The Quarterly Publication of
the British Leprosy Relief Association

LEPROSY REVIEW

VOLUME XXXVI NO. 2 APRIL 1965

PRINCIPAL CONTENTS

8 PORTMAN STREET LONDON W1

Five shillings plus postage Annual subscription one pound sterling including postage

LEPROSY REVIEW

VOLUME XXXVI NO. 2 APRIL 1965

Contents

Edited by Dr J. Ross Innes, Medical Secretary of the British Leprosy Relief Association, 8 Portman Street, London, W.1, to whom all communications should be sent. The Association does not accept any responsibility for views expressed by writers. Printed by Eyre and Spottiswoode Limited, Her Majesty's Printers, at Grosvenor Press, Portsmouth.

Contributors of original articles will receive 25 loose reprints free, but more formal bound reprints must be ordered at time of submitting the article, and the cost reimbursed later.

Editorial

1 'LEPROSY REVIEW' CONTINUES UNDER ITS OLD NAME

To keep the record straight because International Journal of Leprosy **32,** 2, 1964 in a news item misquoted *The Star* and conveyed the impression that *Leprosy Review* was called 'Lepra Magazine' and published twice a year, it is necessary to ask our readers to note that this is not correct, and *Leprosy Review* will continue to be published as such under that name, four times a year.

2 FORTHCOMING CONGRESS OF THE MEXICAN SOCIETY OF DERMATOLOGY

We have been informed by the Secretary, Dr Francisco Xavier Olivares, of this Society that from 13th to 16th October, 1965, the Mexican Society of Dermatology will hold its third Congress in the City of Monterrey, Mexico, and the subjects will be occupational dermatology, syphilis, collagenosis, cutaneous oncology, mycosis, leprosy and other subjects. Further information can be obtained from the Secretary, Ensenada 209 Ote. Col. Mitras, Monterrey, N.L. Mexico.

3. PRICE INCREASE OF LEPROSY REVIEW

With much regret it has been found necessary to double the subscription to *Leprosy Review*. This has been due to investigation of the rising costs of printing and it is intended that, in order to cover the cost of production, the price for a single copy of the Journal will be sh10/– whereas hitherto only sh5/– per copy has been charged. It is hoped that all subscribers will give us their support and pay the annual subscription which will be raised to **£2 per annum from 1st January, 1966.**

4 CORRECTIONS

(a) *Omission from paper on 'An Electrophoretic Study of Leprosy Serum and its possible Relationship with Haemagglutination Titre' by G. Banerjee and A. N. Roy. Lep. Rev.* **36,** *No.* 1, *January* 1965, *pp.* 41-42.

Table II provided by the authors was inadvertently omitted and is here published in its new and short form.

TABLE II

Mean total and fractional serum proteins and haemagglutination titres in 32 leprosy patients

Total Protein %	*Albumin*	*Globulins* α_1	α_2	β	γ	*Total Globulin*	*A/G Ratio*	*Haemagglutination titre*	*No. of cases*
8.2	28.3	10.8	12.9	12.5	33.4	72.9	0.39	1.25	32
					Bact. negative cases		0.39	1.15	14
					Bact. positive cases		0.39	1.33	18

(b) *Paper on 'The Antimycobacterial Activity of B 663', by V. C. Barry and M. L. Conalty, Lep. Rev.* **36,** *No.* 1, *January*, 1965, *pp.* 3-7.

The following corrections should be made:

(i) Chemical Formula on page 3 – where 'NRH' appears, it should be 'NHR'.

(ii) Table I on page 3 – 'Scolochromogens' should read 'Scotochromogens'.

(iii) Line 2, page 4 – '1955a and 1958b' should read '1958 and 1961'.

(iv) Page 5, line 18 – 'R″ = N·CH_2·CH_2NEt_2' should read 'R″ = CH_2·CH_2NEt_2″.

(v) Page 6 colume 2, line 15 – 'emplying' should read 'employing'.

(vi) Page 7, column 2 – The name 'STEEKNEN' should read 'STEENKEN'.

Lep. Rev. (1965), **36**, 2, 53/54

Toxic Effects of Prolonged High-dose Dapsone Self-medication

S. G. BROWNE, M.D., F.R.C.P., F.R.C.S., D.T.M.
Leprosy Service Research Unit, Uzuakoli, Eastern Nigeria

Early reports of the toxic effects of dapsone in the high doses then given refer mainly to acute haemolytic anaemia and various forms of dermatitis. Although dapsone is currently given for mycetoma and dermatitis herpetiformis in doses higher than those now generally advocated for leprosy, toxic phenomena attributable to these high doses are not common in patients under treatment for these conditions.

Two patients have been seen in Eastern Nigeria in whom prolonged self-medication with excessive doses of dapsone for suspected leprosy led to changes in the skin, damage to the kidneys, and to mental disturbances which were probably secondary to the resulting uraemia.

CASE REPORTS

A man of about 30, and weighing 125 lbs. (56·8 kg.) was brought by his brother to the Oji River Leprosy Settlement with the story that he had taken as treatment for leprosy (which he himself had diagnosed) four 100 mg. tablets of dapsone every weekday for two years. Acting under misguided lay advice, he had taken these heroic quantities in a bold and determined effort 'to get rid of his leprosy quickly'. He had stopped this treatment four months previously. Careful questioning of the brother produced confirmatory evidence that the tablets were indeed dapsone, and that 400 mg. had been regularly taken as stated.

On examination, no evidence of active leprosy could be seen in skin or nerves and no *M. leprae* were found in smears from the skin or nasal mucosa, but some hypopigmented areas were present that were typical of healed minor tuberculoid lesions.

The patient was grossly uraemic; his tongue was dry and furred, his breath foul. He was lethargic and mentally confused. Cerebration was very slow, and he understood and responded to questions with great difficulty and retardation. His speech was slurring and indistinct. The face was suffused and oedematous, the eyes being almost closed.

The skin over the entire body was thick and hard, feeling like a tense and tough leather drum-head. It was so bound to the deeper tissues that it could not be plucked up in folds. Over the dorsa of the hands and feet, it was much thicker than elsewhere, and darker, having the appearance and the feel of scorched velvet, dry and hard and finely papular. The lips were fissured and much thickened.

Neither the patient nor his brother associated the gradually developing toxic phenomena with the drug. They attended the Diagnostic Clinic with the object of ascertaining if the patient was still suffering from active leprosy.

There is nothing in the patient's previous medical history to suggest that the impaired kidney function antedated the beginning of dapsone treatment.

The blood showed a slight degree of anaemia.

The urine boiled solid with albumin, and contained numerous cellular casts and erythrocytes.

The patient was seen again four weeks later. Cerebration was rather less slow, but the other signs and symptoms showed no improvement, and the urinary findings were unchanged.

* * *

Within three months, a patient presented himself at Uzuakoli with a similar history and with similar, though less severe, toxic manifestations. In this case, however, it was not possible to obtain independent confirmation concerning the dose of dapsone taken (which was probably 400 mg.), the frequency (probably three or four times weekly) or the total length of treatment.

DISCUSSION

The nephrotoxicity of the sulphones was recognized from early tests on laboratory animals. (The use of diaminodiphenyl sulphoxide was considered inadvisable by Browne and Davey (1962) because of its toxic action on the kidney.) When given in therapeutic doses, however, even for prolonged periods, dapsone itself is rarely the cause of demonstrable kidney damage.

The diverse manifestations of cutaneous sensitivity to dapsone are well known, but the peculiar hyperkeratosis here reported, however, appears to be unrelated to drug sensitivity, and seems rather the result of prolonged toxic action on the epidermis. Apart from the generalized oedema, the changes in the skin may reasonably be attributed to the weekly ingestion over two years of 2.4 gm. of dapsone.

The mental condition was similar to that frequently observed in uraemia, and does not indicate a specific action of dapsone on the cerebral tissues.

SUMMARY

A case is reported in which an adult man had treated himself with a daily dose of 400 mg. of dapsone six days a week for two years, suffering from severe damage to kidneys in consequence. The retarded cerebration noted was probably uraemic in origin. The skin of the dorsa of hands and feet was hyperkeratotic, dry and hyperpigmented.

ACKNOWLEDGEMENTS

My thanks are due to Dr W. Felton Ross, the then Area Superintendent of the Oji River Leprosy Control Area, for showing me the first patient, and to Dr S. O. Egwuatu, Chief Medical Officer, Ministry of Health, Eastern Nigeria, for permission to publish this article.

REFERENCE

BROWNE, S. G. and DAVEY, T. F. (1962). *Leprosy Rev.*, **32,** 194.

Lep. Rev (1965), **36,** 2, 55/57,

Nerve Abscesses in African Leprosy

S. G. BROWNE, M.D., F.R.C.P., F.R.C.S., D.T.M.
Leprosy Service Research Unit, Uzuakoli, Eastern Nigeria

Wheate (1964) has recently drawn attention to the rarity of so called nerve 'abscesses' in Africa. Browne (1957) reported but two instances in some ten thousand leprosy patients seen in the Belgian Congo. In some parts of Africa, e.g. Northern Uganda, the condition is apparently somewhat less uncommon, but in countries outside the African continent, e.g. India, especially the North (Int. J. Leprosy, 1955) nerve 'abscesses' are of relatively frequent occurrence. Lowe found a 2% incidence among five thousand patients at Dichpali (1934).

Prevalence in Eastern Nigeria

While precise figures are impossible to come by, it is indicative of the rarity of nerve 'abscess' that only three patients out of about eight thousand seen during the past seven years at Uzuakoli itself or at the district clinics have been diagnosed as having a localized area of autolysis of a peripheral nerve trunk of such dimensions as to be appropriately designated by the term 'abscess'.

CASE REPORTS

Case 1

A male patient, age 42, was admitted to Uzuakoli Settlement suffering from major tuberculoid leprosy. He had numerous lesions, including a large one embracing the left elbow and the adjacent skin of the arm and forearm. After three months of treatment with standard doses of dapsone, at a time when the skin lesions were flattening and repigmenting rapidly, he developed a localized swelling in the neighbourhood of the left ulnar nerve above the elbow. On admission, the nerve had been enlarged and hard in this situation. The swelling rapidly became fluctuant, and was aspirated, about 20 ml. of thin fluid being withdrawn. The cavity was completely emptied. There was no recurrence and no sequelae, and when the patient was discharged two years later, no sensory or motor loss in the area of innervation of the nerve could be detected.

Microscopical examination of the fluid revealed recognizable acid-fast bacilli in moderate numbers, in spite of the fact that none had ever been found in routine smears of the skin. The cellular elements present in the fluid were very degenerate, and no cocci or other organisms were found.

Case 2

A male patient, age 28, was admitted to Uzuakoli Settlement for treatment of 'major tuberculoid leprosy'. He had right foot-drop, and had already received treatment at a district clinic for some six months. On admission, some of the lesions were raised centrally, and slightly positive bacteriologically. The superficial nerves of the extremities were enlarged in the usual situations, and hard.

Within two months of beginning dapsone treatment at Uzuakoli, the patient experienced an acute exacerbation of existing lesions, and new skin lesions appeared. The right external popliteal nerve in its subcutaneous course became very large and exquisitely tender. Exposed at open operation, the nerve was seen to be about an inch in diameter, its oedematous and hyperaemic sheath being surrounded by thick bands of adhesions. When the sheath was incised, creamy 'pus' exuded. The incision was prolonged, and masses of necrotic débris and slough were removed from about three inches of enlarged nerve. The wound was drained and closed in layers. Convalescence was uneventful, and the wound healed rapidly.

Examination of several smears taken of the exudate, and of necrotic material from the surface of the nerve, all failed to show any acid-fast whole bacilli or débris, or any pyogenic organisms. On his discharge three years later, the foot-drop had completely recovered, and the skin lesions were inactive. The peripheral nerves were still slightly enlarged, but not hard or tender on palpation.

Case 3

A male patient of 19 years of age had been under treatment for major tuberculoid leprosy at a district clinic for four years. Extensive lesions covering both palms were accompanied by marked anaesthesia of the hands and severe clawing. Both ulnar nerves had been greatly enlarged since before treatment began; the external popliteal nerves also were considerably enlarged. All skin smears were bacteriologically negative.

At operation, each of the ulnar nerves above the elbow was found to be well over an inch in diameter. In the right nerve, there was an obvious abscess cavity full of thick pus. In the left nerve, the abscess appeared to have eroded the thickened sheath to involve the adjacent epitrochlear gland. The pus evacuated was similar to that on the right side.

Microscopical examination of loose necrotic tissue removed from both nerves revealed masses of caseating material showing typical tuberculoid granulomata with numerous giant-cells. In the case of the left nerve, small collections of acid-fast bacilli were found both in the fibrous tissue of the degenerate nerve sheath and in the necrotic but recognizable nerve tissue. No other organisms were seen. Scanty degenerate pus cells were present.

On his discharge from treatment a year later, no improvement was observed in the sensory or motor deficiency in the hands.

DISCUSSION

The infrequency of caseation of peripheral nerves in Africa is worthy of remark. In centres where a high proportion of patients with acute neuritic symptoms are submitted to open operation for 'decapsulation' or 'stripping' or simpler procedures, many of them are found to have small areas of caseating autolysis in the nerve, but local and circumscribed accumulations of fluid are rarely sufficiently large to justify the term 'abscess'.

The large numbers of patients with tuberculoid leprosy in Africa, attaining sometimes 92% of the total requiring treatment for leprosy, and including a variable proportion of cases of major tuberculoid leprosy which pass through phases of acute exacerbation, should make for a larger number of nerve 'abscesses' than is actually the case. Many examples of localized caseation do not proceed to frank abcedation, but resolve spontaneously and are absorbed. Others may even calcify.

The patients recorded in this paper were suffering from major tuberculoid leprosy, but the clinical appearances, the stage of the disease reached, the history of acute exacerbation varied within wide limits.

The quantity of fluid evacuated and its nature varied: it was thin and sanious or thick, even viscid. The colour varied from dirty white to ochre. Necrotic material appeared as small flakes in a thin fluid, or as large fragments in a pultaceous mass. Acid-fast bacilli were sometimes found, usually in degenerate form. Pyogenic cocci were consistently absent, and the cellular exudate was uniformly scanty.

Usually, the more localized the 'abscess', the more acute and severe are the local and neurologically distant symptoms. A small quantity of caseating material under tension within an unyielding tough and fibrous nerve sheath, will occasion severe pain both locally and throughout the area of distribution of the nerve whereas a slowly-developing 'abscess' containing perhaps over 200 ml. of thin exudate may be almost symptomless.

The amount of destruction of the nerve fibres bears little relation to the volume of the abscess contents. In the second case reported above, clinical recovery from foot-drop of some months duration was apparently complete. In the third case, however, long-standing tension within the nerve sheaths resulted in permanent nerve damage.

There thus appears to be a great variation in the pathological manifestations of this presumably allergic localized autolysis of a nerve trunk at certain well-defined sites. The vigour of the immunological response to a paucibacillary infection seems to be the important factor.

SUMMARY

The clinical features of three cases of nerve abscess seen in about eight thousand patients in Eastern Nigeria, are reviewed. The comparative rarity of the condition in Africa is emphasized.

The variability of the symptomatology, of the findings at operation, and of the macroscopic and microscopic appearances, are all worthy of mention.

ACKNOWLEDGEMENT

My thanks are due to Dr S. O. Egwuatu, Chief Medical Officer, Ministry of Health, Eastern Nigeria, for permission to publish this article.

REFERENCES

BROWNE, S. G. (1957). *Leprosy Rev.*, **28,** 20.

International Journal of Leprost, Editorial (1955), **23,** 69

LOWE, J. (1934). *Int. J. Leprosy*, **2,** 304.

WHEATE, H. W. (1964). *Leprosy Rev.*, **35,** 86.

Lep. Rev. (1965), **36**, 2, 59/67

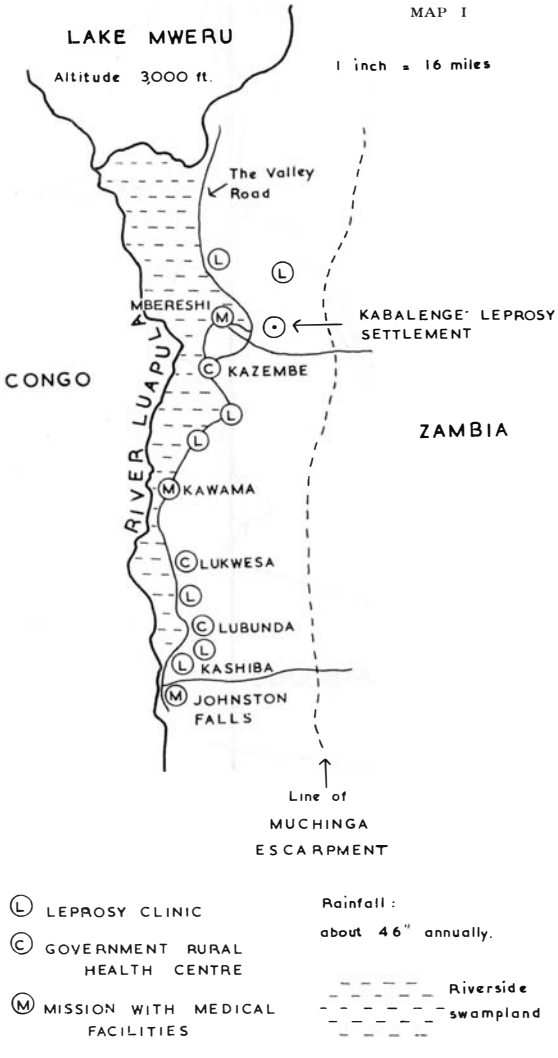
Leprosy in the Luapula Valley, Zambia: History, Beliefs, Prevalence and Control

P. GLYN GRIFFITHS, M.C., B.SC., M.B., Ch.B., M.R.C.P.(London), M.R.C.P.(Glasgow)
(*Medical Superintendent, Liteta Leprosarium and Luapula Leprosy Settlement, and Leprologist, Republic of Zambia*)

The Luapula Valley

The Luapula River drains the swamplands of Lake Bangweulu on the Central African Plateau (Map 2), and, sweeping round to the North, flows into Lake Mweru, which at Pweto empties itself into the River Luvua, a tributary of the great Congo River system.

