LEPROSY REVIEW

Volume 51, Number 1, March 1980

Published Quarterly for the
British Leprosy Relief Association

ISSN 0305-7518

Editorial

A GUIDE TO LEPROSY CONTROL, WHO/LEP/79.9*

Long awaited, but nevertheless extremely welcome, is this 1979 issue of an invaluable guide, from the Leprosy Unit, Division of Communicable Diseases, Geneva, Switzerland. The up-dated edition has been prepared '. . . not only in response to numerous requests, but because the thirteen years that have passed since the second edition have seen great changes, both in our basic knowledge of leprosy and in the approach to leprosy control in relation to National Health programmes'. Many of those who in previous years have had to plunge head-first into the deep end of leprosy control in endemic areas, often with little or no experience in the control of leprosy, or indeed of any communicable disease, must have taken great strength from the clear definitions and methods of procedure in the 1966 Guide, and the new one will surely continue to fulfil this need.

It is indeed true that the thirteen years between these two editions have seen important changes in the state of our knowledge of leprosy, but it must also be admitted that many of the old difficulties remain with us, and some new ones have appeared. Our understanding of the mode of transmission of this disease is still far from complete, and such knowledge as we have, notably on the massive excretion of bacilli from the nose of lepromatous patients, has not found a practical application in the field which might help to break the chain of infection. The lack of an *in vitro* culture (or of a reproducible, reasonably rapid alternative) still greatly hampers our assessment of drug therapy, so that in most parts of the world, heavy reliance must still be placed on clinical findings over long periods of time, together with routine bacteriology and the histopathological examination of biopsies.

Looking at the problems of control on a world-wide basis, the earlier pages of this Guide draw attention to the continuing and embarrassing figure for registered cases (3,599,949), compared with those estimated to exist (10,595,000), the former figure including about 1½ million cases under the International Federation of Anti-Leprosy Associations (ILEP), whose member organisations are exceedingly anxious to find and treat more cases. This 'block' is still rather inadequately accounted for, particularly in view of the fact that undiagnosed (and therefore untreated) cases, many of them with a lepromatous or border-line-

*Available from WHO, 1211 Geneva 27, Switzerland.

lepromatous classification, are known to exist in areas where good quality control services have been available for many years. Nor can it be attributed to lack of money.

Page 13 of the new Guide emphasizes that '. . . Poor attendance of out-patients constitutes one of the main obstacles in the effectiveness of leprosy control programmes' – a reminder that we have as yet failed to analyse the reasons for non-compliance in leprosy patients and that in some control areas the problem is now being recognized on an alarming scale.[1] Closely related to this subject is that of dapsone resistance, a relatively recent, but apparently increasing problem which receives attention on several pages in this 1979 edition, Annex IV.1, setting out the various drug combinations which have been advised. Annex V on the control of sulfone intake by urine tests, reminds us that careful urine testing in the field has confirmed that a disturbing percentage of patients, who actually attend and collect tablets, may ingest them in inadequate dosage, or not at all.

Whilst it is possible that primary health care, or some other form of integration, or the use of an existing health infrastructure, may greatly assist in finding and treating more cases of leprosy, it looks as if there is an almost urgent need to look carefully at the matter of patient compliance, since this is the cause of relapse, some of which may be due to dapsone resistant organisms. Is there a case, one wonders, after all these years of conventional leprosy control, some of which has been carried out at great expense, for (1) analysing the length of time for which patients in various categories, and in various countries, *have actually attended*, before becoming 'lost to control', and (2) basing the most important (and often the most expensive) period of chemotherapy and supervision *on this period*?

The new Guide is essential for all those working in the field, whether directing, supervising, or actually carrying out the daily tasks of leprosy control. It should also be read by research workers, for it touches on almost all aspects of this complex disease, expertly balancing hard facts against the areas of uncertainty and ignorance, in which so much more work remains to be done.

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LEPROSY REVIEW. Some recent changes in the style and format of submitted manuscripts; printing; subscriptions and distribution.

Instructions to Authors. A change to the 'Vancouver style' of printing, as already adopted by a number of leading medical journals in the UK and USA, has been accepted by *Leprosy Review*, and detailed instructions given in Number 4, **50**, 1979. The necessary format is best seen in any number of the *British Medical Journal, the Lancet, Annals of Internal Medicine* or *the Journal of the American Medical Association.* As early as possible in 1980, we would like to see manuscripts, especially from the UK, Europe and the USA, conforming to this style, and by the end of 1980, the change should be generally accepted by all contributors.

Printing. With Number 1, **51**, 1980, we are changing to the Alden Press Limited, Osney Mead, Oxford OX2 OEF, and there will at the same time be a change to a larger page size, approximating to that last used for *Leprosy Review* in 1970. We wish to record our thanks to Academic Press in London for so many years of high quality printing of this journal.

Subscriptions and distribution. With the above change to printers in Oxford, the distribution will be organized from LEPRA at Fairfax House, Causton Road, Colchester, CO1 1PU, England. The new subscription rates, starting with Number 1 of **51**, 1980, are given on the inside cover of this number.

Reprints. Fifty free copies are given to each author.

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Association of tuberculosis and leprosy in South Africa

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Received for publication 7 August 1979

Summary In a study of the simultaneous occurence of pulmonary tuberculosis and leprosy it was found that 13.4% of leprosy patients were also suffering from tuberculosis on admission to hospital. This figure is considered to accurately reflect the prevalence of the association of these two diseases *in South Africa.* Tuberculosis occurred throughout the leprosy spectrum and in general responded well when appropriate therapy was added to standard leprosy treatment. There is potential danger in that rifampicin resistant strains of *M. tuberculosis* may be selected for if the clinician fails to recognize the simultaneous condition.

Introduction

Although many publications refer to the association of leprosy and tuberculosis in a patient as being 'not uncommon', few present results which throw any light on the prevalence of such an association, prior to post mortem. Gajwani *et al.* (1968),[1] Gupta and Prasad (1971),[2] Agnihotri *et al.* (1973),[3] Premanath and Ramu (1976)[4] and Bhargava and Mathur (1976)[5] have reported on clinical and therapeutic details in cases of the simultaneous occurrence of tuberculosis and leprosy. Post mortem examination has variously revealed that in 54.7% (Mitsuda and Ogawa, 1937),[6] 27% (Desikan and Job, 1968)[7] and 6% (Sungei Buloh Sanatorium, 1974)[8] of cases of leprosy death was due to tuberculosis. It is to be expected that the prevalence of the association will vary with individual susceptibility to both diseases and the prevalence of infectious cases of tuberculosis and leprosy in a given population. It is important to be aware of and to recognize such cases in order that they be properly handled.

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Material and Methods

The study group consisted of 112 consecutive admissions to the Westfort leprosy hospital, Pretoria, and these were classified for leprosy according to the system of Ridley and Jopling (1966).[9]

Each patient had a posterior–anterior chest X-ray performed and the films were read by an experienced tuberculosis doctor who classified them into four groups: (1) no tuberculosis pathology, (2) evidence of current pulmonary tuberculosis, (3) shadows characteristic of an old healed tuberculosis and (4) shadows of uncertain aetiology.

Three early morning sputum specimens were taken from each patient on admission. If a patient was incapable of a productive cough then the three specimens were induced by the inhalation of saline aerosol (Gatner *et al.* 1977).[10] The definitive and more sensitive sputum culture technique was preferred to smear microscopy for making the diagnosis of tuberculosis. Sputa were decontaminated/digested by the N-acetyl-L-cysteine/NaOH method (Kubica *et al.*, 1964)[11] and three tubes of Löwenstein–Jensen culture medium were inoculated per specimen. On aerobic incubation at 35–37°C colonies of *Mycobacterium tuberculosis* generally appeared in three weeks and identity was confirmed by examination of a Ziehl–Neelsen stained smear and positive reactions in the niacin and nitrate reduction tests.

When a diagnosis of tuberculosis in addition to leprosy was made, whether on the basis of radiology or sputum culture, standard leprosy chemotherapy was supplemented with tuberculosis treatment. Rifampicin intake at 450 mg/day was extended beyond the standard rifampicin course for leprosy and isoniazid (400 mg daily), pyrazinamide (2 g daily) and streptomycin (1 g three times per week) added.

Results

Table 1 summarizes the results of screening 112 confirmed leprosy cases for pulmonary tuberculosis at the time of admission to hospital. A total of 87 were negative for tuberculosis on radiological and bacteriological examination and 8 persons (7.1%) showed radiological evidence of old healed tuberculosis lesions. Five individuals (4.5%) were positive for tuberculosis on the basis of both radiological and bacteriological examinations, 7 (6.3%) were diagnosed as having radiologically active pulmonary tuberculosis and 3 (2.7%) were sputum culture positive for *M. tuberculosis* with no radiological evidence of tuberculosis, a not uncommon finding in the field of tuberculosis (Schmidek and Hardy, 1967;[12] Husen *et al.*, 1971).[13] The overall positivity rates for radiology and sputum culture were 10.8% and 7.2% respectively. A diagnosis of pulmonary tuberculosis on the basis of radiological and/or bacteriological findings was made in 13.4% of the patients examined.

Table 1. Summary of the results of screening 112 confirmed leprosy cases for pulmonary tuberculosis

Number negative for TB on X-ray and culture	87 (77.6%)
Number with X-ray evidence of old TB	8 (7.1%)
Number positive for TB on sputum culture only	3 (2.7%)
Number positive for TB on X-ray only	7 (6.3%)
Number positive for TB on X-ray and sputum culture	5 (4.5%)
Number with X-ray lesions of uncertain aetiology	2 (1.8%)

A correlation of the diagnostic criteria for tuberculosis with the patients' leprosy classification is shown in Table 2. In this context, the actual status of the 'old TB' group with respect to simultaneous disease is uncertain because of the difficulty of determining the time of onset of leprosy disease. However, tuberculosis appears to occur throughout the spectrum of leprosy. No allusion can be made to the TT classification other than that it is rarely encountered in South Africa and made no appearance in this study.

Table 2. Correlation of TB diagnosis with leprosy classification for 23 patients†

Leprosy classification	Tuberculosis diagnosis			
	Culture positive only	X-ray positive only	Culture positive and X-ray positive	Old healed TB
LL	2	1	1	2
BL	–	1	2	1
BB	–	1	–	3
BT	1	4	2	1
Burnt out	–	–	–	1

† The simultaneous disease appellation for the 'old TB' group is uncertain.

Table 3 shows a tabulation of bacteriological and radiological details for 15 leprosy patients who had simultaneous tuberculosis. All cases were placed on a full TB treatment. Of the 8 culture positive individuals, 5 were positive on all three sputum specimens, 2 were positive on two sputum specimens and patient L's sputum was positive at the 3-colony level on only one occasion. Radiologically 7 cases can be described as mild and 5 as severe pulmonary tuberculosis. In 3 cases there was no radiological abnormality detected.

Follow-up of the 15 individuals with diagnosed simultaneous disease revealed that after three months of tuberculosis chemotherapy 10 showed clinical improvement and 5 had either been discharged or there was no follow-up data available. Radiologically, 6 cases showed improvement, 2 were unchanged and 2 were normal throughout.

Table 3. Bacteriological and radiological details for 15 leprosy patients with simultaneous tuberculosis

Patient	No. of specimens positive on sputum culture	Degree of culture positivity	X-ray pathology
A	0	–	Early infiltration left upper lobe
B	3	100–200 colonies	Bilateral infiltration
C	0	–	Opacities, right apex
D	0	–	Nodulations, both lung fields
E	2	21–99 colonies	No abnormality detected
F	0	–	Fibrotic infiltration left upper lobe and right apex
G	3	Confluent growth	Extensive fibrosis whole left lung and cavities left apex
H	2	21–99 colonies	No abnormality detected
I	3	Approximately 500 colonies	Light fibrosis, right apex
J	0	–	Fibrotic infiltration right mid lobe and base
K	0	–	Early infiltrate both apices
L	1	3 colonies	Fibrotic infiltrate, right apex
M	3	Confluent growth	Fibrosis, left apex, cavities
N	3	21–99 colonies	No abnormality detected
O	0	–	Fibrotic infiltrate, right apex

Discussion

Leprosy is a non-priority disease in South Africa since there is an annual incidence of only 1 case per 100,000, many occurring amongst citizens of the black states and homelands. The Westfort leprosarium in Pretoria acts as a central diagnostic centre to which all suspected cases in South Africa and the surrounding states are referred. In the course of the present study, all confirmed leprosy cases within a ten-month period were examined for pulmonary tuberculosis on admission. The association is not infrequent when patients with leprosy are examined but is not detected when patients with TB are examined. The overall simultaneous disease rate of 13.4% is considered to represent an accurate estimate of the prevalence of such a phenomenon *in South Africa* and whilst causing concern, its recognition enables this problem to be solved. Cases of leprosy where death was due to tuberculosis are rarely encountered.

The rates for radiologically and bacteriologigally diagnosed tuberculosis amongst leprosy patients, 10.8% and 7.2% respectively, are relatively high even

when compared with local figures in this high prevalence tuberculosis area. In random sample tuberculosis prevalence surveys, the Tuberculosis Research Institute has determined culture positivity rates varying between 0.9% in Lebowa and 4.3% in the Republic of Transkei (TBRI Annual Report, 1976 and 1977).[14] The high culture positivity rate for tuberculosis amongst leprosy patients seems likely to be compounded from the high local rates of prevalence of tuberculosis infection and the immunologically compromised leprosy patient. Whilst leprosy is decreasing in South Africa, tuberculosis remains the major infectious disease but the results of the present study do not support Chaussinand's (1948)[15] belief that tuberculosis is responsible for the decline of leprosy in Europe. The tendency is for the South African black to become infected with *M. tuberculosis* in infancy and youth and most of the cases of pulmonary tuberculosis are considered to result from endogenous reactivation of a previous infection. The suggestion is that leprosy may encourage the concurrent development of tuberculosis.

The standard chemotherapy for leprosy in South Africa is a regimen of dapsone and rifampicin. With the exception of one patient, all leprosy patients who were culture positive for tuberculosis carried a fairly heavy bacterial loading of *M. tuberculosis*. If the clinician handling such cases is unaware of the coincidence of tuberculosis with the leprosy, then a dangerous situation arises wherein a patient may receive monotherapy for tuberculosis with rifampicin. The emergence of rifampicin-resistant strains of *M. tuberculosis* becomes a potential problem which can be avoided by careful screening for tuberculosis and proper management of the simultaneous conditions.

Having completed the exploratory phase of this study the realization comes that there are many facets to this problem. New admissions to hospital have been exclusively considered but long-stay patients, open to infection and disease, have been overlooked. The possibility of the emergence of tuberculosis whilst in hospital must be examined. Immune function parameters in simultaneous disease will also be an area for future examination.

Acknowledgements

The authors wish to express their gratitude to Dr W S R Studzinski, Medical Superintendent of the Westfort Hospital, for his help and co-operation in the performance of this study and to Mrs J Koch for assistance with specimen collection.

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Lepr Rev (1980) **51**, 11–18

Some plants used in the treatment of leprosy in Africa

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Received for publication 12 August 1979

Summary Thirty-four speices of plants reported used in the treatment of leprosy in Africa are reviewed. The botanical and vernacular names, localities and comments on the plants are given. The importance of research into herbal medicine to establish the efficacy and toxicity of plants used is discussed.

Introduction

For centuries herbal medicine, a branch of traditional medicine, played an important role in the treatment of diseases world-wide. However, traditional medicine has almost completely been replaced by modern orthodox medicine in industrialized countries, while in the developing countries of Africa and Asia it still remains the dominant form of health care, especially in rural areas. It is often the only form of treatment sort and is sometimes regarded as superior to orthodox medicine in some respects. In some cases it is the last resort sort by Patients who feel no substantial relief after attending a clinic or hospital, particularly in cases of chronic sickness.

Leprosy is one of the most dreaded diseases and almost all branches of traditional medicine including psychotherapy, therapeutic occultism and herbal medicine have been employed in its treatment. In addition, social ostracism was practised. However, herbal medicine has played the most important role in the treatment of leprosy. Even in orthodox medicine plant extracts played an important role in the treatment of leprosy. Chaulmoogra oil (from *Hydnocarpus spp.*) dominated the treatment until the advent of sulphones.

The developing tropical countries with their luxuriant and varied flora and long practice of traditional medicine have accumulated a mass of folk medicine that needs urgent investigation. This is because those versed in traditional medicine are getting fewer and fewer as the younger generation embraces modern education. A few of the plants have been studied and their action on animal body and the rationale for their use by traditional healers confirmed or

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Table 1. Some plants used in the treatment of leprosy in Africa

Plants	Vernacular names	Locality	Comments	References
Acacia arabica, Willd.	Arab (E. Sudan): 'sunt'	East Sudan	A decoction of the pods is drunk and rubbed on the skin	Dalziel (1937)[1]
Acacia Seyal, Del.	Hausa: 'dushe'	Nigeria	Decoction of the bark is used	Dalziel (1937)[1]
Acanthospermum hispidium DC.	Twi: 'sraha nsoe'	Ghana		Dalziel (1937)[1]
Aframomum mala, KSchum	Kimbunga: 'mitwewe'	Tanzania	Decoction of the root is taken	Haerdi (1964)[2]
Bauhinia rufescens, Lam	Bamb: 'sifile'	Sudan	The bark or root is made into an extract, boiled and drunk	Dalziel (1937)[1]
Bauhinia Thonningii Schum.	Hausa: 'Kalgo' Yoruba: 'abafe' Ibo: 'Okpo-atu'	Nigeria	The bark, root or leaf may be chewed	Dalziel (1937)[1]
Caloncoba Welwitschii	Mpomgwe: 'ebongo'	Gabon	The seeds are very rich in chaulmoogra oil and are very much valued for treatment of leprosy	Raponda-Walker and Sillans (1961)[3]
Caloncoba glauca Gilg	Mpomgwe: 'ebongo'	Gabon	The seeds contain Chaulmoogra oil suitable for treatment of leprosy	Raponda-Walker and Sillans (1961)[3]
Capparis tomentosa, Lam.	Hausa: 'haujeri'	Nigeria	The bark and root are used	Watt and Breyer-Brandwijk (1962)[4]
Butyrospermum parkii, Kotschy		French Guinea	The crushed bark is used	Dalziel (1937)[1]

Cassia siberiana, DC.	Hausa: 'gama fada'	Nigeria	Roots are used in combination with other drugs	Dalziel (1937)[1]
Clematis hirsuta, Guill: and Perrq.		French Guinea and Sudan	Used internally in Leprosy	Dalziel (1937)[1]
Commiphora spp.	Kihehe: 'mutelera'	Tanzania	Decoction of the root is drunk and the fruit juice rubbed on the skin	Haerdi (1964)[2]
Cordia goetzei, Gurke.	Kimbunga: 'mgongolokashuka'	Tanzania	The juice of the leaves and a decoction of the root are drunk. The ash from the leaves is rubbed on the skin	Haerdi (1964)[2]
Crinum giganteum, Andr.		Congo	The bulb is used	Watt and Breyer-Brandwijk (1962)[4]
Culcasia spp.	Galoa: 'Owavi-indjina'	Gabon	The leaves are effective against leprosy	Raponda-Walker and Sillans (1961)[3]
Cyrtanthus obliquus, Ait.		South Africa	The root is used	Watt and Breyer-Brandwijk (1962)[4]
Dichrostachys glomerata, Choir.	Bamb: 'buru',	East Sudan	Decoction of the root is used	Dalziel (1937)[1]
Drymaria Cordata Willd.		Gabon	This herb is used in treatment of leprosy	Raponda-Walker and Sillans (1961)[3]
Eleusine coracana, Asch. & Gr.		South Africa	Used with *Plumago zeylanica* as a remedy for leprosy	Watt and Breyer-Brandwijk (1962)[4]
Erythrina sacleuxii, Hua.	Kihehe: 'muhemi'	Tanzania	Decoction of the root and that of *Rubia cordifolia* is drunk for months	Haerdi (1964)[2]
Ficus lecardii, Warb.	Hausa; 'baure' Yoruba: 'aba' Ibo: 'akakaru'	Benue-Bauchi, Nigeria		Dalziel (1937)[1]

Table 1 continued

Plants	Vernacular names	Locality	Comments	References
Guiera senegalensis Lam.	Hausa; 'Sabara' Fulani: 'geloki'	Sokoto, Nigeria	Plant has special reputation as a preventive of leprosy. A cold decoction is drunk every morning and evening. In particular it is given to new-born child and the child of a leper or where there is suspicion of hereditary taint or early symptom	Dalziel (1937)[1]
Hilleria latifolia, H. Watt.	Twi: 'anafranaku'	Ashanti, Ghana	The plant is boiled and drunk	Dalziel (1937)[1]
Lasiosiphon kraussianus, Meisn.	Hausa: 'tururibi'		Methanol extract of the root was reported to have a therapeutic action in leprosy	Tubery (1968)[5]
Lonchocarpus cyanescens, Benth.	Me: 'njala wai'	Sierra-Leone	The root is used	Dalziel (1937)
Ocimum viride Willd.	Mpongwe: 'nunduwele'	Gabon	The leaves are used	Raponda-Walker and Sillans (1961)[3]
Parkia filicoides, Welw.	Hausa: 'dorawa' Yoruba: 'Irugba' Ibo: 'agirili-Igala'	Nigeria	The young unexpanded flower buds are sometimes used as a medicine or preventive	Dalziel (1937)[1]
Pentaclethra macrophylla, Benth.	Basa: 'blay-bu'	Liberia	Wood is sometimes boiled with other native drugs and used. The pounded bark is applied locally	Dalziel (1937)*1*
Plumbago zeylanica, Linn.		South Africa	The powdered root is used internally and locally with *Eleusine corocane*	Watt and Breyer-Brandwijk (1962)[4]

Rubia cordifolia, L	Kipogoro: 'muswania'	Tanzania	The juice of the leaf is rubbed on the skin. Decoction of the root together with that of *Erythrina sacleuxii* is boiled and drunk	Haerdi (1964)[2]
Sapium grahamii, Prain	Hausa: 'yazawa'	Nigeria	The leaves and roots with the leaves of *Loranthus spp.* found on *Vitex cienkowskii* and shea butter tree are used.	Dalziel (1937)[1]
Stereospermum kunthianum, Cham.	Kimbunga: 'mkokonanguruwe'	Tanzania	Decoction of the root and bark is drunk together with that of *Tamarindus indica*. Also the ash from the bark and root is mixed with oil and rubbed on the skin lesions	Haerdi (1964)[2]
Tamarindus indica, L.		Nigeria	An extract is made of the bark and husk of the pods of *Tamarindus indica* and the leaves and bark of *Diospyros mespiliformis* and drunk	Dalziel (1937)[1]
Tamarindus indica, L.	Kiswashili: 'mkwaju'	Tanzania	Decoction is made from the root and bark along with those of *Stereospermum kunthianum* and drunk	Haerdi (1964)[2]

rejected but a great majority has not been investigated, even though there is increased awareness of the role of traditional health care in the developing countries.

The therapy of leprosy is not yet satisfactory and it may be that traditional herbal remedies would have something to offer for effective treatment or a model on which chemists can work and improve upon.

This review of some plants used in the treatment of leprosy in Africa (Table 1) is presented with the hope that it would stimulate research interests to establish their efficacy or otherwise in the treatment of leprosy.

Discussion

The importance of investigations into traditional herbal medicine cannot be overemphasized. A number of drugs used in modern orthodox medicine originated from folk medicine. For instance, d-tubocurarine a muscle relaxant used in modern orthodox medicine was isolated from curare which was used as arrow poison by the South American Indians (Goodman and Gilman, 1975).[6] Quinine was discovered from the bark of the Cinchoma tree which was also used in South America for the treatment of fever. Until some decades ago Cinchoma alkaloids formed the sole chemotherapeutic agents for specific treatment of malaria. *Rauwolfia* was used by the ancient Hindus for the treatment of hypertension, insomnia and insanity. On investigation, reserpin was isolated and is a valuable antihypertensive agent as well as tranquilizer. The ancient Hindus also used Belladona plants from which atropine and scopolamine were isolated and used to present day (Goodman and Gilman, 1975).[6] Ipecacuanha was used by natives of Brazil in the treatment of diarrhoeas. It was used as such in modern orthodox medicine for the treatment of amoebiasis, though its use is limited because it causes severe gastrointestinal irritation, nausea and vomiting, but its emetic property is now used to induce vomiting in case of orally ingested drugs. *Cascara Sagrada* obtained from the bark of *Rhamus purshiana* was used by Indians of California as a carthartic and is still used as such in modern orthodox medicine.

All these examples point to the fact that investigations of folk remedies could lead to the discovery of potent drugs, not only for the diseases for which they were originally used by the natives but also for diseases unknown to the natives. The fact that plants like *Calonchoba welwitschi* and *Calonchoba glauca* used by the natives in treatment of leprosy contain chaulmoogra oil (Raponda-Walker and Sillans, 1961)[3] shows that some of the herbal treatment would be effective.

