FIG. 8. (*a*) Diagram to show the plan used to record misreference quickly. Standard points marked X are tested in random order and degree of misreference if any recorded in centimetres. (*b*) Misreference map be taken from case records.

FIG. 9. Foot print (Harris and Beath Mat) of a patient with scarred but broad based foot successfully treated with microcellular rubber sandal.

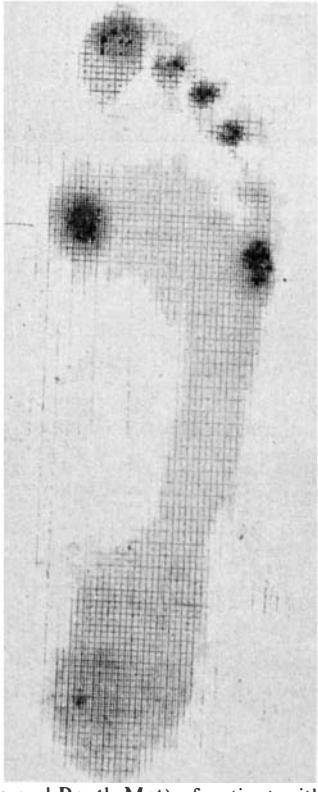

FIG. 10. Foot print (Harris and Beath Mat) of patient with rigid foot and spots of high pressure needing special carved clogs.

(d) *The Healed Heel Ulcer.* "Patients who have had heel ulcers must have rigid sole footwear with resilient insoles" (WARD, D.). For practical purposes, this dogmatic statement is, in my experience, true and although a few patients with heel ulcers can get away with wearing microcellular rubber sandals, the large majority have to continue to wear rigid sole footwear.

Sources of Supply

(a) *Microcellular Rubber:* Nigerian Shoe Factory Limited, P.O. Box 141, Kano.

(b) '*Rubazote*': Expanded Rubber Company, Mitcham, Croydon, England.

(c) *Buckles, Button Clasps and Irons for Clogs:* James Horsefield Limited, 26 Paradise Street, Sunbridge Road, Bradford.

(d) *Braised Nails:* Charles Lane and Sons Limited, Leeds Nail Works, Leeds 10.

(e) *Manufactured Clog Soles:* British Clog Manufactures Limited, Snaithe, Goole, Yorkshire.

(f) '*Silcoset*' *Rubber:* Imperial Chemical Industries Limited, Hexagon House, Blackley (P.O. Box 42), Manchester 9, England.

(g) *Adhesives:* An excellent adhesive can be made in countries where rubber is produced by dissolving smoked rubber sheet in petrol.

(h) Technique of hand making of clogs (R. Turner, 82/86 Lowergate, Clitheroe, Lancs.)

Appendix

The footprint mat was obtained through the courtesy of Dr. Harris of Toronto who invented the mat (Hardy and Clapham). The mat has a smooth upper surface, the under surface bears a set of intersecting rubber ridges of different heights designed to give an indication of the pressure over the sole as a whole. A study is being made of foot prints in normal people and in leprosy patients with or without anaesthesia and will be published in due course. It is our impression that this is going to be a most useful clinical instrument for helping to assess the type of footwear needed by leprosy patients.

Acknowledgements

The author gratefully acknowledges the fact that the Shoe Workshop at Oji River was initiated by E. W. Price, M.D., F.R.C.S., and it is on the foundations laid by him in 1958 that the work has developed. Special thanks are also due to David D. Ward, M.C.S.P., who is in charge of the Shoe Workshop at Karigiri.

I thank Dr. S. E. Onwu, M.V.O., O.B.E., Chief Medical Officer,

Director of Medical Services, and Permanent Secretary to the Ministry of Health, Eastern Region, Nigeria, for permission to publish.

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*ALECTRA PARASITICA
A. Rich (variety *Chitrakutensis*)
An indigenous drug in the treatment of leprosy in Bihar —a preliminary observation

By BIRENDRA N. PRASAD, M.B., B.S., PH.D.
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Introduction

Only two years back an indigenous plant was brought to light by the former Health Minister of Bihar, Shri B. C. Patel, who very sincerely wanted the plant to be scientifically assayed for the treatment of leprosy. This plant was shown to be effective in "Kushta" by the practitioners of indigenous medicine.