MAP 1



This paper considers leprosy amongst the people living along the East bank of the Luapula River for the sixty-odd miles between Johnston Falls and the town of chief Kazembe of the Lunda (Map 1).

Population

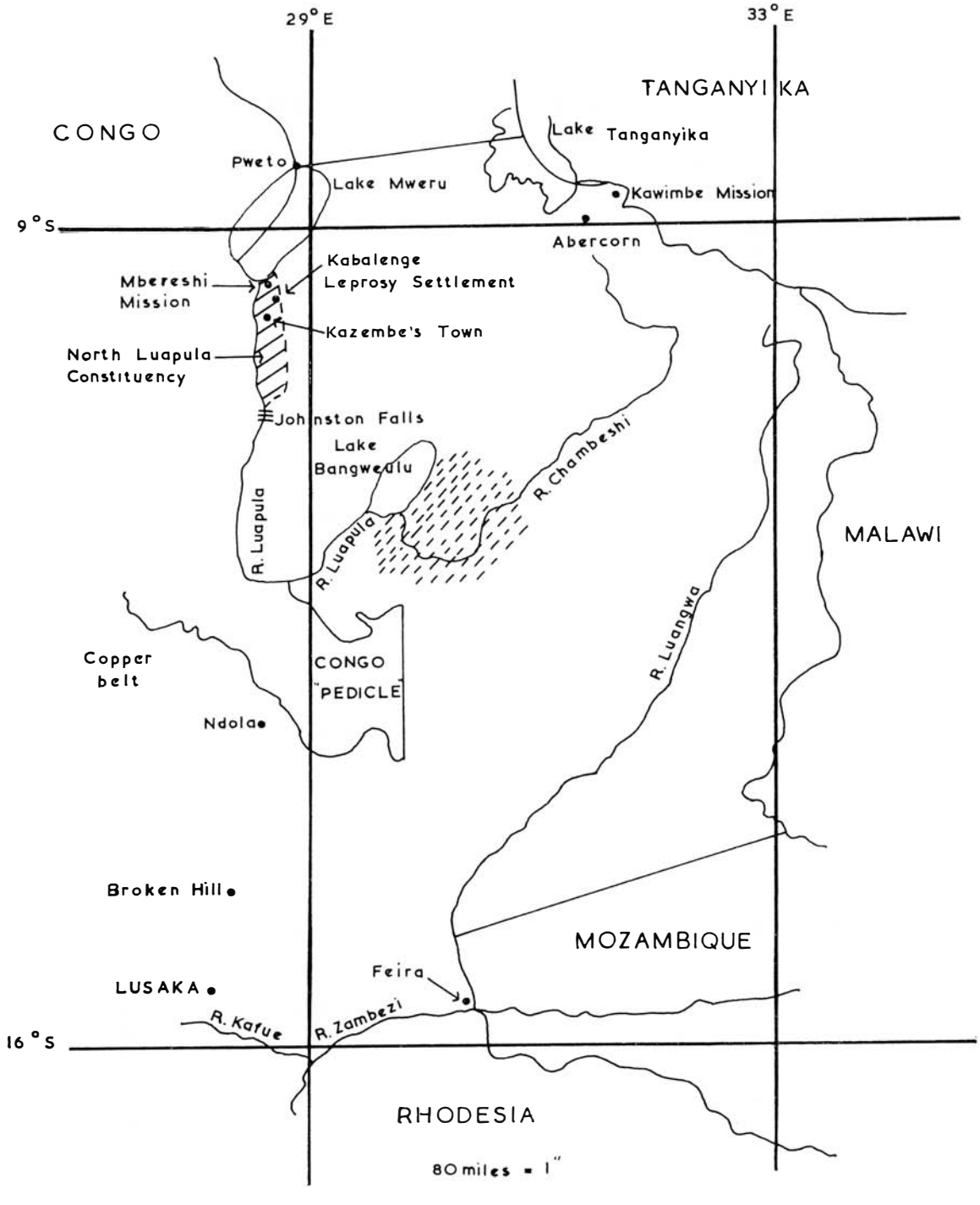
In this small area there is, for Zambia, an unusually high concentration of inhabitants. The Census taken in 1963, and the Registration of electors in the same year, offer accurate population figures, and there are some 21,000 persons over 21 years of age living in the area. This is a very different state of affairs from that prevailing in the greater part of the rural areas of Zambia; for the most part the Zambian rural population is very sparsely distributed, at only about *eight* per square mile, *all ages.* In the 600 square miles under consideration here, the *adult* population density is *35* per square mile! In fact, the population is much more concentrated than this suggests, as the people inhabit large villages, of a median range of 20 to 30 houses, ranging up to 145 houses, and in the case of Kazembe's town, over 1,000. Only about an eighth of the villages lie off the main swamp-margin road (Cunnison, 1959).

As one travels along this road, which links Kazembe's town with Johnston Falls, village succeeds village along the road side, so that it is often difficult to know where one village ends and the next begins.

The North Luapula constituency is identical with the area chosen for this investigation; thus it was possible to check the register of voters against the Census figures. Practically every single person over the age of 21 years registered for the election (which was the first under universal suffrage), so it is believed that the 1963 population figures used here are remarkably accurate.

Population growth has been very rapid—from 27,154 in 1941 to over 51,000 in 1963 (all ages).

MAP 2


29° E
33° E
TANGANYIKA
CONGO
Lake Tanganyika
Pweto
Lake Mweru
Kawimbe Mission
9° S
Abercorn
Kabalenge
Leprosy Settlement
Mbereshi
Mission
Kazembe's Town
North Luapula
Constituency
Johnston Falls
Lake
Bangweulu
R. Chambeshi
R. Luapula
R. Luapula
MALAWI
R. Luangwa
Copper
belt
CONGO
"PEDICLE"
Ndola
Broken Hill
MOZAMBIQUE
Feira
LUSAKA
R. Kafue
R. Zambezi
16° S
RHODESIA
80 miles = 1"

In 1963 there were 101 persons under 21 years of age for every 70 over that age.

About 25 per cent of the adult males are away from the valley at any one time, as they go in large numbers to the Copperbelt to seek work. Many stay away from their villages for very many years; some leave the valley for only a year or two at a time.

The people are of the 'Luapula Type', Kazembe Lunda (or Luunda), and Chishinga, who are groups of the Central Bantu, Northern Division (Mitchell, 1960).

Historical Background

The date of the establishment of chief Kazembe's overlordship in the Luapula Valley is known fairly accurately. Lacerda visited Kazembe's town in 1798, and recorded that the dynasty had been there for about fifty years at that time (Cunnison, 1959).

The Lunda chief Kazembe and his followers had come to the Luapula from the great Mwata Yamvo kingdom in the middle Congo; they conquered peoples such as the Bwile and Shila whom they found living in the valley.

The Congo (Leopoldville), from which Kazembe and his people came, has a high prevalence of leprosy. There were 275,000 cases under treatment in the Congo in 1956, or 20 per 1,000 of the population (WHO, 1959).

In the fascinating *Report on Leprosy* produced by the Royal College of Physicians of London in 1867, Gavin Milroy, Secretary of the College's Leprosy Committee, contributed a 'Sketch of the Geographical Distribution of Leprosy'. (It was this report which discredited entirely the belief that leprosy was contagious, and was regarded by the Editor of *The Lancet* (1867) as '*the authority*' on leprosy of the time!) Milroy writes:

'The chief seats of leprosy in recent times continue to be the same regions of Africa and Asia where it was originally seen, and where it was known to have been most common in remote ages.'

He mentions that slaves brought to the West Coast of Africa from the interior 'are frequently affected with the disease'.

There is no doubt that slaves were taken from the Luapula Valley to the West Coast; many of these slaves were obtained by Portuguese and Arab slave-traders with the aid of Kazembe (Cunnison, 1959), and some of those slaves to whom Milroy refers may possibly have come from the Luapula, therefore.

In the same Report, Mr Bradshaw, Colonial Surgeon in Sierra Leone, commented that leprosy was particularly common in 'natives who come from the Niger and Congo neighbourhoods'.

The origins of leprosy remain a mystery; Rogers (1924) connected the high prevalence rates in Central Africa to an Egyptian record of 1350 B.C. of leprosy among negro slaves from the Sudan and Dafur. But Feeny (1964) considers that early 'knowledge' of leprosy in Africa was probably 'supposition'. Møller-Christenson (1963) examined many thousands of mummies and skeletons from ancient Egypt and Palestine, and found no evidence of leprosy earlier than about A.D. 500.

Traditional Beliefs about Leprosy

That leprosy is, in fact, a disease long known amongst the people of the Luapula Valley appears to be confirmed by the many words in their language which they use to describe it. (Lunda, which is akin to Bemba, is the language mostly in use.)

Thus there is a word for leprosy in general: 'tembwe', almost a euphemism; this word covers all manifestations of the disease. A single patch of diseased skin caused by leprosy is 'chibashi'. Skin thickening due to leprosy is 'mamombo'; the nodular form is 'mapumba'; the blistering often noticed early in the course of the disease is 'mavovela' or 'matutulu'. 'Kaswandala' describes the patient with only one or a few skin patches, with or without coincident loss of the fingers. 'Mamombe' rather more definitely defines as leprosy the skin patches, and 'mumba' identifies lepromatous skin nodules, with the connotation (associated with others of these disease-names) that it is a disease which leads inevitably to gross deformity through the loss of fingers or toes.

There is a proverbial saying: 'Nsala ni mamombo tayalila apepi' . . . hunger is like leprosy, it doesn't kill quickly'.

There is a considerable volume of folk-lore and traditional belief associated with the disease:

The disease was often believed to be a *punishment* (how reminiscent of Mediaeval Europe!):

(a) It might be caused by theft, especially by stealing an animal or a fish taken from someone else's trap. The owner of the trap would put a special 'medicine' into the trap to cause leprosy in the thief.

(b) Or it could be caused by adultery; the aggrieved husband could, by arrangement with a worker-of-spells, cause leprosy to attack the offender.

(c) Eating the flesh of certain animals, especially the hippopotamus, caused leprosy in some people. This was sometimes thought to be due to the spirit of a person dying with leprosy having taken up residence in the hippo. (This belief spreads as far South as to the Feira District on the Zambesi, where the Chikunda people live, and I have had patients from Feira who believed their leprosy was due to eating hippo.) Kazembe himself never ate any of the larger animals such as elephant, hippo, or eland, because they were his 'fellow-chiefs of the bush' (Cunnison, 1959).

Witchcraft was believed to be an important cause of leprosy, but was thought to be incurred sometimes by such foolish behaviour as insolence to an old and respected member of the community.

When someone with leprosy *died*, he was not buried but his body was covered in thick bark, and either thrown into a cave or pit, or put up into a tree in the way that a leopard stores his kill. Should anyone be foolish enough to bury the patient, the leprosy would pass to the grave-digger.

Eating guinea-fowl, bushbuck, bubble fish, any kind of red or scaleless fish (e.g. 'Sampa') makes leprosy worse. The disease being red in colour on the skin, red things as a whole tend to aggravate the leprosy.

The *symptomatology* of leprosy is well known to the rural people. Before the leprosy makes itself manifest on the skin, the patient suffers 'kunanuna' (formications), and 'kubaba' (itching without actually wanting to scratch). This is a very good description of prodromal symptoms often seen in leprosy. Patients from areas of high prevalence, such as the Luapula Valley, know the disease well, and to this day they speak of having suspected that they had leprosy when they had these prodromata, 'before the leprosy showed itself on my skin, when I felt it inside my body'.

Remedies used by the village herbalists (the 'shinganga') are many. For a localised patch (tuberculoid type) multiple scarification with the application of a caustic is commonly carried out; for more widespread types, such as the lepromatous type, lotions and also herbal potions are used. Often enough no actual 'practitioner' is called upon, as many of the older people know which kinds of herb, bark, etc., are usually used to make up these 'cures'.

Diagnosis of leprosy is usually very promptly made by the older people in a village community and is often made also by the 'shinganga' if someone goes for treatment with some ailment not yet knowing that he has leprosy. Surprisingly, rarely are the people wrong in their diagnosis. All too often I see patients who knew well that they had leprosy, but could not persuade the staff at hospital to accept the diagnosis! Many of the older generation of 'shingangas' (who, by the way, are very far from being 'witch-doctors') are very honest practitioners, and accept no fee in the event of their failing to effect a cure; some of them around the Liteta area send any new leprosy which they see direct to the Leprosarium for treatment! Some, again, distinguish between types of leprosy which they feel that they can treat successfully (e.g. one or two isolated patches only) and types which they know from experience will get worse under their treatment (e.g. nodular lepromatous disease). They maintain their reputation in the treatment of leprosy from those cases of tuberculoid disease which are probably in any event self-healing, as so often in this type their local scarification of the skin is followed by apparent cure.

Isolation: there was, in addition to the beliefs mentioned above, a generally accepted notion of the contagiousness of leprosy. Old people tell me that, around the turn of the century, segregation was quite rigidly practised when someone was obviously severely attacked by leprosy (this usually meant that the patient had gross tissue loss of hands or feet, and often enough such a patient was probably not infectious at all). The sufferer had to live in a hut by himself, far from the village, and to its West (the prevailing wind being from the East). Anyone kind enough to take food to the patient should be a spinster or a widow, and, when taking the food, should walk backwards, so as

not to see either the patient or his hut. The food used to be left halfway between the village outskirts and the 'isolation hut'. Small wonder that, under these conditions, people isolated for leprosy often died of hunger. They were never slain, because it was believed that the man who killed someone with leprosy would himself contract the disease.

Many of the beliefs recounted above are still to be found amongst the older generation; but the segregation system was discarded around 1915 to 1920 with the increasing influence of the Missions and of the Central Government.

Amongst some of the younger generations, a depressing apathy succeeded the old beliefs, and many came to think of leprosy as an act of fate, for which nothing much could be done either in the way of treatment or of control.

In 1915 the London Missionary Society formed a small 'isolation camp' at Mbereshi, near Kazembe's town. Its modern successor is the Luapula Leprosy Settlement at Kabalenge, near Kawambwa, on the escarpment just above the valley itself, which was started by Mr W. Densham, a B.L.R.A. worker, as a joint government and mission enterprise in 1944. By the end of 1963 nearly 6,500 patients had been admitted there. (Many of those admitted came from other Districts and Provinces of Zambia.)

This change in the approach to leprosy is reminiscent of Latapi (quoted by Frenken, 1963):

'He who threw stones at the leprosy sufferer, making him flee, did a primitive and barbaric sanitary work. But the first man who took him in, nursed him, and looked after him, was a precursor of our Christian Society.' It was in fact the Christian Missions which first undertook the care and isolation of leprosy in Zambia.

Early Historical References to Leprosy in Zambia

The earliest record of leprosy in Zambia which I have been able to find is by Livingstone (quoted in Gelfand, 1957). Amongst patients seen by Livingstone at Naliele (Barotseland) was a man 'seized by a species of leprosy called Mbingwa which soon produces ankylosis of the joints'. As all the medicines he had tried from the local practitioners had failed to cure him, this man attempted to end his life by thrusting a spear into the hollow above his collar bone (Gelfand, 1957). (The word 'Mbingwa' is still the one used most widely for leprosy by the peoples of Barotseland).

In 1869, Livingstone recorded seeing much leprosy on his journey from Ujiji into the Congo (Gelfand, 1957); in that journey he was travelling through country not very far from the Luapula.

Sekeletu, son of Sebituane of the Makololo, then the rulers of Barotseland, was said to have been 'carried off by leprosy' (Gelfand, 1961), though Livingstone had diagnosed pemphigus when he examined him.

In 1893 Dr C. B. Mather, of the London Missionary Society, founded the first leprosy settlement in Zambia, at Kawimbe, near Lake Tanganyika. Dr Mather wrote in a report to London:

'I rejoice to chronicle the building and occupation of a small hamlet, outside the village, for outcasts suffering from a disease resembling leprosy. There are seven houses in it, and some twenty people living in them at present'. (Gelfand, 1961).

There is to this day a very well run leprosy settlement run by the Mission at Kawimbe.

In 1908, F. W. Worthington, Secretary of Native Affairs with the Chartered Company, reported that in the 'Batoka district' (part of the Southern Province of Zambia) leprosy had an incidence of 21.5 per 1,000, and in the Sesheke District of Barotseland 25.4 per 1,000 (Gelfand, 1961).

Modern Scientific Reports on Leprosy in Zambia

Cochrane visited the country in 1932, and stated 'it is known that certain areas of this territory, e.g. Barotseland, are centres of a very high incidence of leprosy. If, as there appears to be, about 1 per cent of the population around Livingstone either suffering from leprosy or its effects, the percentage in Barotseland must be staggering'. (Cochrane, 1932). (He was indeed correct – in July 1964, 6,331 persons were registered on the Barotseland Leprosy Register out of an adult population of 187,400 – or 34 per 1,000).

In 1940 Muir visited Zambia. He quotes 'official figures' (based upon tax exemption statistics) for the year 1934. These varied from 13.1 per 1,000 in Barotseland to 0.73 per 1,000 in the Eastern Province, with a total of 6,748

leprosy patients in an estimated population of 1,334,465, or 5.2 per 1,000 (Muir 1940). These figures only took into account those persons deemed unfit to work to collect their tax money, and this decision was made by administrative officers, whose estimation of disability probably varied very much. When Muir visited this country, he noted that the whole number of patients provided for by institutions was 'not more than two hundred and fifty'. This was a far cry from today's situation. In December, 1963, there were 15,300 leprosy patients actually under treatment in the whole of Zambia, 4,500 odd of these being in nine Government and 21 Mission Leprosy Settlements, the remainder attending at some 350 treatment centres as out-patients.

In 1949, Sister Elsie Baker, of the London Missionary Society's Leprosy Settlement at Kawimbe (founded in 1893, *vide supra*), carried out a leprosy survey along the Southern shore of Lake Tanganyika in the Abercorn District. She examined 4,670 people, and found that 75 (16 per 1,000) had leprosy. She reported, however, that there was 'a gross concealment of cases' in the area. (Baker, 1949).