However, it is not only important to investigate the herbals to establish their efficacy but it is also equally important that their toxic effects be investigated. In the past few years, there have been a number of reports of poisoning in humans after administration of herbs. In Jamaica, venoocculsive liver disease

in children was traced back to consumption of 'bush teas' which are infusions of various plants including *Senecio* and *Crotalaria spp.* (Schoental, 1963).[7] There was a decrease in the incidence of this disease following a successful educational campaign against 'bush teas' (Schoental, 1972).[8] Schoental and Coady (1968)[9] reported on the hepatoxicity of a number of Ethiopian and East African medicinal plants, including *Senecio, Crotalaria, Heliotropium* and *Cynoglossum* species. Liver cirrhosis and tumours were produced in experimental animals by these plants. Also alkaloids from South African plants used as medicinal plants induced liver tumours including malignant hepatocarcinoma in rats (Schoental, 1968).[10] Cycads used in East Africa have been shown to contain carcinogenic factors (Muegera 1977.)[11] It has been suggested that high incidence of primary liver cancer reported from South Africa might be related to the use of hepatotoxic plants in medicinal herbs as the incidence of primary liver cancer is not higher in American blacks than in whites (Schoental, 1968).[10]

Other herbally induced liver conditions include hepatitis (Mokhobo 1974,[11] 1976)[13] and liver necrosis (Wainwright and Schonland 1975).[14] The plant *Callilepis laureola* was incriminated in the latter case. Renal failure has been reported as a consequence of widespread use of nephrotoxic traditional herbal medicine in Central Africa (Lowenthal *et al.*, 1974;[15] Dukes *et al.*, 1969)[16] and in South Africa (Buchanan and Cane, 1976).[11] Among the plants incriminated are *Asparagus spp, Securidaca Longepedunculata, Euphorbia matabensis spp* and *Crotalaria laburnifolia* (Dukes *et al.*, 1969).[16] Other toxic effects reportedly associated with herbal medicine include aplastic anaemia (Lowenthal *et al.*, 1978),[18] severe penile burns caused by *Cussonia Corbisien* and *Steganotaenia araliacea* (Buchanan 1975),[19] shock, hypotension, acidosis (Buchanan and Cane 1976),[17] dehydration, paralytic ileus and perforation of the intestines (Solleder 1974).[20]

These reports stress the importance of thorough investigations into the herbals and these should include chronic toxicity tests especially with those that are to be used over a long period in the treatment of diseases like leprosy. Plants that are acutely toxic are usually recognized by the natives but those that have insidious effects that would be revealed after a latent period are unlikely to be known by those who use them.

However, these reports of toxicity should not deter investigations to foster the development of herbal medicine. Some of the principles contained in these plants may be toxic in large amounts but may prove of benefit to disease conditions when used in small amounts. This is of course true of all drugs. There are also incidences of carcinogenicity, teratogenicity, iatrogenic diseases and toxic reactions to synthetic drugs. One should therefore not discard a plant merely because it contains toxic substances or has caused poisoning when used in human. The dose used has to be taken into consideration in judging the plant.

[*Addendum.* Our attention has recently been drawn to three other communications which are relevant to this subject; (1) Pares Y. Inventory of African

Higher Plants Used in Folk Medicines for Leprosy Therapy. 1 – Families *Acanthaceae* to *Dilleniaceae.* Personal communication in Leprosy Scientific Memoranda, June 1979, Memo L-1033/1, (2) Phillipson JD. Natural products as a basis for new drugs. *Trends in Pharmacological Science,* 1979, **1**, No 2, 36, and (3) WHO. Inventory of medicinal plants; selection and characterisation. *WHO Chronicle,* 1979, **33**, 56. Based on documents prepared for WHO on this subject, 9–13 October 1978, Geneva. Reference: unpublished WHO documents DPM/WP/78.2 and 4. *Authors*].

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Lepr Rev (1980) **51**, 19–28

Immunoglobulin concentration in mothers with leprosy and in healthy controls and their babies at the time of birth

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Received for publication 28 October 1979

Summary Immunoglobulins were quantitated in sera from 52 matched mothers at delivery and in the corresponding cord blood samples. The cord IgA concentration was significantly increased in babies from mothers with active lepromatous leprosy compared to a control group, and a group where the mothers suffered from tuberculoid leprosy. The cord IgM concentration was normal both in babies from mothers with active lepromatous leprosy, the control group and the group of mothers suffering from tuberculoid leprosy. Since IgA does not cross the placenta, this increase reflects an active increased production of IgA in the foetus of mothers suffering from active lepromatous leprosy. This could indicate transfer of *M. leprae* or *M. leprae* antigens across the placenta into the foetus.

Introduction

In some maternal infections, namely rubella, cytomegalovirus infection, toxoplasmosis and syphilis, transplacental transfer of pathogens occurs (Alford, 1962;[1] Scotti and Logan, 1968;[2] McCracken and Shinefield, 1965)[3] causing a severe generalized infection in the foetus. Under these circumstances, the foetus can start to produce antibodies in utero. This antibody production is sometimes indicated by increased IgM and/or IgA concentration in cord blood (Stiehm *et al.*, 1966),[4] and may be proven by specific antibodies of the IgM or IgA class against the infectious agent (Scotti and Logan, 1968;[2] Reimer *et al.*, 1975).[5]

Up to the present time leprosy has not been demonstrated to cause intrauterine infection. The first clinical signs of manifest leprosy have been

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demonstrated at 1.5 to 2 years of age (Soul, 1958;[6] Worth, 1960).[7] Based upon these observations, it was generally thought that leprosy bacilli do not infect the foetus. The long incubation period before the appearance of definite clinical signs and symptoms has made the subject difficult to study.

A prospective study on the effect of leprosy on pregnancy, parturition and of the baby was carried out in Addis Ababa, Ethiopia, from 1975 to 1978. As part of this study, IgA, IgM and IgG were quantitated during pregnancy and at birth. We were especially interested in the increase of IgM and/or IgA concentration in cord blood as an indication of foetal exposure to *M. leprae* antigen(s).

Materials and methods

PATIENTS

Fifty-two pregnant women were selected for this study. All of them attended the outpatient clinic at the Addis Ababa Leprosy Hospital. The patients were clinically and histologically classified according to the Ridley-Jopling scale (Ridley and Jopling, 1966)[8] and were divided into four groups.

Group 1

Seventeen mothers who suffered from lepromatous leprosy (LL-BL) with a positive bacterial index (BI), i.e. with acid fast bacilli in one or several skin smears taken from 6 different sites. All of them were treated with 100 mg DDS daily.

Group 2

Five mothers who suffered from lepromatous leprosy with a negative BI (LL-BL). Four of these patients received DDS, 50 to 100 mg daily, and had been on continuous treatment for at least 5 years. One patient had stopped treatment prior to the study.

Group 3

Sixteen mothers who suffered from tuberculoid leprosy (BT). Six patients still received DDS treatment (50–100 mg daily) and 10 patients were released from control before the trial started and did not receive any treatment.

Group 4

Fourteen mothers without any clinical sign of leprosy (NL), but with the same socio-economic background as the leprosy patients.

The patients were divided into these 4 groups to separate the mothers with highly bacilliferous disease from the others, since the foetus in the first group would have the greatest chance of being exposed to *M. leprae* or their antigens. All the patients were Ethiopians living in the villages around the leprosy hospital under poor socio-economic conditions. Serum samples were obtained during the last trimester of pregnancy, and from the mother at delivery and from cord blood. The serum samples were stored at $-20°C$ and freeze dried before transportation to Norway. Prior to estimation of the immunoglobulin concentration, the sera were reconstituted with distilled water, and 0.01% NaN_3 was added as a preservative. They were subsequently stored at $+4°C$.

IMMUNOLOGICAL METHODS

Immunoglobulin concentrations were determined by the single radial diffusion technique (Mancini *et al.*, 1964;[9] Mancini *et al.*, 1965;[10] Fahey and McKelvey, 1965[11]) with specific anti-IgG, anti-IgA and anti-IgM (Dakopatts a/s, Copenhagen, Denmark) in 1% Litex agarose gel (Litex a/s, Glostrup, Denmark) containing 0.05 M barbiturate buffer of pH 8.6. The antisera were tested for specificity by immunoelectrophoresis and single radial diffusion using sera and isolated immunoglobulins from patients with myeloma and macroglobulinaemia, and sera from individuals with isolated lack of IgA. The sera were found to be monospecific by these methods.

Immunoglobulins in the maternal sera were quantitated by the single radial diffusion method routinely used in our laboratory. A 1.5 mm thick agarose gel was made on a glass plate of 11 x 20 cm. The total volume of agarose gel on the plate was 44 ml and the amount of anti-IgG 3.7 ml, i.e. 0.17 ml anti-IgG/cm^2. In this plate, 66 wells were punched out with a diameter of 2 mm. A volume of 5 μl of either standard or sera to be tested was filled in the wells. Locally prepared IgG standard solutions were used and controlled at regular intervals against the Behringwerke's IgG standard (Behringwerke AG, Marburg, Frankfurt/M, Germany). The plates were left in a moist chamber at room temperature for 24 hrs. The precipitin rings had a sharply defined edge and were measured directly on the unstained plates.

The IgA and IgM concentrations in maternal sera were determined in the same way using 0.04 ml anti-IgA or anti-IgM per cm^2 gel. The Behringwerke IgA and IgM standards were used to prepare the standard curves.

The amount of IgA and IgM in cord blood is so low that it is difficult to determine the concentration by single radial diffusion methods (Papadatous *et al.*, 1969;[12] Evans *et al.*, 1971[13]). The technique was modified to ensure that minute amounts of IgA and IgM could be detected. The concentration of anti-IgA was lowered to 0.35 μl anti-IgA/cm^2 in the agarose gel. At this point, weak but definite precipitin rings with sharply defined edges could be seen after staining with Coomassie brilliant blue when minute amounts of IgA were put in the wells. This concentration of anti-IgA in the gel was therefore chosen

to detect IgA in the cord sera. Wells with a diameter of 2 mm were made and filled with 5 µl either standard or test sera. The plates were left in a moist chamber for 48 h, washed and pressed 4 times, left for a final wash overnight, dried and stained with Coomassie brilliant blue. In this way distinct precipitin rings were obtained demonstrating IgA in concentrations down to 4×10^{-3} g/l, and the IgA concentration could be determined if above 8×10^{-3} g/l.

The concentration of IgM in the cord blood is 5 to 10 times higher than IgA (Faulkner and Borella, 1970;[14] Hardy *et al.*, 1969[15]). It was therefore easier to determine the IgM concentration in cord blood. The agarose gel contained 0.7 µl anti-IgM/cm^2. The plates were left at room temperature for 48 h, washed and stained as for the IgA plates. The standard used was diluted Behringwerke IgM standard.

For calculation of the statistical significance of difference between groups, Wilcoxon's modified ranking test was used (Documenta Geigy, 1962).[16]

Results

IMMUNOGLOBULIN CONCENTRATION IN MATERNAL SERA AT DELIVERY

The median IgG concentration in maternal sera at delivery was 8 g/l with a range of 3 g/l to 16 g/l. Figure 1 shows that there was no significant difference between the four groups of patients.

The median IgA concentration was 1.24 g/l with a range of 0.25 to 2.6 g/l.

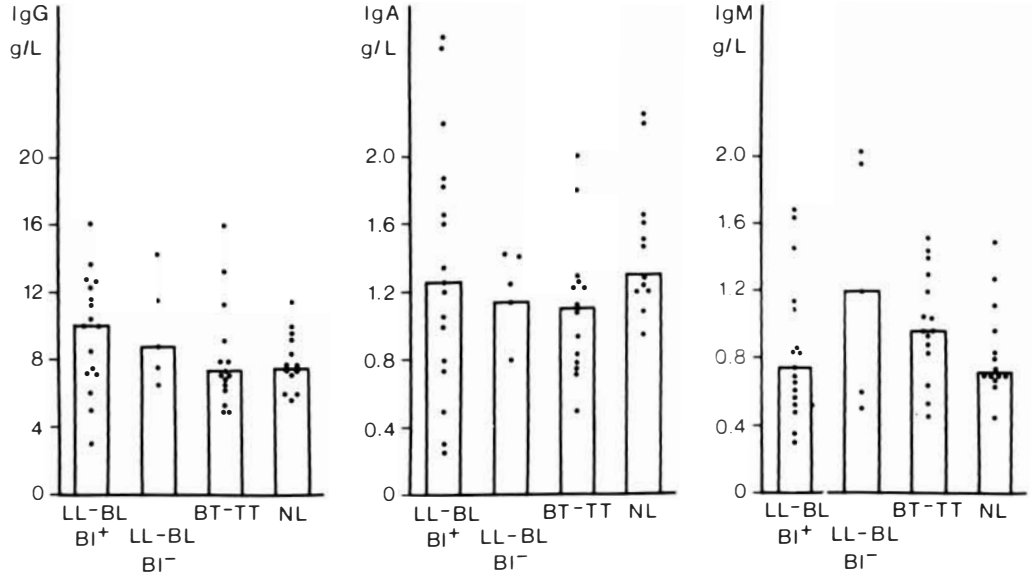

Figure 1. IgG, IgA and IgM concentration in maternal serum. Each point represents one individual and the top of the columns the median value.

The median IgM concentration was 0.82 g/l with a variation between 0.3 and 2.0 g/l. Neither IgA nor IgM concentration showed any significant difference between the four groups of patients, as shown in Fig. 1.

The IgG concentration in sera obtained from the mothers during the last three months of pregnancy was higher than at delivery. This fall of IgG concentration from pregnancy to delivery was observed in 24 out of 36 women. The 3 women with IgG concentration below 6 g/l at delivery had IgG concentration below 6 g/l when tested in the 3rd trimester.

IMMUNOGLOBULIN CONCENTRATION IN CORD BLOOD

Figure 2 shows the IgG concentration in the cord sera. The highest concentration was found in group 1 with a median value of 9.5 g/l, but there was no significant difference between the four groups. There was a good correlation between the IgG concentration in cord blood and maternal sera taken at delivery in each mother–baby pair. Out of 52 pairs, only 12 pairs showed a difference greater than 25% between the IgG concentration in cord blood and maternal blood taken at delivery.

The IgA concentration could be measured by single radial diffusion methods at levels above 8×10^{-3} g/l. IgA could be detected if the concentration was above 4×10^{-3} g/l, but it could not be quantitated at levels between 4 and 8×10^{-3} g/l. These two limits are indicated on Fig. 3 with horizontal dotted lines. Out of 17 cord sera in group 1, two fell below the detection limit of 4×10^{-3} g/l, while 12 out of 35 in group 2, 3 and 4 fell below this limit. The median value of each group is indicated on Fig. 3 with a horizontal bar. Group 1 had a median value of 9.5×10^{-3} g/l while the median value of group 2, 3

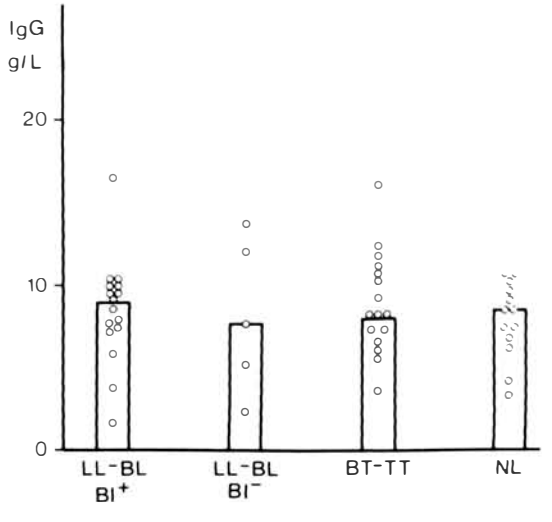

Figure 2. IgG concentration in cord serum, otherwise as for Figure 1.

and 4 fell below 8×10^{-3} g/l. This difference is significant using Wilcoxon's ranking test. The cord serum labelled 110 on Fig. 3 is excluded from the series because of possible leakage of maternal blood into this cord blood sample. The IgM concentration of this cord blood sample was 110×10^{-3} g/l, and both the IgA and the IgM concentration was lower in a sample taken 6 weeks after birth from the same baby. In the other cord sera, there was no correlation between high concentration of IgA and IgM, nor between IgA and IgM concentration in matched maternal and cord blood samples.

The IgM concentration in cord sera is shown in Fig. 4. The control group had the highest concentration with a median value of 74×10^{-3} g/l, while the median value of the three other groups varied from 40 to 54×10^{-3} g/l. These differences were not statistically significant ($p > 0.1$).

Discussion

Leprosy has not yet been described in patients below 1.5 yr (Noussitou *et al.*, 1976),[17] in children it is still uncommon below the age of four, thus it is generally thought that leprosy is not transferred to the foetus.

Leprosy has an incubation time of 2 to 5 yrs (Newell, 1966)[18] which can be partially explained by the slow multiplication rate of *M. leprae* (Shepard and McRae, 1965).[19] After experimental inoculation of armadillo, more than 9

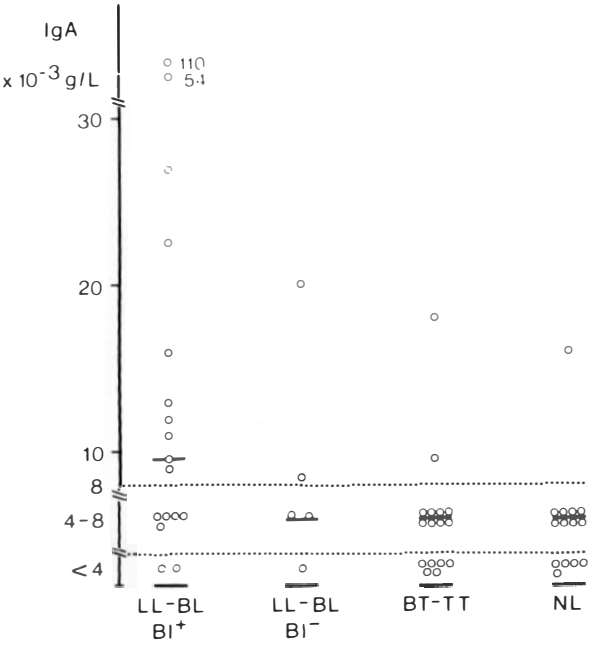

Figure 3. IgA concentration in cord serum. See text for explanation of the two horizontal dotted lines. The horizontal bars show the median value for the 4 groups.

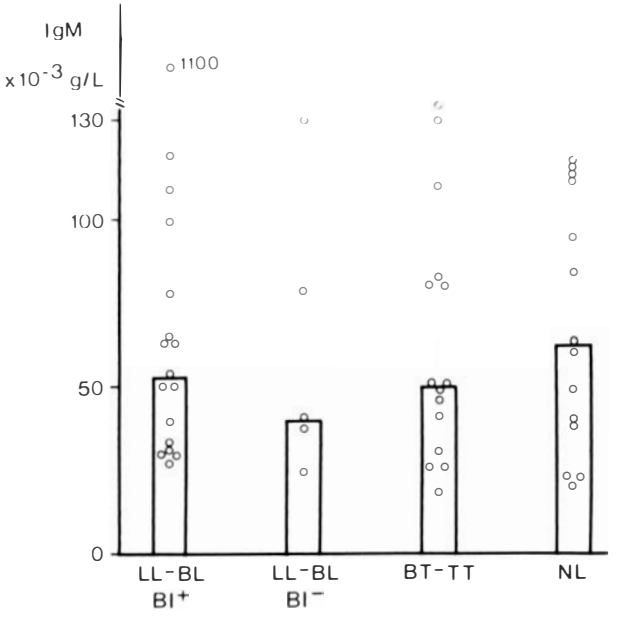

Figure 4. IgM concentration in cord serum, otherwise as for Fig. 1.

months elapsed before the leprosy bacilli had multiplied sufficiently to cause any clinical sign of leprosy (Kirchheimer and Storrs, 1971;[20] Storrs, 1973[21]). The absence of published reports of leprosy in humans occurring within the first 1.5 years of life could be explained by the long incubation time even though the infection was acquired in utero.

Patients with active lepromatous leprosy, can have up to 10^5 leprosy bacilli per ml of blood (Drutz *et al.*, 1972).[22] In pregnant women with active lepromatous leprosy, the exposure of the placenta to *M. Leprae* bacilli is intense and leprosy bacilli could cross the placenta and infect the foetus. However, soon after birth the newborn baby will be exposed to a heavy dose of *M. leprae.* The lepromatous leprosy mother can shed up to 2.4×10^8 leprosy bacilli from her nose in 24 h (Davey and Rees, 1974)[23] and leprosy bacilli can be present in breast milk (Pedley, 1967)[24] The long incubation period of leprosy makes it impossible to decide if the baby was infected with leprosy before or after birth.

IgG crosses the placenta, therefore most of the IgG present in the cord blood has been made by the mother. The lower IgG concentration at parturation compared with that of the last trimester of pregnancy has been documented previously (Wagner and Knobloch, 1973;[25] Maroulis *et al.*, 1971[26]). It is probably caused partially by active transport of IgG across the placenta and by increased catabolism in the mother around delivery.

IgM and IgA do not cross the placenta. Increased concentration of these

immunoglobulins in cord blood could be taken as an indication of stimulation of the immune system of the foetus by transfer of antigen(s).

Increased IgM concentration in cord blood may be found in congenital infections such as syphilis, toxoplasmosis and cytomegalovirus infections but even in these diseases heavy congenital infections are not always associated with increased IgM concentration in cord blood (Reimer *et al.*, 1975;[5] McCraken *et al.*, 1965;[3] Hardy *et al.*, 1969[15]). Several workers have determined the IgM concentration in large numbers of cord sera and babies with abnormal IgM concentration were followed for clinical and serological signs of congenital infections. In many instances (from 60 to 80%), babies with increased IgM concentration in cord blood could not be associated with any sign of congenital infection or disease during the first year of life (Hardy *et al.*, 1969;[15] Miller *et al.*, 1969[27]). Furthermore, intra-uterine infections such as syphilis and rubella do not always cause an increase in foetal IgM, therefore increased foetal IgM must be regarded as a non-specific and poor indicator of intra-uterine infection.

Little information is available regarding the IgA concentration in cord blood. In many instances, IgA has only been demonstrated in 5 to 10% of the cord sera examined. This has been due to insufficient sensitivity of the assay, the detection limit being $50–200 \times 10^{-3}$ g/l (Stiehm *et al.*, 1966;[4] Evans *et al.*, 1971;[13] Seth *et al.*, 1971[28]). Faulkner and Borella 1970[14] developed a radioimmunoassay for quantitation of IgA in cord blood samples. They found that IgA was present in all cord sera tested in concentrations ranging from 1.5 to 25.5×10^{-3} g/l with a mean value of 8×10^{-3} g/l. In our sera, we could determine IgA concentration down to 8×10^{-3} g/l, and detect but not accurately quantitate down to 4×10^{-3} g/l. IgA could be detected in 43 out of 52 cord sera we examined, and the concentration could be determined in 20 out of 52 sera. The median IgA cord concentration in our series is between 4 & 8×10^{-3} g/l. Our IgA cord blood concentrations are in agreement with the concentrations found by Faulkner and Borelli.

Increased IgA concentrations were demonstrated in cord blood from babies of mothers with active lepromatous leprosy (group 1). It is significant that at least 9 out of the 16 women in group 1 had an active relapse or were diagnosed as having lepromatous leprosy during this pregnancy. These women would have a large quantity of *M. leprae* bacilli in their blood stream throughout the pregnancy thus exposing the placenta, and possibly the foetus, to massive antigenic stimulation. The median cord IgA concentration in group 1 was 9.6×10^{-3} g/l, while the median cord IgA concentrations in the three other groups (2, 3 and 4) was below 8×10^{-3} g/l. Cord IgA concentration was above 8×10^{-3} g/l in 9 samples out of 16 in group 1, while the cord IgA concentration was above 8×10^{-3} g/l in only 5 samples out of 35 from groups 2,3 and 4. These differences are significant using Wilcoxon's ranking test. These results indicate that the immune system of the foetus was often stimulated when the mother suffered from active lepromatous leprosy.

Other possibilities should also be considered. Leakage through the placenta could occur due to damage of the placenta in mothers with active lepromatous leprosy. The difference in IgA concentration in maternal and cord serum is great, about 500 times higher in the mother. A small placental leakage would lead to a marked increase in cord IgA concentration. Placental leakage ought to lead to simultaneous leakage of IgM and IgA. IgM concentrations in cord sera were normal, also in group 1. Except for one cord serum, marked 110 on Fig. 3, we have found no indication that the increased IgA in cord blood from group 1 could be caused by leakage. The cord serum marked 110 has been excluded from the calculation due to possibility of placental leakage. The increased IgA concentrations in the other cord sera in group 1 must have been produced by the foetus before birth. This may have been caused by transfer of *M. leprae* or *M. leprae* antigen(s) across the placenta. Studies of the antigenic specificities of these babies' IgA will be studied later.

Acknowledgements

This work was supported by grants from the Norwegian Research Council for Science and the Humanities and Anders Jahre's Fund for the Promotion of Science.

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Lepr Rev (1980) **51**, 29–33

Leprosy in China

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Received for publication 16 December 1978

Summary An account is given of a personal visit to China in early 1978. A list of 14 questions concerning the extent, classification and treatment of leprosy was submitted and the answers are recorded in this article, concluding with some recommendations for the promotion of Franco-Chinese exchanges in leprosy.

Motives for making the journey

When the Organization 'Visage du Monde' ('Face of the World') asked me what subjects would particularly interest me in the course of a journey in China, I immediately said that my desiderata would include obtaining information on the state of the struggle against leprosy in China.

Itinerary

The journey ran from 29 April to 16 May 1978:

29–30 April; journey from Paris to Peking
30 April–5 May: stay in Peking and its neighbourhood
5–8 May: stay in Aniang and its neighbourhood (Lien Sing)
9–11 May: stay in Cheng-Tchou and its neighbourhood (Kaiphong)
12–14 May: stay in Canton and its neighbourhood (Foshan)
15–16 May: journey from Canton to Paris via Hong Kong

Throughout the journey, in every clinical establishment I visited and in every interview with medical personnel, the subject of leprosy came up. Health officials from Peking and Canton were able to give only concise replies, but in Canton an official Government representative was able to reply at length to the list of written questions that I had previously submitted to the authorities, at their request.