On investigation it was found out that the plant was unknown and unnamed till now. A botanical expedition arranged by the Botanical Survey of India to the Central India discovered this plant. Its identification was confirmed by Kew Herbarium, London, and it was named *Alectra parasitica* A. Rich. (*Var. Chitrakutensis*).

This is a parasitic plant which grows on the root of Vitex Nigundo. It springs up during the rains and sucker rhyzome matures in the month of October and November, when it is collected. Dried powder of the mature rhyzome is used for the treatment of leprosy.

It has been used in powder form against leprosy by the practitioners of indigenous medicine in a dose of 90 grains per day in divided doses.

In order to put this drug on scientific basis it was decided to investigate its pharmacognosy and phyto-chemistry. The chemical composition of the plant has been determined (PRASAD and GOEN, 1961) and has been found to contain some alkaloid, the nature of which is still to be determined. Other detailed investigations about pharmacological properties and clinical evaluation are proceeding.

On screening it was found that the crude drug was active against *M. tuberculosis* in a concentration of 6 per cent or above (in vitro).

Method and Material

10 cases each of lepromatous and tuberculoid type of leprosy were chosen for study during the period of January 1961 to February 1962 at the Drug Research Section of the Institute of Pharmacy. The patients belonged to different districts of Bihar and had agreed to visit the centre at regular intervals and when called for.

The drug powder was made into tablet form of 0·5 gm. and was given in a dose of 8 tablets daily orally in divided doses. A dose more than 4 gm. was not tolerated by the patients.

* Original paper read in the All India Dermatological Congress—1962, Calcutta.

The scheme followed for the research was:

1. Clinical examination of the patient.

2. Photograph of the patient was usually taken.

3. Bacteriological examination of the skin smear formed the basis for confirming diagnosis. In lepromatous cases number of bacilli under 1/12 eye piece of microscopic field was determined before the therapeutic trial was started.

4. The cycle of physical examination and microscopic examination was repeated every six months.

5. Blood examination—Total count, W.B.C. count, differential count and Haemoglobin percentage were done in every case.

Results

In the tuberculoid type of leprosy patients were relieved of tingling in 6 months time. It was accompanied with diminution of the area of the anaesthetic patch. It was noted that anaesthesia began diminishing first at the periphery. There was spectacular effect on the thickness of the nerve during this short period particularly in one case. The depigmentation gradually diminished in intensity. The tuberculoid group of cases were bacilli free from the very beginning.

In lepromatous cases all the patients showed extensive lesions all over the body. Acid fast-bacilli were present in all the samples of skin smear. On treatment with the drug under investigation, the raised erythematous patches became flattened out, lost their erythema and were changed to dark hue in two months' time. The overlying skin became shrivelled due to decrease in infiltration. The lesions to respond first were on the extremities, then those on the trunk and last of all the facial lesions responded.

After 6 months the number of acid fast bacilli decreased to an enormous extent from (++++) to (+). The patients were satisfied and they always came with a feeling of well-being.

The nasal smear became negative after 6 months of therapy.

Discussion

Daily dose of 4 gm. was tolerated well by the patients. Any increase in dosage was followed by a few loose motions. Otherwise there was no other side reactions. The drug in powder form was bulky and not convenient for the patients to carry and take. They liked tablets and the tablet form being more convenient was adopted during the trial.

During this short experience the drug has been found free of any toxic reactions. No untoward action could be noted on the erythropoetic system nor was there any case of sensitization. Further work is being done.

Summary

It may be concluded from the short preliminary clinical trial on a very limited number of patients that this indigenous drug has a definite role in the therapy of leprosy. An evaluation of the drug for over one year has shown encouraging results. It deserves further clinical trial, in a more systematic way in different recognised institutions to arrive at a conclusion.