During April to June 1950 the first major leprosy survey in Zambia was carried out by Ross Innes. In a sampling survey, he examined 27,915 persons, and found an average prevalence of 12.6 per 1,000. He found prevalence to be much the highest in the Luapula Valley; but he was not able to extend his survey beyond the Northern, Eastern, and Southern Provinces, and so did not visit Barotseland. Only 18 per cent of the new leprosy which he diagnosed was amongst children. (By 1949 Ross Innes found that there were 1,714 patients isolated in eight leprosaria, and that 295 new cases were reported during that year). (Ross Innes, 1950 and 1951, and Pizzi, 1952.)

In the North Luapula Constituency of the Luapula Valley Ross Innes found prevalence rates as follows:

Chief Kazembe's area:	25 per 1,000 in Musanda sub-area 17.3 per 1,000 in Mwansabombwe area
Chief Lukwesa's area:	25.6 per 1,000
Chief Lubunda's area:	20.6 per 1,000
Chief Kashiba's area:	19.1 per 1,000

110 cases of leprosy were found amongst 5,319 persons examined, or 20.7 per 1,000, in the whole of this Valley area (figures abstracted from Ross Innes, 1950).

In addition, there were many patients from the areas of these four chiefs already under treatment at the Kabalenge Leprosy Settlement. Records for that period are incomplete, but I have been able to trace 56 adult admissions from the area to the Settlement, all of whom were in-patients at the time of Ross Innes' survey. (This gives a figure of half as much again for the prevalence of the disease, if one ignores the fact that Ross Innes was able to examine only 5,000 odd of the more than 30,000 persons of all ages in the area in the year of the survey.)

Ross Innes concluded that the picture was of 'a moderately severe, but widespread leprosy of ancient origin, which is nowadays slowly but surely increasing'.

He made a number of detailed practical recommendations to the then Director of Medical Services, including the following:

(1) The purchase and free issue of the Sulphone drugs.

(2) The appointment of a territorial leprologist.

(3) The strengthening, encouragement and enlargement of the regional leprosaria.

(4) The establishment of a new 'central' leprosarium.

(5) The avoidance of compulsion and rigid repressive legislation in leprosy.

(6) The development of the 'outward' look in all existing and future leprosaria.

In December 1952, Cochrane visited Zambia for the second time, and he fully supported the policy advised by Ross Innes.

It is gratifying to be able to report that all six of Ross Innes' recommendations have been carried out; though the sixth has only been followed through by certain of the leprosaria in the territory (notably Chitokoloki, Luampa, Fiwila, Kawimbe, Chikankata, Liteta, and, as will be related here, most notably from the Luapula Leprosy Settlement, Kabalenge, Kawambwa).

J. T. Worsfold (1957), working in the North-Western Province of Zambia, found a prevalence of 11.85 per 1,000 in a most detailed intensive survey covering 20,148 people in the Balovale District. In 1958 Worsfold reported a decline in

leprosy in the same area, and he concluded that this decline had begun before the introduction of sulphone therapy.

Garrod's Campaign in the Luapula Valley

(This rather odd sub-title may remind the reader of 'Jeb Stuart in the Shenandoah Valley', and it had something in common with that famous cavalry campaign, being hard-hitting, energetic, and enthusiastic, but with much longer lasting and more fruitful results than the short whirlwind campaign of the secessionist general.)

In February 1954 Dr J. M. B. Garrod (later Director of the East African Leprosy Research Centre at Alupe) took up duties at the Luapula Leprosy Settlement, Kabalenge, as its first Medical Superintendent, and as the territory's first leprologist.

Prior to his arrival Mr L. W. Corbridge had been lay Superintendent of the Settlement since 1946. He had been trained as a B.L.R.A. worker by A. B. MacDonald in Itu, Nigeria, and had already laid the ground for an 'outward looking' approach to the leprosy problem in the valley. Several small leprosy clinics had been set up along the valley road for out-patient treatment of patients whose treatment had been stabilised at the main settlement at Kabalenge, where a male nurse Mr Spengeler had been added to the staff.

The local authorities (the chiefs and their councillors) were persuaded to construct, at no cost to the Government Medical Department, seven clinics along the valley floor in the most densely populated areas which had no Government or Mission general medical clinic. In addition, the local authorities agreed to build houses for dressers seconded from the Leprosy Settlement to man these clinics. These 'Leprosy Clinics' were additional to the three Mission Medical treatment centres (Mbereshi, Kawama, and Johnston Falls) and the three Government Rural Health Clinics (at the towns of Chiefs Kazembe, Lukwesa and Lubunda) already in existence (Map 2).

Thus, in addition to the 'parent' Settlement at Kabalenge, there were 13 treatment centres along the sixty mile strip of valley bottom where there had been shown to be (by Ross Innes) such a high prevalence of leprosy.

The dressers who manned the leprosy clinics were trained in the basic principles of diagnosis and treatment of leprosy at the Kabalenge Settlement before being posted to their new stations. Each dresser spent two days in each week giving out Dapsone tablets to the patients for whom he was responsible. (Injectable 'Avlosulfon' given once every two or four weeks is now used instead). During the remainder of the week, the dressers visited the villages in their area on foot or by bicycle, examining contacts, seeking new cases, and following up any patients who had failed to attend regularly for treatment. Each of the treatment centres was visited at intervals of not more than three months by staff from the Kabalenge Settlement; at each of these visits the patients at the out-patient treatment centres were clinically reviewed, and newly discovered patients examined. A close liaison was maintained with the local authorities, particularly with regard to any patients who defaulted from treatment; and the respect in which the Officers of the chiefs was held was sufficient, without invoking any laws, to persuade most defaulting patients to return to regular treatment.

This system has been continued ever since 1954, and attendance at the clinics is still excellent, thanks to the co-operation of the local authorities.

The Results of the Campaign

The projected eradication campaign by B.L.R.A. to be carried out in Malawi in the near future, makes this an appropriate time to offer the results of this relatively simple campaign in an area of high leprosy prevalence.

TABLE I

North Luapula Constituency, Kawambwa District, Zambia

(*i.e. the areas of Chiefs Kazembe, Lukwesa, Lubunda and Kashiba*)

Adult population, 1963:	21,000
Total population, 1963:	51,000
Total adults treated for leprosy, 1953-1963:	1,815
Prevalence of leprosy:	86 per 1,000 adults 36 per 1,000 all ages

TABLE II

New Cases of Leprosy attending for treatment for the first time: 1953-1963 (*adults*)

1953:	88	*Totals for the eleven year period from each chief's area:*	
1954:	459*		
1955:	323		
1956:	203	Kazembe:	525
1957:	164	Lukwesa:	368
1958:	116	Lubunda:	505
1959:	100	Kashiba:	417
1960:	123		
1961:	108		1,815
1962:	71		
1963:	60		
Total:	1,815		

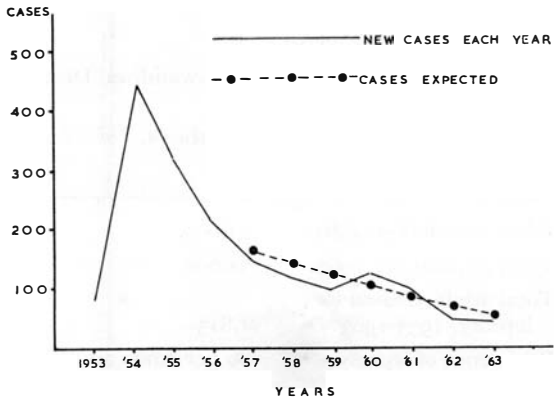
*Since 1954, when the campaign was started, and in which year nearly one quarter of all the treated cases were first brought under treatment, there has been an annual reduction in the number of new cases found.

From 1956 on the annual reduction bears a remarkably close resemblance to the 15 per cent annual decrease reported by Browne (1962) in Eastern Nigeria, where a similar campaign has been under way for a long time. Table Three illustrates this trend.

TABLE III

Annual Rates, new Leprosy, Luapula North

	New Cases	*Expected new cases at a reduction by* 15% *annually*
1956:	203	
1957:	164	170
1958:	116	145
1959:	100	123
1960:	123	105
1961:	108	90
1962:	71	77
1963:	60	66



To show the numbers of new cases of leprosy brought under treatment annually, and to compare these figures with those which would be expected if there were an annual 15 per cent decrease.

Tables one to three and the accompanying graph show the effect of following the policies advised by Ross Innes and Cochrane. In particular, both had advised that leprosaria should be 'outward looking', extending their services into the district around, and not just waiting for patients to present themselves at the leprosarium for treatment. Although there had been a leprosy settlement in the District (first at Kawimbe from 1915, and then at Kabalenge from 1943) for very many years, the effect of setting up 'satellite' out-patients clinics manned by dressers trained in leprosy work can be seen in the sudden jump of new cases from 88 in 1953 to 459 in 1954.

Patients found on first examination to have positive smears were retained as in-patients at Kabalenge until negative; but all those bacillary negative and deemed suitable for out-patient treatment were treated *ab initio* at the valley clinics, or were given a short period of 'stabilisation' of their treatment in Kabalenge Settlement, and then transferred to out-patient treatment at their nearest valley clinic.

Routine methods of treatment were used, Dapsone alone being available at first, but Thiacetazone, Thiambutosine, Solapsone, Ditophal, and I.N.H., being introduced as indicated during the later years of the campaign.

Treatment for leprosy, as throughout Zambia, is free of charge.

SUMMARY

A small but intensive campaign against leprosy in an area of high prevalence, carried out for ten years, is described. To serve a population of 51,000 (of whom 21,000 were adults), there was one 'parent' Leprosy Settlement, and there were 13 out-patient treatment centres. Seven of these latter mere manned by dressers who regularly visited the villages in their area as well as carrying out routine out-patient treatment.

Figures are given showing a steady decrease in new incidence of leprosy in the area annually, since the beginning of the campaign (1954).

86 per 1,000 of the adult population have been treated for leprosy between 1953 and 1963. Annual incidence rates for the years 1962 and 1963 have been only about 3 per 1,000 adults.

Traditional beliefs in the area are described, and what little can be traced about the history of leprosy in Zambia is set forth.

ACKNOWLEDGEMENTS

For information on the beliefs and customs of the people, I am grateful to Mr William Kawandami, now retired, and until recently the head artisan at Kabalenge Leprosy Settlement; and to Senior Medical Assistant Mr A. D. Musopelo and Medical Assistant Mr C. Mapulanga.

For records from 1953 to 1961, I have used the clinical notes and admission books maintained under the supervision of Dr J. M. B. Garrod, (1954-1956), Dr H. Jocelyn Smyly (1957-1958), Dr E. J. Currant (1959-1961), and Mr L. W. Corbridge, (who 'held the fort' as Superintendant during periods when there was no Leprologist).

To the Royal College of Physicians, London and the Royal Society of Tropical Medicine and Hygiene I am indebted for much help with reprints and photostat copies of articles on leprosy. I am especially grateful to Mr L. M. Payne, Librarian of the Royal College of Physicians, for a copy of the '1867 Report' and for much other contemporary material.

Officers of the Government Administrative service at Kawambwa have been very helpful with population figures.

I wish to thank Dr D. A. W. Rittey, Secretary for Health, Republic of Zambia, for permission to submit this article for publication.

REFERENCES

BAKER, E. (1949). (unpublished). A report on a survey of Leprosy in the Northern District.
BRADSHAW. (1867). In *Report on Leprosy by the Royal College of Physicians*, London. p. 52.
BROWNE, S. G. (1962). *Postgrad. Med. J.*, **38,** 87.
COCHRANE, R. G. (1932). *Leprosy Rev.*, **3,** 25-28.
COCHRANE, R. G. (1952). (unpublished). A report to the Director of Medical Services on Leprosy in Northern Rhodesia.
CUNNISON, I. (1959). *The Luapula Peoples of Northern Rhodesia*, Manchester.
FEENY, P. (1964). *The Fight against Leprosy*, London
GELFAND, M. (1957). *Livingstone the Doctor*, Oxford.
GELFAND, M. (1961). *Northern Rhodesia in the days of the Charter*, Oxford.
INNES, J. R. (1950). (unpublished). A report to the Director of Medical Services, Northern Rhodesia
INNES, J. R. (1950). *East Africa Med. J.*, **28,** 21-28.
(1867). *Lancet* Editorial, **1,** 63.
LATAPI, F., quoted by Frenken, J. H. (1963). *Diffuse Leprosy of Lucio and Latapi*, Oranjestad. p. 89.
MILROY, G. (1867). *Report on Leprosy by the Royal College of Physicians*, London. p. 227.
MITCHELL, C. (1960). *Rhodesia and Nyasaland*, Salisbury. p. 180.
MØLLER-CHRISTENSEN, V. (1963). *Origin and antiquity of Leprosy*, Eighth International Congress on Leprosy, Rio de Janeiro.
MUIR, E. (1940). *Leprosy Rev.*, **11,** 18-24.
PIZZI, M. (1952). W.H.O. Epidemiological and Vital Statistical Reports, Geneva., **5,** 263-282.
World Health Organisation. (1959). Epidemiological and Vital Statistical Report, **12,** 65.
WORSFOLD, J. T. (1957). *Central African J. of Med.*, **3,** 362.
WORSFOLD, J. T. (1958). *Leprosy Rev.*, **4,** 222-226.
White Fathers. (1947). *Bemba-English Dictionary*, Chilubula.

Lep. Rev. (1965), **36**, 2, 69/71

Basic Principles in Carrying Out a Pilot Therapeutic Trial in Leprosy

W. H. JOPLING, F.R.C.P.E., M.R.C.P., D.T.M.&H.
Jordan Hospital, Redhill, Surrey, and *The Hospital for Tropical Diseases, London N.W.1.*

1 A TRIAL OF A NEW ANTI-LEPROSY DRUG

The Patients

Patients for the trial should be suffering from lepromatous leprosy as this is the type of leprosy which responds most poorly and most predictably to standard treatment, lesions are plentiful, and acid-fast bacilli are present in large numbers. Borderline (dimorphous, intermediate or bipolar) cases are less suitable as their progress on standard treatment is more variable and less predictable, and the numbers of bacilli in skin lesions are less plentiful and consistent. Tuberculoid cases are unsuitable as the diagnosis is not always easy to establish, and the fact that bacilli are absent from skin lesions makes progress difficult to assess.

Patients should not have had previous treatment. This does not apply to those who were treated several years previously and have relapsed after stopping treatment, but to those who are already under treatment at the time of commencing the trial.

Finally, the trial should be carried out on in-patients, thus making it easier to supervise treatment, to make regular assessments of progress, and to discover any complications. One cannot be sure that out-patients are taking tablets as directed or that they will report at regular intervals for examination.

Preliminary Tests

A careful record must be made of the appearance and distribution of skin lesions, the presence of thickened peripheral nerves, and the extent of any sensory impairment. Visual acuity in each eye should be recorded; a patient who does not understand letters of the alphabet can be shown drawings of well known animals or household objects, and testing charts of this type can be made if they cannot be obtained. The eyes should be examined with a torch and corneal loupe for the presence of superficial punctate keratitis, and this is important as corneal changes are slow to clear on standard sulphone therapy and may even become worse.

General medical examination should include a record of weight and height, and the following tests are obligatory: Blood count (haemoglobin, red blood cells, white cells and differential), examination of the blood for malarial or other parasites, urine and stool examination, and chest X-ray. Any intercurrent disease should be treated before the patient enters the trial.

Eight skin smears are made in order to estimate the Bacterial Index and to note the morphology of the bacilli. Smears are taken from the two ear lobes and from six active-looking skin lesions on various parts of the skin; these six sites are carefully marked on a chart so that future smears will be made from the same lesions. Nasal smears are not recommended. An increasing proportion of fragmented and granular bacilli during the course of treatment is a valuable index of improvement even if the total quantity of acid-fast material in smears remains unchanged. There are several systems in use for recording the Bacterial Index, and the one used at the Jordan Hospital is that described by Ridley (1958):

6 + more than 1000 bacilli in an average oil-immersion field.

5 + 100-1000 bacilli in an average oil-immersion field.

4 + 10-100 bacilli in an average oil-immersion field.

3 + 1-10 bacilli in an average oil-immersion field.

2 + 1-10 bacilli, on average, in 10 fields.

1 + 1-10 bacilli, on average, in 100 fields.

For recording the morphology of bacilli in smears we use the Granularity Index designed by Ridley (1964).

A skin biopsy is carried out to establish the type of leprosy and to assess the heaviness of the infection (see Ridley's papers, mentioned above, for a description of the Biopsy Index). It is desirable to choose a raised, plaque-like lesion for biopsy, and, if possible, one that is large enough to enable further biopsies to be taken from other parts of it during the course of the trial. In the unusual event of there being no lesion large enough for this, a careful note should be made of the position of at least six skin lesions of similar size and consistency so that they can be removed during the course of the trial. My method is to biopsy two different lesions in order to reduce the chances of error, and we take the mean of the two Biopsy Indices. I use a skin biopsy punch with a circular cutting edge 5 mm. in diameter, and this is driven down to the subcutaneous tissue with a rotatory boring action after 1 - 2 ml. of 1% lignocaine hydrochloride mixed with hyalase (hyaluronidase) has been injected into the centre of the portion of skin to be removed. Where facilities for histological work do not exist, arrangements can be made to send tissue by Air to a centre where sections can be cut and examined, e.g. to Dr D. S. Ridley's laboratory at the Hospital for Tropical Diseases in London, or to Dr R. G. Cochrane's Leprosy Research Unit at 57a Wimpole Street, London, W.1. The tissue can be sent in a suitable fixative.

The lepromin test is not essential if the trial is being confined to lepromatous cases as the reaction will remain negative throughout.

Photographs should be taken to show the extent and distribution of the lesions, and should include a front view of the face and two side views to include the ears.

Details of the Trial

As soon as it has been decided to carry out a trial, all lepromatous cases admitted to hospital after that date are included and each patient is given an ordinary hospital number and also a special number for the trial ('T.1.', 'T.2.', 'T.3.', etc.). All those with odd numbers in the 'T' series are given sulphone alone, and those with even numbers receive sulphone plus the trial drug, thus avoiding bias in the selection of cases. As both groups of patients receive a proven anti-leprosy drug no ethical problem is raised. All patients should receive the same sulphone on a predetermined dosage scheme, and parenteral sulphone is preferable to oral. The number of patients in the trial will depend on the number available, and, although larger numbers are desirable, as few as 10 would give useful information about a new drug. The co-operation of an independent assessor (who would not know which patients were receiving the trial drug) would be an advantage.