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The official was Dr Yang Si Kuang, who had been a Medical Specialist in Leprosy for 15 years in charge of a Hansenian hospital with 200 beds situated near Canton, and Member of the Association of Dermatologists of the Province of Canton. As he only spoke Chinese, it was necessary to employ an interpreter for the three hour long interview. I was fortunate in having the opportunity to brief the interpreter assigned to us in the medical terminology involved in Hansen's Disease, before the interview.

Results obtained

The list of written questions was as follows:

1. Number of registered leprosy patients treated in China?
2. Approximate number of leprosy sufferers not yet officially recognized as such?
3. The provinces most affected?
4. Do statistics exist for each province?
5. Various clinical forms met with?
6. Where are the patients treated?
   - at home?
   - in general care centres?
   - in specialist centres?
   - in classified villages?
7. Forms of treatment in use?
8. Forms of prevention?
9. Are acupuncture and traditional medicine used in treating leprosy in China?
10. State of research into leprosy in China?
11. Is preventative surgery ('neurolysis') as well as reparatory surgery used in treating leprosy in China?
12. Are there any problems in reintegrating non-contagious leprosy patients into Chinese society?
13. Would Chinese doctors be interested in taking part in the International Congresses in Leprology?
14. Are there any ways in which France and China could cooperate in the realm of leprosy? (exchange of information, scholarships, exchange of personnel, courses etc . . .)

The replies to these questions were as follows:

1. The number of patients is under 500,000. In the province of Canton which is one of the most affected, it does not exceed 100,000.
2. Dr. Maxwell's estimates which pre-dated the revolution and which were of

the order of 2 million leprosy sufferers in China are unfounded. Dr Yang considers that this figure was based on an estimate in a deprived region and extrapolated (wrongly) to the whole of China.

3. The provinces on the sea borders are the most affected, as well as Yunnam and Szechuan.

   The other inland regions seem to be practically free from the disease. Inland in Canton there are some areas where the prevalence is of the order of 0.4 to 0.5%.

4. Statistics for individual provinces do not exist. However, a start has been made in seeking out leprosy sufferers in China as a whole and this should be complete in 2 years' time.
5. The clinical forms of leprosy met with in China are:
   - type T = 70–80%
   - type L = 15–25%
   - type I = 5–8%
   - type BL = 1%
6. Patients are treated in different ways according to the clinical form of their leprosy:
   - carriers of type T are looked after at home.
   - carriers of other types are looked after in specialized centres:

   (a) Hansenian hospitals of different capacity:
   - large units (200 beds) for the province;
   - medium-sized units (40–60 beds) for the districts (sometimes one hospital for 2 or 3 districts)
   - small units (10–20 beds) for the communes.

   These hospitals are only for working people who qualify for free treatment.

   (b) Hansenian villages reserved for peasants who receive free treatment in these villages where they work according to their capabilities. It would seem that a valley where there are several segregated patients, treated by doctors and nurses who voluntarily exclude themselves from the regional community, does not exist in Yunan as the author was informed, but does exist in Szechuan. Similarly, an island off Shanghai would seem to harbour several hundred leprosy patients in its centre.
7. Treatment of leprosy combines:

   (a) Western medicine:

   DDS: 2 mg/kg of body weight per day

   DADDS: IM every two months for patients who live very far from treatment centres.

   RIFAMPICIN: for those seriously affected and relapsing.

   THALIDOMIDE: for reactive states.

   CORTISONE: for reactive states (less commonly used)

LAMPRENE: for reactive states (even less commonly used). On the other hand, the use of sulfonamides, including long-acting forms was unknown.

(b) Traditional medicine included:

roots, stems, flowers, leaves, fruits } of various plants still being studied, either in simple or combined form. Some of these plants are also used in the treatment of tuberculosis.

8. A prevention of leprosy campaign was inaugurated by ex-President Mao Tsetung in his National Programme for the development of agriculture in 1956. Article 20 of this programme stipulates that every means should be taken to prevent and actively treat leprosy.

   All the bare-foot doctors in the regions where leprosy is prevalent receive specific training in leprosy treatment in courses ranging from 15–20 days to 3 months in duration.

   34,000 bare-foot doctors have been initiated into the treatment of leprosy in the province of Canton, as well as 300 dermatologists. There is constant liaison between these two sorts of doctors. The bare-foot doctors do a preliminary searching out of leprosy sufferers. After bacteriological and anatomo-pathological examination, diagnosis is confirmed by the second category of doctors. As the bare-foot doctors are of both sexes, entire sections of the population can be screened without difficulty. Also, the socialist regime makes mass examination easy. On the other hand, mass campaigns are synchronized with anti-tuberculosis campaigns. Thus in Canton 7 million intradermal BCGs have been performed in 2 years, with success rate ranging from 40 to 60% positive skin-tests. Chemo-prophylaxis was not mentioned.

9. Acupuncture is used in the treatment of leprosy alongside traditional medicine, especially in the case of neuritic pains. There are no special points – the needle is placed at the site of the pain.

10. In China, research is primarily concentrated on the combination of Western treatment with traditional treatment of leprosy. It is carried out chiefly in the specialized hospitals and the villages for the sick, in the Dermatology Departments of ordinary hospitals, under the aegis of the Association of Dermatologists on the one hand and the Association of Chinese Doctors on the other.

11. Finally, in Canton there is an Institute of Traditional Medicine whose main objective is research into the potentialities of associating Western therapy with traditional therapy.

12. 'Neurolyses' are only very rarely used in preventive surgery: they are used in the case of painful neuritis and gross oedema in the main nerve trunks. The subject of the place of surgical repair was not brought up in the interview.

13. Social reintegration of arrested leprosy patients ('malades blanchis') does not present any problems, either as regards returning to a former job in the town or country. The same job is always kept open. If the 'malade blanchi' comes across any opposition from neighbours or colleagues there is political inducement for the latter to change their behaviour or, failing that, a seance of self-criticism is arranged to win them round. I myself witnessed a lady who had a 'saddle-nose' working at a lathe in a workshop, and her presence did not seem to worry anyone in the least.
14. Dr Yang showed much interest in an invitation to attend an International Leprosy Congress, and it would be of the greatest value if the organizing body for the next Congress in India could issue such an invitation formally to the Minister of Health.
15. Finally, Franco-Chinese exchanges on leprosy would be useful to both parties. Dr Yang has left his address so that the latest Western literature can be sent to him on the treatment of leprosy. The question of grants and exchanges of personnel could profitably be discussed further with the Ministry of Health as well as the French Embassy in Peking.

    A request for a Chinese-speaking French doctor to spend some time in the Institute of Traditional Medicine in Canton could also go through the Ministry of Health of the People's Republic of China. The authorities in the Institute of Traditional Medicine in Canton, for their part, would be happy to grant this request and recommend it to their country's Ministry.

Lepr Rev (1980) **51**, 35–42

The Marchoux Institute

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Received for publication 12 March 1979

Summary ·An account is given of the origin and development of the Marchoux Institute in Bamako and of its present-day activities as a centre of research in dermatology, leprology, tropical epidemiology and as a collaborating centre with WHO. Thanks to the collective efforts of the 8 member states of OCCGE (Organisation de Coordination et de Coopération pour la Lutte Contre les Grandes Endémies), together with financial assistance from ILEP (The International Federation of Anti-Leprosy Associations), the Institute has intensified its activities in the fields of research, training of personnel, and the organization of control work in the field.

Historical account

As far back as the early years of this century, the Health Authorities of the French-speaking countries of West Africa were aware of the dimensions of the leprosy endemic they were facing. The administrative centralization characteristics of France proved to be adaptable to conditions in West Africa providing, as it did, for the establishment of a plan of campaign for the control of the major endemic diseases. The overseas medical corps, consisting in the most part of doctors from the Navy Health Department in Bordeaux who had undergone special training in tropical medicine, formed the core of the various health campaigns in these African countries.

After the successful control of trypanosomiasis (due to the strategy devised and exemplified by Jamot), of yellow fever (eliminated by the Dakar vaccine developed by Laigret), and of smallpox, there remained to be tackled the scourge of leprosy. When no medication better than chaulmoogra-oil was available, it was evidently necessary for research in leprosy to be prosecuted, and for auxiliary staff to be trained to secure data on the health situation and to carry out a campaign for the control of transmissible diseases.

Thus it was that the Marchoux Institute came into being, bearing the name

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of a distinguished French scientist who had done important work on leprosy. Founded in the year 1934, the Institute has trained successive generations of medical auxiliaries who were available when the sulphone drugs appeared on the scene in the years following the Second World War. Several Directors have made their mark – Tisseuil and Baudiment before the war; Laviron from 1940–1957, Languillon from 1957–1971, and then Saint-André.

Pharmacologists attached to the Institute discovered local plants that provided a source for chaulmoogra-oil and a full-blown factory produced enough oil to supply all the French territories. Laviron and Jardin made a formulation of a long-acting suspension (15 days) of sulphone in chaulmoogra-oil. Languillon conducted many drug trials, and showed the efficacy of the long-acting sulphonamides. Bourrel, and after him, Giraudeau, pioneered the surgery of nerves and reconstructive procedure. Carayon, from Dakar, took a lively interest in this work and cooperated with them. Sansarricq instituted activities in epidemiology.

The Marchoux Institute has thus benefited from a very capable staff ever since its formulation despite the ups and downs due to the Second World War and various episodes of civil disturbance and war in Africa itself.

The present situation

In 1960, the decision of France to grant independence to African colonies led to the break-up of the older divisions (French Oriental and French Equatorial Africa) into various autonomous States and it was feared that the health gains might be placed in jeopardy.

Good sense eventually triumphed; thanks to the new leaders and especially to the personal influence of Doctor-General Richet, a kind of 'common market' in health matters came into being in the newly independent countries of French West Africa. Thus it was that OCCGE was formed – the Organization for Cooperation and Coordination in the Control of Endemic Diseases. This inter-State organization, of which France is a member, has its headquarters in Bobo-Dioulasso in Upper Volta. Here the Muraz Institute is concerned with research in bacteriology, parasitology and epidemiology, and trains laboratory staff. The doctors are joined by French research entomologists from the Overseas Scientific and Technical Bureau. In addition, there is at Bouaké (in the Ivory Coast) a centre specializing in onchocerciasis.

In Bamako, there are two Institutes – the Marchoux Institute for leprosy, and the Institute for Tropical Ophthalmology, and in Dakar there is an Institute engaged in nutritional research.

The doctors and the staff of these institutes are mostly Army doctors, seconded from and paid by the French Overseas Cooperative Service, and placed at the disposal of the Organization. The same applies to the various

research workers. Africans are in the process of taking over at the present time.

The budgets of these Institutes, under the control of a Secretary-General, are supplied by the Member-States. Besides their research programmes in the various fields, the workers are instructed each year by the Member-States to carry out a programme of practical intervention, such as a newly-discovered outbreak of tryphanosomiasis, or some epidemic. Teams composed of variously qualified experts act as task forces, bringing help even to less accessible areas where they treat various diseases in a combined effort.

The Institutes exercise a most important role in the training of auxiliary staff.

The Marchoux Institute

The Institute, being in a central geographical situation, acts as a focus for the various Member-States: Benin, Ivory-Coast, Upper-Volta, Mali, Mauritania, Niger, Senegal, Togo (Guinea, a former member, is no longer interested).

A – BUILDINGS

Four large two-storey buildings, two of which house the staff (nurses, visitors' rooms for doctors), and the other two are for the administrative services, the Director's office, classrooms, consulting rooms, epidemiology service, and the bacteriological and parasitological laboratories.

A fifth large one-storey building houses the chemical and immunological laboratories, and the ophthalmological consulting room with that of the dermatologist adjoining. Other buildings include:

A surgical block comprising two operating theatres and a recovery room, three wards with 110 beds, a building for the pharmacy and tailor, a building for radiology, 2 buildings used as out-patient dispensaries, treating 1,500 leprosy patients, 82 small houses for leprosy patients participating in controlled trials (most of these patients have lepromatous leprosy; residence guarantees regular treatment), various storerooms, and kitchens, four villas and five apartments for doctors and African (male) nurses, lodgings for probationers, two schools; a chapel; a mosque.

All these buildings have suffered in the past because the purchasing power of an unchanged budget did not permit proper maintenance. Recent financial help from ILEP (Follereau Foundation) will permit renovation.

B – EQUIPMENT

Surgical instruments and laboratory equipment have been recently renewed, thanks to a grant from ILEP.

C – STAFF

Reduced in 1971 to two doctors (the Director and a surgeon), it now consists of five:

The Director, a dermatologist, a Professor on special assignment, an assistant dermatologist; an epidemiologist, a graduate of the National School of Public Health, Rennes; a hospital surgeon; a pharmaceutical biochemist, and a (French) female laboratory assistant.

All these members of staff belong to the French Cooperation Service; the four doctors are Navy doctors seconded to this service. The medical staff is assisted by four nurses (of whom three are nuns), from Canada, France and the Netherlands. Of the five indigenous qualified and highly competent African nurses, four are from Mali and one from Benin; one X-ray technician and three laboratory staff are from Mali. The ophthalmologists from the Institute cooperate with the staff of the Institute Marchoux and visit the clinics regularly.

D – ACTIVITIES

1. *Training of staff*

The whole basis of the admission of patients to hospital and the training of staff, is clinical consultation.

A dermatologist – and the first such specialist to work in the Institute since its foundation – the present Director has made a point of reintegrating leprosy into dermatology. The advantages are obvious: a better knowledge of differential diagnosis, especially of early forms of leprosy which leads to better training of probationary staff and hence more accurate case finding. It is evidently of the greatest importance to diagnose the disease at its earliest stages, when the signs are still equivocal. Furthermore, case finding is made easier by reason of the fact that patients come complaining of some skin condition – not for leprosy – that may be camouflaged by any other dermatosis. The patient does not start with the idea that he might have leprosy simply because he is going to the Marchoux Institute. This system has led to a fourfold increase in the discovery of early cases of leprosy, and its success has made the appointment of a second dermatologist necessary.

The probationer-auxiliaries gain a good knowledge of diagnostic dermatology. They can be useful in a wider field, as for example in onchocerciasis; trained in the search for *M. leprae*: they can also examine sputum for *M. tuberculosis*. Thus, this category of auxiliary is more profitable elsewhere.

2. *Categories of trained staff*

Two kinds of practical instruction are offered to the students coming from the French-speaking countries:

(*a*) *Leprosy controllers.* These are auxiliaries who have had a general training and several years of practical experience, who come to the Institute to gain knowledge of leprology. Their course is of three months' duration. The instruction is essentially practical:

outpatient clinics in dermatology
case presentation
practical laboratory work.

The theoretical instruction is as concise as possible and always illustrated by clinical demonstrations.

These probationers are integrated into the life of the hospital, and take their turn in the clinics, wards, dispensary and laboratory. Besides, they are trained in view of their epidemiological bias, by a specialist. Their function will be to control the medical case provided by auxiliaries in a given district, to keep the record cards up-to-date by means of an annual examination, and to organize case-finding campaigns.

(*b*) *Leprosy specialists.* These are recruited in small numbers from the best of the leprosy controllers who have been on the job for some years. They follow a one-year course, and share fully in the work of the Institute and hospital during this year. Their function is to supervise the work of the leprosy controllers and to offer advice to the doctors, who may not be very familiar with the leprosy campaign.

The Director, a professor at the Medical School, Mali, teaches dermatology to students in their fifth year. The students also follow practical courses during their attendance at these lectures.

As will be seen, the training of staff – the traditional role of the Institute Marchoux – has greatly increased during the past few years, and will increase still more in the future.

3. *Research*

More recently, research activities have concentrated on chemotherapeutic trials in cooperation with WHO, long-acting DADDS (Hansolar), clofazimine, and drug combinations (rifampicin and other drugs); and especially on the stimulation of cell-mediated immunity by different products, such as BCG vaccine, *Neisseria Perflava*, microbial lysates, and levamisole – all in previously untreated patients suffering from lepromatous leprosy.

Initially used alone with success, these various products have been given in association with different drugs, with good results. These trials have been monitored by the use of the macrophage migration inhibition test. Other components are on trial.

The study of ENL has been pursued along clinical, anatomo-pathological and therapeutic lines; the remarkable activity of chloramphenicol has been noted. Important observations on the positive and differential diagnosis of

leprosy have been made. A teaching film has been produced.

A study of eye lesions has been made and the existence of retinal lesions has been noted. Attention has been directed to inflammatory episodes occurring in the course of tuberculoid leprosy (BT); many patients have been followed for several years along clinical and immunological lines, and immunological reversal reactions associated with unpredictable and severe nerve damage have been demonstrated.

Such patients have been treated by means of rifampicin and corticosteroids together, and then with long-acting sulphonamides and clofazimine, and also by specific desensitization, using progressively increasing doses of lepromin. This method has unquestionably improved the skin and nerve lesions, a combination of these two lines of treatment having proved the most beneficial.

4. *Epidemiology*

In the different French-speaking countries, pilot surveys of the population at risk have permitted a precise evaluation of the dimension of the leprosy endemic: these suggest a 25–30% proportion of the official figures. Actually, the recommendation of the WHO regarding 'discharge from treatment' and 'cure' of tuberculoid forms had not been adhered to. It is thus apparent that the 20-year-old leprosy campaign has been a real success.

On behalf of the WHO, a pilot area 90 miles away from Bamako, has been studied for three years. A count of patients under treatment will be made after a census of the whole population, in order to provide a basis for various field enquiries in the future.

Finally the Institute has been active in the field of tropical dermatology (onchocerciasis, trypanosomiasis), and appropriate publications have appeared in the French medical literature.

5. *Reconstructive surgery*

This has greatly benefited from the work of Dr Giraudeau who has elaborated some original techniques and simplified certain classical procedures.

Conclusion

Thanks to the collective efforts of the Member-States, thanks also to the financial help of ILEP, the Marchoux Institute has increased its activities during the past few years in the important fields of research and training of staff. It has resumed its field activities in the evaluation and organization of anti-leprosy campaigns among the eight Member-States of the OCCGE.

Acknowledgement

I wish to record my sincere thanks to Dr S G Browne, the Leprosy Study Centre, 57a Wimpole Street, London, for his expert translation of the original.

Table 1. Epidemiologie de la lepre en Afrique de l'Ouest Francophone. Commencée sur une grande échelle en 1955, par la mise en place des circuits de masse antihanséniens, la campagne de lutte contre la Maladie de Hansen (détection et traitement) dans les pays de l'Afrique de l'Ouest Francophone s'est intensifiée dupuis lors. Les chiffres rapportés dans le tableau I correspondent à l'évolution entre 1955 et 1970.

	1955	1960	1965	1970†
Lépreux recensés	250,257	378,218	525,931	465,494
Lépreux traités	127,077	228,870	226,217	223,221
Lépreux traités régulièrement		106,053	190,576	157,076
I.S.T.			108,803	106,705

I.S.T. = Inactivés sans traitement.
† = Sans le Togo et la Guinnée.

Table 2. La lepre dans les etats de l'OCCGE. Evolution de la situation épidémiologique dans l'ensemble des Etats de 1971 à 1976

ANNEE	Population estimée	Lépreux recensés	Prévalence pour 1000	Nouveaux lépreux (dépistés dans l'année)	Incidence pour 1000	Inactivés	Inactivés Total lépreux recensés (%)
1971	27, 936,000	471,870	16.9	15,578	0.6	174,640	41.9
1972	28,720,000	468,485	16.3	16,056	0.6	173,147	41.4
1973	29,314,000	456,223	15.6	14,265	0.5	171,740	42.3
1974	29,856,000	433,742	14.5	14,663	0.5	166,628	43.1
1975	30,651,000	405,657	13.2	14,267	0.5	150,917	37.5
1976	28,776,000†	339,203	12	11,844	0.4	144,679	42.6

†Population en 1976 : sauf Bénin et Mauritanie

Table 3. La Lepre dans les Etats de l'OCCGE. Situation épidémiologique en *1976:* vue détaillée de la situation dans les differents états membres de l'OCCGE (Organisation de Coordination et de Coopération pour la Lutte Centre les Grandes Endémies).

Etats	Population estimée	Lépreux recensés	Prévalence pour 1000	Nouveaux lépreux (dépistés dans l'année)	Incidence pour 1000	Total inactivés	Inactives Total lépreux recensés (%)
Bénin	3,210,000	–†		–	–	–	–
Cote D'Ivoire	5,008,000	94,758	18.9	3,050	0.6	44,879	47.4
Haute-Volta	6,166,000	82,909	13.4	2,215	0.4	50,912	61.4
Mali	5,869,000	101,746	17.4	2,845	0.5	29,717	29.2
Mauritainie	–	–	–	–	–	–	–
Niger	4,725,000	21,495	4.5	1,108	0.2	2,690	12.5
Senegal	4,185,000	21,764	5.2	1,461	0.3	4,460	20.5
Toga	2,333,000	16,531	7.1	1,165	0.5	12,021	72.5
Total/OCCGE	28,276,000‡	339,203	12	11,844	0.4	144,679	42.6

†Aucuneinformation en 1976
‡Population en 1976 ' sauf Bénin et Mauritanie

$$\text{Prévalence pour 1000} = \frac{\text{Lépreux en compte} \times 1000}{\text{Population recensée}}$$

$$\text{Incidence pour 1000} = \frac{\text{Nouveaux lépreux} \times 1000}{\text{Population recensée}}$$

Lepr Rev (1980) **51**, 43–49

Leprosy in the Seychelles

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Received for publication 12 May 1979

Summary The early history and possible origins are outlined, and an account given of the more recent trends in the development of leprosy, based on a brief analysis of records available in the Department of Public Health.

Although the total number of patients is not high, leprosy continues to be a Public Health problem in the Seychelles which is going to require a much higher level of awareness if it is to be eradicated from this country.

Introduction: the historical development of leprosy in the Seychelles

Although the Seychelles were discovered in the early sixteenth century they were administered by the French until ceded to Great Britain following the Treaty of Paris and finally became an independent republic in 1976. From the first settlement until 1903 the islands were administered from Mauritius (Lionnet, 1972).[1] Because of this history the early development of the Seychelles is closely interwoven with that of Mauritius.

Leprosy must have been introduced into Mauritius and its dependencies soon after the islands were first settled, possibly by the direct introduction of leprosy from France, or more probably through the traffic of an infected slave, as whilst the French held Mauritius they found leprosy to be such a problem that they used the island of Diego Garcia as a place for isolating leprosy cases. Pridham (1846)[2] recorded that there were at least 10 cases isolated there in 1792.

Leprosy was probably not introduced into what is the present territory of the Seychelles until the early nineteenth century as Malvavois, an Administrator of the islands in the time of the French occupation and a prolific writer, makes no mention of leprosy, or the use of any island as a leprosarium, although Fauvel (1909)[3] records that he does mention the existence of a hospital on Mahe in 1787.

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De Quincy, a successor of Malavois, stated in 1801 that there was no country as healthy as Mahe and that Europeans and blacks lived to a great age. He is also recorded by Fauvel (1909) as stating in comment on a census of the population in 1804 that there had never been any epidemics in the Seychelles.

Because of the distance involved in sending lepers to Diego Garcia, round about 1817, Providence Island was in use as a leper station for lepers from Mauritius and probably from the Seychelles as well as it was claimed that the worst cases were sent to the island by Madge who was Administrator of Seychelles from 1814 to 1826 (Dayer, 1967).[4] It seems highly likely that leprosy arrived in Seychelles sometime prior to 1817.

By 1825, there were known to be lepers on many islands including Denis Island, Agalaga, Diego Garcia and Mahe itself. Dr Cardogan at that time stated that he had met with several slaves on various parts of Mahe who appeared to him to have leprosy.

Leprosy was becoming a more serious problem and it was therefore decided that Curieuse Island would be acquired by the Seychelles Government for conversation into a leper settlement. The island was acquired in 1829 and the first overseer appointed in that year.

Shortly after the settlement opened a ship of the Royal Navy, HMS Jaseuse, visited Curieuse. The Surgeon from the ship visited the island and inspected the settlement which at that time held 64 cases of whom 12 were women and 2 were children. Most of the cases were said to be grossly mutilated and several had lost fingers and toes.

By 1851, the number of inhabitants in the settlement had fallen to 50 of which 3 men 9 women and some children were free of disease. The following year the Government of Mauritius thought it necessary to gradually abandon the leper camp leaving only the inmates of Seychelles origin. The reasons put forward for abandoning or running down the settlement were that it had not been shown beyond reasonable doubt that the disease was contagious or infectious and probably more importantly it was argued that by closing the leper settlement it would be possible to build a general hospital on Mahe at little or no cost to the government. The settlement was not closed however, but was used as a combined settlement for paupers and lepers. The leper settlement was one side of the island whilst the pauper camp was on the other side. Mrs Barklay (1890)[5] reported leprosy to be very prevalent in 1883. Whole families were stated to have been seen in advanced states of leprosy whilst some were so disfigured that if they were involved in a case in court they were not brought into the witness box because of their appalling disfigurent.

At the time of Mrs Barklay's visit in 1883 there were no laws in Seychelles to compel lepers to go to the leper settlement. The first ordinance regulating the conduct of lepers was enacted in 1896. An unmarried woman in an advanced state of leprosy had become pregnant by a man with advanced leprosy. Mainly

because of the effect this case had had at the time Mauritius ordinance No 39 of 1882 was enacted as Seychelles Ordinance No 12 of 1896. Even this law only allowed for the compulsory segregation of vagrant, convict or pauper lepers. This ordinance was only repealed in 1938 (Laws of Seychelles, 1971).[6]

In 1900 Curieuse leper settlement was closed and the patients removed to Round Island situated near Bay St Anne, Praslin. In 1919 the Governor thought that Round Island, Praslin, was too far from the main island of Mahe so in the following year the patients were transferred to Round Island, Mahe. The proximity of the mainland proved a disadvantage however, as there were continuous escapes and fraternization with the general population so that it was decided to move the male lepers back to Round Island, Praslin. This was done in December 1930.