If the alkaloid is made available in pure form, it will be possible to proceed with the systematic work of finding out the pharmacological action, absorption and excretion, toxicity, dosage and then its clinical evaluation and with this end in view, the work is being continued.

Acknowledgement

Acknowledgement is due to Messrs. Baidyanath Ayurved Bhavan, Patna, for the generous supply of indigenous material for clinical and chemical evaluation.

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LETTER TO THE EDITOR

MINISTRY OF HEALTH,
P.O. BOX 8093, CAUSEWAY, SALISBURY,
RHODESIA AND NYASALAND.

Dear Sir,

I have read with great interest the paper by Dr. N. D. Fraser of the Mission to Lepers which appears on pages 141 to 153 of the *Leprosy Review* Vol. 33 No. 2 of April, 1962. The report does however contain some inaccuracies which you may consider should be drawn to the attention of the author. It is not unexpected that the Federal organisation in Rhodesia and Nyasaland has rather confused Dr. Fraser.

Dr. Currant was not the Leprosy Specialist for the Federation; the Federal Ministry employs three Leprosy Specialists all on the highest specialist scale, one stationed in each Region, Dr. Griffiths in Northern Rhodesia (who has replaced Dr. Currant), Dr. Currie in Nyasaland and Dr. Allan in Southern Rhodesia. Dr. Currant was therefore not the Leprosy Specialist of the Federation but the Leprosy Specialist for the Northern Rhodesia Region of the Federal Ministry of Health.

Later on page 147 there is reference to the Health Department of the Northern Rhodesia Government. This Government has no health department and it is obvious that Dr. Fraser really meant to refer to the Northern Rhodesia Region of the Federal Ministry of Health. This confusion is not really very surprising because it is not really very usual that Health should in a Federal system be a Federal rather than a regional responsibility, although here the Constitution does not bar the Territorial Government from operating in the health field. They would, however, be rather unlikely to do so when the allocation of financial responsibility for the subject rests with the Federal Government.

Yours faithfully,

I. M. BLAIR,
Secretary for Health.

REPORTS

The Gambia Leprosy Control Project. Summary of Annual Report for 1961. By I. A. SUSMAN, M.B., CH.B., D.T.M.&H. *Medical Officer, Leprosy, Mansakonko, Gambia*

1. Introduction

This year has been one of re-organisation of the department, which is still in the "Project" stage and is not yet a "Service".

A "Service" must include facilities for medical and surgical treatment, physiotherapy, rehabilitation, laboratory procedures, isolation accommodation, etc.

The former Medical Officer, Leprosy, left the Gambia early 1960 and was replaced in March 1961. Meanwhile BELRA had supplied a layworker, Mr. F. Mead who, as Leprosy Control Officer, supervised the Project until the arrival of the Medical Officer.

The activities until March were apparently carried on according to the former plan of the Project using static clinics at Health Centres, dispensaries and sub-dispensaries, for the distribution of DDS tablets. For various reasons, given below, a high percentage of absenteeism was prevalent throughout the clinics.

The M.O. Leprosy did an initial tour of the whole country in March/April and then proposed a new plan of operations based on Mobile Treatment Circuits which was later put before, and discussed with representatives of WHO and UNICEF

Several difficulties and drawbacks were experienced including the absence of a Leprosy Headquarters and Centre, lack of efficient transport, no laboratory facilities, etc., and the difficulties of travel on very poor roads, especially during the rainy season when floods, broken down bridges etc., at times completely prevented trekking.

A new dosage schedule with DDS which still remains the standard treatment of patients, and is administered orally to a maximum of 600 mgm. once per week, was introduced.

Although facilities are not yet available to carry out controlled trials with new drugs, three patients at Allatento Isolation Village were started on Etisul (Etip, Diethyl dithiolisophthalate) in addition to DDS towards the end of the year.

A system for the prophylactic treatment of child contacts of contagious patients using a mixture containing DDS and Multivite was introduced for trial.

New specially designed printed registers replaced the old foolscap books; and clinic tickets, and Transfer Certificates (in English and French) were put into use.