Observations on both groups should include:

(a) Daily Observations: Morning and evening recordings of body temperature.

(b) Weekly Observations: *Clinical:* Notes should be made on the condition of the patients, with special reference to the appearance of skin lesions, their colour on inspection and their consistency on palpation. Peripheral nerves should be palpated for any change in thickness or any tenderness. Weight and visual acuity should be recorded. *Pathological:* Haemoglobin and total white cell count. Urine examination for protein and sugar.

(c) Monthly Observations: A record should be made of any change in keratitis (if present), and skin sensation is tested for any increase or decrease in anaesthesia.

(d) Three-monthly Observations: Photographs are taken, and these should be comparable with the original ones as regards body sites, lighting, distance, and in all other respects. Eight smears are made from the sites previously used.

(e) Six-monthly Observations: Two skin biopsies are carried out.

Problems arising during the course of the Trial

Treatment need not be interrupted for an intercurrent infection, but a more difficult problem is posed by the development of a lepra reaction (E.N.L. or Type II reaction – Jopling, 1959). The ideal solution is to continue anti-leprosy treatment and to use all available means, including steroids where necessary, to control the reaction. Waters (1963) in his trial of macrocyclon adopted this policy with success. A lepromatous exacerbation (Type I reaction – Jopling, 1959) does not call for any reduction in dosage of anti-leprosy drug or for any special treatment. If the trial drug produces a toxic effect such as anaemia, granulopenia, or proteinuria, the safest course of action would be to abandon the trial. In such an event a note should be published without delay in a Leprosy Journal drawing attention to the drug's toxicity.

2 A TRIAL OF A DRUG TO CONTROL LEPRA REACTION

In order to avoid bias in the selection of cases and to supply a control series for comparison with the trial drug, the first patient to undergo a lepra reaction is numbered 'T.1', the second 'T.2.', and so on. Those with odd numbers receive a placebo and those with even numbers receive the anti-inflammatory drug. As there may be objections to giving an inert drug to patients suffering from reaction, the best plan is to give two aspirin tablets thrice daily to those in the control series, and the effect of the trial drug can be compared with that of aspirin. A rule must be made from the very beginning of the trial on the question of whether to continue or stop the anti-leprosy drug when reactions occur, and the safest plan to adopt is to stop it as soon as the trial drug (or the aspirin, as the case may be) is commenced.

REFERENCES

JOPLING, W. H. (1959). Correspondence – Reactional Leprosy. *Leprosy Rev.* **30,** 194-196.

RIDLEY, D. S. (1958). Therapeutic trials in leprosy using serial biopsies. *Leprosy Rev.*, **29,** 45-52.

RIDLEY, D. S. (1964). *Leprosy in Theory and Practice*, pp. 620-622, ed Cochrane, R. G. and Davey, T. F., Bristol: John Wright & Sons Ltd.

WATERS, M. F. R. (1963). Chemotherapeutic trials in leprosy. *Leprosy Rev.*, **34,** 173-192.

Lep. Rev. (1965), **36**, 2, 73/74

Observation on the Frequency of A.B.O. and Rh Blood Groups in Leprosy and Non-Leprosy People in Ghana

J. A. K. YANKAH, A.I.M.L.T.
Senior Laboratory Superintendent, Ankaful Leprosarium – Ministry of Health, Ghana

The epidemiology of leprosy clearly shows, that exposure to the infection is not the sole factor in the spread of the disease; since the number of individuals exposed who do not develop the disease is so great that the significance of this observation cannot be ignored.

As early as the middle of the last century, leprologists believed that leprosy might have a hereditary basis. This theory derived its support from the writings of Danielsson and Boeck (1848). These investigators regarded family group-incidence of leprosy shown on records, not as a result of intrafamily infection, but as a result of a hereditary disease, transmitted from one human being to another.

Virchow, Bobes *et al.* were also strong advocates of this view and it remained valid until it was pushed to the background by the convincing evidence of *Mycobacterium leprae* being essentially the cause of disease.

In recent years many factors have been mentioned as being possible agencies, in addition to mere contact with *Mycobacterium leprae*, responsible for the development of leprosy in man. One such factor is blood group antigens on which many workers have carried out a series of observations on the frequency of A.B.O. blood groups in leprosy but with conflicting results.

Recently there have been isolated references to the relationship between A.B.O. blood groups and leprosy. (Sazue, Kawarura *et al.*)

Hsuen, J. and others (1963) observed that the incidence of leprosy is high among Group O and low in Group B, but omit to make clear if the local blood group distribution of the population was taken into consideration and compared with the frequency among leprosy patients.

On the other hand Sato, S. and others recorded no specific relation between A.B.O. and S. blood groups in leprosy (1949).

These two independent observations prompted us to make our own study of blood group distribution among leprosy patients in Ghana but before attempting to give the comparison, an effort was made to get the blood group distribution in Ghana so as to compare it with our results among leprosy patients.

Blood group distribution has been studied only among Ewes and Ashantis of Ghana, the then Gold Coast, by Armattoe 1953.

This we thought might not represent the blood group distribution in the whole country since these two tribes form less than half the total population of Ghana.

To move nearer to getting a fair sample of all the tribes of Ghana, 400 blood donors made up of various tribes were selected to give the frequency of the human blood groups in Ghana. It is interesting to note that the percentage of distribution was actually the same as Armattoe's observation recorded among the Ewes and Ashantis only.

The population of Ankaful Leprosarium is made up of a cross section of entire population of Ghana with every tribe represented; Lepromatous and Tuberculoid patients were grouped for A.B.O.and Rh.

TABLE I

Table I shows the comparison between leprosy population and the general population by blood groups and Rh distribution

Blood Group	*A*	*B*	*O*	*AB*	*Rh+*	*Rh-ve*	*Total*	*Remarks*
Leprosy Patients	87	99	196	18	373	27	400	The A.B.O. frequency confirms the observations of Armattoe, 1953.
Blood Donors	83	100	204	13	375	25	400	,,

TABLE II

Table II shows Blood group distribution of the percentage of Leprosy and General population.

Blood Group	*A*	*B*	*O*	*AB*	*Rh+*	*Rh-ve*	*Remarks*
	%	%	%	%	%	%	
Leprosy Patients	21.75	24.75	49	4.5	93.25	6.75	The Rh frequency % confirms the observation made by Mourant 1953
Blood Donors	20.75	25	51	3.25	93.75	6.25	,,

TABLE III

Table III shows Comparison of frequency of blood groups between Lepromatous and Tuberculoid Leprosy patients.

Blood Group	*A*	*B*	*O*	*AB*	*Rh+*	*Rh-ve*	*Total*
Lepromatous	54	58	75	9	183	13	196
Tuberculoid	33	41	121	9	190	14	204

Of the Group O patients in Table III, 75 of them are lepromatous and 121 are tuberculoid.

This difference might be an interesting significance which needs further study, and might explain the findings of Hsuen and others.

It appears from this result that Group O patients might have more natural resistance to leprosy than the other blood groups; a pressing need therefore is for further tests.

CONCLUSION

Our findings confirm Sato's observation that there is no specific relation between A.B.O. and Rh blood group antigens.

That the proportion of lepromatous and tuberculoid type of leprosy among Group O patients may be significant in the immunological aspect of the disease.

SUMMARY

The view is discussed of some leprosy workers with regard to hereditary factors in leprosy and the theory that contact alone is insufficient explanation for the manner of spread of leprosy.

(2) Blood groups and Rh factors are compared between a cross section of the community with leprosy and the normal population.

No significant differences appear, thus confirming the findings of Sato *et al.*

Tuberculoid leprosy was found to be significantly higher among Group O leprosy patients and this difference needs further investigations.

ACKNOWLEDGEMENTS

My thanks are due to Dr B. D. Molesworth for his encouragement and advice and Dr A. A. Darkwa for his helpful suggestions and to the entire staff at the Ankaful Laboratory who helped on the technical side.

I also wish to thank the Chief Administrator, Ministry of Health, Ghana for permission to publish this paper.

REFERENCES

1 ALI, M. (1931). Blood-groups among lepers *J. Egypt med Ass.* **14,** 119-122.

2 ARMATTOE, R. F. G. and N. N. Blood groups of the Ewe and the Ashanti of the Gold Coast. *West Africa Med. J.* **2,** 89-93.

3 KEIL, E. (1939). Hereditary and factors in Leprosy. *Leprosy Rev.*, **10** (3) 163-68.

4 SATO, E. 1949 (La-Lepro). **18,** 65-68.

5 HSUEN, J. (1963). *Leprosy Rev.*, **34,** (3) 143.

Lep. Rev. (1965), **36,** 2, 75/76

The Effect of 'Etisul' on the Fragmentation of *M. Leprae* in Lepromatous Leprosy

D. A. SCARISBRICK, M.B., B.S.
Purulia Leprosy Home and Hospital (The Mission to Lepers), Purulia, W. Bengal, India

Whilst there has not been complete agreement concerning the usefulness of Etisul as an anti-leprosy drug (for review of the literature see N. A. Torsuyev, 1962), T. F. Davey (1959 and 1960) and other workers have found that it is effective, and that Etisul acts mainly on the bacilli of normal morphology, causing them to become fragmented. Therefore it was decided to conduct a small-scale controlled trial with the prime object of determining the effect of Etisul upon the degree of fragmentation of the *M. leprae*.

Method

Eleven male patients were selected, all having been admitted to the institution between three and five months before the trial began. They were all highly positive lepromatous patients, having bacillary indices (B.I.) of at least 4. The B.I. was determined by the examination of five skin smears, expressed in terms of the particular scale in use in this institution at the time of the trial. Except for two patients (A3 and B3) none had received any anti-leprosy treatment prior to admission. All patients received general medical examination and were free from abnormality apart from their leprosy.

All the patients received DDS, beginning with small doses and increasing to a maximum of 400 mg./week at the beginning of the trial. Because it was hoped to show the effect of Etisul on the fragmentation of the bacilli patients were selected who had no history of lepra reaction, as this might have recurred and obscured the results. No serious lepra reaction occurred in any of the patients during the trial.

The patients were divided into two groups, Group A containing six patients, and Group B containing five patients. Group A received Etisul in addition to DDS, Group B formed the control, receiving DDS only.

The trial ran for a period of four months (17 weeks). Each patient received by inunction 5 ml. of Etisul three times a week (on Monday, Wednesday and Friday). The drug was applied to the back, the patients forming a circle and each man rubbing the back of the man in front. The inunction lasted for 20 minutes and the patients were allowed to take a bath one hour after the inunction ceased.

At the beginning of the trial smears of each patient were made in five sites and the B.I. determined, and at the same time the degree of fragmentation was recorded; this was expressed as the percentage of fragmented bacilli (including beaded forms) present in the slides, the percentage being estimated to the nearest 5% on the basis of a count of the bacilli.

At the end of the trial the smears were taken again and the B.I. determined, and again the percentage fragmentation was recorded. All the bacteriological examinations were done by the same technician, who did not know which patients were receiving Etisul and which were in the control group.

Toxic Effects

One patient (A5), who had a B.I. of 4.4 at the beginning of the trial, after three weeks treatment with Etisul, developed an urticarial eruption, beginning on the area of the back over which Etisul was being applied and spreading to involve the whole body within 24 hours. Etisul was discontinued. Little improvement followed the administration of antihistamines, both topically and systemically, but improvement was rapid when prednisolone was given orally; the steroid was withdrawn when the eruption had subsided and the patient has remained well since, continuing to take DDS.

No other toxic effects were reported.

RESULTS

The results are shown in the tables below. Improvement was expressed as a decrease in the B.I., and as an increase in the percentage of fragmented bacilli.

Group A – Etisul

Patient No.	*At beginning:* B.I.	% *frag.*n	*At end:* B.I.	% *frag.*n	*Improvement:* B.I.	% *frag.*n
A1	5.0	75	4.4	90	0.6	15
A2	4.2	90	3.8	95	0.4	5
A3[1]	5.0	90	4.8	90	0.2	0
A4	5.0	80	4.6	90	0.4	10
A6	4.4	90	4.2	90	0.2	0
Average	4.7	85	4.4	91	0.36	6

Group B – control

Patient No.	*At beginning:* B.I.	% *frag.*n	*At end:* B.I.	% *frag.*n	*Improvement:* B.I.	% *frag.*n
B1	5.4	70	4.2	80	1.2	10
B2	4.8	75	4.8	80	0	5
B3[1]	4.6	75	4.6	80	0	5
B4	4.0	90	3.0	90	1.0	0
B5	5.6	80	5.2	90	0.4	10
Average	4.9	78	4.4	85	0.52	6

([1] – *had received previous treatment*)

LIMITATIONS OF THE METHOD

There are two main limitations in this trial, the first being the small number of patients involved; this was due to the desire to include as far as possible only patients just beginning Sulphone therapy, and to exclude those patients known to be liable to lepra reactions.

Secondly the estimation of the percentage fragmentation was a visual estimation and relatively inaccurate.

CONCLUSION

Within the limitations of this trial, no advantage has been shown to follow the use of Etisul in lepromatous leprosy, when the patients are receiving DDS, improvement being judged by the decrease in the Bacillary Index and the increase in the percentage of fragmented bacilli in the patients' smears. In addition there seems to be a real risk of toxic effects with Etisul treatment.

The B.I. and the percentage fragmentation will be determined and again compared after an interval, in order to determine any late effects. It will be recalled that the trial of Etisul lasted four months.

I am very grateful to Dr E. Muir, at whose suggestion this trial was conducted, and who gave helpful advice.

My thanks are also due to the Medical Division of I.C.I. Ltd., who kindly supplied the Etisul.

REFERENCES

TORSUYEV, N. A. ET AL. (1962). 'Our experience in the treatment of Leprosy with Etisul'. *Leprosy Rev.*, **33,** 222.

DAVEY, T. F. (1959). 'Diethyl Dithiolisophthalate in the Treatment of Leprosy'. *Leprosy Rev.*, **30,** 141.

DAVEY, T. F. (1960). 'Some Recent Chemotherapeutic Work in Leprosy'. *Trans. Roy. Soc. Trop. Med. Hyg.*, **54,** 199.

Lep. Rev. (1965), **36**, 2, 77/81

Priscol in the Treatment and Prevention of Leprosy Deformities

J. S. MATHUR, M.D., D.P.H.(Lond.), F.R.I.P.H.H.(Lond.)
Reader in Social and Preventive Medicine, College of Medical Sciences, Banaras Hindu University, Varanasi
and
K. N. SAXENA, M.D., D.T.M.&H.
Reader in Skin and V.D., S. N. Medical College, Agra

Leprosy is a very serious problem in most of the South Asian countries. They have on an average five to ten leprosy patients per 1,000 population. In some places its incidence is as high as 30 to 50 per 1,000. WHO Expert Committee on Leprosy (1960) estimated that 25 per cent of all leprosy patients suffer from some degree of physical disability. Various permanent disabilities and crippling defects are the usual outcome of this disease. The handicapped leprosy patients become a burden on society. In the absence of any other occupation, many of them become mendicants. Loss to a country is in terms of physical and moral suffering, deprivation of economic and productive labour, and financial outlays on social and welfare activities (Hemerijckx 1961).

Modern medicine has made tremendous progress in the treatment of leprosy. During the last 100 years almost every type of drug and surgical manoeuvre has been tried for the cure and prevention of this dreadful disease and its manifestations, but only a few of them are considered really effective. In spite of the use of these drugs physical defects in leprosy patients continue to occur. Surgical correction, physiotherapy and splintage of anaesthetic fingers and toes in the treatment of leprosy are not without risk. Even with splintage and physiotherapy the fingers tend to go back to their original position. It is against the principles of surgery to operate for reconstructive surgery with an open wound on the part. Moreover for reconstructive surgery in leprosy, properly trained orthopaedic and plastic surgeons are required. To restore the hand to some degree of usefulness a series of tendon transplant operations need to be performed. In India the number of leprosy patients is very large and only few hospitals are taking an active interest in reconstructive surgery.

Material and Method

Eighteen patients of neural leprosy aged 22 to 74 years with varying degree of deformities and contractures of fingers and thumb were studied from leprosy hospitals of Varanasi and outpatient department of S.N. Hospital, Agra. Clinical and laboratory diagnosis of leprosy was made. All these patients were receiving antileprosy treatment for the last four to eight years in leprosy hospitals. They noticed even after anti-leprosy treatment for few years, a gradual increase in the degree of deformities and contracture of fingers and thumb, wasting of hand muscles and varying degree of loss of sensations for touch, temperature and pain on the hand and forearm. A weekly record in the improvement and experience of various symptoms was kept. The patients are still receiving the same therapy for the improvement and prevention of any more deformities and contractures.

Priscol 1 ml. (Tolazoline hydrochloride) was injected twice a week in the ulnar nerve in ulnar groove by the technique used by Saxena and Mathur (1963). These patients were also kept under antileprosy treatment and were given sulphones. A weekly record of degree of improvement noticed and felt was kept. Photographs of initial deformities and contractures of fingers and after receiving priscol treatment for one and a half to two months were taken to judge the degree of improvement in deformities and contractures. In six patients, priscol injection has been stopped and they are now kept only on sulphones in follow up of two months. The rest of the 12 patients are still under the priscol and sulphone therapies.

The deformities and contracture of fingers were classified as severe and moderate, depending on the degree of deformity of fingers, involvement of number of fingers and their

use in daily work. Severe deformities and contractures involve more than one finger and their incapacitation to an extent where they cannot be used even for every day work. Moderate deformities and contractures may involve one or more fingers but they remain useful to some extent for day-to-day work.

Response to this therapy was noted as excellent, beneficial, or poor, judging by considering the overall improvement of fingers and hand, improvement in the degree of deformity and contractures and the regaining in varying degree of lost sensations. Results are described 'excellent' when the hand and fingers can be used for fine work and the patient allowed to return to the old profession. There is considerable improvement in the power of the hand and return in sensations for touch, temperature, and pain nearly towards normal. Fingers had almost straightened. Results are classified as 'beneficial' when the hand and fingers can be used only for routine work. Sensations return from 50 to 75 per cent but they do not become normal. In poor results the patient can use the hand a little more but not freely so as to perform day-to-day work. There is slight improvement in the degree of deformity with or without slight improvement in the degree of sensation.