It was during the period of time that the lepers were on Round Island Mahe that a concerted effort was made to bring leprosy under control which including help from the British Leprosy Relief Association. The association supplied information and literature and in an attempt to improve treatment provided the Department of Agriculture with 3 pounds of seeds of Hydnocarpus Wightiana with the hope that Chaulmoogra oil would be produced locally. A supply of 4% creosote was to be used to sterilize the oil produced.

The islands used at that time were not really suitable as leper settlements as they were so small and lacking in water so it was proposed in 1934 to once again build a leper settlement on Curieuse. The government took back Curieuse in 1938 and the following year the male lepers were transferred there to be followed by the return of the females the year after.

The leper settlement remained in existence on Curieuse until 1968 when the lepers in the settlement at that time were either discharged or transferred to a new settlement at Anse Louis, Mahe. This settlement was only in existence for a very short time as it was closed in 1969 and converted into an old people's home The lepers were either discharged to continue treatment at home or those who had no home to go to remained in the care of the Anse Louis settlement.

In Seychelles the attitude and treatment of Leprosy seems to have passed from the extreme measure of banishing the leper to the furthest islands of the territory to the present day acceptance of home treatment. This attitude has probably arisen because of the availability of medical treatment but in addition there appears to have been a change in the severity of the infection so that there is no longer a pathological fear of the disease amongst the general public.

Recent Trends: An Analysis of Records currently Available in the Department of Public Health

MATERIALS AND METHODS

Leprosy is a notifiable infection disease so a register of cases known to the Public Health Department has been maintained for many years. Although

it is unlikely that notification is complete as there is still a tradition that leprosy is something much worse than an ordinary infectious disease for which effective treatment is available, it is thought that the register contains a very high proportion of the known cases of leprosy. The following facts have been collected from the leprosy register.

RESULTS

A total of 143 cases have been registered of which 83 (58%) were male and 60 (42%) were female.

Table 1 summarizes the occurrence of new cases by type of leprosy and the sex of the patient. A preponderance of males is seen for all types of leprosy throughout the period. The proprotion of tuberculoid to lepromatous leprosy has changed in favour of lepromatous leprosy over the same period.

Table 1. Type of leprosy by decade of detection and sex of patient

	Tuberculed			Lepromatous			Other types		
Decade	Male	Female	Total	Male	Female	Total	Male	Female	Total
1930–39	4	4	8	4	1	5	2	1	3
1940–44	5	3	8	8	6	14	0	0	0
1950–59	7	13	20	18	8	26	0	0	0
1960–69	2	0	2	22	16	38	1	0	1
1970–78	2	1	3	8	7	15	0	0	0
Total	20	21	41	60	38	98	3	1	4

Table 2 shows the age of the patient at the time of diagnosis as well as by the type of leprosy. The range of age at which the diagnosis of leprosy was made is wide but when the median age in each decade is obtained it shows that there has been a marked rise in the age at which leprosy was diagnosed (Table 3).

Discussion

Leprosy has been known to exist in Seychelles for more than 150 years but new cases have continued to occur each year inspite of the introduction of new forms of therapy as they have become available.

A leprosy register has been maintained for many years which shows that the incidence of new cases per thousand of the population rose from 0.58 in 1930 to 1939 to 0.67 in 1940 to 1949 and reached a peak in 1950 to 1959 of 1.34 with a fall to 0.99 in 1960 to 1969. It has been calculated that if new leprosy cases occur in the 1970s at the same rate throughout the decade the rate will be 0.49 per thousand.

Table 2. Age at time of Diagnosis by sex and type of leprosy

Sex	Type of Leprosy	Age (years)									
		0–9	10–19	20–29	30–39	40–49	50–59	60–69	70+	Not Started	Total
Male	Tuberculoid	1	3	55	4	0	3	1	2	1	20
	Lepromatous	1	6	12	9	8	15	3	3	3	60
		2	9	17	13	8	17	4	5	4	80
Female	Tuberculoid	0	2	1	4	11	2	1	0	0	21
	Lepromatous	0	4	7	4	3	6	8	0	6	38
		0	6	8	8	14	8	9	0	6	59

Table 3. Median age at time of diagnosis by decade

Decade	Median age (years)	Range	(years)
1930–39	7	5	55
1940–49	30	11	60
1950–59	43	10	84
1960–69	58	6	76
1970–78	42	20	65

studies of these trends are very dependent on the quality of records maintained over the same periods. Leprosy is probably the only disease for which some records are available over many decades in Seychelles.

The rise in incidence in new cases over the period 1930 to 1959 could have been due to a real increase in occurrence but was also contributed to by a more humane approach to leprosy and the increasing availability of more effective therapy which encouraged patients to come forward to be treated. Oil of chaulmoogra was replaced by the Introduction of sulphetrone in 1949 and sulphetrone was itself superceded by dapsone in 1951.

The decline in new cases of leprosy since 1959 has probably been due to a number of factors amongst which would be the reduction in number of factors amongst which would be the reduction in number of infectious cases by the use of dapsone, the possible prevention of leprosy as a side effect of introducing BCG vacination as a population-wide service in 1958 and the general improvement in nutrition and socio economic conditions that have taken place in the Seychelles. Hopefully these improvements will continue to produce a population that is more resistant to leprosy and there will be a further reduction in the number of new cases seen.

As leprosy becomes less common its importance as a factor in the differential diagnosis of skin and neurological disease tends to be forgotten and it may only be after failure of treatment for other suspected skin conditions or when sensory loss becomes obvious that the diagnosis become apparent. A further difficulty is for recently trained medical personel who have not had the experience of seeing the early and reversible stages of leprosy sufficiently often to be confident of making a diagnosis, or realizing the need to appropriately investigate patients with undiagnosed skin lesions.

The long latent period between exposure and the apparence of symptoms makes it difficult to pinpoint the time at which exposure to leprosy occurred and the mildness of the disease in many cases prolongs the time between the occurrence of symptoms and seeking medical assistance.

The age distribution at the time of diagnosis suggests that many patients were exposed to infection in adolescence but a significant proportion must have been exposed late in life unless there was excessively long latent period or the disease was ignored for a very long time. In new cases of leprosy the delay

between the patient noticing a sign or sympton of leprosy and the diagnosis being made is about one year so that if this experience was similar during previous decades it would appear that this delay is not significant as far as the age of detection is concerned.

Cases of leprosy with known exposure to other cases before they developed the disease have had a maximum latent period of about fifteen years, from the earliest possible time of exposure. If this latent period applies to the cases without known exposure it suggests that exposure is taking place even into late middle age so that no age group is spared from infection although the younger age groups seem to be more susceptible.

Conclusions

Leprosy has been known to exist in the Seychelles for 150 years. The disease appears to be less severe now than in the past, but new cases of leprosy continue to occur.

A greater awareness of the existence of leprosy and a higher index of suspicion, leading to earlier diagnosis, would greatly improve the chances of controlling this disease in the Seychelles.

Acknowledgement

I wish to record my thanks to all the Health Inspectors who provided much of the information recorded here.

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Lepr Rev (1980) **51**, 51–61

REPRINTED ARTICLE: RESEARCH IN LEPROSY

We are most grateful to the Editor, Professor J L Turk, for permission to reprint the following article, from *Clinical and Experimental Immunology*, 1979, **36**, 1–7.

Research in leprosy

A REPORT OF A COMMITTEE SET UP BY THE MEDICAL RESEARCH COUNCIL TO STUDY FUTURE PROSPECTS*

Summary Recommendations for future research in leprosy include (i) cultivation of *M. leprae in vitro*; (ii) genetic control of susceptibility, including twin studies and HLA typing; (iii) precise antigenic analysis of *M. leprae*; (iv) mechanisms involved in the macrophage response to mycobacterial infections; (v) more use of experimental models such as normal mice infected with *M. lepraemurium*; (vi) reassessment of the protection afforded by BCG; (vii) assessment of protection afforded by killed (armadillo) *M. leprae* vaccine; (viii) pathogenesis of erythema nodosum leprosum including a study of the effect of thalidomide; and (ix) development of *in vitro* systems for drug sensitivity testing.

Introduction

The committee was set up for a number of reasons. In the first place, the increasingly widespread recognition of dapsone resistance made it clear that the road to the effective control of leprosy was still undefined and certainly a long one. Secondly, the identification of the nine-banded armadillo as an animal host susceptible to *M. leprae* and capable of yielding hitherto unimaginable quantities of bacteria opened up a whole new range of research possibilities. Thirdly, in addition to these biological developments and perhaps in part because of them, the World Health Organization included leprosy in its Special Programme for Research and Training in Tropical Diseases.

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099-9104/79/0040-0001 $02.00

Both the Scientific Working Groups on the Immunology (IMMLEP) and Therapy (THELEP) of Leprosy, set up under the Special Programme, have now made expert comprehensive reviews of their respective fields. This review has focused selectively on those areas for research which seem especially important or likely to be productive, and has tried to identify ways in which resources may be used most effectively to complement and support the WHO Special Programme.

Bacteriology

IN VITRO CULTIVATION OF *M. LEPRAE*

Renewed attempts to cultivate *M. leprae in vitro* should constitute the most important aspect of research into leprosy at the bacteriological level. Fresh approaches should include modern cell culture techniques. This would give a steady source of bacteria without the need for an uncommon, expensive host such as the armadillo. If a vaccine against leprosy is developed, there will certainly not be enough armadillo-grown bacteria to satisfy world needs. Bacteria produced *in vitro* would also be more free from tissue components and micro-organisms likely to contaminate animal products, and thus more suitable for research into the antigenic structure of *M. leprae*, and for the development of a vaccine. *In vitro* cultivation would also greatly simplify the testing of chemotherapeutic agents for activity against *M. leprae*.

The emergence of dapsone resistance means that new drugs must be developed and, if these are to be widely used in those parts of the world where they are most needed, they must be inexpensive. Unfortunately research into the development of new drugs against leprosy is at a low ebb. It is particularly important, therefore, that testing procedures for anti-leprosy drugs are not unduly complicated, time-consuming or expensive. An *in vitro* system for the growth of *M. leprae* would be the most attractive solution, but other tests for the viability of *M. leprae* could be developed and used to screen test substances for anti-bacterial activity. For instance, the incorporation of tritiated thymidine (or even tritiated DOPA) by freshly isolated dividing bacteria could give a measure of *in vitro* activity which might be adapted as a test system (Khanolkar *et al.*, 1978), and the same method can be used to check for the growth of *M. leprae* in cultivated human macrophages (Krishnaprasad *et al.*, 1977). Other and perhaps simpler tests of bacterial metabolism and viability could be explored.

There is a strong case for the continued study of mycobacteria other than *M. tuberculosis* and *M. leprae*. These other mycobacteria at times infect and sensitize man, either contributing to disease (as suggested in *M. vaccae* in Crohn's disease), or seriously affecting the response to mycobacterial vaccines such as BCG. Such studies seem likely to make an important and practical

contribution to our understanding of immune responses to tuberculosis and leprosy.

Epidemiology

GENETIC CONTROL OF SUSCEPTIBILITY

There have been a number of reports suggesting a genetic determinant of susceptibility to *M. leprae*. Especially important have been studies of the relative susceptibilities of monozygotic twins. The best study is that of Chakravarti & Vogel (1973) in India, in which among sixty-two monozygotic pairs, thirty-seven (59.7%) were concordant for leprosy and thirty-two were also concordant for leprosy type.

Another approach to the search for a genetic factor has been to survey patients for HLA type. The best study so far has been from the Leiden group (de Vries *et al.*, 1976). Initial studies in Surinam were with HLA-A and HLA-B types. Siblings with the same type of leprosy were found to have a significant excess of identical HLA haplotypes, whereas siblings affected with different types of leprosy shared a haplotype less often than expected. This was taken to indicate that susceptibility both to leprosy and the type of disease are controlled by at least two HLA-controlled genes. Recent studies by the same group in Wardha (India) suggest the association of a particular HLA-determinant (DW2) with susceptibility genes for tuberculoid leprosy. In a small study in Ethiopia of HLA-D identity using mixed lymphocyte culture, Stoner *et al.* (1978) compared seven patients with their lepromatous siblings, suggesting that susceptibility and the development of lepromatous disease are not under HLA-HLA-D control.

STUDIES OF TRANSMISSION

The route by which *M. leprae* enters and infects the body has not yet been established. The likely possibilities are through the skin or nasal mucosa, or by inhalation into the lungs. New evidence is accumulating in support of airborne transmission. Of particular importance is the observation that the average yield of *M. leprae* from a nose blow in a lepromatous patient is as high as 2.8×10^8 bacilli. These bacilli have been shown to be viable by mouse footpad inoculations: they may remain viable for 1–2 days, and occasionally for as long as 7 days (Davey & Rees, 1974). Evidence for infection through the nasal mucosa has been provided by biopsy studies. In some patients nasal mucosa biopsy has provided the only evidence of leprosy. *M. leprae* has been found in the nasal mucosa of household contacts; some biopsies have shown evidence of nerve inflammation suggesting local infection with *M. leprae* (Chacko *et al.*, 1977).

Further research on transmission is needed. Immunologically deprived mice could be a useful animal model for the study of infection by inhalation (Rees & McDougall, 1977). Understanding the mode of infection in man is so important to all control programmes that the possibility of primary infection through the nasal mucosa is clearly a field for intensive investigation.

Immunology

BACKGROUND OF IMMUNOLOGICAL SPECTRUM

A major breakthrough was achieved by Ridley and Jopling (1966) in the classification of leprosy according to a clinico-pathological spectrum. This classification, which correlated lymphocytic infiltration, the appearance of cells of the mononuclear phagocyte series and bacillary infiltration with Mitsuda skin test reactivity, indicated that the spectrum of disease ranged from a high resistance (tuberculoid: TT), through a number of borderline points (borderline tuberculoid: BT, borderline: BB and borderline lepromatous: BL), to a low resistance (lepromatous: LL). It is suggested that the basis for the spectrum was determined by the immunological status of the individual. Moreover, as host resistance to mycobacteria was manifestly due to cell-mediated immunity, it was logical to suppose that the variations in the clinical status of the patient could be correlated with other parameters of cell-mediated immunity. These included delayed hypersensitivity skin tests to extracts of *M. leprae* and the lymphocyte transformation test.

Early results from Godal and his collaborators, working with relatively small patient samples, appear to confirm the spectrum using these tests (Myrvang *et al.*, 1973). However, a number of observations (Bjune *et al.*, 1976) have indicated that although delayed hypersensitivity skin tests and lymphocyte transformation tests may correlate with the allergic reactivity of the patient, they correlate only broadly with host resistance. At two particular points on the spectrum, TT and BT, correlation is with inflammatory response rather than with resistance. Much stronger reactions are found in BT than in TT. This would indicate a dissociation in the antigens responsible for host resistance and those responsible for allergic reactivity. A number of points follow on from this. Firstly, the use of a soluble skin test antigen like PPD-tuberculin derived from *M. leprae*, is not a good reagent for assessing host resistance in leprosy. In practice it has been found that even with an armadillo-grown antigen, the best skin test reagent to date is one containing all the antigens of *M. leprae* that would give a nodular granuloma in the skin and be read 2–4 weeks after intradermal injection. Secondly, there is at present no suitable *in vitro* test that can be used to assess host resistance to *M. leprae*. This is

especially so as the other widely used parameter of cell-mediated immunity, the leucocyte migration inhibition test, is poorly reproducible and difficult to qualify.

ANTIGENIC ANALYSIS OF *M. LEPRAE*

M. leprae is poorly antigenic compared with other mycobacteria. Immunization of rabbits with *M. leprae* derived from armadillos results in antibodies against seven antigens only, as compared with BCG which stimulates production of antibodies against seventy components, and *M. lepraemurium* which produces antibodies against thirty to forty antigens. However, if the rabbit serum is concentrated, antibodies can be detected against twenty *M. leprae* antigens. All seven components that are reasonably strong antigens cross-react with the antigens of other mycobacteria, especially BCG. Antibodies against *M. leprae* antigen 7, which is equivalent to BCG antigen 60, are found in the sera of tuberculoid as well as lepromatous patients. So far antigenic analysis of *M. leprae*, which began with striking results from Harboe and his group in Oslo (Harboe *et al.*, 1977), has failed to demonstrate any specific antigen of *M. leprae* that might be associated with host resistance.

There is no doubt that a more precise antigenic analysis of *M. leprae* is of critical importance in the investigation of the clinical status of patients with leprosy. It is particularly important to determine which antigens are responsible for the allergic manifestations of tuberculoid types of leprosy and which are associated with the development of host resistance. Moreover, it is possible that host resistance depends on the development of an immune response against some of the weakest antigens, which might in turn explain why many patients develop the low resistance lepromatous form of the disease.

EXPERIMENTAL MODELS

Much of the earlier experimental work in leprosy has been with the thymectomized and irradiated mouse, in which host resistance to *M. leprae* has been artificially reduced. Currently, a number of laboratories are working on mouse infection with *M. lepraemurium*, which is a more natural infection in mice and provides a model where immunological mechanisms are intact. Inbred strains of mice can be divided into two groups, high resistance strains (such as C57Bl) and low resistance strains (such as BALB/c). In these, there is direct evidence that host resistance is under genetic control. Although *M. lepraemurium* causes systemic rather than cutaneous disease, the pattern of infection in the different strains directly parallels the spectrum in human leprosy.

M. lepraemurium infection of mice has a number of other advantages over *M. leprae* infection. (1) In a natural infection, it is possible to follow the development and loss of cell-mediated immunity using both the delayed

hypersensitivity and lymphocyte transformation tests. Different types of delayed hypersensitivity, e.g. Jones–Mote reactivity, can also be studied in this model. (2) The mechanism of failure of cell-mediated immunity and host resistance in a mycobacterial infection can be studied with particular reference to the role of suppressor cells and immunoregulatory mechanisms. (3) Owing to the greater potency of *M. lepraemurium* antigens, it should be easier to characterize them and determine which are responsible for the development of host resistance and which are involved in cell-mediated hypersensitivity mechanisms.

ERYTHEMA NODOSUM LEPROSUM ENL

Whereas it has been considered that the hypersensitivity mechanisms underlying the cutaneous and nerve lesions of tuberculoid and borderline tuberculoid leprosy and reversal reactions are cell-mediated, it has been suggested that ENL could be an immune complex-mediated reaction.

ENL may in fact be two disease states occurring frequently at the same time and developing about 6 months after the onset of chemotherapy. Cutaneous ENL, which incidentally bears no resemblance to erythema nodosum, has features suggestive of an Arthus reaction. These include cutaneous vasculitis, massive infiltration with polymorphonuclear leucocytes and the demonstration of granular deposits of immunoglobin and complement (C3) in the tissues. Systemic manifestations associated with ENL consist of fever, arthritis, uveitis and a transient proteinuria which is distinct from the massive proteinuria of amyloid disease found in advanced cases of leprosy, especially those with recurrent ENL. The uveitis of ENL, and indeed the ocular manifestations of leprosy in general, are important lesions which have been relatively neglected. All these systemic manifestations of ENL may occasionally be dissociated from the cutaneous manifestations.

Numerous attempts have been made to demonstrate changes in serum complement levels in ENL, including total CH50, C3 and Clq binding tests. Most have shown little correlation. Recently, however, Bjorvatn *et al.* (1976) have demonstrated increased levels of the C3 breakdown product, C3d, in the plasma of 70% of patients with ENL and in only 18% of patients with lepromatous disease without ENL. This has suggested that in cutaneous ENL the breakdown of C3 is an extravascular event. No other studies of the different parameters of immune complex formation have looked at the cutaneous and the systemic disease separately. One possbility is that changes in circulating complement and the increase in Clq binding activity only occur in systemic forms of the disease. Moreover, there is no evidence that the cutaneous manifestations are due to immune complexes that are known to deposit in areas where the blood vessels are damaged from other causes. It could be that the primary cutaneous lesion is due to the activation of C3 through the alternative pathway, which results from

release of mycobacterial polysaccharides when organisms are killed too rapidly by chemotherapy.

A further line of research into ENL that needs consideration is the role of thalidomide in suppressing this reaction. So far, thalidomide has not been shown to affect any allergic reaction in experimental animals, nor does it appear to affect any other allergic type of reactions in man. Further thought should be given to the action of thalidomide *in vivo*, as elucidation of its action could throw light on some of the pathological and immunological mechanisms underlying ENL.

ARMADILLO *M. LEPRAE* VACCINE

A protocol has been developed by IMMLEP for isolating *M. leprae* from the tissues of infected armadillos by means of enzyme digestion using collagenase, trypsin and chymotrypsin. Proteolytic enzymes are known to destroy protein antigenicity; the present method of extracting *M. leprae* may therefore be reducing the potency of the preparation and have to be modified.

A vaccine may be ineffective in patients with lepromatous leprosy in whom there is an underlying specific immunological defect and whose tissues are loaded with large numbers of live *M. leprae*. However, such a vaccine will be particularly useful in children at special risk, for example those who are considered uninfected but who live in a leprosy endemic area, and especially those resident in a leprosy household. As there is every indication that armadillo *M. leprae* are not attenuated and would be highly infective for man, these organisms could be used for vaccine only if rendered uninfective. The relative efficiencies of dead mycobacteria and attenuated live mycobacteria in increasing host resistance have been intensively studied over 50 years by workers such as Arnold Rich and Sidney Raffel (Turk, 1975). Whereas a live attenuated vaccine like BCG markedly increases host resistance, dead mycobacterial preparations, even in adjuvant, do not appear to be able to increase host resistance although they produce strong delayed hypersensitivity reactions to tuberculin. The production of an attenuated live armidillo *M. leprae* vaccine comparable to BCG could well take many years. A dead vaccine might produce strong allergic reactivity, possibly without protection. Experiments now in progress on the inhibitory effect of a killed armadillo *M. leprae* vaccine on the limited growth of *M. leprae* in the footpads of normal mice are, therefore, of particular interest (Shepard, Walker & Van Landingham, 1978). Another approach to this problem is to look at the effect of irradiation in abolishing the infectivity of *M. leprae* without reducing its immunizing potential (R J W Rees, personal communication). A suitable protocol for such a study might be developed using *M. lepraemurium* in mice.

There is considerable cross-reaction between the antigens of *M. leprae* and those of other mycobacteria. So far, it appears that an antigen specific for *M. leprae* has not been characterized. It is thus logical to look more carefully at the possible usefulness of the most widely available live attenuated mycobacterial preparation, BCG vaccine.

Stanford (1977) has compared the protection conferred by BCG against leprosy in Uganda and Burma with the protection against tuberculosis in the UK and the USA (Table 1). He considered that the differences observed could have been due to differences in the mycobacterial in the environment. He then looked at protection against leprosy in Burma and Uganda as a function of the age at which the children had been vaccinated (Table 2).

Table 1

	Protection from tuberculosis (%)		Protection from leprosy (%)
UK	78	Uganda	80
USA	14	Burma	17

Table 2

Age vaccinated (years)	Protected (%)	
	Burma	Uganda
0–4	66	78
5–14	25	77

Analysed in this way, the data suggested something had happened to children between the ages of 4 and 15 in Burma to change their response to BCG vaccination. He found that *M. marianum* was more common in Burma than in Uganda and that skin test positivity to *M. marianum* antigens reached 30% at the age of 10 years. He therefore suggests that *M. marianum* is one of the environmental mycobacteria immunizing children in Burma in a way which blocks their ability to respond to BCG, with the increase in host resistance observed elsewhere. In the laboratory it was found that skin testing of mice by the footpad swelling technique with reagents of high specificity, following challenge with various species of mycobacteria, showed that there were two patterns of response, one for species not pathogenic for mice and another for pathogens. Moreover, he has shown that pre-feeding mice with *M. marianum* converts the response to BCG from the non-pathogenic to the pathogenic. *M. leprae* has been found to have a similar effect to *M. marianum*, so the possibility

exists that *M. leprae* vaccination, far from increasing host resistance to *M. leprae*, might actually decrease resistance.

It was considered that more attention should be given to the results of BCG vaccination in leprosy and that further trials should be undertaken in which the BCG is administered shortly after birth.

Chemotherapy

The early hope that dapsone would be an all-sufficient drug for the treatment of leprosy has not been fulfilled for two reasons, drug-resistance and microbial persistence.

Secondary resistance to dapsone has now been recognised clinically in most countries where leprosy is endemic. Although low dosage and irregularity of treatment appear to facilitate the emergence of resistance, this still develops where treatment is regular and dosage adequate (Meade *et al.*, 1973). The duration of treatment before resistance becomes evident, has varied between 5 and 24 years in one series (Pearson, Rees & Waters, 1975). Resistance has been encountered only in lepromatous (LL) and borderline lepromatous (BL) cases. These clinical observations have been confirmed in the laboratory by mouse diet, compared with levels of 0.0001% to which all strains of *M. leprae* tested in the past have been fully sensitive (Ellard *et al.*, 1971).

In this context of a world-wide emergent secondary dapsone resistance, primary infections with resistant *M. leprae* are inevitable, and have now been identified in at least two centres where a careful search has been made (Pearson, Haile & Rees, 1977; Jacobson & Hastings, 1978).