A new system of compiling Monthly Return Forms by the Staff was introduced.

Stress was laid on the importance of propaganda, using posters in English and Vernaculars.

The Gambia News Bulletin published an article headed "Leprosy Sufferers Cured" to show that the first batch of patients ever in the Gambia had been issued with Discharge Certificates.

The Inspecteur lèpre de l'O.C.C.G.E. of the Institut Marchoux, Bamako, Mali, paid a liaison visit in July.

Courses of Instruction were held at the station of the M.O. leprosy, for all old and new staff, during the year, consisting of the elements of Anatomy, Physiology, Public and Personal Hygiene and First Aid and a more detailed study of Leprology, including the keeping of necessary records.

2. Statistics

At 31st December 1961 there was a total of 4,135 cases registered for treatment of whom approximately 39% were children, 33% women and 28% men.

At the beginning of 1961, for comparison, there were 6,275 patients registered but the rate of absenteeism was high and only about 30-40% of this total were regularly attending.

During the year, 1,152 new patients were put on to the registers.

From the last quarterly return of patients under treatment for 1961, the following figures were obtained.

Men	*Women*	*Children*	*Total*
1,144	1,357	1,634	4,135

These patients were distributed in the various Divisions as follows:

	Men	*Women*	*Children*	*Total*
Colony	53	33	15	101
Western Division	203	184	169	556
Lower River Division	365	494	569	1,428
MacCarthy Island Division	321	386	455	1,162
Upper River Division	202	260	426	888
Grand Totals	1,144	1,357	1,634	4,135

Therefore, by calculation, 3,292 patients had been removed from the registers during the year. 72 had died, 229 were discharged and 2,991 had absconded.

The reasons for this large number of patients who abandoned treatment appear to have been long distances to travel to the clinics, ulcers and deformities of the feet, self transfers of Gambians to clinics in neighbouring Senegalese territory, and the return home of

"French" subjects. In addition, loss of interest by the patients due to irregularity of attendance of the Assistant Leprosy Inspectors at the clinics, especially due to lack of transport, also contributed to this large degree of absenteeism.

However, a number of absentees were starting to return to treatment and the attendance rate was increasing with the inauguration of the new system of Mobile Circuits.

After the Clinics had been re-organised with the new registers, which did not record those patients who had been absent for more than ten weeks prior to the new entries being made, there was an increase in the attendance rate to between 50 and 90% at most clinics. This was, as stated, mainly due to the establishment of Mobile Treatment Circuits in some districts.

The Lepromatous rate has been estimated at 5-6%.

It has also been estimated in previous surveys that the incidence of Leprosy in the Gambia is between 20 and 30 per thousand, that is, between 8-10,000 cases.

A country-wide tour of all the leprosy clinics was started in November by the M.O. Leprosy in order to examine all the patients attending, to verify diagnoses, to record particulars of the disease and to issue Discharge Certificates to those in whom the disease was cured or arrested.

No. 1 certificate was issued to a young woman, completely recovered and fit without any residual stigma of the disease, at Kiti in the Western Division.

At 31st December, the following numbers of patients had been examined at clinics in the Colony, Western and Lower River Divisions:

	Men	*Women*	*Boys*	*Girls*	*Total*	%
Lepromatous	35	16	5	1	57	6
Dimorphous	17	28	5	2	52	5·4
Tuberculoid	240	291	153	156	840	87·5
Indeterminate	—	6	—	9	15	1·1
Grand Total	292	341	163	168	964	100

Of this grand total, 229 (24%) were issued with Discharge Certificates and are hoped to be kept under periodic (six monthly) observation.

The tour is being continued till May 1962, after which it is hoped to have a complete pattern of the types of leprosy and its complications occurring throughout the Gambia.

3. Staff

The Staff of the Leprosy Project on 31st December consisted of:

1 Medical Officer, Leprosy, i/c at Mansa Konko, L.R.D.

1 BELRA layworker, as Leprosy Control Officer, at Bansang, M.I.D.
1 Leprosy Inspector, grade II at Mansa Konko, L.R.D.
12 Assistant Leprosy Inspectors—2 in W.D.
4 in L.R.D.
4 in M.I.D.
2 in U.R.D.
2 Clinic Assistants (Leprosy)—in L.R.D. and U.R.D.
1 Clerical Assistant at Mansa Konko, L.R.D.