TABLE I

Severe and Moderate deformities and contractures

Type	*Total Number of cases*	*Number of Fingers Involved*					*Degree of deformity and number of fingers in each group*				*Number of cases with usefulness of fingers*
		Small	*Ring*	*Middle*	*Index*	*Thumb*	0-45°	46-90°	91-145°	146-180°	
Severe deformity and contractures	12	12	12	9	6	3	8	7	13	14	To some extent in one only
Moderate deformity and contractures	6	6	4	–	–	–	10	–	–	–	6

TABLE II

Deformities and Contractures before and after the treatment

Type	*S. No.*	*Duration of illness in years*	*Degree of Contractures of digits before treatment*					*Degree of contractures after treatment*				
			L	*R*	*M*	*I*	*T*	*L*	*R*	*M*	*I*	*T*
Severe deformities	1 GAR	7	175	165	160	160	120	95	70	70	70	100
	2 LR	6	160	110	110	115	—	60	0	0	15	—
	3 ML	6	120	110	115	115	40	30	15	15	10	10
	4 MSL	6 months	175	170	30	—	—	0	0	0	—	—
	5 MS	6 months	170	170	30	—	—	0	0	0	—	—
	6 GAR	8	160	160	150	160	135	110	90	90	100	70
	7 LRR	6	140	80	80	85	—	30	25	15	15	—
	8 SN	4	50	20	10	—	—	0	0	0	—	—
	9 BP	6 months	55	45	—	—	—	10	0	—	—	—
	10 S	5	95	95	—	—	—	35	30	—	—	—
	11 MZ	7	130	100	100	90	—	50	40	40	30	—
	12 G	2½	70	45	—	—	—	50	25	—	—	—
Moderate deformities	1 ML	2	40	20	—	—	—	0	0	—	—	—
	2 S	6 months	30	15	—	—	—	0	0	—	—	—
	3 Jg	2	25	—	—	—	—	0	0	—	—	—
	4 Jw	1	30	—	—	—	—	0	—	—	—	—
	5 J	6 months	35	25	—	—	—	0	0	—	—	—
	6 P	1	30	20	—	—	—	5	0	—	—	—

L = Little finger *R = Ring finger* *M = Middle finger* *I = Index finger* *T = Thumb*

RESULTS

All the patients felt lightness of hand and forearm on the first day after first priscol injection. For the first two to four injections, eight patients felt pin-pricks in forearm and hand, while four patients complained of sense of heaviness in the injected limb. The degree of improvement varied in different patients after a number of priscol injections were given. Generally there was apparent improvement in sensations, degree of deformity, and contractures, power of hand and movement of fingers after four to six priscol injections. Table 1 shows the distribution of cases of severe and moderate deformity and contractures.

All the patients regained usefulness of fingers and hands. The ulnar nerve was painful to touch in 15 patients and pain along the ulnar nerve was complained of by four patients. The nerve became less painful after priscol injections and pain along the nerve subsided in two patients while in the other two pain subsided to the extent of 75 per cent.

Table 2 shows the degree of deformities and contractures of fingers in all the patients before and after priscol therapy. Degree of deformity and contracture was measured at the metacarpo-phalangeal joints. Out-stretched hand was taken at 0° to 180° axis and right angled flexed fingers at 90°. 0° was at the tip of small finger of stretched hand and proximal medial end of the hand was taken at 180° angle.

The response to treatment in all the 18 cases is shown in Table 3.

Case 1. *M.S.* Aged 20 years complained of loss of sensation, deformities of little, ring and middle fingers (Fig. 1), ulcer on the dorsum of the ring finger and wasting of muscles for the last one year. He had been receiving antileprosy treatment for the last six years. The hand was swollen for the last two to three months. He was treated continuously with intraneural priscol along with sulphones. After six priscol injections sensations in completely lost area returned to normal, swelling of the hand subsided, deformity started improving and ulcers healed. With eight injections of priscol the skin colour returned to normal and hair growth appeared and with 14 to 17 injections the contracture of the fingers improved (Fig. 2). Priscol has been stopped for the last two months. He is receiving only antileprosy drugs.

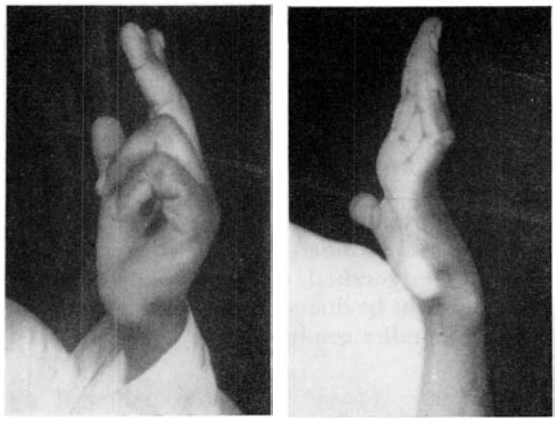


Fig. 1. Deformities of fingers and hand before priscol therapy. Fig. 2. Improvement in deformities of fingers and hand after priscol therapy.

Case 2. *G.D.M.* Aged 32 years complained of loss of sensation, wasting of hand muscles, deformities and contractures of all the fingers of hand for the last seven years (Fig. 3). He had ulcers at the interphalangeal joints of middle, ring and index fingers. He had been on antileprosy treatment for the last eight years. After eight to ten priscol injections, the deformities improved (Fig. 4), power in wasted hand muscles improved, ulcers at interphalangeal joint healed early and skin elasticity returned. Contractures at the interphalangeal joints now interfere with the further extension of fingers. He is still receiving priscol and antileprosy treatment.

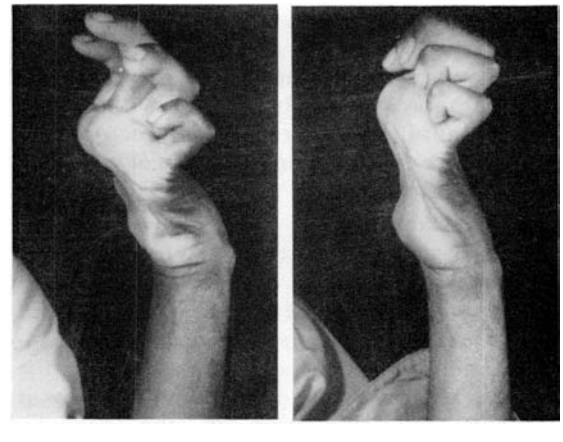


Fig. 3. Deformities of all the fingers and hand before priscol therapy. Fig. 4. Improvement in deformities after 10 priscol injections.

TABLE III

Type of cases	*Total number*	*Response to therapy*		
		Excellent	*Beneficial*	*Poor*
Severe deformities and contractures	12	9	2	1
Moderate deformities and contractures	6	6	—	—

DISCUSSION

One of the features of leprosy is its predilection for peripheral nerves. Degree of dysfunction from the lesions of these nerves varies from loss of sensation to deformities, contractures and loss of organs. The ulnar is the commonest nerve involved in polyneuritic cases. In the present series it was affected in all the patients. The contracture of small finger in all the cases had occurred earliest and was followed by the involvement of ring and other fingers and thumb. In cases with longer duration of illness more and more digits were involved.

Intraneural priscol improved earlier the deformities of ring, middle, index finger and thumb. The response in small finger was delayed and was not of the same magnitude as noted with other fingers.

All the patients in the severe group had adhesions of skin of small finger and some patients of a few other fingers also due to contractures at interphalangeal joints or adhesions followed ulcers. These contractures and adhesions of skin were more marked at middle and terminal interphalangeal joints. They were responsible for poor improvement in cases with beneficial and poor results. The adhesions of skin as well as early involvement of small finger appear to be the reason for poor and delayed improvement. In patients with moderate degree of deformities and contractures the improvement with intraneural priscol was early and complete.

Saxena and Mathur (1963) have shown in their earlier work that neural signs and symptoms of leprosy have a close relationship with the blood supply of the nerves to the affected part. Priscol has a local spreading and vasodilatory action on the blood vessels supplying the affected part and the nerves and thereby it improves the circulation in the partially ischaemic nerve bundles. Long continued ischaemic changes over years degenerate the nerve bundles resulting in varying degree of irreversible damage and loss of function. In the present series patients with longer and severe contractures did not show complete recovery. In two of the patients there was complete correction in the contracture of index and middle fingers after four priscol injections.

Saxena and Mathur (1963) observed vascular involvement in leprosy and reported warming of cold skin of the hand, return of healthy skin colour, growing of hairs and return of venous prominence in hand. Similar observations were made by Chatterjee (1955). Cochrane (1959) found sensory, motor and trophic changes in the parts supplied by the partial ischaemic nerve bundles. Chatterjee (1955) reported correction of deformities in some of the patients with the improvement of blood supply.

Priscol has no systemic effect on leprosy. Oral and systemic administrations were tried but they did not show any improvements in the degree of deformities and contractures or anaesthesia. Intraneural priscol injections given in one limb did not improve deformities, contractures and lost sensations in the other limbs.

Improvements were more rapid in the initial stages of priscol therapy. Muscular contractures, strength of hand muscles, and anaesthesia continued to improve even after the skin lesions had subsided. Wasted muscles of the hand showed considerable improvement and the depressions caused by wasted dorsal interrossei and lumbricals improved. Chatterjee (1955) considered residual abnormality after the skin reactions had subsided to the fibrosis inside the nerves. The residual deformities after priscol therapy might be due to fibrosis or degeneration of nerve bundles resulting from long continued ischaemia.

Khanolkar (1955) and the editorial in *Leprosy in India* (1953) considered ascending degeneration of nerves in leprosy. It is difficult to explain on this assumption the present improvement of deformities, muscle strength and

anaesthesia in such a short time with priscol therapy. Normally nerve after injury regenerates at a rate of 3 to 4 mm. in a day. Chatterjee (1955) found it difficult to explain clinical signs on the basis of nerve degeneration.

Krogh (1929) and Lewis (1927) have shown that capillaries can contract independently of one another and of arterioles. Chatterjee (1955) considered vascular constriction responsible for wasting and deformity in leprosy. In chronic lesions of leprosy there is gradual constriction of blood vessels of nerves and tissues causing gradual wasting, paralysis of muscles, deformities and contractures. The constriction of blood vessels inside nerve fibres may not be uniform all over and may affect various nerve fibres differently. The work of Crutz *et al.* (1931, 1933), Goheen (1933), Chatterjee (1955), Lowe and Chatterjee (1937), Sharpey-Schafer and Wallace (1942) and Saxena and Mathur (1963) points towards the affection of vascular supply to the nerves in leprosy. Denny-Brown and Brenner (1944), Causey and Palmer (1949), and Cochrane (1959), found morphological changes similar to Wallerian degeneration of nerves on being relatively partial ischaemic due to pressure. They also found complete morphological and functional restitution on restoring blood supply.

SUMMARY

Twelve leprosy patients with severe deformities and contractures and six with moderate deformities and contractures were given intraneural priscol in conjunction with standard antileprosy treatment. All the 18 cases except the three with severe deformities and contractures showed excellent response. The three patients with severe deformities and contracture also showed improvement and results in them were beneficial but mild. Priscol corrects early deformities completely and prevents further development of deformities and contractures.

ACKNOWLEDGEMENT

I am extremely thankful to CIBA of India Ltd. for supplying priscol ampoules for the trial on leprosy patients.

REFERENCES

CAUSEY, G. and PALMER, E. (1949). *J. Physiol.*, **109,** 220.

CHATTERJEE, S. N. (1955). *Int. J. Leprosy*, **23,** 1, 1-18.

COCHRANE, R. G. (1959). *Leprosy in Theory and Practice*, Wright, Bristol.

CRUTZ, M. C., ABUEL, J. I. and SAMSON, J. G. (1933). *Leprosy*, India, **5,** 51.

CRUTZ, M. C., ABUEL, J. I. and SAMSON, J. G. (1931). *J. Philippine Islands Med. Assoc.*, **11,** 474-476.

DENNY-BROWN, D. and BRENNER, C. (1944), *Arch. Neurol. Psychiat.*, **52,** 1.

Editorial. (1952). *Leprosy*, India, **24,** 35-45.

GOHEEN, R. H. (1933). *Leprosy*, India, **5,** 4-5.

HEMERIJCKX. (1961). *Med Ed. Bull., VI*, **2,** 16-19.

KHANOLKAR, V. R. (1952). *Leprosy*, India, **24,** 62-77.

KROGH, A. (1929). *The Anatomy and Physiology of Capillaries 2nd ed.*, New Haven, Yale University Press.

LEWIS, T. (1927). *The Blood vessels of the Human Skin and their responses*, Shaw & Sons Ltd., London.

LOWES, J. and CHATTERJEE, S. N. (1937). *Leprosy*, India, **9,** 115-120.

SAXENA, K. N. and MATHUR, J. S. (1964). *J. Ind. Med. Assn.*, **42,** 3, 131-33.

SHARPEY-SCHAFER, E. P. and WALLACE, J. (1942). *Brit. Med. J.*, **2,** 304-307.

WHO Expert Committee. (1960). *Technical Report Series, No.* 189.

Lep. Rev. (1965), **36,** 2, 83/85

The Rapid Healing of Plantar Ulcers

GILBERT B. R. WALKEY, M.B.B.S., F.R.C.S.
Surgeon, The Catherine Booth Hospital
and
HARRY W. WILLIAMS, F.R.C.S. (Edin)
Head of the Reconstructive Surgical Unit, The Catherine Booth Hospital, Nagercoil, S. India

Plantar Ulcers – Speedy Healing

The problem of the plantar ulcer of leprosy has been the subject of a number of scientific papers in recent years. Price (1) has restricted the use of the title to ulcers occuring in the anaesthetic but mobile foot thus differentiating ulcers occurring in feet with fixed deformities. It has been stressed that the second group demands surgery directed to the deformity as a prequisite to healing of the ulcer, and in the former group the provision of protective footwear following the healing of the ulcer. For the actual healing of the ulcer only one approach has been advocated by the many writers on this subject, namely, complete rest to permit a natural healing by scar tissue. The practical detail varies from bed rest with normal local measures to clean the ulcer, to the use of plaster of paris casts or its more elaborate descendent, the Karagiri boot. Andersen (2) as basis for this method, quotes Trueta, who popularised the plaster cast immobilisation of osteomyelitis in contrast to the frequent dressings current until 1935. Contemporary with Trueta, Gillies and the then, small group of plastic surgeons shewed that many indolent ulcers (such as varicose ulcers then commonly treated by local applications and support) could be healed quickly by excision, which included the hard fibrous bed of the ulcer, and the application of a split skin graft.

The attention of one of us (H.W.W.) was drawn to the problems of leprosy that might be amenable to plastic surgery by Paul Brand in 1956. A visit to the nearest leprosarium gave the immediate impression of plantar ulcer as the commonest cause of disability amongst leprosy patients. This impression is confirmed by all subsequent experience and is quoted by Languillon (3) who observed that among 3,000 leprosy patients examined 403 patients had 1,049 perforating plantar ulcers. The immediate reaction of the plastic surgeon was to excise and graft. At this time it was generally held that split skin would not stand up to hard wear and was therefore unsuitable to palmar or plantar surfaces. One article however had appeared by Wynn Williams (4) in which a split skin graft applied to the plantar surface had not needed to be replaced by full thickness skin. The first leprosy ulcer treated by this method was a large one of the heel. This graft took completely and was seen regularly for three years without evidence of breakdown (12). A small series completed in 1958 shewed that two thirds of ulcers treated in this way were healed in a fortnight.

At this point it might have been claimed that a specialised technique was involved and therefore the method unsuitable for wide application. A second series published in 1963 shewed an improved percentage cure and this time the surgery had been shared with a junior registrar. The present series has been largely the work of a third general surgeon, but again the results are similar.

RESULTS

	Number of ulcers	*Healed 1st Opn.*	*Healed 2nd Opn.*
Present series	62	44	7
Published in 1963(10)	45	39	4
Published in 1959 (11)	21	13	8
	128	96	19

To recapitulate the method:

1 Complicated ulcers i.e. with underlying osteomyelitis or neuropathic joint must be dealt with on the usual lines.

2 The ulcer is cleaned with Eusol and a Eusol pack is applied for 24 hours before operation.

3 The ulcer is cleaned with Cetavlon 1% and

the whole ulcer – sides and floor, is completely excised in one piece. A THIN split skin graft is cut from the thigh or calf, spread on sterile vaseline gauze and applied to the raw area followed by gauze wrung out in normal saline, which presses the graft into the depression evenly*.

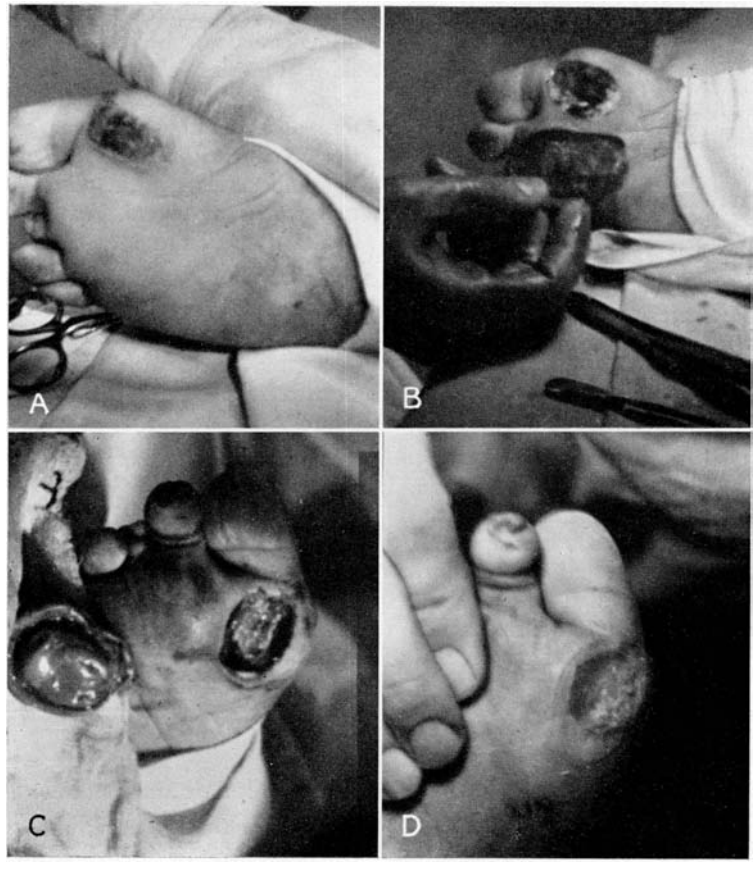
4 Cotton wool and a pressure bandage is applied. Crepe bandages are a luxury: we use, knitted cotton bandages which wash and wear.