Quite separate and distinct from the problem presented by dapsone resistance is the phenomenon of microbial persistence. In cases of lepromatous leprosy, *M. leprae* may remain viable in tissues over long periods of time in spite of apparently effective therapy. In one study, fresh tissue biopsies from skin, nerve, striated muscle and smooth muscle (dartos) from lepromatous patients who had received continuous chemotherapy, principally with dapsone, for 10–12.5 years yielded bacilli which multiplied in mouse footpads, and on successful passage were found to be fully sensitive to 0.0001% dapsone in the mouse diet (Waters *et al.*, 1974). Persisters have also been isolated from sulphone-resistant patients treated for long periods with clofazimine or with rifampicin, either along or in combination with thiambutosine (Rees *et al.*, 1976). Thus, there is as yet no indication that any of the newer mycobactericidal drugs are more effective than dapsone in preventing persistance. Monitoring lepromatous patients for persistence will be an essential feature of all future chemotherapy trial protocols.

Persistence of bacteria seems to occur largely or entirely in macrophages. Research into the macrophage response has focused on the lysosomal system. Pathogenic mycobacteria, in a way not well understood, often inhibit lysosomal fusion or the fusion of lysosomes with phagosomes. Because none of the drugs so far tried appears to prevent persistence, it is obviously essential that this line of research should continue to be followed.

Support for research in leprosy is currently provided in the UK by the World Health Organization TDR Special Programme, the Medical Reseach Council, The Wellcome Trust and LEPRA.

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Lepr Rev (1980) **51**, 63–72

Leprosy and the community

THE VICTOR HEISER PROGRAM FOR RESEARCH IN LEPROSY

We have in past numbers frequently drawn attention to the various scholarships and other forms of financial support which may be obtained on application, and at advertised times, to this Program (450 East 63rd Street, New York, New York 10021, USA). The back page of one of their current brochures contains the following succinct statement entitled 'Leprosy Research Today':

Current research in leprosy falls under three main headings: Bacteriology, chemotherapy, and immunology.

Bacteriological research revolves around the fact that *Mycobacterium leprae* has not been cultivated *in vitro* (on bacteriological medium). Dr Armauer Hansen in Norway first observed the organism microscopically in 1873, but the organism was not grown outside the human body until 1960 when it was found it would grow in the foot pads of mice. Recently armadillos (*Dasypus novemcinctus*) have been used to grow large numbers of *M. leprae*. Attempts to grow *M. leprae* on bacteriological medium continue and have received recent encouragement from studies that have shown how to grow *M. lepraemurium*, a related pathogen for mice which was also thought to be non-cultivable until a few years ago.

Chemotherapeutic work has involved screening of drugs against *M. leprae* in mouse foot pads, studies of the action of drugs in mice and in man, and investigation of the pharmacokinetics (absorption of the drug, distribution in the body, metabolic alterations of drug and disposition). The most useful drugs are dapsone (DDS), clofazimine, and rifampin. In its severe (lepromatous) form, leprosy is an extraordinarily difficult disease to treat, and it requires chemotherapy for many years, practically for life. If treatment is interrupted too early, the patient relapses, with damage to himself and risk of infection of his contacts. During the long treatment, drug-resistant *M. leprae* may emerge, also causing progressive disease in the patient and risk to his contacts. More rapidly effective drugs or combinations of drugs are badly needed.

On the immunological front, new diagnostic skin tests and blood tests are being developed that may be useful in detecting early infection. Use is being made of the larger amounts of *M. leprae* grown in the armadillos to develop

vaccines for *M. leprae* and study the chemistry and antigenic makeup of the organism.

All these research efforts are directed along two lines. One line is the attempt to increase understanding of this microorganism, which is so difficult to work with because it appears to multiply so slowly (1/12th as fast as the tubercle bacillus), and because it has not been grown on bacteriological medium or in tissue culture. The other line of effort is to develop new methods of treatment and control. Even the milder (nonlepromatous) forms of the disease cause frequent crippling and require years of treatment. To stop transmission of the disease, lepromatous disease must be prevented or detected early and promptly treated. An effective vaccine would offer the best chance of control or eradication, but methods for early diagnosis and more rapidly effective treatment would be extremely helpful.

'COMMENT COMBATTRE LA RESISTANCE A LA DAPSONE?'

Rapport de Heathrow, 1977. ILEP

This is the French translation of the booklet originally issued in English in 1977, as the result of a meeting between members of ILEP, LEPRA, WHO and The Leprosy Mission in Heathrow, London. It could profitably be read in conjunction with the Fifth Report of the WHO Expert Committee on Leprosy, Technical Report Series, 607, 1977 (on which much of its main subject matter is based), and with 'Drug resistance in leprosy' by Dr S G Browne, published in *Partners*, March, 1977. (It should be noted that in some of the original copies of the Heathrow Report in English, there was an error on page 7, concerning the dose of dapsone. Under Dapsone tablets, line 9 should read '. . . in a dose of 6–10 mg/kg body weight per week.' – the words *per week* having previously been omitted).

UNIT FOR THIRD WORLD HEALTH:

University of Oxford Medical School and World Community Development Service

As a development of an organization called World Community Development Service, founded by a medical student in Oxford, Mr Mukesh Kapila, a unit for Third World Medicine was formed some months ago, with a more recent change to the present title of *Unit for Third World Health*. The President is Professor David Weatherall, FRCP, FRCPath., FRS, and the Vice-Presidents are Dr Bent Juel-Jensen, DM, FRCP, FRGS, and Mr Mukesh Kapila, BA. The Unit's purpose is described as follows:

'The Unit for Third World Health is a forum to explore issues related to the problems of health and techniques of appropriate medical practice in the lesser developed countries. It is sponsored by the University of Oxford Medical School and World Community Development Service.

PRINCIPLES

'The problems of health in the Third World are awesome in their extent and implications. Oxford has an active tradition of contact with the lesser developed countries and has the human and material resources to play a more significant role in helping to tackle these important issues. The Unit provides an arena for contact between health practitioners and others working in the field of development.

PRACTICAL AIMS

'The Unit has begun to undertake the following activities, from September 1979:

(1) A series of monthly *Lectures & Seminars* on health and related issues. The topics include:
Tropical Epidemiology;
Nutrition & Hygience
Population, fertility & mortality patterns. Fertility control.
Clinical topics – leprosy, malaria, TB, etc. New developments.
Medical care in disaster situations
Models of alternative health delivery systems. 'Paramedics'.
Economics of health care. Political factors in planning.
Work and role of Medical Missionaries; other charities.
Work and role of international agencies, WHO, UNICEF, etc.
Drugs and the role of pharmaceutical companies.
(2) Guidance on *electives* in the Third World. Orientation courses for medical students and others going to work overseas are offered. The Unit hopes to maintain long-term links with certain projects.
(3) The following *awards* are offered for activities in Third World Medicine:
Three Travel Scholarships for Electives (value approx. £200).
Three Prizes for piece of research or study (value approx. £150).
(4) It is hoped to publish a regular *Bulletin* containing original articles, reports, book reviews, in conjunction with the Oxford Medical School Gazette.
(5) It is hoped that, in time, a service will be established (books, journals, other materials) to provide up-to-date information on current medical activity in development, here and elsewhere.'

Ideas and involvement in the activities of the Unit would be greatly welcomed.

Further details (including, current programme card for lectures and seminars, dates of orientation courses and application forms for Awards) may be obtained from David Vickers, Osler Cubicle, Level 3, John Radcliffe Hospital, Headington, Oxford.

WHO; $25.5 MILLION IN 1979 FOR TROPICAL DISEASES RESEARCH AND TRAINING

With acknowledgements to the *WHO Chronicle*, we reproduce the following extract of information concerning the budget for the Special Programme:

A maximum 1979 programme budget of US $25.5 million, of which $22 million has already been made available or pledged, was approved by the Joint Coordinating Board of the Special Programme for Research and Training in Tropical Diseases at its first meeting in Geneva in November 1978. The Board is the programme's top administrative body and comprises the three co-sponsors – the United Nations Development Programme, the World Bank and WHO – together with 27 governments and organizations. The programme was launched in 1976 to develop effective controls against six major tropical diseases; malaria, schistosomiasis, filariasis (including onchocerciasis), trypanosomiasis, leishmaniasis and leprosy.

Addressing the opening session of the Board, Dr Halfdan Mahler, WHO's Director-General, said that in the past, when the industrialized countries mounted campaigns aimed at worldwide health problems, it was they who often reaped the greatest rewards. With the Special Programme, however, all the world's peoples will benefit. Also, he said, the technology being developed by the programme, in its broadly-based framework of research, can have a much greater and more immediate impact on the health situation in developing countries than has ever been achieved before.

The Special Programme is now deeply committed to the involvement of developing countries in the solution of their disease problems, with the full participation of the global scientific community in setting the broad scientific priorities and engaging in the goal-oriented research leading to new drugs, diagnostic tests, vaccines, pesticides and other tools. Although the programme is looked upon as an effort of 20 years or more, it is hoped that within the next five years some new technology for control of some of the tropical diseases mentioned above will be ready for extensive trials in the countries needing them.

WHO; THE USE OF FORMULATED PLANS OF ACTION FOR NATIONAL LEPROSY CONTROL PROGRAMMES (A HYPOTHETICAL PLAN FOR UNIFORM STRATEGY)

Prepared by the WHO Leprosy Unit, Division of Communicable Disease, LEP/79.1, the first three paragraphs of the Introduction to this excellent document read:

'The Report of the Fifth Expert Committee on Leprosy has attributed the disappointing progress made in many leprosy control programmes "mainly because of the failure to define the true magnitude of the problem, or to provide a true estimate of the level of human and financial resources required, and the period of time for which they are required, to attain the programme objectives".

'The planning and programming of leprosy control measures are regarded as essential, and involve three basic principles which, in brief, are (a) the need for coverage of the whole country, (b) the provision of resource allocations to be sustained for a prolonged period of time, and (c) the control measures to be developed as an integral part of the health services.'

In the light of these considerations, an attempt to provide effective leprosy control measures involves a project formulation within the country health programme – a process which ensures a full examination of the current epidemiological, operational and administrative problems.'

Taken with WHO's new *Guide to Leprosy Control*, 1979, this document should be of immense value to those who have to formulate plans of action. The section on drugs is particularly good. Page 14 refers to the potentially very useful *standardized reporting forms* (OMSLEP) which have been jointly devised by WHO and the School of Public Health, Louvain University, Brussels – already described in *Leprosy Review* in its account of the last meeting of ILEP in Madrid, June 1979.

WHO; *WEEKLY EPIDEMIOLOGICAL RECORDS*; LEPROSY SURVEILLANCE

1. No 14; 6 April 1979

LEPROSY SURVEILLANCE

Singapore. – In 1977, 90 new leprosy cases (including 11 imported cases) were registered in Singapore. One third of these cases had bacteriologically positive skin smears. Of 2,449 contacts which were screened, 19 (0.8%) were found to have the disease. There were 4.4% of the cases in the age group 0–9 years, 10% in those 10–19, 22.2% were 20–29, 11.1% were 30–39, 20% were 40–49, 13.3% were 50–59 and 18.9% were more than 60 years old. The male to female ratio was 1.5 to 1.

The distribution of the different forms of the disease in 1977 was similar to that for the preceding five years: lepromatous 24.4%,

SURVEILLANCE DE LA LÈPRE

Singapour. – En 1977, 90 cas nouveaux de lèpre (dont 11 importés) ont été enregistrés à Singapour. Chez un tiers des malades, les frottis cutanés se sont révélés bactériologiquement positifs. Sur les 2449 contacts qui ont été contrôlés, 19 (0,8%) étaient atteints de la maladie; 4,4% des malades avaient entre 0 et 9 ans, 10% entre 10 et 19 ans, 22,2% entre 20 et 29 ans, 11,1% entre 30 et 39 ans, 20% entre 40 et 49 ans, 13,3% entre 50 et 59 ans et 18,9% plus de 60 ans. Le rapport de masculinité est égal à 150.

En 1977, la distribution des différentes formes de la maladie a été semblable à celle des cinq années précédentes: lépromateuse

borderline 12,2%, tuberculoid 58.9% and indeterminate 4.4%. As shown in *Table 1* a lower percentage of cases occurs in those of Indian origin than those of Malay and Chinese origin.

The drug principally used for therapy is dapsone but lamprene, rifampicin, ethionamide and thiambutosine are also available. Thalidomide is used as a drug only on selected male patients with severe erythema nodosum leprosum reactions. With the increase in sulfone resistance and the introduction of initial multiple drug chemotherapy, the cost of treatment has increased tremendously. This is particularly so with the greater use of lamprene and rifampicin. In 1977 there were 30 cases in which relapse occurred.

24,4%, borderline 12,2% tuberculoïde 58,9% et indéterminée 4,4%. Comme le montre le *Tableau 1*, le pourcentage est moins élevé dans le group indien que chez les individus d'origine malaise et chinoise.

La chimiothérapie repose essentiellement sure la dapsone, mais on utilise aussi les produits suivants: lamprène, rifampicine, éthionamide et thiambutosine. La thalidomide n'est administrée qu'à certains malades de sexe masculin présentant un érythème noueux lépreux grave. Du fait de l'accroissement de la résistance aux sulfones et de l'introduction d'une chimiothérapie initiale associée, le coût du traitement a considérablement augmenté, surtout depuis que l'on fait davantage appel au lamprène et à la rifampicine. En 1977, il y a eu 30 rechutes.

Table 1. Ethnic distribution of different forms of leprosy, Singapore, 1972–1977
Tableau 1. Répartition des différentes formes de lèpre selon la race, Singapour, 1972–1977

Ethnic Group – Group ethnique	Tuberculoid Forme tuberculoïde	Borderline Forme borderline	Lepromatous Forme lépromateuse	Indeterminate Forme indéterminée	Total
Chinese – Chinois	253 (49.8%)	85 (16.7%)	135 (26.6%)	35 (6.9%)	508
Malays – Malais	22 (51.2%)	7 (16.3%)	10 (23.3%)	4 (9.3%)	43
Indians – Indiens	29 (54.7%)	9 (17.0%)	7 (13.2%)	8 (15.1%)	53

(Based on/D'aprés: *Epidemiological News Bulletin*, Singapore, Vol. V, No 1, January/janvier 1979)

2. No 21; 25 May 1979

LEPROSY SURVEILLANCE

UNITED STATES OF AMERICA. – Reported leprosy cases in California have gradually increased over the last two decades: the case rate per million population rose from 0.7 in 1960 to 3.7 in 1975. Currently, 50 to 70 new cases of leprosy are reported yearly in California. The increase is due mainly to increasing immigration from areas of the world where leprosy is still prevalent. Also, the medical community is more aware of the disease and patients are less afraid of being "discovered". While individuals born in the US who live in tropical countries may acquire leprosy and return with it, the majority of California cases are reported among

SURVEILLANCE DE LA LÈPRE

UTATS-UNIS D'AMÉRIQUE. – Les cas de lèpre notifiés en Californie ont progressivement augmenté au cours des deux dernières décennies, la proportion des cas par million d'habitants passant de 0,7 en 1960 à 3,7 en 1975. A l'heure actuelle, de 50 à 70 cas nouveaux de lèpre sont notifiés chaque année en Californie. Cette augmentation s'explique principalement par une immigration plus forte en provenance de régions du monde où la lèpre reste répandue. En outre, le corps médical est davantage conscient de la maladie, les malades redoutant moins quant à eux d'être «dépistés». Encore que les personnes nées aux Etats-Unis et demeurant

the foreign born. Of 493 new cases reported in California since 1970, over 90% were foreign born.

The emphasis in leprosy control has shifted from prolonged isolation and confinement to early detection and treatment of cases, with surveillance and chemotherapy of contacts. With appropriate therapy a patient can be rendered non-infectious in a very short time but must continue with medication. No restrictions in employment or school attendance are indicated for patients regarded as non-infectious.

dans des pays tropicaux puissant contracter la lèpre et la rapporter, la majorité des cas notifiés en Californie concernent des personnes nées à l'étranger. Sur 493 cas nouveaux notifiés en Calfornie depuis 1970, plus de 90% étaint nés à l'étranger.

En matière de lutte antilépreuse, isolement et enfermement prolongés le cèdent au dépistage et au traitement précoces des cas, avec surveillance et chimiothérapie de contacts. Moyennant un traitement convenable, le malade cesse d'être infectieux dans des délais très brefs, ce qui n'empêche qu'il doit continuer la médecation. Il n'y a pas lieu d'apporter de restrictions à l'emploi ou á la fréquentation scolair des malades considérés comme non infectieux.

(Based on/D'après: *California Morbidity, Weekly Report*, No 48, 1978.)

WHO; *IMMLEP; TDR THIRD ANNUAL REPORT*, Facts and Figures No 2 (1 July 1978–30 June 1979).

We are grateful to WHO for permission to publish the following list of the *Principal Investigators and Project Titles* in the Special Programme for Research and Training in Tropical Diseases, of which IMMLEP is a sub-component:

Studies on Antigenic Specificity of *M. Leprae*: Dr Masahide Abe, National Institute for Leprosy Research, Tokyo, Japan

M. Leprae/Monocytes: Dr N H Antia, The Foundation for Medical Research, Bombay, India

In vitro Interaction between Macrophage Lymphocytes and *M. Leprae*: Dr N H Antia, The Foundation for Medical Research, Bombay, India

Experimental Reproduction of *Lep.* in *Dasypus Novemcinctus* and *Dasypus Hybridus*: Dr Luis Maria Balina, Universidad del Salvadore (ILAFIR). Buenos Aires, Argentina

Furniture de *M. Leprae* (Supply of *M. Leprae*): Dr G Baranton, Institut Pasteur Francaise, Cayenne, French Guiana

Suppressor Cells in Leprosy: Dr G Bjune, Ullevaal Hospital, Oslo, Norway

Induction of CMI: Sensitization of Guinea Pigs to *M. Leprae*: Dr B R Bloom, Albert Einstein College of Medicine, New York, United States of America

Isolation and Characterization of a Protein Specific for *Mycobacterium Leprae*: Dr T M Buchanan, University of Washington, Seattle, United States of America

Vaccine Studies Against Lepromatous Leprosy: Dr J Convit, National Institute of Dermatology, Caracus, Venezuela

Epidemiological Studies: Dr J Convit, National Institute of Dermatology, Caracus, Venezuela

Purification of *Mycobacterium Leprae* from Armadillo Infected Tissues: Dr J Convit, National Institute of Dermatology, Caracus, Venezuela

Antigen Fractionation: Dr K Dawidowicz, National Institute of Dermatology, Caracus, Venezuela

Taxonomy: Dr J Delville, Catholic University of Louvain, Bruxelles, Belgium

M. Leprae Purification: Dr P Draper, MRC, National Institute for Medical Research, London, United Kingdom

Physiology and Cultivation of *M. Leprae*: Prof J H Hanks, Johns Hopkins University School of Hygiene and Public Health, Baltimore, United States of America

Importance of Defined Antigenic Components of *M. Leprae* for Protective Immunity and Other Immunologic Aspects of Leprosy: Dr M Harboe, Ullevaal Hospital, Oslo, Norway

Antigenic Interrelationships among Mycrobateria: Dr R C Hastings, US Public Health Services Hospital, Carville, United States of America

T Sub Sets in Leprosy – Analytical Study on Cellular Collaborations in Immune Response to *M. Leprae*: Dr S Izumi, Kyoto University School of Medicine, Kyoto, Japan

Lymphocyte Transformation Test in the Epidemiological Study of Leprosy: Dr C K Job, Schieffelin Leprosy Research Centre, Tamil Nadu, India

Supply of *M. Leprae*: Dr A A Juscenko, Leprosy Research Institute, Astrakhan, U S S R

Electron Microscopic Study of *M. Leprae*: Dr A A Juscenko, Leprosy Research Institute, Astrakhan, U S S R

Supply of *M. Leprae*: Dr W F Kirchheimer, US Public Health Services Hospital, Carville, United States of America

Effect of Specific Vaccine on Cell-Mediated Immunity of Armadillos against *M. Leprae*: Dr W F Kirchheimer, US Public Health Services Hospital, Carville, United States of America

Purification and Characterization of *M. Leprae* Antigens and their role in Humoral and Cellular Immune Responses: Dr G Kronvall, Department of Clinical Microbiology, Lund University, Lund, Sweden

Immunomodulation of *Mycobact. Lepraemurium* Infection in Mice: Dr P H Lagrange, Institut Pasteur, Paris Cedex 15, France

Cell Mediated Immunity to *M. Leprae*: Dr M J Lefford, Trudeau Institute, Saranac Lake, United States of America

Transmission of Chimpanzee Leprosy: Dr Joel F Leininger, University of Iowa/ Institute of Agricultural Medicine, Iowa City, United States of America

Autoimmunity to Microfibrils and Schwann Cells in Leprosy: Dr E Linder, University of Helsinki, Helsinki, Finland

Induction CMI: Dr G B Mackaness, Trudeau Institute, Saranac Lake, United

States of America

Production and Supply of *M. Leprae* from Nine-Banded Armadillos: Dr Wayne M Meyers, Armed Forces Institute of Pathology, Washington, United States of America

Immune Complexes in Leprosy: Dr P A Miescher, Hopital Cantonal, University of Geneva, Geneva, Switzerland

A Comparative Study of the Lipids of Leprosy Bacillus: Dr D E Minnikin, University of Newcastle Upon Tyne, Newcastle Upon Tyne, United Kingdom

Purification of *M. Leprae*: Dr T Nakayama, National Institute for Leprosy Research, Tokyo, Japan

Immune Response to *M. Leprae*: Dr T Ozama, National Institute for Leprosy Research, Tokyo, Japan

Supply of *M. Leprae*: Dr J Pacheco, Institute of Tropical Zoology, Caracus, Venezuela

Taxonomy: Dr Y Pervukhin, Leprosy Research Institute, Astrakhan, U S S R

Maintenance of *M. Leprae* Bank; Supply of *M. Leprae*; Purification/Standardization and Antigenicity/Immuno. of *M. Leprae*: Dr R J W Rees, MRC National Institute for Medical Research, London, United Kingdom

Purification of *M. Leprae* and Immunity to *M. Leprae* in Mice: Dr Charles C Shepard, Center for Disease Control, Atlanta, United States of America

Supply of *M. Leprae*: Dr Charles C Shepard, Center for Disease Control, Atlanta, United States of America

Maintenance of a Colony of Armadillos Infected with *M. Leprae*: Dr Charles C Shepard, Emory University, Atlanta, United States of America

Vaccination of Armadillos with *M. Leprae*: Dr Charles C Shepard, Center for Disease Control, United States Public Health Service, Atlanta, United States of America

Vaccination of Armadillos with *M. Leprae*: Dr Charles C Shepard, Emory University, Atlanta, United States of America

Taxonomy: Identification of Protective Immunity to Mycobacteria: Dr J L Stanford, Middlesex Hospital Medical School, London, United Kingdom

Supply of Armadillo Tissues Infected with *M. Leprae*: Prof E E Storrs, Medical Research Institute, Florida Institute of Technology, Melbourne, United States of America

Reproduction of *Dasypus Novemcinctus*, the Nine-Banded Armadillo, in Captivity Year 1/2 of Study: Prof E E Storrs, Medical Reseach Institute, Florida Institute of Technology, Melbourne, United States of America

Taxonomy: Prof G P Talwar, All India Institute of Medical Sciences, New Delhi, India

Macrophage – T Cell Interactions in the Immune Response to *M. Leprae*: Dr E Thorsby, National Hospital of Norway, University Hospital, Oslo, Norway

AG. Purification of *M. Leprae*: Dr M Ulrich, National Hospital of Dermatology,

Caracas, Venezuela

Supply of *M. Leprae*: Dr G P Walsh, Gulf South Research Institute, New Iberia, United States of America

WHO: STUDY GROUP ON NERVOUS DISEASES

Press Release WHO/30, 8 October 1978

Experts in the field of neuroscience and neurology from 12 countries met at the World Health Organization (WHO) in Geneva from 1 to 4 October 1979 to study disorders of the peripheral nervous system

They reviewed the multitude of diseases that affect human nerves and made recommendations concerning prevention, treatment and research.

Dr Ch'en Wen-chieh, Assistant Director-General of WHO, opened the meeting on behalf of the Director-General. He stressed that peripheral neuropathies deserve special attention because of their widespread incidence in both industrialized and developing countries.

Infectious diseases of nerves caused by bacteria, viruses, and environmental toxins were the subjects of discussion. The Study Group also discussed autoimmune disorders such as the Guillain-Barré syndrome which is of particular concern in developing countries, as well as diabetic neuropathy and its social-economic implications, and other diseases caused by under-nutrition in developing countries and malnutrition in industrialized societies.

[The full report has been requested and, subject to permission from WHO, will be published in a later number this year. *Editor*]

Lepr Rev (1980) **51**, 73–82

Field Workers' Forum

JOB DESCRIPTIONS AND STANDARDS OF PERFORMANCE

W F ROSS
American Leprosy Missions, Inc., 1262 Broad Street, Bloomfield, New Jersey, 07003, USA

The following model job descriptions are not intended for universal adoption in their present form. However, they do outline all the elements that their compiler has observed in the work of effective primary contact workers and supervisors in many different situations. They are intended to be useful as check lists for the following three purposes.

1. Compilation of new job descriptions through job observation and analysis.
2. Revision of existing job descriptions.
3. Preparation of behaviorally stated objectives for training purposes.

Ideally a job description is a narrative statement which describes with reasonable accuracy and specificity the work a particular individual is expected to do. It should enable both the worker and his supervisor to readily recognize that the duties listed have been carried out to an acceptable standard. Standards of performance, though often omitted from job descriptions, are an essential part of the description. The list of duties enables workers to know what they are expected to do. The standards of performance show them how well they are expected to do it. It is readily admitted that the fulfillment of some important duties cannot be directly measured. Duties numbered 3 and 5 on the list, for instance. By the same token workers may meet the particular standards set and still not fulfill the duty really satisfactorily. This does not vitiate the principle that standards ought to be set, but it does mean that we need to search for more relevant and easily measurable standards. Clearly, different standards will apply in different situations. It is for this reason that some of the statements of standards have been left incomplete. The frequency of visits which the supervisor should make to each unit (Standard Number 1) for instance, will depend upon what is practical as well as what is desirable. In other instances standards which, in the opinion of the compiler, will be sufficient to insure an acceptable level of case detection, patient care, and case holding have been suggested. Your help with the refinement of these job descriptions

will be greatly appreciated, especially if it is based on the actual observation of work done in the field.