The assistance of some Dresser/Dispensers was retained for conducting leprosy clinics at certain stations.

4. Transport

Two UNICEF Land Rovers were in use by the M.O. Leprosy and the L.C.O. (BELRA).

Four of the eight motor cycles supplied by UNICEF had to be withdrawn owing to constant break-downs and long periods of unserviceability. (The remaining four were withdrawn at the beginning of 1962.)

A few government bicycles were in use and new ones were awaited for all the A.L.I.'s.

5. Out-Patient Treatment

At the beginning of the year, treatment was being carried out solely at static clinics—that is, at established Health Centres, Dispensaries and Sub-dispensaries. This system meant that many of the patients had to walk anything up to 10 miles and even more, each way, in order to get their DDS. This was one of the main reasons for the high rate of absenteeism.

In May, the first Mobile Treatment Circuit was introduced in Brikama, W.D., area by means of a motor cycle.

By this system, treatment is taken as near to the patients' homes as possible.

During the year, such circuits were introduced from eight other centres, some being carried out by means of a motor-cycle, and others, a push-bicycle.

Unfortunately, the motor cycles had to be withdrawn and even some of the push-bikes became unreliable.

However, a reduced rate of absenteeism was attained, and also an increased number of patients registered, in those places where the circuit was maintained.

It was intended to extend this method of giving treatment to every station as soon as transport became available.

The circuits varied from about 70-200 miles covered each week, depending on the vehicle which was being used, and treated some 50-200 patients daily spread over 5-10 or more "Stops".

The "Stops", where no building such as a Dispensary was available, consisted simply of shelters of wood and leaves, or Krinting (bamboo) put up by the patients themselves or the Alkalo (Headman). In many cases, the clinics were held under the shade of a large tree at the outskirts of the Village.

6. Allatento Isolation Village

This is situated on the main road about 1 mile west of Bansang Hospital in the MacCarthy Island Division of the Protectorate.

It consists of ten mud huts with thatched roofs and a new treatment block. There are cooking and sanitary facilities.

Plans for improvements and extensions are being carried out.

On 31st December, there were 17 patients resident, as follows:

	Men	*Women*	*Boys*	*Girls*	*Total*
Lepromatous	7	2	1	—	10
Dimorphous	3	—	—	—	3
Tuberculoid	4	—	—	—	4
					17

Weekly DDS has been the means of treatment. It is hoped to be able to introduce a daily routine in the future.

Although facilities were not available for controlled testing of new drugs, three severe lepromatous patients were put on to Etisul liquid (kindly donated by I.C.I.) in addition to their DDS, and clinically, were showing excellent improvement.

Several of the patients run their own private farms (groundnuts and coos) around the village.

7. Plans for the Future

The most important and pressing need is for a Leprosy Headquarters and Centre including, of course, hospital accommodation.

A laboratory service is vital—at least, facilities for bacteriological examinations even if only field work is being done.

It is hoped that Mobile Treatment Circuits by means of Land Rovers (provided by UNICEF), instead of bicycles, will eventually cover the whole country, bringing treatment as near to every patient's home as possible. It has, of course, been shown in other countries that the most efficient method of mass treatment is the Land Rover Circuit.

When sufficient and efficient transport (in the form of Land Rovers) becomes available, then the Project Staff (under present circumstances inadequate) will become available to carry out more extensive examination and supervision of contacts, detection of new cases, and investigation of patient absentees.

A survey of all school children in the Gambia is planned on the P.T.S. (Propaganda—Treatment—Survey) system in the future.

Additional Notes

The territory of the Gambia consists of the British Colony and Protectorate in West Africa extending along both banks of the River Gambia to a distance of 7-15 miles and for about 300 miles from its mouth. It is an enclave of the Republic of Senegal and it has an area of about 4,000 square miles and a population of about a third of a million. The country consists largely of creeks and swamps. Bathurst is the capital, situated on an island at the mouth of the river. Ground-nuts are the chief export.