5 First dressing is done after 10 days, care being taken not to pull on the graft in removing the dressings. During the ten days, patients can get around on crutches and work in occupational therapy classes.

DISCUSSION

1 This is the most expeditious method of healing a plantar ulcer and is applicable to ulcers large and small in Groups I or II of Lennox (5) but not a complicated ulcer (see below). Writers describing the plaster cast technique say that most ulcers should be healed in six weeks (6) though treatment may be continued for several months in some cases. By this grafting technique seventy five per cent of ulcers should be healed in 20 days.

*In earlier cases, the graft was applied over a Stent impression of the ulcer. This is a good method, but saline gauze firmly and quickly applied works just as well. The Stent mould should be removed by the 5th day.



A. Ulcer of plantar surface.
B. Excision and Stent impression taken.
C. Graft at removal of mould five days later.
D. Healed ulcer thirty days later.

2 The technique is simple and any medical officer can quickly learn it. Here are a few important tips:

(a) The bed to be grafted is similar to that in a varicose ulcer, giving a brisk capillary haemorrhage. A hot saline swab should be firmly applied by an assistant and only withdrawn when the graft and dressings are all ready for speedy application. Blood clot is death to a graft!

(b) The thin skin graft can be easily cut with any standard graft knife. We use a Humby pattern. However, with practice an intradermal injection of local anaesthetic can be made into the thigh or calf raising a rigid plaque of skin. With a board to flatten, a graft large enough for an average ulcer can be cut with a Bard-Parker blade.

(c) After the first dressing we apply a sterile vaseline gauze and bandage for another week. This isn't vital, but patients feel more confident if the newly grafted area is protected. Do not despair of a 'poor take' at ten days. The second dressing often shews complete healing.

3 Price describes the plantar ulcer as 'a chronic ulceration of the anaesthetic foot characterized by a marked tendency to recurrence' (7) and Andersen (8) speaks of an 'evil cycle of scar – ulcer – scar'. Rigid scars are notoriously unstable in weight bearing areas. The technique described here removes the hard fibrous tissue and a split graft developes subcutaneous tissue which soon fills the depression leaving a mobile graft area. We have been impressed by the fact that an ulcer of $\frac{1}{2}$ in. diameter is commonly $\frac{3}{4}$ in. or even 1 in. diameter, for the heaped up cornified margin is undermined all round by a granulation-lined cavity.

4 It is emphasized that this method does not obviate the need for proper footwear and orthopaedic procedures indicated in second deformities.

SUMMARY

A technique for excision and grafting of plantar ulcers is described which gives healing in 20 days in $\frac{2}{3}$ of all cases. Over the total this gives a percentage of 75 per cent healed at the first operation and 90 per cent after two. In the later case the period has been four to five weeks. Of the remaining 10 per cent a few were complicated cases at first missed but several have been large deep lesions of the heel of the type described by Lennox (9). In these we have eventually secured healing. It must also be added that even when counted unsuccessful at the first attempt, the size is usually much reduced by partial take.

All of the early cases in this series were transferred from leprosaria but as the programme has become known patients have walked into outpatients to disclose ulcers of many years standing hidden by footwear. Two are worthy of mention.

Case 1 *A.B.* This man had maintained a good position in a Government Service by taking maximum sick leave each year and his shoes hid one toeless foot with an ulcer 2 in. broad extending right across the heads of the metatarsals. He went home healed but returned next year with a small breakdown at one end. This was grafted and better shoes were made. He returned again this year for part of his holiday. The ulcer has not reappeared and his medical officer certified a well healed foot permitting promotion to a higher grade.

Case 2 *B.C.* Again this was an anterior arch ulceration of ten years duration and healed at the first operation permitting discharge in 30 days by which time shoes with microcellular rubber in-sole and metatarsal bar had been fitted.

REFERENCES

1 PRICE, E. W. (1964). *Leprosy Rev.*, **35,** 4A. 267.

2 ANDERSON, JOHS G. (1964). *Leprosy Rev.*, **35,** 4A. 251.

3 LANGUILLON, J. (1964). *Leprosy Rev.*, **35,** 4A. 239.

4 WYNN-WILLIAMS, D. (1953). *Br. J. of Plastic Surgery, Vol. VI, No.* 2, 123.

5 LENNOX, W. M. (1964). *Leprosy Rev.*, **35,** 4A, 245.

6 ANDERSON, JOHS G. (1964). *Leprosy Rev.*, **35,** 4A. 251.

7 PRICE, E. W. (1959). *Leprosy Rev., XXX,* **98,** 105.

8 ANDERSON JOHS G. (1964). *Leprosy Rev.*, **35,** 4A. 251

9 LENNOX, W. M., (1964). *Leprosy Rev.*, **35,** 4A. 245.

10 WILLIAMS, H. W. (1959). *British Journal of Plastic Surgery, Vol. XI, No.* 4. p. 309.

11 WILLIAMS, H. W. (1964). *Indian Journal of Surgery. Vol. XXVI*;, *No.* 1. p. 64.

12 WILLIAMS, H. W. (1957). *Indian Journal of Surgery, Vol. XIX, No.* 1. p. 2.

Lep. Rev. (1965), **36,** 2, 87/90

Leprosy Education in the Villages

R. VEDABODAKAM, L.M.P.
Medical Officer, St. Luke's Leprosarium, Tirunelveli Dist., India.

Effective leprosy control must rest upon accurate survey work, and upon a system of follow up and tracing of defaulters. In practice many schemes began with a survey of the control area by paramedical workers. Ideally this continues with the administration of drugs and follow up by paramedical workers under the general direction of the doctor, and in many units propaganda is conducted as opportunity and means permit. An ideal scheme is naturally costly in terms of personnel and money, and is beyond the scope of small general medical units in areas where leprosy happens to be endemic.

St. Luke's Hospital, Nazareth, is such a unit. It is a Christian hospital of 120 beds, completely staffed by nationals, and deriving no financial help from the diocese, the state, nor from overseas. The leprosy problem of the surrounding district came to our notice in the following way. Six patients from the village of Peikulam attended the outpatient clinic at St. Luke's. This involved walking a distance of over 22 miles in hot sun at a time when drought and near famine prevailed. Nevertheless their condition began to improve. Suddenly they stopped attending, and in order to obtain information about them we went to their village which we had never visited before. We found them famished, with blistered feet, and in a distressed condition from the long walks in the tropical sun. Their plight suggested an immediate sample survey of the locality. This was undertaken, and revealed a tragic situation. In a village of 86 houses there were 42 leprosy patients, men, women, and children. A nearby village with 82 houses had 36 patients; a small school with 40 children had nine; another with 120 had 13. A hamlet of 11 houses had nine heavily infected patients.

The presence of so many leprosy patients in such a small area immediately suggested the need for a local treatment centre. Twice a week we visited the infected villages and attempted to distribute sulphone tablets from stands under convenient trees. Swarms of patients gathered to receive the tablets, but to our surprise, the villagers chased us from place to place, fearing that these groups of patients would import the disease into their own village. Eventually we approached the Collector of the district who allocated an area of land just outside the village of Peikulam for our use, and here has grown up a unit with accommodation for 48 inpatients, and with rehabilitation activities based upon two acres of land with a well, oil engine and pump set. With assistance from American Leprosy Missions and the British Leprosy Relief Association expansion is continuing, with influential people of the district lending their support.

Although it has become our aim to eradicate leprosy from the endemic area, it became quite clear that a thorough survey and epidemiology programme based upon paramedical workers was beyond the means of St. Luke's. Nevertheless we felt that we might reach out to the villages by means of systematic propaganda and educational work, and that this might in some measure take the place of survey work. The illiteracy of the remote villages presented an obstacle, and drove us to improvise our own method of portraying the basic scientific truths of this complicated disease.

The real problem was not that of the beggars, but of those lakhs (lakh = 100,000) of patients who have neither discovered their disease nor been recognised by society. There are also those who suspect their condition but conceal the evidence because they are afraid that society will ostracise them as soon as they become known as leprosy subjects. The public and many patients still do not know that there are cheap and effective drugs available, and they do not know that with these drugs early patients can be cured before they develop deformity. Wide publicity for these facts was needed in our area in a form readily understood by the villager. We felt that our project would only be possible

if every resident of the villages was reached, both patient and unaffected persons; we felt that the entire population of each village would have to be given the knowledge of leprosy before we could succeed in our plan, which is the eradication of leprosy from the endemic area. It is our purpose in this paper to describe the effects of a simple educative propaganda venture upon the response of the villagers to anti-leprosy work in a highly endemic area.

The Educative Programme:

Initially this took the form of a ten minute talk before starting the clinic on outpatient days at Peikulam. Later we felt that this was only touching the fringe of the problem and was not reaching the hidden cases in the villages. Thus the form of propaganda now in use was devised, and has now been carried out regularly for the past 3 years in the remote corners of this area of endemicity.

Our aim was to reach every member of the village with our propaganda. We included the healthy members in the hope that social ostracism would afterwards be rejected by their minds. We regarded the education of the healthy residents as a decisive factor in encouraging the concealed patients to come out into the open for treatment. Social ostracism is perhaps the major obstruction to our effort to clean up the area, and our propaganda contains much material aimed at the healthy individual. This material emphasises the relatively rapid cure of early cases and the importance of inducing them to come forward for treatment. Without the co-operation of the uninfected we felt that our attempts at leprosy control would prove largely fruitless. It was something of a challenge to capture the interest of the healthy villager and to convert it into fascination and co-operation.

Presentation of the Propaganda Programme:

This can be varied to suit local conditions, but the method which we found to be acceptable in the villages of South India is as follows:

The village is selected, and a week in advance the President of the Panchayat is informed of the proposed visit. The news is circulated and the village becomes expectant. We arrive in the village at 6.00 p.m. (Sunday) in our ambulance fitted with loudspeaker and gramophone, run off the van battery. First we contact the Panchayat President (Panchayat = Village Council) and request him to preside at the function. The ambulance tours in the village relaying music and announcing who we are, the purpose of our visit, and extending a warm invitation to everybody to attend the lecture and see the pictures. The meeting convenes at a spot chosen by the President, the programme opening with a few selections of classical music. Meanwhile the doctor and his assistants take a stroll through the streets to acquaint themselves with the atmosphere and status of the village, and the general capacity of the people to understand the subject to be presented. It is now 7.30 p.m. and the whole village has usually mustered at the meeting place. The magic lantern and the screen are set in position. A kerosene Petromax lamp first provides light for the audience and lecturer, and then is put into the lantern to project the pictures onto the screen. Thus one kerosene lamp serves both purposes, there usually being no street lighting in the village.

FIG 1 The team with ambulance fitted with loud speaker.

FIG 2 The Panchayat President introduces the subject and the speaker.

FIG 3 With lantern and screen in position the doctor begins the lecture.

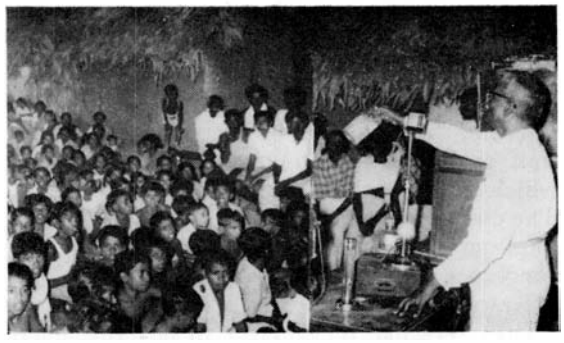


FIG 4 A section of the audience; the speaker demonstrating a specimen to illustrate a point.

The chairman introduces us and the subject we have come to present as the one most urgently needed to help the infected village. Soon rapt attention prevails. The lecture is delivered in homely language illustrated with simple analogies in such a way as to arrest the audience's attention. The material contained in the lecture may be briefly stated as follows.

Synopsis of the Lecture.

Leprosy is a social menace. Untreated it ruins individuals insidiously, and ravages families, communities, and the nation. It is not a respector of persons. The ratio of recognised to unrecognised cases is 1 : 8. The disease is caused by the leprosy bacillus which attacks mostly skin and nerves. *Mode of infection:* Repeated contact with infected people and material, especially an infected close relation. *What are the nerves?* Nerves illustrated by reference to the head telegraph office in the state capital and its relation to small telegraph office (some local offices can be mentioned) by wires. So also is the brain related to the fingers and toes through sensory and motor nerves. When these minute nerves are attacked by leprosy germs sensation is first affected, and later movements. *First signs:* Invariably an anaesthetic patch since the minute nerve fibres underneath have been attacked by the germs, as exemplified by white ants eating the roots of grass, rendering it white. Insidiously the patch develops, becoming two or more patches in the course of months. After a year or so a bent finger develops, and later other deformities which can be recognised, shunned, and ostracised by all. An untreated leprosy subject in a village may disseminate the infection unwittingly to others. He may be an unrecognised source of danger, but he cannot be driven out because he is by right a citizen. But with regular treatment he shakes off the germs slowly but surely and after a time he becomes negative. Though deformed such 'burnt out' patients are no longer a danger to home or society as they are devoid of the germs in their bodies. Therefore insist that all cases take treatment in their own interests as well as those of their families and society at large. *Prevention:* Voluntary segregation at home under regular treatment soon enables the patient to become negative and to take his rightful place in the home and society. Though deformity may persist after he is declared negative, he ceases to be a danger to society as a result of his co-operation with the doctor.

The poor patient cannot heartlessly be thrown out of the village; on the other hand he should become the concern of the whole village lest he spread the infection by wandering about uncared for and without treatment. The village should act not by coercion but by love and concern for the poor brother. The village Panchayat should provide for him a separate hut with bed and clothing. From the Panchayat funds food should be supplied to the patient and his household, and the village should see that he takes treatment regularly from the clinic. Thus the disease binds the sufferer to the hearts of the villagers, and they demonstrate their rejection of ostracism in a practical manner. *Cost of treatment:* The cheapness of treatment is strongly emphasised, plus the fact that it is available free to all living in the endemic area.

Thus none can excuse themselves on the grounds of poverty. The efficacy of treatment is stressed, and numerous medical and surgical cures are portrayed on the screen.

While the lecture is proceeding some of the staff go round the streets putting up posters which reinforce the facts stated by the lecturer. The posters are intended to be seen the following morning as the villagers go to work. The lecture concludes with the announcement that booklets are available about leprosy at a nominal price (25nP). We like the villager to pay this small sum so that he values the literature. Thus the lecture ends, and after the chairman's closing remarks, the meeting closes with the national anthem from the ambulance gramophone. The lecture with pictures has taken an hour and a half, and it is now 9.00 p.m.

Results: It is naturally difficult to assess objectively the effects of these lectures. The results of a changed attitude towards leprosy takes time to manifest itself, and the incidents which spring from it occur out of sight of the workers. 77 villages have been visited in the past two and a half years, and all have given a full and sympathetic hearing. Even without the help of psychologists and social workers we have been able to detect some evidence of the effects of the visits. Regularly, immediately after the lecture additional cases from the visited village appear at the next outpatient clinic at Peikulam (Table I). Some of these recognise the disease themselves as a result of what they have heard, others are sent by the heads of families for similar reasons. Some say that the healthy neighbours urged them to take treatment.

A parish priest has observed that ulcers on the hands of many of his parishioners have disappeared. Itinerant cases are directed by villagers to the leprosarium, and influential people are taking interest in the work. Occasional detailed surveys some weeks after a lecture have mostly shown that all the cases of the village have come forward and are receiving treatment.

TABLE I

Village	*No. of known cases in the village before the lecture*	*No. of additional cases presenting as a result of the lecture*
A.	16	30
B.	13	25
C.	20	30
D.	5	15

etc.

Many of the new cases are early, and hence amenable to rapid cure. They thus become valuable advertisements for our campaign. In some villages, presentation for regular treatment by the local cases has become a matter of community interest, and it is commonly our experience that the healthy villagers become co-partners in the great enterprise of eradicating leprosy from their district. Ostracism has become much less, and we now sometimes get interested villagers looking on at the clinics.

Conclusion

We do not believe that the village meetings along will root out every case of leprosy. This can only result in course of time from the work of a full scale leprosy control scheme. But we do believe that our modest and improvised effort is yielding useful results in the form of increasing numbers of patients coming forward for treatment, and also in a more liberal attitude on the part of village communities to their own patients.

We suggest that a modest propaganda programme might with advantage be considered by small hospitals wishing to take up antileprosy work, as an interim method of reaching leprosy in the villages, until a full scale epidemiology programme can be started.

Abstracts

1 **Capreomycin: Activity against Experimental Infection with Mycobacterium leprae.** CHARLES C. SHEPARD, *Science*, Oct. 16, 1964, Vol. 146, No. 3642, pp. 403-404.

Capreomycin is a peptidic antibiotic against *M. tuberculosis* in mice. It is about as active as streptomycin, kanamycin and viomycin, and tubercle bacilli resistant to streptomycin were susceptible to capreomycin. It could replace streptomycin in humans in conjunction with PAS in pulmonary tuberculosis. Toxicity to the drug was infrequent. Shepard and Chang tested it against infection of mice in foot-pads with *M. leprae* and found that it protected against the infection and suggest its controlled therapeutic trial in the human disease.

2 **Studies on Leprosy Bacilli in Man and Animals.** R. J. W. REES, *Proceedings of the Royal Soc. of Med.*, June, 1964, **57,** No. 6, pp. 482-483.