Job Description
(compiled March 1975)

1ST GRADE SUPERVISOR

DISTRICT LEPROSY CONTROL OFFICERS

Job Summary

Supervises staff doing leprosy case-finding and case-holding work.

Duties	*Standards of Performance*
1. Supervises clinical work done by his subordinates by scheduled and by unannounced visits.	1. Visits and reports on each clinic under his care at least times each 12 weeks.
a. Checks and corrects diagnoses.	a. 1. No false positive diagnosis. 2. Does not miss more than 1.5% of cases.
b. Checks and corrects classification including classification of deformity.	b. 1. Does not wrongly classify more than 5% of cases.
c. Checks and corrects case histories and clinical descriptions.	c. 1. Includes sufficient data to support 2. All entries true but not exhaustive.
d. Checks treatments given.	d. 1. 99% correct.
e. Checks recognition of 1. Reactions Type 1. 2. Reactions Type 2. 3. Eye Problems.	e. 1. 95% correct. 2. i. 75% correct first time. ii. 95% correct second time. 3. 100% correct first time.
f. Checks management of injuries.	f. 1. No injuries missed. All injuries properly managed.
g. Checks measures taken to prevent deformity.	g. 1. 80% of patients can recite main causes of deformity. 2. 95% of cases in need soak and oil. 3. 95% of cases in need give evidence of doing exercises by no deterioration in mobility. 4. 90% of cases in need of footwear have and wear it. 5. 90% of patients can recite indications for seeking help with neuritis.
h. Checks general health education given.	h. 1. 90% of patients can recite reasons for regular treatment.

Duties	*Standards of Performance*
i. Instructs his staff with regard to home visits – ensures that they are carried out.	i. 1. All visits ordered are actually done.
j. Carries out school surveys with his staff.	j. 1. Takes initiative to examine . . . pupils per quarter.
k. Checks records for completeness and accuracy.	k. 1. All records up to date. 2. No arithmetical errors. 3. 5% recording errors.
2. Undertakes the following clinical work himself.	
a. Prescribes treatment for leprosy and complications.	a. 1. Can list indications and dangers of all treatments used. 2. Follows standard drug schedules. 3. Refers cases beyond his competance.
b. Prescribes, measures, and fits footwear.	b. 1. $<10\%$ of patients reject the shoes he orders. 2. $>90\%$ of patients regularly wear the shoes he orders. 3. All shoes are appropriate and fit well.
c. Refers cases for hospital care and surgery.	c. 1. 90% of referrals accepted as appropriate by the receiving doctor. 2. 90% of cases appropriate for referral are referred in good time.
d. Takes smears.	d. 1. 90% of smears taken are free of blood, and are correctly fixed and labelled on arrival. 2. . . . % of . . . cases have smears taken . . . x each year.
e. Declares cases inactive and released from control.	e. 1. Can list criteria for inactivity and release from control (WHO definitions) accurately. 2. Applies these criteria to all cases.
3. Administers the work in his district.	
a. Arranges personnel matters, e.g. salary, leaves, transfers, personal, confidential and other reports.	a. 1. Completes all formalities accurately and by the due date. 2. Keeps confidential matters confidential.
b. Ensures that clinic supplies are maintained, e.g. drugs, records, footwear.	b. 1. Always carries a minimum of . . . months stock of listed items. 2. Keeps an accurate and up to date inventory. 3. Accounts for all stock issues.

Duties	*Standards of Performance*
c. Sets goals for field staff and plans their day-to-day work.	c. 1. All his staff clear as to their jobs. 2. All his staff have plans for use of each working day.
d. Maintains the morale of his staff by personal example and by assisting them to achieve their own organizational and personal goals.	d. 1. Does his own work well. 2. *Helps* his staff to do their work when needed. 3. Listens to and helps to solve staff problems. 4. Provides the resources staff need, so far as it is in his power to so do.
4. Trains and develops his staff.	
a. In-service training.	a. 1. Gives in-service training as need and opportunities arise.
b Courses.	b. 1. Plans course based on the needs of the job that is to be done. 2. Uses appropriate methods of training. 3. Measures results by objective tests.
c. Selects staff for further training.	c. 1. 50% of those selected succeed.
5. Maintains good personal relationships with local leaders.	5. 1. Visits . . . of them at least . . . times each year. 2. Keeps them informed of clinic progress. 3. Enlists their help in case-finding and case-holding and in public health education.
6. Plans and carries out public health education programmes.	6. 1. Makes initial assessments of public knowledge and attitudes to leprosy. 2. Plans and carries out programmes. 3. Makes follow up assessments to measure results. 4. Achieves helpful changes in public attitudes.
7. Collects required statistics and submits required reports.	7. 1. All reports in and complete on due date. 2. Arithmetically accurate.
8. Makes suggestions for improving the service.	
9. Functions as primary contact worker when necessary.	9. At least meets standards set for the primary contact worker.

Job Description
(compiled October 1974)

PRIMARY CONTACT WORKER

Job Summary:

Undertakes the work of clinic running, case finding, and case management. Seeks to impart a rational attitude to leprosy to all with whom he comes into contact.

Job Description:

Duties	*Standards of Performance*
1. Makes the diagnosis of leprosy.	1. Uses clinical methods. Does not miss more than 2% of cases. Does not over diagnose more than 0.1%.
a. Recognizes cases beyond his competence to diagnose.	a. Refers not more than 15% of the cases he sees to his supervisor for diagnosis.
2. Classifies leprosy cases.	2. Uses whatever system is in force in his district with 95% accuracy.
3. Writes a case history and clinical description.	3. 1. Legible handwriting. 2. Relevant history. 3. Sufficient details in the clinical description to: a. support the diagnosis. b. support the classification. c. show activity, including nerve trunks activity. d. show deformity. Items recorded as above to be true but not exhaustive.
4. Treats leprosy.	4. Follows the schedules given to him without exception.
5. Recognizes complications including the following:	
a. Reactions. 1. ENL. 2. Neuritis.	a. 1. The first time patient attends with ENL with 95% accuracy. 2. The first time patient attends with neuritis with 90% accuracy.
b. Eye Involvement: 1. Lagophalmos. 2. Conjunctivitis. 3. Corneal ulcer. 4. Uveitis.	b. Recognizes all cases seen. Not more than 15% over diagnosis.

Duties	*Standards of Performance*
6. Manages injuries.	6.
a. Closed superficial injuries.	a. Misses less than 10% at first visit.
b. Open injuries.	b. 1. Does not miss any. 2. 90% of wounds seen before are now clean. 3. 100% of wounds have splints where appropriate.
c. Deep closed wounds.	c. Recognizes 90% first time.
7. Prevents deformity.	7. a. Knows all patients with neuropathy.
	b. 75% of patients with dry hands and feet soak and oil regularly
*It is recognized that these depend on factors beyond the field worker's control. e.g. cost of footwear and its availability.	c. *90% of patients in need of footwear have and wear it. No primary ulcers in patients diagnosed without ulcers.
	d. No new contractures developing during treatment.
8. Gives health education to his patients and the general public.	8. a. 80% of patients on treatment for more than six months have an understanding of: 1. the need of long-term treatment. 2. the dangers of irregular treatment. 3. the symptoms of ENL, neuritis, eye disorders. 4. what causes wounds on hands and feet. 5. simple measures to prevent wounds. 6. simple measures to treat wounds.
*This will obviously depend upon the field worker's opportunity to reach members of the general public.	b. *Members of the public he has had the opportunity of speaking to understand the cause of leprosy, its low infectivity and treatment, the non-infectious nature of the large majority of obvious cases, the signs of early leprosy.
9. Undertakes home visits, and school and other surveys.	a. Performs according to instructions.
	b. Standard of diagnosis and classification made as in Items 1 and 2 above.
10. Keeps records of patient attendances, treatments, and incidental problems.	a. Uses the documents provided.

	b. Records all attendances and treatments with 95% accuracy. c. Incidental problems recorded legibly with full identification data.
11. Makes periodic reports.	Uses the prescribed forms appropriately.
12. Maintains good, personal relations with his patients.	a. Knows all his patients by name. b. Knows which of his patients have particular financial social or personal problems. c. Shows respect for his patients in his use of greetings and in his general demeanor.
13. Manages his clinics with competance and compassion.	a. Attends clinics regularly at the advertised time. b. Runs the clinic in accordance with local instructions.

* * * *

The Leprosy Mission; 50 Portland Place, London W1N 3DG. 'Teaching and Learning Materials'

This list published in the previous number of *Leprosy Review* includes the following useful information when ordering:

1. Send all orders to 'Teaching and Learning Materials', The Leprosy Mission, 50 Portland Place, London W1N 3DG, England.
2. Surface mail will be used unless airmail is requested. All airmail postage will be charged.
3. Free materials – Small orders: no charge for surface mail. Large orders: a charge will be made for surface mail.
4. Books marked * – Payment must accompany order, no charge will be made for surface mail.
5. Make cheques/International Money Orders payable to 'The Leprosy Mission'

Appropriate Technology for Health Directory, December, 1978, WHO, Geneva.

This is a 74-page paperback of A4 format, compiled by the Appropriate Technology for Health Programme, WHO. Reference Number ATH/78.2. The Introduction reads as follows:

'In April 1978 we produced the first ATH Directory containing 209 names and addresses from 46 countries. Since then we have received many more completed questionnaires and this first revised edition now includes 382 organizations, institutions and individuals from 75 countries.

'In order to standardize country codes with those used within the United Nations system, we have changed the country numbers into three letter codes. The code for each country can be found in the Country Index. We hope that this is not too confusing for those already used to the first edition.

'For those working in the ATH field who have not yet completed a questionnaire, a copy is given at the back of the Directory. This should be completed and returned to the address given below. We would especially like to hear from people working in countries not yet included in the Directory.'

This Directory is packed with useful information, including the addresses of all people and agencies mentioned. Available from the ATH Programme, WHO, 1211 Geneva 27, Switzerland.

List of Educational Aids, 1979. The Armed Forces Institute of Pathology, Washington, DC, USA.

This is a paperback of 242 pages, listing the immense collection of educational material which has been assembled by AFIP. The introduction states: 'While the study materials listed are principally designed for use by military and federal agencies, they are made available for loan to civilian professional users on an "as available" basis.' And again: '. . . In borrowing the material your cooperation in adhering to the "Conditions of Loan" will greatly assist the Institute in providing the best possible service to you and other professional users. . . . The material should be returned by First Class mail.' (The other conditions of loan are given in full). All main medical subjects are covered and there is also a section on veterinary disease. The section on Infectious Disease has sub-headings – Geographic; Immunology and Bacteriology; Mycobacterial Diseases and Virology.

This is an invaluable source of teaching material of very high quality, almost certainly under-used by those working in leprosy and related diseases.

***Educator's International Guide to Free and Low Cost Health Audio-Visual Aids,* 1979. $14.95 plus $1.00 for postage/handling.**

This is a paperback of no fewer than 311 pages, containing over 2,000 entries, published by Pharmaceutical Communications Inc., 42.15 Cresent Street, Long Island City, N.Y. 11101, USA.

The enormous number of aids listed are under two main headings; 1.

'Materials of Professional Interest' and 2. 'Materials of Interest to Applied Medical Personnel and the General Public.'

The subject matter ranges over the whole field of medicine from Alcoholism to Venereal Disease but does not attempt to deal with tropcial or mycobacterial diseases. Leprosy is not included but this book is nevertheless worth examination by all concerned with teaching and training, if only to emphasize the extraordinary range and depth of educational material which is listed by this one agency.

Auxiliaries in Primary Health Care. **An annotated bibliography edited by Katherine Elliott, Assistant Director of the CIBA Foundation; compiled by the Appropriate Health Resources and Technologies Action Group (AHRTAG). Intermediate Technology Publications Ltd, 1979, (9 King Street, London WC2E 8HN).**

This is a paperback of 126 pages listing published work which is intended to be of practical value to those who are going to do most of the work in Primary Health Care. The forward is by the Director-General of WHO, Dr Halfdan Mahler. The main headings are:

1. Education and training of auxiliaries in primary health care.
2. Auxiliaries and Community Health and Development.
3. Geographical index
4. Subject index.
5. Useful addresses
6. Journals referred to in the bibliography
7. Publishers referred to in the bibliography.

Leprosy Control Services as an Integral Part of Primary Health Care Programms in Developing Countries. **Horst Buchmann, MPH. Printed by the German Leprosy Relief Association, Wurzburg, Federal Republic of Germany, 1978.**

This 79-page paperback represents '. . . a slightly revised version of the author's master's thesis submitted to and accepted by the University of North Carolina at Chapel Hill, School of Public Health, USA. The introduction reads:

'The following paper has grown out of the author's personal commitment to the combat against leprosy and out of a concern for the relative ineffectiveness of the currently predominant anti-leprosy strategy, in spite of considerable efforts. It attempts to explore the reasons for its failure and suggests an alternative approach, based upon an unconventional concept that is seen to hold great promise to the future control and the ultimate eradication of leprosy.

'It also presents the key elements of this approach and discusses issues relevant to its viability and potential impact. Finally, the paper identifies some of the major constraining factors to an efficient and effective implementation of the outlined concept.'

This interesting and extremely well annotated booklet is in 2 main parts: 1. *The need and rationale for leprosy control services to become an integral part of primary health care (PHC),* and 2. *Implementation of a leprosy integrated primary health care program.* The most important proposals are on pages 36 and 37, where, having accepted the principle of integration, the author goes on to suggest that '. . . leprosy services assume the role of health vanguard, becoming a nucleus as well as a motor and pacesetter for an improved health care infrastructure; they pioneer the provision of conditions that are more conductive to rural development.' In view of the fact that a number of countries – and one thinks particularly of Africa – have leprosy services which are in fact better run, if not more effective, than several of the other health services, this idea is certainly not to be dismissed. Mr Buchmann's booklet should be read with care by all those considering the integration of leprosy into systems of primary health care. It is doubtful if any other publication contains such an exhaustive list of references on leprosy and primary health care and the author is greatly to be congratulated on this stimulating account of a subject of undoubted importance to the future of leprosy control.

Lepr Rev (1980) **51**, 83–90

News and Notes

DAMIEN–DUTTON AWARD TO DR S G BROWNE

One of the more prestigious distinctions in the world of leprosy is the annual Damien–Dutton Award, presented by the Damien–Dutton Society of New York – a 15,000 member leprosy research and rehabilitation organization named for Father Damien and Brother Dutton who worked together on the island of Molokai a hundred years ago.

This year the award went to Dr Stanley G Browne, CMG, OBE, the former BMS missionary and Medical Consultant to the Leprosy Mission, who now directs the Leprosy Study Centre in London, serves as Secretary to the International Leprosy Association, and is due to become President of the Baptist Union in 1980–81. The presentation was made at Carville, Louisiana, USA, at the end of September.

SASAKAWA FOUNDATION FELLOWSHIP; 1978

This 99-page paperback booklet is a collection of selected reports submitted by recipients of Fellowships granted by this organization in the past three years, since the beginning of the programme. The reasons and aims of the Fellowship programme are described in the Forward by the Chairman of the Board, Professor Ishidate, as also in a 'Memorandum on Sasakawa Foundation Fellowships,' and in a 'Postscript' by Dr Yo Yuasa, Medical Director. These excellently presented Reports are a tribute to efforts being made by this Foundation in the vital matter of training and encouraging more people to work in leprosy.

BOMBAY LEPROSY PROJECT

Annual Report, 1978 (with a brief account of activities during January–July, 1979).

Dr R Ganapati, Bombay Leprosy Project, 6/27 Amar Bhuvan, Sion (East), Bombay 400-022, India has kindly drawn attention to this up-dated version of

a report on activities to July, 1979. The Project is sponsored by the German Leprosy Relief Association and covers all aspects of control work including case detection, treatment, mass health education campaigns, research and the teaching of field work to undergraduate the post-graduate medical students. Results are actively published in the medical press. Current research activities include:

(i) 'Integration of Leprosy into General Health Services – A feasibility study in an urban area' has been sanctioned and is under operation in collaboration with the RRE Society and TN Medical College.

(ii) Prof J L Stanford of the Middlesex Hospital Medical School, London, has approached the authorities of the German Leprosy Relief Association Wurzburg, regarding our collaborative study based on skin testing of slum children with myobacterial antigens. During his recent visit to Bombay a pilot skin testing was successfully carried out in two slums.

(iii) Prof Dr Med M Dietrich, Tropeninstitut Hamburg, has selected Bombay Leprosy Project as one of the centres for carrying out drug trials based on Rifampicin and Clofazimine on the pattern of THELEP.

(iv) Prevalence of leprosy in a leprosy colony as well as an adjoining normal slum is being studied to assess the influence if any of the colony over the normal population. This investigation is carried out in collaboration with the RRE Society.

(v) Basic data on the prevalence rates in a few slums have been worked out and presented in a recent conference at Madras.

(vi) Routine follow up (with BI and MI) of patients on different drugs like Rifampicin, Clofazimine, etc is, being done to assess the long-term effects of these drugs.

(vii) Dapsone/Creatinine ratio in urine of smear-positive patients is being carried out with the help of RRE Society to assess the regularity of intake of the drug dispensed at the clinics.

(viii) Surveys of general hospitals for leprosy has been carried out in collaboration with the RRE Society and the figures presented in a recent conference.

(ix) Figures of leprosy among preschool children have been worked out and an article based on these is shortly to be published.

(x) A study based on DADDS in non-leproratous leprosy has been submitted to the ICMR for grants.

SCHISTO UPDATE

This is a paper-bound, rapid communication quarterly, published with the cooperation of the National Library of Medicine, Bethesda, Maryland, USA, through the use of MEDLARS (Medical Literature Analysis and Retrieval

System). One of the larger issues recently issued, *Schisto Update* July 1977–December 1978, lists articles concerned with schistosomiasis in approximately 2,300 journals published throughout the world which were indexed in MEDLARS during this period. The quarterly is mailed free of charge to all persons expressing interest in receiving it. Requests should be addressed to: The Edna McConnell Clark Foundation, 250 Park Avenue, New York, New York 10017, USA.

Whilst much of this may appear peripheral to leprosy interests, those in parasite, and other branches, of immunology will have little to lose by browsing through the very clearly presented material in these pages. There are in fact occasional reports of direct relevance to leprosy, though it is unlikely that they will escape the eagle eye of *Excerpta Medica.* The January–March 1979 issue contains the following announcement:

International Tropical Diseases Research Fellowships

The National Institute of Allergy and Infectious Diseases (NIAID) and the Fogarty International Center (FIC) of the United States National Institute of Health, in cooperation with the UNDP/World Bank-WHO Special Programme for Research and Training in Tropical Diseases, have made available a limited number of postdoctoral fellowships for advanced training in tropical diseases research in the United States of America.

The initial programme emphasis will be placed on the following six diseases: malaria, schistosomiasis, filariasis, trypanosomiasis, leishmaniasis and leprosy. The fellowships are for junior and mid-career professionals, who should have a doctoral degree in medicine and/or biomedical sciences and are not United States citizens. Good knowledge of and ability to communicate in the English Language are essential. Applicants must give an undertaking to return to their own countries to take up a public health or academic position immediately upon completion of the training.

Fellowships will normally be for a period of one year but, if necessary, they could be for shorter periods of no less than six months. Fellowships may, in special circumstances, be extended for an additional year.

Application forms and relevant documentation may be obtained on request from the WHO Regional Offices.

EXCERPTA MEDICA

Leprosy and related subjects. Section 51.

Excerpta Medica, 305, Keizersgracht, 1016 ED, Amsterdam, the Netherlands. Published for the Leprosy Documentation Service, Royal Tropical Institute, Mauritskade 63, 1092, AD Amsterdam, the Netherlands, and with the aid of the Netherlands Leprosy Relief Association, Amsterdam; member of ILEP.

1979, Vol 1, Issue 7, has already appeared, true to the remarkably rapid and prompt standards already established by this abstracting service, which is obviously unique. Readers may have been interested to note the number of tuberculosis entries which are included, and the Executive Chief Director has very kindly written to confirm that a decision has in fact been taken to include most of the mycobacterial literature (including tuberculosis) in this journal – but omitting many articles which deal purely with aspects such as the X-ray diagnosis of tuberculosis, which would be irrelevant to leprosy.

Tuberculosis is also represented in part in Section 15; Chest diseases, Thoracic surgery and Tuberculosis, but it selects for publication only about 50% of the articles on tuberculosis appearing in the literature, whereas Section 51 probably publishes more than that.

We congratulate Excerpta Medica, the Royal Tropical Institute and ILEP on the very high quality of this service:

SCHIEFFELIN LEPROSY RESEARCH & TRAINING CENTRE, KARIGIRI, SOUTH,INDIA, SCHEDULE OF TRAINING COURSES FOR THE YEAR 1980

Courses	Qualification	Duration	Commencing date	No of Seats	Fees (Rs)
FOR DOCTORS:					
(a) Condensed course for doctors	MBBS., or equivalent from any recog. University	1 week	Jan.14 Sep. 8	20	25
(b) Medical students course	Undergraduates	1 week	Pooja Holidays	20	–
(c) Medical officers course	Medical personnel engaged in leprosy work	6 weeks	Jan. 28 July 14	16	50
(d) Ophthalmic aspects in leprosy	Qualified medical personnel (included in 6 weeks course)	3 days	Feb. 4–6 Jul. 21–23		10
FOR NON-MEDICAL PERSONNEL:					
(a) Non-medical supervisors course	Fully qualified paramedical workers with a minimum of 3 years experience	4 months	June 9	12	200
(b) Orientation Course in Leprosy (Personnel not requiring any Government recog certificate)	For paramedical personnel (Nurses, Physios, OT and Administrators) 1 week Doctors' Course & 3 weeks inservice training	1 month	Jan. 14 Sep. 8	6	–

(c) Paramedical Workers course	SSLC passed, graduates preferred	6 months	Sep. 1	20	200
(d) Refresher Course	Qualified PMWs	3 weeks	June 9	20	50
(e) Leprosy for general health workers	Persons now working or trained general health workers	3 weeks	Mar. 31 Nov. 17	20	30
(f) Physiotherapy Tech. Course	SSLC passed, graduates preferred	9 months	June 16	8	200
(g) Laboratory Technician	SSLC passed, PUC preferred	12 months	July 7	4	150
INSERVICE TRAINING					
(a) Inservice training in Medicine, Surgery, Pathology, Control & Laboratory Technology	For suitably qualified personnel by previous arrangement	9 months	by	by arrangement	
(b) Prosthetic Technicians	SSLC passed, PUC preferred	18 months	Jan. & July	3	
(c) Shoe-makers' Course	V standard with knowledge of English preferred (by previous arrangement)	6 months		by arrangement	
(d) Smear Technicians	SSLC passed, qualified Laboratory Technicians	3 months 1 month		by arrangement	50
(e) Medical Record-keepers	Inservice by previous arrangement – SSLC with proficiency in typing and good English	2 months		by arrangement	50

Note:

These courses are recognized both by the Government of Tamil Nadu and the Government of India. Candidates will be awarded Government recognized certificates.

Inservice Training for Doctors: In the case of inservice training, medical personnel are expected to carry out routine regular duties in the concerned departments like any other member of staff in that particular department.

All courses for non-medical personnel are open only for spondored candidates. Private candidates will not be accepted for any of them.

Food and accomodation will be provided either in the Guest House in the case of medical and overseas personnel, or in the Hostel for non-medical personnel. Family accomodation *will not be* provided unless previously arranged, subject to availability.

Please note that in view of the very limited number of rooms available in the Guest House, Guest House accomodation is *not guaranteed.* This is allotted only on a 'first come, first serve' basis. However, alternative accomodation can be arranged either in one of the lodges in the town Vellore (at approximately Rs. 5/-–Rs. 10/- per day) or in the CMCH-Annexe (at Rs. 15/- per day) according to preference of candidates. Non resident trainees can utilise the services of the Staff Bus that leaves the CMC Hospital compound at 7.15 a.m. sharp.

Application forms will not be considered if they are not accompanied by a postal order for Rs. 10/- towards registration fee.

For prescribed forms and other details, please contact: *The Training Officer, S L R & T Centre, SLRS P.O., via. Katpadi 632 106, North Arcot Dist., S. India.*

THIRD WEST AFRICA LEPROSY CONFERENCE; MONROVIA, LIBERIA, 10–14 SEPTEMBER 1979

This Conference was jointly sponsored by the Government of Liberia and the German Leprosy Relief Association (DAHW), ILEP coordinator for the National Leprosy Control Programme in Liberia, and it was organized by the National Leprosy Control Board of Liberia and the West African Leprosy Secretariat (Administrative Director, Fr Rocco Serra, sx, PO Box 673, Freetown, Sierra Leone). Following the official opening in the Monrovia City Hall, the main sessions were held in the J F Kennedy Memorial Hospital, and attended by members of the medical and nursing staff, including trainee physician-assistants. The earlier presentations were devoted to accounts of national leprosy control programmes in Liberia, Sierra Leone, Ghana, Nigeria, Cape Verde, Gambia, Senegal, Ivory Coast and Guinea. Dr S J Nkinda described progress in the combined leprosy–tuberculosis programme in Tanzania, and the formal and informal discussions of this subject covered the pro's and con's of attempting to deal with both diseases in one programme (some delegates considering that integration meant that either one or other of them would not be well handled, whilst others thought that the time had come to include them routinely in the general health services, or primary health care). The training and functions required by leprosy staff for integration into Primary Health Care were described by Miss Jane Neville (The Leprosy Mission, London) and experiences of PHC in Liberia and Sierra Leone were discussed fully in the closing session.