The high estimate of 8-10,000 cases (2-3%) of leprosy in the Gambia, given above includes disabled and burnt-out cases and those still requiring to come under treatment.

A much smaller proportion of the children, as compared with adults, are of the lepromatous type.

Although a rather higher proportion of women than men are under treatment in the Gambia, a larger proportion of the lepromatous patients are men. Usually, the disease has a higher incidence in males, especially adults. This is said to be probably related to men's generally greater exposure to the disease by reason of their daily occupation outside the home, but this does not apply in the Gambia.

The predominant type of leprosy in the Gambia is tuberculoid in nature, but a large percentage of these cases appear to have suffered deformities and mutilations of the hands and feet.

In the Gambia, the stigma attached to the disease does not appear to be nearly as marked as in many other countries.

The Gambia Leprosy Control Project first came into the stage of implementation in August 1957.

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Carville Host to Missionaries

The Third Seminar on Leprosy in collaboration with the American Leprosy Missions, Inc., New York City, was hosted by the U.S. Public Health Service Hospital at Carville, 5th April, to 11th April. Thirty-seven missionary doctors, nurses, and administrators, from more than 15 countries, including Viet Nam, Thailand, Liberia, Pakistan, Ghana, Nigeria, India, Korea, Paraguay, and West Africa, gathered to share experiences and knowledge, and to study together with the Carville staff.

The group was welcomed late Thursday by Mr. James C. McCullough, Carville's Training Officer. Following this, Dr. E. B. Johnwick, Medical Officer in Charge, reviewed, for the participants, the Historical Development, Objectives, and Administrative Structures of the U.S. Public Health Service Hospital at Carville.

Friday's programme was chaired by Dr. E. B. Johnwick, who discussed "Trends in Leprosy Control". It also included Dr. Paul Fasal, Consultant to the U.S. Public Health Service in San Francisco, California, who conducted the presentation on "The Clinical Aspects of Leprosy" and presented a number of cases. Later in the day, Dr. George L. Fite, Chief of the Laboratory Branch at Carville, presented material on the "Pathology of Leprosy", and Dr. James C. Callaway of Carville discussed the drugs used in modern treatment of leprosy.

Dr. Oliver W. Hasselblad, President of the American Leprosy Missions, Inc., conducted a panel discussion Saturday morning on "The Recruitment, Preparation, and Training of Leprosy Workers". Panel members included Dr. Fred Scovel, who has served in India and China, Dr. Harold Brewster of the Methodist Board of Missions, and Dr. Olaf Skinsnes, Professor of Pathology, University of Chicago.

Sessions on Monday, 9th April, featured Dr. Marvin F. Miller, Professor of Psychiatry, Louisiana State University School of Medicine, on "The Psychiatry of Leprosy", Dr. John R. Trautman, Chief, Clinical Branch, Carville, on "Complications of Leprosy and Their Management", and Dr. William B. Snyder, Carville, on "Ophthalmology in Leprosy". The concluding session for the day was a clinic of Representative Orthopaedic Problems conducted by Dr. Daniel C. Riordan of New Orleans, Louisiana.

Tuesday's sessions included a slide demonstration of "The Implications of Leprosy in Dentistry" by Dr. Raymond P. Breaux, Carville staff, Demonstrations in Physical and Occupational Therapy by Carville staff members; a "General Survey of Leprosy Research" by Dr. George L. Fite. The concluding session for the day on the topic of "Nursing Procedures" was conducted by Sister Alphonsa, Director of Nurses at Carville.

The final day of the seminar featured a panel discussion on the

subject of "Meeting Field Problems in Leprosy Work" led by Dr. Oliver W. Hasselblad, including Dr. Robert F. Goldie, who served in Ghana, Dr. J. R. Schmidt, on home leave from Paraguay, and Dr. Tinsley Smith, from the Congo.