The author gives a description of leprosy in man and animals and points out the common feature of leprosy bacilli is that they still cannot be cultured in bacteriological media, which has seriously restricted the scope of fundamental and applied research. However, considerable advances have been made recently by using rat leprosy bacillus for study with which it has been possible to determine the rate of multiplication as based on divisions only every ten to 14 days. It has also been possible to distinguish dead and live bacilli by the electron microscope. The degenerate form was incapable of producing the disease in mice even in the light microscope such bacilli could be distinguished by irregular staining under carbol fuchian.

Tissue culture methods have been grown more or less continuously by subculturing the infected cells every 20 or 30 days. These rat leprosy bacilli still fail to grow in ordinary bacteriological media but retain their pathogenicity for rats and mice.

Human leprosy bacilli behave similarly under the electron and light microscope and it was found that on average less than 50 per cent of them remain viable. Under treatment with DDS it seemed that certain of the bacilli were dead, but the host was unable to destroy the dead bacilli rapidly or efficiently. It may be that many leprosy manifestations are brought about by dead rather than living bacilli.

Shephard claims the successful transmission of human leprosy to the foot-pads of mice and the work of Rees with 21 strains of varied provenance have produced an infection in the foot-pads of mice and many first passages have been obtained and a few second passages. The calculated generation time of the human bacillus in the foot-pad is about 15 to 25 days. The infection is reproducible in different strains of mice. It could be used for testing drugs and is completely inhibited by DDS.

3 **Histological Observations on 'borderline' leprosy.** KUNDU, S., GHOSH, S. and SENGUPTA, P. C., *Bull. Calcutta Sch. of Trop. Med.*, Oct., 1963, v. 11, No. 4, pp. 148-151. (11 refs.)

The authors recall that borderline leprosy was recognized by the first WHO Expert Committee and later by the Madrid Congress 1953. The histological features were described by various workers, but considerable difference of opinion remains regarding the tissue changes. The authors selected and studied histologically 30 active untreated 'borderline' patients and found that tissue changes were extremely variable and did not always conform to the clinical features and the lepromin test. The extremely unstable state of the host-parasite relationship was shown by the varying proportions of lepromatous and tuberculoid elements. Development of tuberculoid histology can be controlled favourably in subsequent biopsy specimens with the help of standard specific anti-leprosy drugs, and therefore the unstable state can be modified. On the contrary they found that the appearance of vacuolation (hydropic degeneration) in the giant cells, along with foamy changes in other cells, demonstrated an unstable state which leads to lepromatous changes. This comes about probably through repeated reactions or may be due to a low immune status of the individual host. They think that borderline patients, both clinically in leprosy and histologically, should be put into a separate group and should not be classed with reactional tuberculoid patients.

Lep. Rev. (1965), **36,** 2, 93

Letter to the Editor

Central Leprosy Teaching & Research Institute,
Tirumani, Chingleput,
S. India.

No. F.12(12)Epid/65 11th February, 1965

Dear Sir,

Permit me to make use of your correspondence column to find out if any of your readers have seen leprosy in an albino. I have advanced certain ideas about the skin pigment vis-a-vis leprosy and information of the kind I am after may help me to develop the hypothesis. Albinos cannot be very uncommon among populations in Asia, Africa or South America which are endemic to leprosy, and therefore if the disease affects an albino, the likelihood is that he should have come under notice of those engaged in leprosy work. Hence this enquiry.

Yours faithfully,

Dr P. Mohamed Ali, M.B.E.,
M.B.B.S., D.P.H.,
Head of Division of Epidemiology

Lep. Rev. (1965), **36,** 2, 95/100

Reports

VI Conference of the Indian Association of Leprologists IX All India Leprosy Workers' Conference. Madras, 27th - 31st January, 1965

(DR R. J. W. REES has kindly contributed this personal description of the Conferenecs. He was present at them).

'As Chairman of LEPRA Medical Committee I have recently had the pleasure of attending these two meetings in Madras. At these conferences Dr Dharmendra was President of the Indian Association of Leprologists and Dr R. G. Cochrane President of the All India Leprosy Workers (a particularly nice appreciation of their respect for his achievements in the field of leprosy in India). These two Associations must be congratulated in their far-sighted policy of running the conferences consecutively in order that they can both be attended by all medical and para-medical personnel working in the fields of leprosy. International medical and non-medical representatives from Denmark, Japan, Nigeria, Pakistan, Philippines and United Kingdom were present. The United Kingdom was represented by Dr R. G. Cochrane as President of the All India Leprosy Workers and in addition to myself Air Vice-Marshal Crisham, General Secretary of LEPRA, not only attended the conference but toured a large number of the many leprosy units in the State of Madras receiving financial assistance from LEPRA.'

A general review of the papers presented will be reported in *Leprosy Review*. I will confine my remarks to my general impressions of the conferences. Both conferences were efficiently run with adequate time for discussion. The highlights of the medical and scientific meetings included genetics, plantar ulcers and corrective surgery, chemotherapy of leprosy and experimental transmission and metabolic studies on *M. leprae*. In particular the genetic studies undertaken by Dr Mohamed Ali at the Central Leprosy Research Institute, Chingleput, the very special contribution of India in the field of corrective surgery following in the footsteps of Mr Paul Brand and the highly suggestive evidence initiating from India that lower doses of dapsone are not only as effective as higher doses but they are associated with a significantly lower incidence of reaction. These latter findings were supported by Dr Stanley Browne of Nigeria. Results presented indicated that doses as low as 50-100 mg. dapsone twice a week were as effective as standard treatment of 600 mg. per week. Such findings indicate the necessity for a complete reappraisal of dapsone therapy and strongly suggest that the very practical application of intermittent treatment of leprosy with once weekly or perhaps even once fortnightly dapsone may yet be achieved.

The All Indian Leprosy Workers' Conference left a very real feeling of the dynamic and practical methods which were being applied both by the Government and voluntary services to deal with the present estimate of 3.5 million cases of leprosy in India who were particularly concentrated in the Eastern Districts. Dr Koshoo on behalf of the Central Government presented a fair assessment of the achievements gained during the III Plan and those envisaged in the IV Plan to deal with the tremendous problem facing a country with very restricted financial means. Dr Wardekar presented a very fair assessment of the special contributions which voluntary organisations can make to the leprosy problem in India. Because the total leprosy problem in India was so large it could only be tackled by funds from the Government. Nevertheless, voluntary organisations could still play an essential part on a qualitative basis by concentrating their efforts on specialised or pilot projects.'

Sixth Conference of the Indian Association of Leprologists. Summary of Papers derived from the detailed official programme.

(**1**) *Course of Erythema Nodosum Leprosum* by J. G. TOLENTINO, M.D., was the result of a study of 103 newly admitted lepromatous patients over 56 weeks. About 73.8 per cent had ENL at one time or other, and 22.0 per cent had it more or less continuously. The ENL lesions were papules, nodules or larger lesions than normal, and accompanied by constitutional symptoms in about 70 per cent of patients.

There are indications that anti-leprosy therapy needs to be continued in patients suffering from ENL, rather than suspended.

(**2**) *Exacerbated Lesions in Leprosy:* C. K. JOB, B.SC., M.D., delivered a paper based on a study of exacerbated lesions in leprosy over a period of three years. He found that exacerbation manifests itself in different ways in different forms of leprosy. In the indeterminate group exacerbation shows as progression to other forms of the disease, so may be said not to occur in stable indeterminate leprosy but in the unstable. In the tuberculoid group exacerbation may be localized to a dermal area or a nerve trunk or generalized in the whole area of the skin and widely in nerves. There is evidence of a blood spread of the disease causing metastatic lesions. In the borderline group the exacerbation follows the same pattern as in the tuberculoid group but in much worse form. In the lepromatous group the acute exacerbation is always generalized. The more common is in the form of ENL which is specific to the lepromatous type, but there is also the exacerbated lepromatous granuloma.

(**3**) *The Theory of Suprarenal Cortex Damage in Leprosy and its Role in Leprosy Including the Exacerbations* was a paper given by DR D. CHAKRABARTHY and points out the difficulty of a single theory explaining all the phenomena of exacerbation. After discussing the basic disturbance of endocrines and chronic inflammation, the author advances the important theory of damage of the suprarenal cortex. Such damage will cause deficient secretion of the gluco-corticosteroids. This theory has been previously adduced to explain some of the exacerbation phenomena caused by potassium iodide. A plea is made for further investigation.

(**4**) *Study of Reaction in Tuberculoid Leprosy* by DR S. CHOUDHURY, M.B.B.S. and DR S. GHOSH, M.B., D.T.M. The authors mention the unsatisfactory state of the nomenclature of reaction and mention their findings in 218 leprosy patients of tuberculoid reaction, of whom 46 patients were intimately observed. There was a sudden appearance of new thick erythematous lesions, as well as activation of existing lesions. Most patients were bacteriologically positive and became negative within a short period, and in most patients under review the lepromin test was positive. There was no detectable pattern in results from blood cholestorol, albumen, and globulins.

(**5**) *Certain Pathological Features of Reaction in Lepromatous Leprosy* by C. G. S. IYER and SRI P. B. NATH. The authors studied the histological findings in 40 patients with reactions in lepromatous leprosy. The dominant feature was inflammation of an acute or subacute nature in a background of pre-existent regressive lepromatous exudates. It was noted that subcutaneous nodulation formed from fibrous tissue which enmeshed a previous inflammatory exudate. In a few cases, subcutaneous nodulation resulted from lymph nodes, nerves, or skeletal muscle previously involved.

(**6**) *Blood Chemistry in Acute Exacerbations in Leprosy* by S. BALAKRISHNAN. This paper presents data from biochemical investigations on the blood serum during exacerbation and subsided phases, with normal controls. The data chiefly referred to are protein and lipid patterns, as the deviation from normal was significant in these. There was a constant lowering of albumin and increase of globulin, irrespective of the phase, whether reactive or subsided. Moderate globulin increase was also noted in patients with acute reaction, and a general lowering of cholesterol levels was noted. Preliminary studies in serum sialic acid, a constituent of mucoprotein, showed a raised level in leprosy sera, particularly in reactive states.

(**7**) *The Significance of the Genetic Approach to Leprosy* by R. G. COCHRANE, M.D., F.R.C.P. The author mentions the genetic factors in leprosy and requests serious attention to the genetic factors. This is likely to explain several anomalies which are urgent and open up a wide further field.

(**8**) *Genetic Influence in Leprosy* by P. MOHAMED ALI. This paper presents findings of several studies in the Research Institute, Chingleput. Infectiousness alone cannot explain everything, for it was noted that the incidence of leprosy has no relation to sanitation, housing conditions, economic status of the family, educational status of the patients and family, nor to nutrition. It was found that there was no correlation between number of patients and the size of the family. No age group is particularly vulnerable to leprosy, nor is age a bar to incidence of the disease. There was no basis for the ideas of adult insusceptibility and the necessity of prolonged intimate contact. Monozygotic twins have a much greater concordant susceptibility to the incidence of leprosy than dizygotic twins.

The author explains the various anomalies in the epidemiology of leprosy more readily on a hypothesis that susceptibility to leprosy is genetically determined and cites facts which support the genetic theory, namely (a) the significant sex ratio, particularly on lepromatous leprosy, (b) the finding of two decisive periods when infection is apt to occur, (c) the greater concordance among monozygotic twin pairs, (d) the disease tends to cling to families, (e) there is a racial predilection for certain types of leprosy.

The distribution of leprosy in India and the high level in Madras State may also be explained on a genetic basis, but the author does not think there is a single irregularly dominant gene. He thinks the genetic influence may be multi-factorial.

(**9**) *Study of Genetic Inheritance in Relation to Leprosy and Environmental Factors* by V. K. SHARMA. The author discusses the role of genetics in his paper and points out the multitude of factors. The author's studies in Uttar Pradesh indicated the possible social factors. Much work in sectors other than genetics has to be done, though genetics is undoubtedly important.

(**10**) *Determining Factors in Localization of Foot Ulcers* by H. SRINIVASAN. The author points out that a knowledge of such factors should be most helpful in prevention and therapy. He discusses these factors in normal feet with normal usage, and abnormal feet, and emphasizes that each patient and each foot should be considered in detail so that harmful factors can be recognized.

(**11**) *Plastic Aspects of Scars on the Anaesthetic Foot* by W. M. LENNOX. From ulcers which may recur where ulceration has destroyed the special subcutaneous pulp, scars may break down as a result of pressure and crushing of cells and shear and rupturing of cells. Sites which are prone to reulceration are scars over recognized pressure points, scars over pressure points in distorted feet, and heel scars. Recommended methods of treatment are physiotherapeutic in massage and ultrasonics, and surgical such as splint

skin grafts, local flaps, direct flaps, pulp flaps, early correction of claw toes, trimming of underlying bone. Orthopaedic deformity should be corrected first. If the foot ulcerates in spite of protective footwear, then plastic surgery should be considered.

(**12**) *Patterns of Disintegration of the Tarsus in the Anaesthetic Foot* by J. HARRIS and P. W. BRAND. The authors distinguish tarsal disintegration from distal absorption of the foot. Tarsal disintegration follows certain definite patterns. Mechanical stress determines the pattern. The path of the stream of weight is the core of this. The basic requirements for the development of the patterns are loss of pain sensation and loss of vigorous activity, and other important factors are sepsis, muscular paralysis, and trauma.

It is not invariable, but plantar ulceration usually precedes tarsal disintegration; plantar ulceration is an invariable accompaniment at the stage of the end result. Early diagnosis and prevention are important in management. Conservative treatment includes complete bed rest and provision of special footwear, immobilisation in plaster cast and special surgery.

(**13**) *Dressing Room Surgery for Complicated Ulcers of Leprosy Patients* by S. L. GUDE, M.B., B.S. The author reports the study at Kothara Leprosy Hospital during 1962 and 1963 of 349 leprosy patients treated for ulcers on anaesthetic limbs. He found that 179 patients had repeated admissions and 243 had ulcers with complications from sepsis and needed surgical treatment. They were treated in 552 dressing room operations. These were excision of nails, trimming of bones, sequestrectomies, curetting, amputations of digits, incisions to drain abscesses, debridements, and saucerizations for osteomyelitis. There was a 'no touch technique' and teams of workers organized to bring and remove patients, to make records, to pass the sterile instruments to the surgeon, to clean and sterilize the used instruments at once, and to dress and bandage the wounds.

This method deals effectively with a large number of patients in a short time with few skilled personnel, and keeps the main threatre free of sepsis, and ever ready for action. Artificial anaesthesia is seldom needed because usually these ulcers are on anaesthetic limbs. When needed, two per cent procaine is used by digital block or local infiltration.

(**14**) *Plantar Ulcer and its Management* by S. HASSAN. The author first discusses definition and theories of plantar ulcer. The main accepted facts are that plantar ulcer occurs on the anaesthetic sole of the foot, appears on the walking foot, develops on an area bearing pressure, underlies the bony prominence. Superficial and deep ulcers are the two main types. The first part of treatment is education of the patient in the care of anaesthetic hands and feet. Management of the pre-ulcerative stage is allied to management of the ulcer and of the healed ulcer. In the pre-ulcerative stage rigid rocker shoes should be used. For ulceration a walking plaster cast may be applied below knee, or bed rest given on a posterior slab. Dressing alone cannot heal a plantar ulcer, but local use of an antileprosy drug promises some success. Soft-soled footwear is used for healed ulcers and the scar made mobile by oil massage.

(**15**) *Low-dose Oral Dapsone Therapy in Bacilliferous Leprosy* by S. G. BROWNE. While the maximum tolerated weekly dosage of dapsone is not difficult to determine, much uncertainty still exists regarding the lowest therapeutically active dose. Lowe (1951) expressed the opinion that 'years of experience will be needed before the most effective dose can be determined', and thought that in Indian patients the dosage of dapsone might have to be reduced 'even below 100 mg. daily'.

A group of African adults suffering from severe lepromatous leprosy have been studied for from three to four years while they have been treated with 50 to 100 mg. of dapsone by the mouth twice weekly.

Regular frequent bacteriological examination has been performed, and both the bacterial Index and Morphological Index (the percentage of normal staining solid rods) have been determined.

Results to date indicate a rapidity of a clinical and bacteriological improvement in all respects comparable with that noted on much higher dose regimes of dapsone.

In addition, the incidence of complications has been substantially reduced in number and severity. Anaemia did not occur. The reactions were fewer and of short duration, and less serious than those occuring in similar groups on standard treatment regimes. No instance of allergic dermatitis occurred. There was a lower incidence of polyneuritis.

Further studies are in progress.

(**16**) *Isonicotinyl Hydrazone of 2-Carboxy-Methoxy-Benzaldehyde (Compound 377) in the Treatment of Human Leprosy* by S. GHOSH. It has been reported that Compound 377 has been very effective in suppressing infection in experimental rat leprosy, so the author undertook a clinical trial in human leprosy on 167 patients on a dosage of 200 mgm. orally daily for 18 to 22 months. There were a further 30 patients studied for comparative treatment on dapsone. He found marked improvement in 20 lepromatous patients, moderate improvement in 20, slight in 30, and 10 cases became bacteriologically negative during the period. Of the 97 tuberculoid patients complete arrest of the disease was noted in 11, marked improvement in 19, moderate improvement in 21, slight in 39. No reaction was observed, and histology at intervals revealed regression.

In comparison with the control group, this drug produced chemical and bacteriological improvement within a shorter period.

(**17**) *A New Approach to Anti-leprosy Therapy* by D. CHAKRABARTHY. The new approach is attention to inflammatory or anti-inflammatory as well as bacteriostatic properties of the drug. The author classifies known drugs as follows: drugs with bacteriostatic and inflammatory properties are sulphones, INH, thiosemicarbasone, streptomycin, thiambutosine. The drugs with bacteriostatic and anti-inflammatory properties are amodiaquine and chloramphenicol. Drugs with no bacteriostatic but possessing anti inflammatory are aspirin, salicylates, antimony, glucocorticosteroids, ACTH, calcium and anti-histaminics. The author makes a plea for further research on amodiaquine and chloramphenicol.