Final recommendations and resolutions will be presented fully at a future date, but at this stage it may be recorded that a number of important practical points concerning leprosy control in West Africa was raised, and they included the following:

1. STANDARDIZED RECORDING AND REPORTING SYSTEM (OMSLEP)

Virtually no one had heard of this system, although it was fully discussed at the last meeting of the Medical Commission of ILEP in Madrid (June, 1979) and is advised in the WHO document LEP/79.1; 'The use of formulated plans of action for national leprosy control programmes (a hypothetical plan for uniform strategy)'. During most of this Third Conference in Monrovia, it was repeatedly apparent that there is, in this area of Africa, continued confusion over terms such as tuberculoid, borderline, lepromatous (does this include Borderline-Lepromatous (BL) cases on the Ridley-Jopling classification, or not?), indeterminate inactive, released from control, etc.

2. PREVALENCE RATES

With one possible exception, no country was able to report that more than about 50% of their estimated cases had been registered, and in several instances

this was despite many years of well-organized leprosy control over large areas. The general feeling was that some form of integration, or the eventual use of primary health care services, was likely to be the best way to find more cases and maintain them under regular treatment for long enough – but that this must be backed by experienced supervisory personnel, and adequate referral centres.

3. SUPPLIES OF ESSENTIAL ANTI-LEPROSY DRUGS

It was noted with concern that some areas are still having difficulty in obtaining basic supplies of drugs, notably dapsone; one of these had had no dapsone for approximately 6 months. Despite the grave implications for relapse and drug resistance, it was nevertheless concluded that non-governmental agencies cannot be expected to make good the deficiencies on a regular basis.

4. DAPSONE RESISTANCE

No systematic attempt to submit material for mouse foot-pad inoculation to centres in Europe or America has yet been made from West Africa. Dr Roy Pfaltzgraff (Nigeria) reviewed the clinical signs and treatment of dapsone resistance, and the ensuing discussion covered the considerable costs of the drugs involved – and other reasons for caution in making a diagnosis of dapsone resistance except on very good evidence. It was thought that every support should be given to WHO or other agencies who might undertake mouse foot pad innoculation studies, perhaps from a representative area, where dapsone has been in use for many years.

4. TEACHING/TRAINING MATERIAL FOR LEPROSY; BASIC INFORMATION

A collection of over 30 different books, booklets, WHO publications, transparency teaching sets, etc. were on display during the Conference, and it was clear that many delegates had neither seen nor heard of them before. Readily available publications of undoubted value to those engaged in leprosy control are still not being offered, and regularly circulated, to those who need them. There were requests that ILEP, perhaps through the West Africa Leprosy Secretariat, should put money into the wider delivery of relevant material.

6. FUTURE OF THE WEST AFRICA LEPROSY SECRETARIAT

Those attending were asked, at the conclusion of the Conference, to record their views on the continued existence and future role of this Secretariat. There was unanimous agreement that it should indeed continue, preferably

under the administrative direction of Father Rocco Serra, who has already contributed so much towards the control of leprosy in West Africa. Amongst the many suggestions submitted, there was frequent reference to the need to cooperate much more fully with colleagues in the French-speaking areas of West Africa.

A C McDOUGALL

KATHMANDU WORKSHOP ON LEPROSY

The second International Workshop on Leprosy Control on Asia, with special reference to community involvement and participation, was held in Kathmandu, Nepal, from 11 to 14 October 1979, under the joint sponsorship of the Ministry of Heath of the Royal Government of Nepal, the World Health Organization and the Sasakawa Memorial Health Foundation. The Workshop brought together 18 participants from 11 Asian countries, together with 14 participants from 11 international agencies. In view of the special theme of the Workshop, invitations had been extended to individuals who could contribute their expertise and knowledge in fields (such as sociology and anthropology) not usually represented in the discussions on leprosy control, as well as those concerned with community health, primary health care and health education.

The International Leprosy Association was represented by both its President (Professor M F Lechat) and its secretary (Dr S G Browne), who acted as Resource Persons, presenting papers and being generally available. Ample time was allowed for group discussions, at which the problems of community involvement in leprosy control programmes were identified and their underlying causes explored; then, in final sessions, various approaches were suggested for the solution of these problems.

The full and frank exchange of news between the participants and the experts from such diverse fields proved both lively and rewarding. Thanks to the generosity of the Sasakawa Health Foundation, the recommendations of the Workshop will be published in full in a Report of the Proceedings.

It remains for the governments of the countries of Asia and the voluntary agencies working therein to study these recommendations, adapt them to the local situation, medical and social, and put them into practice.

The first country to have the opportunity to do so is Nepal itself.

A National Seminar in Leprosy Control in Nepal followed hard on the heels of the International Workshop. From 16 to 18 October, about 150 national workers, not all from the health service, gathered in Kathmandu to discuss the recommendations and study their local application.

S G BROWNE

Lepr Rev (1980) **51**, 91–97

Letters to the Editor

Case-finding and case-holding in Malawi

Sir,

Following correspondence with the Director of LEPRA concerning some of my early impressions of leprosy control in the Balaka area, I thought it might be of value to record some thoughts on the two subjects of case-finding and case-holding in this part of Malawi. Case finding would, I am sure be a great deal easier if the population at large and prospective patients in particular, (a) are aware of the simple ways of suspecting leprosy, (b) know where to go for confirmation or otherwise of their suspicions as well as (c) obtain subsequent medical help if needed (d) without a significant measure of social ostracism. It is the person who voluntarily comes forward for help that by and large turns out to be the maximally motivated and co-operative patient. To facilitate this situation inhibitive factors physical and especially social, must be at a minimum in the society.

Case holding also depends on the aforegoing factors but my short experience has shown that the leprosy workers role is here vital. The project grassroot planning must be geared to making case holding easy for the patient. The clinics should be timed regularly, be situated at physically convenient points for the patients, held on days socially convenient to the patient. The leprosy worker should endeavour to develop harmonious medical relationship with his patients. From the time of admission to the time of release from control there is to be continued imploring and coaxing of the patient vis-á-vis his receiving – let alone swallowing – treatment.

As part of health education the patient should be made to understand the main objectives of a control project namely (1) to prevent people from getting leprosy by destroying the primary causative agent, i.e. the leprosy bacillus, (2) to minimize the discomfort of leprosy in those patients already with disease. In endeavouring to accomplish these tasks the patient has an important role to play by ensuring that he co-operates with the leprosy worker and thereby ensuring that his load of germs is destroyed and that progress of his disease is arrested, while discomforts therefrom are alleviated.

We are lucky in this country because ostracisim resulting from leprosy is

of little significance. Among the elderly the ritual of attending the clinic to get the 'magic pill' is something to look forward to. Some of the elderly and middle-aged are most reluctant to be discharged, regardless of the degree of incapacity brought about by the leprosy. Case-holding among adolescents is more difficult. Some of those without obvious leprosy do not want to be known to have leprosy in case this prejudices their chances of marriage (important in agrarian and subsistence communities) and employment. Case holding among children of course is related to the degree of responsibility of their parents or guardians.

On the subject of children and the value of schools examinations, which some observers have found to be highly significant, I have learnt one important point already, and that is that a low incidence in schoolchildren may be misleading if only a small proportion of all children are able to find a place in schools. This situation is often linked with poverty, a factor which is almost certainly one of the many predisposing factors in the spread of leprosy.

N M CHITIMBA

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Does clofazimine have any value in the management of reversal reaction?

Sir,

With reference to the article on clofazimine in *Leprosy Review* **50**, 1979, 134–44, I would like to make the following comments:

Two papers (references 1 and 2 below) are frequently quoted in support of the contention that clofazimine is effective in the management of reversal reactions, but neither paper really makes the case.

In her paper Schulz[2] writes: 'In our patients neuritis was adequately controlled after an average of 3½ months of treatment with clofazimine.' I submit that an average time lapse of 3½ months before the control of neuritis is in reality evidence of the ineffectiveness of clofazimine in these cases.

Both Pfaltzgraff and Schulz deserve thanks and congratulations for having controlled after an average of 3½ months of treatment with clofazimine.' I submit that average time lapse of 3½ months before the control of neuritis is in reality evidence of the ineffectiveness of clofazimine in these cases.

Both Pfalzgraff and Schulze deserve thanks and congratulations for having tackled a problem most of us have evaded, but surely it is time to settle the issue one way or the other. At least we should stop recommending clofazimine for the management of reversal reaction until more definite evidence is available.

Barnetson, *et al.*[3] have done leprosy patients a great service by exploding

the myth of dapsone as a causative agent in reversal reactions by a controlled clinical trial. It is my belief that the alleged effectiveness of clofazimine in reversal reactions is also a myth. Have any of your esteemed readers evidence to the contrary?

W F ROSS

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References

1 Pfaltzgraff RE. The control of neuritis in leprosy with clofazimine. *Int J Lepr,* 1972, **40**, 392.

2 Schulz J. 44 months' experience in the treatment of leprosy with clofazimine. *Lepr Rev,* 1971, **42**, 178.

3 Barnetson R StC, Pearson JMH, Rees RJW. Evidence for prevention of borderline leprosy reactions by dapsone. *Lancet,* 1976, **11**, 1171.

Leprosy control in the Southern Province of Zambia

Sir,

In April 1978 we introduced a modification of the History Record card used by LEPRA in Malawi as a pilot project in our area of leprosy control in the Southern Province of Zambia, which is based on this Hospital. This area includes three districts (Mazabuka, Monze and Gwembe) and serves a population of approximately 200,000 people. We used the card to record standard information on 100 consecutive patients with previously undiagnosed leprosy. Whilst fully acknowledging that no statistical conclusions can be drawn from such a small sample, we nevertheless feel that some of the results are worth recording. Of the 100 patients studied

(1) the majority had had their disease for longer than one year before presentation
(2) 17% presented with inactive disease, 10 borderline, 6 tuberculoid and 1 indeterminate,
(3) 26% were in a state of Type 1 (*syn.* reversal, upgrading) reaction on first presentation. For many, the appearance of oedema or nerve damage was a real factor leading to presentation at Chikankata. Most of these had severe reactions of recent onset and they responded well to therapy. (This finding is in keeping with experience in Ethiopia and suggests that dapsone therapy is not a major factor in the causation of this type of reaction in leprosy.),

(4) 52% had some form of nerve deficit and 42% had actual deformity in at least one limb or eye at the time of diagnosis and finally,
(5) no fewer than 36% of patients presenting for diagnosis had positive smears.

In view of the considerable amount of work that has gone into leprosy control in this area for at least two decades and previously noted by Gauntlett (1969)[1] and du Plessis (1977),[2] the number of patients presenting with positive smears, and the high incidence of established deformity in patients presenting for the first time, is disconcerting.

We are collecting further data, but feel that the evidence to date suggests that there may be much more leprosy in this area than has been so far diagnosed, especially as most patients were self-reporting.

The main purpose of this letter is to suggest that evaluation by small sample surveys, carried out by independent observers, may be of increasing importance in areas such as our own, where considerable resources have been invested attempting to control leprosy, often over long periods of time, and where it is essential to find out what progress has been made.

P A du PLESSIS

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References

[1] Gauntlett SL. Leprosy control in the Southern Province of Zambia. *Lepr Rev,* 1969, **40,** 223–32.
[2] du Plessis PA. Unpublished observations, 1977.

Dapsone and Nerve Damage

Dear Sir,

In the course of my travels over a wide area of the Far East, my attention has been drawn to a considerable number of cases in which the use of dapsone, particularly in high doses from the outset, has been associated, in the opinion of a number of experienced observers, with adverse reactions and nerve damage. I have also been asked if dapsone may, itself, cause nerve damage after long-term use. I am, therefore, prompted to write about three aspects of the use of this valuable drug, namely: 1. the correct dose in relation to body

weight; 2. the possibility that the long-term use of dapsone in some patients may be damaging to nerves; and 3. the possible relation between the use of dapsone in doses in the order of 50–100 mg. daily, from the outset in all cases, and the development of nerve damage.

1. DAPSONE IN RELATION TO BODY WEIGHT

The WHO Export Committee on Leprosy, Fifth Report, Technical Report Series 607, 1977, clearly states that dapsone should be used in doses of 50–100 mg daily in full size adults, on a basis of 6–10 mg/kg body weight per week, with correspondingly smaller dosages for children. I feel that I should draw attention to the fact that in many areas of Asia, the average adult weighs only 45–55 kg – and often suffers from anaemia and not infrequently, from intestinal parasites or other diseases. I therefore wish to record a word of warning about the routine use of 100 mg daily in small patients in this part of the world when 50 mg daily would conform with the recommended doseage.

2. DOES THE LONG-TERM USE OF DAPSONE CONTRIBUTE TO NERVE DAMAGE?

Whilst fully appreciating that lepromatous patients must take dapsone, or some anti-leprosy drug on a very long-term basis (after a period of dual therapy), I feel that I should record results of discussions with a number of clinicians working in East Asia who feel that dapsone, itself, may play some part in the production of chronic neurological problems. I am further stimulated to put forward these views on hearing that some Indian leprologists, at their recent conference in Madras, have suggested that the long-term effects of dapsone in this context should be further investigated. Particularly in view of a number of well-documented reports in the literature of peripheral neuritis in dermatological patients on treatment with dapsone for conditions such as *dermatitis herpetiformis,* I wonder if there is any conclusive scientific work which indicates that dapsone as a drug may, in fact, be neuropathogenic? Many patients from all sectors of the immunological spectrum have been seen with chronic neural complaints and/or slowly progressive nerve deficits, in whom symptons disappear on cessation of dapsone and substitution of another antileprotic. Whilst active disease with dapsone resistance may need to be considered in some more recent patients, this is not likely to be a common causative factor. Is it possible that dapsone's long continued use may contribute to eventual nerve damage in addition to the fibrosis which, understandably, follows bacillary invasion and infiltration of nerves by the leprosy infection? Are there medications in common useage that may increase or decrease peripheral nerve damage in leprosy? Are we, in fact, increasing disability by therapy?

3. A POSSIBLE RELATIONSHIP BETWEEN THE USE OF DAPSONE IN DOSES OF 50–100 MG DAILY FROM THE OUTSET, AND NERVE DAMAGE

This is a matter of much greater and more urgent concern than the above. It was stated, both in Mexico and in the *Lancet* of 17 November 1976, by Barnetson, Pearson and Rees, that higher doses of dapsone may actually prevent reversal reactions. This is contrary to the clinical impressions of many of us who can cite numbers of patients in whom the sudden introduction of such levels of dapsone, even after the use of other antileprotics, has apparently precipitated acute nerve lesions, usually as part of a reversal reaction, and a more chronic type of neural discomfort in some lepromatous type patients. These events are often polyneuritic and leave permanent neural deficits, though I realise that with adequate, early corticosteroid therapy, one may expect a degree of nerve recovery in many cases. However, the use of steroids in the field, under conditions as I seem them in this large area, is far from straightforward. Whilst their use after an acute neural deficit may result in an apparently complete response, we cannot be sure how long such improvement will be maintained, and we must remember the limitations of such therapy. First, in many control programmes there is already difficulty in gaining co-operation of the patients and the general public; if a new diagnosed patient develops paralysis soon after commencing treatment this could hamper the whole programme. This is not theory – it has happened in several areas and usually there is a considerable period of delay before further progress with the control programme is made. Second, the corticosteroids ideally should start at once; certainly within six weeks of the development of the deficit if there is to be real hope of significant recovery of nerve function. In many areas patients can only be seen once in three or even six months – and it is impractical to tell them to 'Hurry to clinic' if a reaction occurs.

Thirdly, it has been suggested that Paramedical Workers should be given supplies of corticosteroids to treat patients with acute nerve deficits and other reaction problems. This is not acceptable to some governments – and it would certainly add complications to the treatment regimes. Simplicity of treatment is one of the reasons given for suggesting that all patients, irrespective of leprosy type, should receive the same dose of dapsone. In some countries, corticosteroids are easily obtained on the local market and have already created many problems in the management of patients. Once a patient has been given corticosteroids for a short time he often states that they make him 'feel good' and so he goes and buys more himself and it is not uncommon to see these patients become dependent on corticosteroids. One young woman has been taking 30 mg prednisolone a day for 3 years to control ENL, and a taxi driver was taking 15–20 mg prednisolone daily for about a year to control the lesions of BL-type leprosy, but neither took any antileprotics! Corticosteroids in the right hands can help – but given without adequate supervision and

understanding can produce more problems than they solve; at least, amongst the very unstable borderline group of patients that are so common in East Asia.

Some experienced workers suggest that with the use of antileprotics other than dapsone, e.g. Lamprene Thiacetasone and Thiambutasone, the incidence of acute neural deficit may be less and there may, possibly, be a decrease in the amount of permanent nerve damage. Some of these drugs may be less effective antileprotics, but the immunologically unstable patients who may benefit from their use are also those in whom secondary drug resistance is less likely to be a problem.

At the Mexico conference, Dr Waters, speaking from the chair, after the paper on Reversal Reaction, pointed out that there may well be definite racial variations in leprosy that, at present, have been little investigated. He has worked with a number of racial groups. I am very conscious of racial variations, and with this possibility in mind, I appeal to readers to try to run their own investigations; treating patients carefully and keeping complete records so that they, or someone else, will be able, eventually, to assess what treatment is best for that particular group of patients. Please do not just accept recommendations based on work in another country without carefully observing the effects in your own group.

Nerve damage is the most disabling physical result of leprosy. Are we increasing or decreasing it by our present therapy?

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Lepr Rev (1980) **51**, 99–100

Book Reviews

The diagnosis and management of early leprosy, by SG Browne, 1979, London, The Leprosy Mission, 50 Portland Place, London, WIN3 DG

This booklet of 35 pages is a revised third edition, the first having been reviewed by Dr TF Davey in *Leprosy Review,* 1975, **46**, page 241. It is part of a series 'Leprosy Today', obtainable free from the publishers, and intended for medical practitioners in countries where leprosy does not constitute a major problem and is therefore in danger of being overlooked. Its content reflects the great experience of Dr Browne and his well-known descriptive ability in this and other subjects; it is altogether a pleasure to read. There are some important changes in the matter of treatment and the fear of drug resistance is mentioned in relation to altered concepts in the treatment of reactions. Although some practitioners, even after reading this excellent book, may not feel able to 'recognize leprosy with assurance and treat it with confidence' it is nevertheless to be heartily recommended for all those who may encounter this disease for the first time.

J E LANDHEER

Three for Compassion, by Val Bock, 1979. The Leprosy Mission, London.

Three young and compassionate Christians recount how they came to leave their home countries to take up work with The Leprosy Mission (TLM), and describe their early experiences of leprosy work: a nurse in India, a physiotherapist in Thailand, and a doctor in Nepal.

A Child in the Midst. The Leprosy Mission, 1979.

The first 11 pages tell the stories, in pictures and captions, of children under treatment in TLM centres and hospitals in various parts of the world, and the final pages contain notes on personnel working in Africa and Asia.

W H JOPLING

Leprosy in the Three Wangas, Kenya: Stigma and stigma management, by I. Bÿleveld, Koninklijk Institut voor de Tropen, Amsterdam-Oost, 63 Mauritskada, Netherlands, pp. 135.

The literature on leprosy is still defective in sociological studies which illuminate the causes of stigma and prejudice, so important in the approach to leprosy control. Dr Bijleveld deserves our gratitude for this detailed and sympathetic study of leprosy stigma among the Wangas of Kenya. By dint of tape recordings of conversations, and of answers given by 85 people to a very carefully devised series of questions, a mass of information on the subject was gathered which is here analysed. It became possible to distinguish between stereotyped traditional thinking about 'the leprosy patient' and the life he must lead according to inherited ideas, and the actual attitude which became possible through personal contact with individual patients in today's setting. Traditionally, the leprosy patient became sociologically 'dead', and many actual patients find this still a powerful

source of anxiety. To increasing numbers of the general public the impact of western ideas is diminishing the potency of tradition, so that the person with leprosy who attends a treatment clinic faces less discrimination than traditional ideas would permit. This is just one of several grounds for hope that with suitable and sustained education on the subject, the destructive pressures of prejudice could be eased. It was interesting to discover how much in line with modern thinking the traditional ideas of the Wangas on the infectivity of leprosy really are. This is a study to be read by anyone interested in the background against which rural leprosy control has to be promoted in Africa. Copies are available from the Department of Social Research at the above address.

T F DAVEY

Lepr Rev (1980) **51**, 101–110

Abstracts

Erratum. In reference number 81 of *Leprosy Review.* **50**, Number 3, September 1979, (page 265), HARBOE, M. *et al.*, 'Formation of antibody against *Mycobacterium leprae* 7 in armadillos. *J Med Microbiol,* v. 11, 525–535, the year was omitted; it is 1978).

131. NOUSSITOU F. **Some aspects of tuberculoid leprosy and chemotherapeutic trials.** *Acta Leprologica,* 1979, v. 74. 1–321.

On a world wide basis the proportion of tuberculoid forms of leprosy is calculated as being about 50%. In the majority of these patients the prognosis is favourable.

The objective of the paper is to establish whether effective therapeutic results can be obtained regularly with short-term mono- or combined therapy.

The history of classification of tubrculoid leprosy is discussed in some detail.

The study of Souza Lima and Souza campos (*Lepro Tuberculoide* 1947, Sao Paulo, Ed. Renasenfa, see also *IJL* **18**, 1955, 133) is quoted as one of the few long-term follow-up studies on the prognosis of different forms of tuberculoid leprosy.

A comparison is made with the Ridley-Jopling classification, including the lepromin test.

The hypothesis is postulated that Ridley's TT-group has an excellent prognosis and no relapse after a reasonably short period of effective therapy.

For trial, five therapeutic regimens are proposed:

Regimen I – 100 mg dapsone + 100 mg clofazimine daily for 2 months, followed by 100 mg dapsone for 4 months.

Regimen II – 100 mg dapsone + 300 mg rifampicine daily for 2 months, followed by 100 mg dapsone for 4 months.

Regimen III – 100 gr dapsone daily + 1 gr streptomycin twice weekly, for 6 months.

Regimen IV – 100 mg dapsone + 350 mg prothionamide daily for 6 months.

Regimen V – 100 mg dapsone daily for 12 months.

It is proposed to adopt the 'Thelep Standard protocol for chemotherapeutie trials' (designed for trials in lepromatous leprosy) with some modifications e.g. omission of mouse-tests and bacteriological follow-up throughout the trial. The selection of patients should be based on chemical and histopathological criteria and on the lepromin-test. The value of the post lepromin scar should also be assessed. The number ot the patients allocated to each regimen should be at least 40 and complete observations should be made in at least 30 patients, for at least 3 years. As many patients as possible should be followed for 5 years.

From the statistical point of view a considerably greater number of patients would be desirable, but this may not be feasible.

The final objectives of the trials are to have those regimens proved to be effective introduced on a wider scale, for treatment of TT and BT leprosy and eventually for indeterminate leprosy as well.

This would allow release from control of a large proportion of the leprosy population and, consequently, a closer follow-up of multibacillary patients would be possible.

It is expected that the regularity of attendance and of drug intake will improve with the short-term treatment. Patients with drug resistant strains of *M. leprae* will be

treated more effectively.

Although more expensive drugs are proposed, it is thought that the overall costs of treatment will be reduced due to its short duration.

The paper should be read in full by everybody who is contemplating drug trials in non-lepromatous leprosy.

D L Leiker

132. NSANZUMUHIRE, H *et al.* **A study of the use of community leaders in case findings for pulmonary tuberculosis in the Machakos District of Kenya.** *Tubercle,* 1977, v. 58, 117–128.

133. ALUOCH JA *et al.* **A second study of the use of community leaders in case finding for pulmonary tuberculosis in Kenya.** *Tubercle,* 1978, v. 59, 233–243.

These two papers describe the results so far achieved in a systematic investigation of different methods of finding active cases of tuberculosis (smear and/or culture positive) amongst persons over six years of age in the Machakos District of Kenya. The methods being investigated are:

1. Interrogation of community elders.
2. Interrogation of household heads during home visits.
3. Examination of cases on the District tuberculosis register.
4. Examination of cases registered as having chronic pulmonary disease.
5. Examination of close contacts of registered cases of tuberculosis.
6. Re-interrogation of community elders after an interval of one year.

A random sample of 20% of the households in the area was drawn and sputum specimens collected and examined from 98% of them. Prevalence of cases in the community was estimated by combining the results of sputum examination amongst suspects identified by elders and household heads with the results of sputum examination of non-suspects in the random sample. The total prevalence revealed was 6.9 per 10,000 persons aged 6 or more, the 95% confidence limits being 3.9 and 9.9 per 10,000.

The initial approach to the elders identified 30% of the smear positive cases and 16% of the culture positive cases in the community – and was relatively easy to carry out.

The interrogation of heads of households, a much more time consuming investigation, yielded 70% of the smear positive and 50% of the culture positive cases. Unfortunately the majority (§§) of the cases identified through interrogation of the elders were previously treated cases and in the opinion of the authors, the work involved in interviewing household heads renders that method impractical for routine use.

In the second survey elders again identified mainly old cases but did name some new sputum positive cases in addition.

Re-examination of cases previously registered in the district tuberculosis register yield six positive cases of 63 examined.

The bateriological examination of household contacts gave only 3 cases among 612 contacts.

Investigation of the effectiveness of requestioning elders, examination of close contacts and identification of cases amongst those attending local dispensaries is continuing.