(**18**) *Treatment of the Residual Patches of Leprosy* by A. T. ROY The stigma attached to the disease much hampers treatment and rehabilitation. Patients with diffuse lepromatous

leprosy may move among contacts undetected and spread the infection, but the least mutilation and scar arouses alarm, quite often unjustified. It is worth while attending to these surgically, and even residual pigmentation can be treated successfully with intradermal Ludocreol.

(**19**) *An Injectable Diphenyl-thiourea Compound in the Treatment of Leprosy* by RUTH PFAU and ZARINA FAZALBHOY. Since 1963 the authors have conducted a controlled clinical trial with injectable Ciba-1906. There were 40 patients on the drug and 40 control patients who received the standard drugs. The dosage of Ciba 1906 began on 100 mgm. and the dose gradually built up to 2 gm. weekly. Tolerance was good and reactions less severe and less frequent. Improvement in the disease was generally good, and the results comparable to those from DDS. The injections were difficult to administer, and five patients developed sterile abscesses at the site of injection. It is a valuable alternative drug, particularly where standard drugs are not tolerated.

(**20**) *Lower Dosage Sulphone Regimen in the Treatment of Lepromatous Leprosy* by G. RAMU and K. RAMANUJAM. The authors studied this in 135 patients over 18 months, with different dosage schedule in groups of cases. They found that the results so far in the smaller dose group are as good as those on the larger dose, and the incidence and frequency of lepra reactions are difinitely lower in the group on the smallest dose, namely 200 mgm. weekly for adults and 100 mgm. weekly in children. The smallest therapeutically effective dose should now be sought.

(**21**) *Observation on Borderline Leprosy* by S. KUNDU, S. GHOSH, and P. C. SEN GUPTA. The authors have studied biopsies of 30 active untreated borderline leprosy patients. In histology the normal epidermal contour was lost and rete pegs were shortened and flattened in most specimens. In over half, a clear more or less continuous epidermal space was noted. The proportion of dermal granuloma was massive to moderate, either focal and compact or confluent in the papillary part. Infiltrating cells of lepromatous tissue changes were common, or Langhan's giant cells in tuberculoid foci were found in various parts of the granuloma. Some of the nerve fibres showed peri-epineural and endoneural infiltrations of a few bacilli, while others showed large numbers of acid-fast bacilli with little perineural infiltration. Vascular changes were noted in a few specimens with periarteritis and bacilli. Vacuolated histiocytes were full of bacilli and also bacilli were found in globi between the axons. Histiochemical observations were of neutral fat, phospholipids, and polysaccharides positive to PAS. Glycogen could not be demonstrated in the cells. Staining with alcian blue showed a fair amount of acid mycopolysaccharides in the dermal connective tissue and Langhan's giant cells.

(**22**) *Borderline Type of Leprosy* by D. CHAKRABARTHY. The author mentions that the borderline type of leprosy, though recognized lately, was mentioned in the Bagvat Nidan of A.D. 200. It is important to recognize it, and he describes six types of borderline manifestations, the central depressed, the extension, the reversed saucer, the ring, the pseudopodial, and the miliary lesion. Borderline is a type which starts and ends as borderline, and it seems that the bacteriologically positive tuberculoid reaction and the reactional tuberculoid are really borderline. The author suggests a new nomenclature which includes the intermediate and its subtypes and introduces a dimorphous group with two subtypes, namely the papular dimorphous (PD) for borderline type, and macular dimorphous (MD) for bacteriologically positive indeterminate patients. Bacteriologically negative forms of indeterminate should not be diagnosed as leprosy in the absence of cardinal signs of the same.

(**23**) *Histopathological findings in cutaneous lesions of Borderline Leprosy* by C. G. S. IYER and P. B. NATH. The authors studied biopsies of cutaneous lesions of 78 patients with borderline leprosy, and some repeat specimens were obtained at intervals of four months to one and a half years. They classified the histological findings with a view to noting any changes in the tissue reactions, content of acid-fast bacilli, and correlation with clinical progress.

(**24**) *Clinical and Pathological Observations on Reactional Stages of Leprosy Including Borderline Leprosy* by M. NISHIURA. The author is carrying out a similar study as the previous authors on reactional conditions in leprosy on material from patients in Thailand and Japan.

(**25**) *Borderline Leprosy* by K. RAMANUJAM and G. RAMU. The authors studied material from 70 outpatient borderline patients at Chingleput over two years, and reported findings. Rebiopsies after subsidence were done in most of the patients.

(**26**) *Physical Medicine in Leprosy* by MRS KAMALA V. NIMBKAR. The author discusses physical agents, mechanical devices, manipulation, massage and exercise, and total rehabilitation which is built on physical medicine.

(**27**) *Post-Operative Physiotherapy Management of Lumbrical Replacement in Leprosy* by SRI N. PALANI. The author discussed standardised operations for the correction of claw hand. The five points which therapists should note at the removal of the immobilising plaster cast are indicated as search for oedema, state of wound healing, note whether any extension limitation of the metacarpophalangeal joint, an angle assessment of fingers and range of motion at every joint.

It is important to give careful management if oedema is found, to avoid prolonged resolution and consequent fibrosis and tendon adhesions. For anaesthetic hands uncontrolled violent exercises are harmful. An ulnar forearm gutter splint is suggested for ulnar drift to the hand. The author found that the graft passing through the carpal tunnel injures the median nerve in extensor flexor manytailed operations. There is great success in correcting claw hand in careful selection of cases, preoperative and post-operative physiotherapy, and in surgical and re-educational methods.

(**28**) *The Use of Physiotherapy in the Preservation and Treatment of the Thumb in Leprosy* by MISS C. THISTLETHWAITE. A good range of abduction is important to the thumb, and contracture makes it unsightly. Physiotherapy can help in prevention of injury, infection, and absorption, and prevention of contracture can be attained by inspection, oil massage, and extension exercises. Prevention of contracture of the thumb web by early inspection for opponens and short abductor paralysis, followed by oil massage. In the treatment of contractures wax, oil, exercises, and splints can all be used beneficially. There is special treatment in relation to certain operations, and re-education exercises should not be forgotten.

(**29**) *The Hand in Acute Stages of Leprosy* by SRI PAUL R. NAMASIVAYAM. Many leprosy patients pass through acute episodes and neuritis, and can be helped here by physiotherapy to prevent stiffness and minimise deformities. In a follow-up study the author found mere paralysis did not lead to stiffness, and that acute episodes are very important in producing stiffness. Great benefit can follow the use of heat, rest, and exercises in the care of the hands in acute episodes.

(**30**) *The Necessity of Physiotherapy Following Reconstruction Operation* by S. L. KOLUMBAN. The importance of physiotherapy *after* a reconstruction operation is emphasized. This phase is crucial and often leads to success or failure of the operation. There is post-operative recommended physiotherapy for every operation, though rather than a set routine, the physiotherapy procedures should be adapted to every problem.

(**31**) *Response to Physiotherapy of Patients with Lumbrical Replacement Operations in Lepromatous and Non-Lepromatous Types of Leprosy* by W. H. JENNINGS. In Kondhwa Leprosy Hospital four different types of lumbrical replacement operations were done on 163 patients, and post-operative physiotherapy was done with warm emollients, and re-educational and mobilisation exercises, and later splinting. Response was good in non-lepromatous patients but lepromatous patients generally did not respond well. For the problem of stiff hands one of the surgeons DR J. M. MEHTA has suggested ionisation with two per cent potassium iodide. Of three patients so treated two have improved.

(**32**) *Recent Applications of Experimental Human Leprosy in the Mouse Foot Pad* by R. J. W. REES. In 1960 Shepard, working in the United States of America, claimed the successful transmission of human leprosy in the mouse foot pad. We have confirmed his claim and at the VIIIth International Congress of Leprology the Committee on Pathology and Experimental Transmission accepted that this type of infection was due to the human leprosy bacillus. This discovery is of the greatest importance and provides, for the first time, an experimental infection for studying the pathogenesis of leprosy.

In our studies we have successfully transmitted human leprosy in the foot pads of mice from 33 patients from different parts of the world; Malaysia (25), Burma (6), East Africa (1) and the West Indies (1). Twenty-seven patients had lepromatous and six borderline or near tuberculoid type leprosy but the type of infection in the foot pad was identical. Although the infection is confined to the foot pad and the bacillary increases are limited to approximately 100 fold, the infection can be maintained successfully by passage from foot pad to foot pad and some of our experiments are in the fourth passage in mice. The infection is suitable for testing the activity of drugs and already we have compared the activities of dapsone, thiambutosine, thiacetazone, phenazine and several of the long-acting sulphonamides. Furthermore, it has been possible to show that the bacilli from some patients who have failed to respond to dapsone are resistant to dapsone treatment in the mouse foot pad. This is the first irrefutable experimental evidence for the existence of DDS resistance strains of *Myco. leprae*. Studies have been undertaken to determine the viability (infectivity) of leprosy bacilli recovered from patients after one or more years treatment with dapsone. As in man, nerves are infected in the mouse foot pad infection. The results of these studies and attempts to enhance the infection in the mouse foot pad were discussed in the meetings.

(**33**) *Facial Nerve Exploration in Leprosy* by N. H. ANTIA and S. C. DIVEKAR. Lagophthalmos is a common complication and the superior branches of the facial nerve are most commonly affected in India. The authors evaluated the pathology of the facial nerve in a preliminary exploration in ten lagophthalmos patients wherein temporalis muscle transfer was to be done. The naked eye and electrical findings were recorded, and the paralysed segment of the nerve excised for histology. DR D. K. DASTUR will present the histopathology in another paper following.

(**34**) *The Facial Nerve in Leprosy* by D. K. DASTUR, N. H. ANTIA, and S. C. DIVEKAR. It was noted at the time of operation that gross change in morphology, if any, was confined to the branches of the facial nerve passing over the zygomatic bone region, especially in the branch pointing to the lower eyelid. There was thickening and firmness of feel of this branch. Even when such a gross change was not noted, electrical response was defective to stimulation of nerve or nerves in the territory in any muscle of the affected region. Histology showed pronounced degeneration of nerve fibres with severe inflammatory and fibrotic reactions of varying degrees. Acid-fast bacilli were occasionally seen.

(**35**) *Experimental Transmission of Human Leprosy Infection to a Hybrid Inbred Strain of Black Mice* by K. R. CHATTERJEE and R. J. W. REES. The use of a hybrid inbred strain of black mice in the studies of transmission of human leprosy to laboratory bred animals was first reported from the School of Tropical Medicine, Calcutta in 1958. Since then this work was carried out at different laboratories of the World. At the National Institute for Medical Research, London, since 1960, 24 experiments were undertaken with this strain of mice brought from Calcutta and maintained at the Institute. Two of these experiments were carried out with 'Freeze-dried' bacilli from mouse passage material from Calcutta but they did not produce infection. The remaining 22 experiments were undertaken with material from fresh biopsies received from Malaya, Burma and Africa.

Two of the biopsies were found to contain culturable acid-fast bacilli and so they are being followed up separately. In nine out of the 20 experiments progressive infection has been established. On an average each mouse received a dose in the order of 10^7 to 10^8 freshly isolated *M. leprae* but during the passages from animals to animals the dose depends on the harvest. The viability of the bacilli as judged from the percentage of solidly stained organisms varied from 20 per cent to 85 per cent with a mean near 50 per cent. To begin with the mice required 8 to 12 months to manifest the infection but once established the mice reached the peak of infection in about 5 to 6 months. Of the 9 successful transmissions, 2 are now in the eighth passage stage, 4 in the seventh, 1 in the fifth and 3 are in the third passage stage.

To begin with the progressive lesions were of mild nature and fewer animals were affected. However, with passages the mice developed more gross and heavy

infection. Once established the infection tends to become more generalised involving liver, spleen, lymph nodes, lungs, skin and nerves. The salient features observed in the infected animals were the involvements of the peripheral nerves in about 80 per cent of the animals. From very mild to heavy infiltration with intracellular acid-fast bacilli was noted in the peripheral nerves. The generation time of the organisms in the animals is round about 20 days. Immunological and serological studies made to compare the antigenic components of the organisms with those of other mycobacteria including *M. leprae* and *M. lepraemurium* are in progress.

(**36**) *Liver Function in Leprosy* by ANNIE VERGHESE and C. K. JOB. The authors studied 20 leprosy patients and estimated liver function. In the lepromatous leprosy group of 11 patients only one patient had a haemoglobin below ten G per cent and two had a raised prothrombin time. All had high globulin and only one had a low albumin level and two showed slight abnormality of BSP excretion, with only one showing significant retention of dye.

In the borderline group of seven patients, the haemoglobin was above ten G per cent in all, with a raised prothrombin time in one. The albumin was low in one and the globulin raised in one. In two patients there was slight abnormality of BSP excretion in two, and significant retention of the dye in one. Focal granulomata were present in the liver in all except two patients.

The two tuberculoid patients studied had normal liver function and no lesions in the liver.

The presence of granulomatous inflammation in the liver of leprosy patients does not necessarily diminish liver function.

(*Note:* Description of papers from the Leprosy Workers' Conference will have to be made in a later issue of *Leprosy Review*, probably the July issue – Editor).

Reviews

1 **Tropical Diseases in Temperate Climates.** KEVIN M. CAHILL, Jan., 1965, J. P. Lippincott Co., Philadelphia/Montreal. 225 pages, 80 figs. 90s net. from Pitman Medical Publishers Co. Ltd., London.

Dr Kevin M. Cahill is head of the Department of Epidemiology and Director of Tropical Medicine in the U.S. Naval Medical Research Unit, Egypt and Sudan. He has broached the subject in order to provide doctors, without first hand experience of tropical medicine, up to date information on the diseases which they could treat in patients in tropical areas and in patients in temperate climates who had been in the tropics. He has succeeded in providing an extremely readable and accurate book giving satisfactory accounts of helminthic, protozol, bacterial, viral, spirochaetal, rickettsial and miscellaneous diseases, and it includes a very useful and practical chapter on 'Advice for Travel in the Tropics'.

The account of leprosy is very balanced and sufficiently conclusive to make anyone intelligently informed on this subject, which is of growing importance and the treatment of which has growing efficiency. The essential points of the necessity to be able to recognise and treat many or even most of the diseases outside the tropics are well met by this book.

These are the days of rapid communications and almost all tropical diseases can become manifest in patients residing in temperate climates. The illustrations are well chosen and very helpful to the understanding of the clinical appearances.

Prof. Woodruff's foreword makes the point that several epidemics have originated from the rapid transmission from one country to another of persons incubating the disease.

2 **Aids to Tropical Hygiene and Nursing.** WILLIAM C. FREAM, S.R.N., Fifth Edition 1964, Balliere, Tindall & Cox Ltd., London, 220 pages, price 10/6, 9 figs, 7 plates, foreword by Dr W. H. Jopling.

This is the fifth edition of a very useful handbook in the Nurses' Aids Series and will find an enthusiastic welcome, as did its predecessors. In the care of patients in tropical diseases a very great debt of gratitude is always owed to the nurses. It is not too much to say that they bear the greater part of the strain. In many places abroad they bear the whole of the strain. In any case this book will prove of great value on preventive medicine and is thoroughly to be recommended. It has an adequate index.

THREE PREPARATIONS DEVELOPED IN THE

CALMIC LABORATORIES

CICATRIN AMINO ACID AND ANTIBIOTIC THERAPY FOR CHRONIC ULCERATION

CICATRIN provides a unique combination of the amino acids, Glycine, l-Cysteine and dl-Threonine and the antibiotics – Zinc Bacitracin and Neomycin Sulphate.

The topical application of CICATRIN to trophic ulcers and other ulcers where delayed healing is due to devitalization of the tissue, has resulted in a marked increase in healthy granulation and control of local infection.

Formula

Each gramme contains:
Neomycin Sulphate 5 mg.
Zinc Bacitracin 250 units
dl-Threonine 1 mg.
l-Cysteine 2 mg.
Glycine 10 mg.

Packs

Available as a Cream or Powder.

POLYBACTRIN ANTIBIOTIC POWDER SPRAY

POLYBACTRIN is a combination of antibiotics dispersed in ultrafine powder form. The application of the spray secures bacterial inhibition over a wide area.

POLYBACTRIN has been established for many years as a safe and most effective treatment and prophylaxis for all surgical conditions carrying a hazard of post-operative infection and will be found particularly useful for the control of persistent infections of soft tissue.

Formula

Net contents of powder 1.5 g.
Each canister contains:
Neomycin Sulphate
495 mg. base
Polymyxin B Sulphate
150,000 units
Zinc Bacitracin 37,500 units
Pressurized with dichlorotetrafluoroethane and dichlorodifluoromethane.
(109 g. approx.)

S.7. A NEW ANTI-FUNGAL AND ANTIBACTERIAL AGENT

S.7. provides di- (2-hydroxy-5-chlorophenyl) sulphide, B.P. approved name 'Fenticlor', a powerful fungicidal and antibacterial agent which has been found extremely effective in the treatment of a wide range of mycotic infections of the skin and mucous membrane.

As a fungicidal agent S.7. shows marked inhibition of Monilia albicans, Aspergillis Niga and Trichophyton interdigitale and other pathogenic fungi commonly met in mycotic infections of the skin.

Formula

Each preparation contains:
1% di-(2-hydroxy-5-chlorophenyl) sulphide

Packs

Available as: Jelly, Cream, Powder and Pessaries.

Full Technical Data and Literature on any of the above preparations available on request from:

CALMIC LIMITED, CREWE, CHESHIRE Telephone CREWE 3251 (7 lines)

LONDON: 2 MANSFIELD STREET, W.1 Telephone LANGHAM 8038

"We consider that dapsone (DDS) is still the drug of choice for general use in active leprosy"

Report of Panel on Therapy
8th International Congress of Leprology, 1963.

As the treatment of choice in leprosy, 'Avlosulfon' (dapsone) is distinguished by its ease of administration, relatively low toxicity, high activity and cheapness in price. It achieves a rapid response in the initial stages of the disease, reduces infectivity and cuts short the period of isolation.

'Avlosulfon' is available as tablets of 0.05 gramme (containers of 1,000) and 0.1 gramme (containers of 100 and 1,000).

Avlosulfon Trade Mark

DAPSONE B.P.

Imperial Chemical Industries Limited
Pharmaceuticals Division Alderley Park Macclesfield Cheshire Ph363/1