These studies are useful as a model for a systematic approach to the determination of the most cost effective methods of case finding in a given community and the original papers should be consulted by anyone planning a similar, and much needed, study of leprosy case finding.

W F Ross

134. GUSSOW, ZACHARY. **Notes on the History of Leprosy in Louisiana.** *Southern Med J* 1979, v. 72, No 5. 600–604.

In the late 1880s it became apparent in Louisiana that leprosy was endemic in the southern part of the state. Initially, the intention was to establish a leprosy hospital

in the city of New Orleans, close to medical facilities, and where the bulk of the patients were to be found. The establishment, instead, of an isolated leper colony at the run-down plantation at Carville, 85 miles up-river, was the result of community indifference, misunderstanding of the nature of the disease, and expected depreciation of property values. Fear of the disease was a secondary matter. The practice of locating residential facilities for the chronically ill at long distances from the centers of physician practice and medical research continues to this day. Interestingly, the arguments that permit this to happen have not changed appreciably from those of a century ago.

(Author's summary)

1. MICROBIOLOGY

135 DAVID HL CLAVEL S, CLEMENT F, MEYER L, DRAPER P, BURDETT IDJ. **Interaction of *Mycobacterium leprae* and mycobacteriophage D_{28}.** *Ann Microbiol (Inst. Pasteur),* 1978, v. 129B, No 4, 561–570.

This study of the interaction between *Mycobacterium leprae* and the mycobacteriophage D_{29} showed that the viruses caused a patchy damage of cell wall structure and the accumulation in the host of internal crystalline structures. Whether the observed ultrastructural alterations were caused by the replication of D_{29} was not clear. Mitomycin C also caused the accumulation of crystalline structures in *M. leprae.'*

136. KAWAGUCHI Y, MATSUOKA M, KAWATSU K. **Pathogenicity of cultivated murine leprosy bacilli in mice. 2. The pathogenicity of bacilli from smooth colonies.** *Jap J Exp Med,* 1978, v. 48, No 3, 211–217.

'. . . bacilli from smooth colonies are generally much less virulent for mice than those from rough colonies of Hawaiian-Ogawa strain and those of the original Hawaiian strain.'

[For part 1 see *Trop Dis Bull* 1978, v. 75, abstr. 2498.]

137. OKADA S, NISHIURA M, OGAWA T, MORI T. **Electron microscopic study of colonies of *Mycobacterium lepraemurium.*** *Int J Lepr,* 1979, v. 46, No 4, 364–371.

2. IMMUNOLOGY, PATHOLOGY

138. SYED MAROOF SAHIB H, VELLUT C. **Some observations on skin reactions induced by lepromin and four other mycobacterial antigens.** *Lepr. India,* 1978, v. 50, No 4, 579–587.

A study on skin reactions induced by *Mycobacterium leprae* lepromin and other mycobacterial antigens was done on 47 leprosy patients of Hemerijckx Leprosy Centre, Polambakkam. There was no exact correlation between lepromin and any 1 of 4 antigens in all types of leprosy.

M F R Walters

139. BJUNE G. **Comparison of various preparations of *Mycobacterium leprae*** and other mycobacteria by lymphocyte stimulation. *Int J Lepr,* 1979, v. 46, No 4, 386–393.

140. FUMAROLA D, JIRILLO E, DE SANTIS A, MONNO R, MUNNO I. **Leukocyte inhibiting factor (LIF) production from human lymphocytes of healthy donors stimulated by armadillo's lepromin.** *Ann Sclavo,* 1978, v. 20, No 1, 33–40.

141. SHEPARD CC, WALKER LL VAN LANDINGHAM R. **Heat stability of *Mycobacterium leprae* immunogenicity.** *Infection & Immunity,* 1978, v. 22, No 1, 87–93.

'The protection provided to mice by vaccines administered intradermally was measured after footpad challenge with Mycobacterium leprae. The protection offered by *M. leprae* suspensions was not decreased when the

vaccines were killed by 60°C heat or at the higher temperatures tested, which included 215°C (autoclave). Even highly purified suspensions retained their immunogenicity. In contrast, the vaccine protection provided by intradermal *M. bovis* (strain BCG) was markedly reduced when heated to 60°C. The enlargement of the lymph nodes regional to the intradermal vaccines was measured and found generally to parallel the vaccine protection provided by *M. leprae* and by BCG.'

142. CARAYON A. Les névrites microangiopathiques dans la lèpre. **[Microangiopathic neuritis in leprosy.]** *Hansenologia Int,* 1977, v. 2, No 1, 15–23.

'Besides the typical hansenic neuritis characterized by a hypertrophic nerve associated with the already well known wide range of neural impairment, there are also microangiopathic lesions. Microangiopathic neuritis have been described by the author together with Camain and Maydat, in borderline and reactional (ENL) cases (1966–1969). [*Trop. Dis. Bull.*, 1970, v. 67, abstr. 1845.]

From the author's observations in the years 1970–1976, *primary* and *secondary, acute* and *slow* varieties of microangiopathic neuritis could be identified and systematized, both in borderline and ENL cases.

'The clinical, immunological pathological and therapeutical aspects of these forms of microangiopathic neuritis are presented.'

143. WAGER O, PENTINEN K, ALMEIDA JD, OPROMOLLA DVA, GODAL T, KRONVALL G. **Circulating complexes in leprosy studied by the platelet aggregation test. The platelet aggregation test and its relation to the Rubino test and other seroimmunological parameters in 135 patients with leprosy.** *Clin. Exp. Immunol.*, 1978, v. 34, No 3, 326–337.

Sera from 135 patients with leprosy were tested by the platelet aggregation test (PAT), by the Rubino test and by other seroimmunological assays. PAT positivity (titre $\geqslant 10$) was 53% in the lepromatous subgroups and 5% in the tuberculoid subgroups ($P < 0.005$). The higher PAT titres and Rubino titres clustered significantly ($P < 0.0005$) toward the lepromatous end of the disease spectrum. A statistically significant correlation was found between the PAT and the Rubino titres ($0.05 > P > 0.025$). . . .

'It was concluded that the PAT is a sensitive detector of IgG complexes peculiar to the lepromatous leprosy. In leprosy the discriminatory power of the PAT seems to be superior to that of other immune complex tests recently applied for the analysis of leprosy series.'

144. SHEPARD CC, WALKER LL VAN LANDINGHAM RM **Immunity to *Mycobacterium leprae* infections induced in mice by BCG vaccination at different times before or after challenge.** *Infection & Immunity,* 1978, v. 19, No 2, 391–394.

'Viable suspensions of BCG, an attenuated strain of *Mycobacterium bovis,* have been previously shown to immunize mice against infections with *M. leprae.* Usually, the mice have been vaccinated about 1 month before challenge. Experiments have now been carried out with single intradermal injections of BCG given before or after the *M. leprae* challenge. Approximately equal immunizing effect was seen in one experiment when the BCG was given at −168, −119, −70, and −28 days relative to challenge. Approximately equal protection was observed in another experiment when the vaccine was given at −28, +28, and +56 days. In the latter experiment, however, vaccine given at +91 days appeared to be somewhat less effective. Enlargement of the lymph nodes regional to the intradermal vaccine site persisted for at least the duration of the experiment, approximately 400 days. Thus, antigenic stimulation appears to have continued throughout the period of observation.'

145. GUPTA, RM, GUPTA, SC, SINGH G, KHANNA S **Immunoglobulins in leprosy.** *Int J Lepr,* 1979, v. 46, No 4, 342–345.

146. GARCÌA GONZÁLEZ J, DIAZ ALMEIDA J, MAYEA MILIAN L DE LA CRUZ CASTILLO F, Estudio de la inmunidad mediada por células a un grupo de enfermos de lepra (test de inhibicion de leucocitos). **[Study of cell-mediated immunity in a group of leprosy patients. The leucocyte migration inhibition test.]** *Revta Cub Med Trop,* 1978, v. 30, No 2, 53–58.

'Ten patients with the lepromin-negative lepromatous form and ten with the lepromin-positive tuberculoid form who underwent the leukocyte migration inhibition test were studied. A marked impairment of cell-mediated immunity in the lepromatous group as well as significant differences of the average inbibition rates between both groups of patients were found. Results from this *in vitro* test were correlated to those from the lepromin skin test and a correspondence in 18 out of the 20 patients studied was obtained.'

147. POULTER LW, LEFFORD MJ. **Relationship between delayed-type hypersensitivity and the progression of** *Mycobacterium lepraemurium* **infection.** *Infection & Immunity,* 1978, v. 20, No 2, 530–540.

'The relationship between the level of delayed-type hypersensitivity (DTH) and the progression of *Mycobacterium lepraemurium* infection was examined after inoculation of mice with 10^8 *M. lepraemurium* in the left hind footpad. The expression of DTH developed over the first 4-weeks of infection, remained high up to week 8, and then dropped to a low level at which it remained for 12 more weeks. The development of DTH was concordant with an initial swelling of the inoculated foot, the appearance of mononuclear infiltrate at this site, and a prevention of any increase in the number of mycobacteria in this foot and in other tissues studied. A decay of DTH reactivity was associated with a progressive increase in the number of *M. lepraemurium* initially at the original site of inoculation and subsequently in all other tissues. Although the expression of DTH was lost, adoptive immunization experiments showed that a population of sensitized lymphocytes persisted within the host. Further experimentation offered evidence to suggest that the level of systemic antigen may be in part responsible for the loss of DTH reactivity.'

[This paper is of special concern to those interested in the down grading of leprosy patients from borderline-tuberculoid to lepromatous leprosy.]

M F R Waters

148. MUSTAFA AS TALWAR GP. **Delayed hypersensitivity skin reactions to homologous and heterologous antigens in guinea-pigs immunized with** *M. leprae* **and four selected cultivable mycobacterial strains.** *Lepr India,* 1978, v. 50, No 4, 509–519.

'Guinea-pigs were immunized with *Mycobacterium leprae* in saline and with autoclaved preparations of *Mycobacterium w.* ICRC bacillus, *Mycobacterium phlei* and *Mycobacterium vaccae.* A group of animals were also immunized with live *Mycobacterium w.* All animals were challenged after one month of injection with Dharmendra and Mitsuda lepromins from *M. leprae* and other mycobacteria. Induration produced in response to the challenge antigens have been recorded on different days. All bacteria produced delayed hypersensitivity response in guinea-pigs to challenge with homologous mycobacterial preparations and *M. leprae.* In most cases, the early reaction was higher with homologous antigens as compared to *M. leprae.* In most cases, the early reaction was higher with homologous antigens as compared to *M. leprae* antigens. The late reactions to homologous and *M. leprae* antigens were however of comparable order especially in animals immunized with *Mycobacterium w,* and ICRC bacillus. Animals immunized with *M. leprae* gave low late reactions with preparations from *Mycobacterium phlei* and *Mycobacterium vaccae.'*

149. ANTHONY, J, VAIDYA MC DASGUPTA A. **Immunological methods employed in an attempt to induce erythema**

nodosum leprosum (ENL) in mice. *Lepr India,* 1978, v. 50, No 3, 356–362.

'. . . none of the methods employed for the induction of ENL in immuno-suppressed *M. leprae* infected mice were successful in simulating the reaction as observed in human leprosy.'

150. MUSTAFA, AS & TALWAR, GP. **Early and late reactions in tuberculoid and lepromatous leprosy patients with lepromins from *Mycobacterium leprae* and five selected cultivable mycobacteria.** *Lepr India,* 1978, v. 50, No 4, 566–571.

'Skin reactions have been measured in tuberculoid and lepromatous leprosy patients with Dharmendra and Mitsuda type of lepromins prepared from *M. leprae, Mycobacterium w,* ICRC bacillus, *M. phlei, M. vaccae* and *M. gordonae.* In tuberculoid patients *Mycobacterium w* gave the closest response to *M. leprae,* however, in lepromatous and borderline lepromatous cases, this bacteria produced greater response than *M. leprae.*'

151. ALEXANDER, J. **Effect of cyclophosphamide treatment on the course of *Mycobacterium lepraeurium* infection and development of delayed-type hypersensitivity reactions in C57Bl and BALB/c mice.** *Clin Exp Immunol,* 1978, v. 34, No 1, 52–58.

'. . . Cyclophosphamide pre-treatment had no effect on the growth of *M. lepraemurium* in C57Bl mice over 12 weeks. In BALB/c mice however cyclophosphamide-pre-treated mice demonstrated considerable resistance to infection at weeks 8 and 10 after infection but not thereafter. Whereas the magnitude of the delayed hypersensitivity response in C57Bl mice could not be correlated with resistance such a relationship could be demonstrated in BALB/c mice.'

152. VINET, J. La lèpre dans l'Empire Centrafricain. **[Leprosy in the Central African Empire.]** *Afr Méd,* 1977, v. 16, No 151, 365–367.

The anti-leprosy campaign started in 1953. The prevalence rate reached a peak in 1958 (6.53/1000), thereafter declining rapidly till 1966 (2.94/1000) and regularly since (about 1.00 in 1975). While the endemic is widespread, the prevalence rates vary in different parts of the country, being high (6.28 to 9.97) in the east and central area, moderate (4.37 to 5.12) in the west-central area, and low (under 4.7) in the west and north.

Children account for about 15.68% of the cases. Since 1953, 74,485 patients have been registered and of these 37,927 have been released from treatment and control.

It is considered that, while the numbers of patients no longer requiring treatment are very satisfactory, the newly registered cases (over 1,000 annually) indicate that transmission is still occurring. More intensive case-finding is advocated, with admission to one of the five hospitals of all patients with lepromatous or reactional tuberculoid disease. A long-acting sulphonamide (sulphamethoxypyradazine, or Fanasil) is the drug of choice at present, but rifampicin and clofazimine are being introduced.

S G Browne

153. LYNCH, P. **Greater Auricular nerve in diagnosis of leprosy.** *Br Med J,* 1978, Nov. 11, 1340.

337 Nepali recruits to Britain's Brigade of Gurkhas were examined in order to find the incidence of thickened nerves in the neck. Other peripheral nerves were examined together with the whole body surface. One or both greater auricular nerves were considered to be thickened in 212 subjects (63%); 21 had ulnar nerve thickening and 4 had hypopigmented macules which were not hypoaesthetic. No nerve biopsies were carried out. Because of the high incidence of thickened greater auricular nerves in this group of healthy young Nepalis the author

suggests that this clinical finding is of doubtful value in the diagnosis of leprosy.

[The fact that these men had 'well developed neck muscles' is significant, for the abstracter has found thickened nerve trunks in association with above-normal muscular development. Examinations of other racial groups are indicated.]

W H Jopling

154. DAVID-CHAUSSÉ J, TEXIER L, DEHAIS J, BULLIER R, LOUIS-JOSEPH L. Manifestations articulaires au cours de 2 cas de lèpre. **[Articular manifestations in the course of 2 cases of leprosy.]** *Bordeaux Méd,* 1978, v. 11, No 14, 1183–1190.

'The authors report on two observations of inflammatory arthrosynovitis occurring in the course of 'leprous reaction'. One involved a case of nervous leprosy, in which an intradermo-reaction of Lepromin was followed by a monoarthritis of the knee; the other a case of lepromatous leprosy in which, a few months after the administration of Disulone, polyarticular damage occurred in the course of an arthritic erythema.

'Various cases noted from the literature are analysed.

'The immunization disorders observed in the course of the leprous reaction provide the most satisfactory explanation.

'Rifampycin, successfully used in one of the cases reported, provides a complement to the therapeutic means against leprous reaction, in which corticoids, Thalidomide and Lamprene have all proved to be truly effective.'

155. KAPUR TR. **Study of non-lepromatous leprosy among Indian Armed Forces personnel.** *Lepr India,* 1979, v. 51, No 1, 81–86.

156. BHAGOLIWAL A, CHANDRA J & MISHRA RS. **Some observations on default among leprosy patients.** *Lepr India,* 1979, v. 51, No 1, 96–102.

4. THERAPY

157. PATTYN SR & SAERENS E. **Evaluation of the activity of streptomycin on *Mycobacterium leprae* in mice.** *Lepr Rev,* 1978, v. 49, No 4, 275–281.

'The effect of streptomycin on *Mycobacterium leprae* was studied in the conventional mouse model. The drug has a relatively high bactericidal activity that places it between dapsone and ethionamide or prothionamide. Its effect is more pronounced when administered immediately after the experimental infection than when treatment is started at a later time. This is probably the result of the higher activity of streptomycin on leprosy bacilli located outside cells. It is concluded that streptomycin could be a valuable companion drug during the initial treatment of dapsone resistant leprosy in countries with limited resources. Streptomycin as monotherapy is not suited for the short course treatment of paucibacillary leprosy.'

[Streptomycin has not in fact been generally recommended by expert committees, such as that of WHO (*Trop Dis Bull,* 1977, v. 74, abstr. 1967), either as a combination drug in the treatment of dapsone-resistant leprosy, or for the treatment of dapsone-sensitive infections. In their discussion the authors state that 'it would be difficult to use [streptomycin] in monotherapy for long periods of time in the treatment of human leprosy.' It would in fact be positively undesirable; apart from the inconvenience and risks of intramuscular injections under field conditions and the side-effects of this drug, it not universally cheap. Furthermore, if used alone, it will lead to resistant leprosy bacilli in about 2 years and could also produce resistant strains of tubercle bacilli.]

A C McDougall

158. BALAKRISHNAN S & SHESHADRI PS. **Influence of rifampicin on DDS excretion in urine.** *Lepr India,* 1979, v. 51, No 1, 54–59.

The plasma half-lives and urinary excretion levels of DDS were compared before and during concurrent administration of Rafampicin in 23 cases of active lepromatous leprosy. The plasma half-life of DDS was found to be slightly less during Rifampicin administration. The urinary excretion of DDS was found to be consistently enhanced in all the cases, particularly during the earlier phase of the therapy. This had no relation to the dose or the total duration of Rifampicin therapy. The findings are discussed.'

159. CARAYON A. La chimiotherapie antihansénienne face a la névrite (orientations nouvelles). **[Chemotherapy of neuritis in leprosy.]** *Hansenologia Int*, 1977, v. 2, No 1, 24–46.

'The mechanisms of activity of chemotherapy, immunotherapy, antibiotic therapy and surgery in hansenic neuritis are presented. The clinical, bacteriological and pathological pictures of the different types, varieties and stages of neuritis are described and should serve as a guide for the institution of the appropriate therapeutical measures.'

160. DELVILLE J, PICHEL AM & BOUCKAERT A. Influence de la pénicille sur l'infection expérimentale à *Mycobacterium leprae* chez la souris **[Influence of penicillin on the experimental infection of mice with *Mycobacterium leprae*.]** *Ann Soc Belg Méd Trop*, 1978, v. 58, No 2, 125–131. English summary.

'After a brief survey of the literature on the use of penicillin as a therapeutic agent in leprosy, the influence of this drug on the experimental *M. leprae* infection of mice is investigated.

'Statistically significant reduction of *M. leprae* is observed in penicillin treated mice. The infection develops normally again after stopping of treatment. This is in accordance with a bacteriostatic effect of penicillin.'

161. LEVY L. **Activity of derivatives and analogs of dapsone against *Mycobacterium leprae*.** *Antimicrob Agents Chemother*, 1978, v. 14, No 5, 791–793.

To investigate the mechanism of the antimicrobial action of dapsone (4,4′-diaminodiphenyl sulphone) against *Mycobacterium leprae*, dapsone and 25 analogues and derivatives were screened for activity in the mouse footpad system by Shepard's kinetic method. From the total of 25, only 7 were active, and all these were metabolized to, or contaminated with, dapsone. The data suggest an antimicrobial effect of dapsone on *Myco, leprae* that is qualitatively different from the effect of dapsone and related compounds on other mycobacteria. The author concludes: 'Not only may the structure of the target enzyme differ importantly from species to species, but the very identity of the target enzyme may differ among mycobacterial species. Therefore, the results of studies of structure-action relationships of dapsone and its analogs and derivatives in cultivable mycobacteria may not be directly applicable to *M. leprae*.'

[The findings and conclusions are of considerable interest, particularly in view of the fact that dapsone is effective against the leprosy bacillus at remarkably low concentrations and through a mechanism which is as yet unknown.]

A C McDougall

162. HASTINGS RC & JOB CK. **Reversal reactions in lepromatous leprosy following transfer factor therapy.** *Am J Trop Med Hyg*, 1978, v. 27, No 5, 995–1004.

'Five patients with active leprosy, four with polar lepromatous (LL) and one with borderline lepromatous (BL) disease, were each treated with transfer factor (TF) from approximately 7.4×10^9 lymphocytes given in 36 divided doses over a 12-week period. The TF was prepared from blood donated by normal, healthy, lepromin skin test-positive individuals. During treatment all four of the LL patients, but not the BL patient, developed clinical reversal reactions. Histopathologically, skin biopsies in these four LL patients showed evidence of

transformation of collections of multibacillary macrophages into paucibacillary epithelioid cells and giant cells. To our knowledge, this is the first histopathologic documentation of reversal reactions occurring in polar LL. To the extent that reversal reactions are evidence of effective cell-mediated immunity to *Mycobacterium leprae*, these results indicate that TF is capable of at least partial correction of the immunologic deficit of lepromatous leprosy.'

163. LEÓN AP & HERNÁNDEZ SILVA J. Ensayo piloto de tratamiento a corto plazo de la lepra por quimioterapia e immunoterapia asociadas, QIA. **[Pilot-type trial of short treatment of leprosy by chemotherapy and immunotherapy associated (CIA).]** *Revta Invest Salud Públ*, 1977, v. 37, No 2, 69–81.

The authors treated 4 cases of lepromatous and 2 cases of borderline lepromatous leprosy with rifampicin (600 mg daily by mouth) together with POG antigen (a polysaccharide of *Mycobacterium tuberculosis* combined to specific IgG) 0.1 to 0.5 ml weekly, fortnightly or monthly, subcutaneously.

The bacteriological index of nose scrapings diminished from an average of 3.1 to zero in 3 months, while that of the skin fell from 4.1 to 0.8 in a year and to zero later.

The morphological index of the skin reduced from an average of 66.6 to zero in 6 months.

Clinical improvement was fast and steady.

The authors believe that their treatment is not only of shorter duration but also that it is probably more effective than any chemotherapy in use up to the present. They consider that it merits further investigation.

J M Watson

164. LANGUILLON J. Traitement de la maladie de Hansen par une dose unique de 1,5 g de rifampicine associée à une sulfonothérapie continue. **[Treatment of leprosy with a single dose of 1.5 g of rifampicin together with prolonged treatment with a sulphone.]** *Méd Trop*, 1977, v. 37, No 6, 717–719. English summary.

After successful experience with various doses of rifampicin given together with other drugs, the author records an investigation into the treatment of newly diagnosed patients suffering from lepromatous leprosy with a single dose of 1.5 g of rifampicin and a daily dose of 25 mg of dapsone for 1 month, increased to 50 mg daily the second month and subsequently. Not only did the Morphological Index fall to zero (from over 50%) in 6 weeks, but the clinical improvement was remarkable.

In the case of relapse due to the emergence of resistant forms of *Mycobacterium leprae*, the author gives 100 mg of clofazimine every other day in addition to the single dose of rifampicin.

The author considers that this regimen should be adopted in mass-treatment programmes in Africa.

S G Browne

5. EPIDEMIOLOGY

165. ARGELLIES JL. Incidence de la maladie de Hansen en Martinique. Analyse épidémiologique critique des modes de dépistage. **[The incidence of leprosy in Martinique. An epidemiological analysis of case-finding methods.]** *Bordeaux Méd*, 1978, v. 11, No 3, 2775–2786. English summary.

This useful paper is based on a critical analysis of case-finding statistics in the West Indian island of Martinique, and attempts to draw conclusions concerning the most effective measures that ensure a maximum detection rate in a population of relatively low leprosy incidence. The situation is complicated by the release from in-patient treatment in a leprosarium of numbers of patients who were subsequently responsible for a real increase in the number of new cases.

The value of clinical examinations of

selected groups of schoolchildren for signs of early leprosy is unquestioned, but is it worth the expenditure of time? The answer is that this procedure may disclose about a quarter of those suffering from leprosy in the same and comparable groups, but that the patients discovered in this way will be suffering from indeterminate rather than from lepromatous leprosy.

The author names and defines indices of success in case-finding, and shows that active case-finding surveys will bring to light patients with very obvious signs of leprosy who would otherwise not report themselves to clinics, or seek treatment for their leprosy.

[In several respects the situation in Martinique is far from typical (for instance, the increased incidence of new cases in older people, and the two-humped curve of incidence) but the conclusion that many undetected sources of contagion exist is undoubtedly true elsewhere. It may be that three-quarters of the cases of active leprosy remain undiagnosed, unregistered and untreated in a stable population like that of Martinique, despite costly efforts at case-finding in a sizeable proportion of the population.]

S G Browne

6. MISCELLANEOUS

166. CDC VET PUBL HLTH NOTES, 1978, Oct 1–2. **Leprosy-like disease in armadillos.**

The capture of 7 armadillos in Louisiana, USA, with naturally acquired leprosy-like disease (LLD) was first reported in 1975. No relationship between these and the occurrence of leprosy in humans then or since, has been documented. Furthermore human leprosy was known in Louisiana prior to the introduction of armadillos to that state.

In July 1978 the center for Disease Control learned of a zoo-confined armadillo that had been diagnosed as having LLD. The origin of this animal was traced to Texas, and animals in that State have been examined. Tests on this animal and others are in progress.

R Schram

[See also *Trop Dis Bull*, 1976, v. 73, abstr. 896.]

CONTENTS

Printed in Great Britain at the Alden Press
Oxford London and Northampton