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THE BRITISH LEPROSY RELIEF ASSOCIATION
VOLUME XXXV NO. 2.
SPECIAL SUPPLEMENT JANUARY 1964

PRINCIPAL CONTENTS

The 8th International
Congress of Leprology,
Rio de Janeiro, September, 1963
Special report comprising
An Editorial
Announcement of the JAMES A. DOULL *awards*
The findings of the Scientific Panels and Round Tables
and some Abstracts of some Papers
which were presented
to the Congress

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Contents

Editorial, giving a general account of 8th International Congress of Leprology, Rio de Janeiro, September 1963 ..... *page* 3

The JAMES A. DOULL AWARDS 6

Round Table on Pathology and Experimental Transmission 9

Round Table on Borderline and Indeterminate Leprosy 15

Panel on Epidemiology and Control 17

Panel on Therapy 33

Panel on Leprosy Reaction 37

Panel on Bacteriology and Immunology 40

Panel on Physical Medicine and Rehabilitation 43

Panel on Surgery and Vocational Training 47

Panel on Educational and Social Aspects 52

Abstracts of Some Papers 58

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

To all readers - this supplemental issue describing the Congress has cost money. Will you be so kind straight away to send to me, Editor, Leprosy Review, 8 Portman Street, London, W.1, the sum of five shillings sterling by postal order or other means, as soon as you receive this issue. Your action in this matter will be most gratefully received.

One of the meetings of the 8th Congress. The cards on the table do not refer to officials of this particular meeting which was the presentation of the Damien Dutton Award to Mrs. Eunice Weaver of Brazil. They are (left to right): DR. J. M. M. FERNANDEZ, President of the International Leprosy Association; DR. FAUSTO GAYOSO CASTELO BRANCO, President of COCIL, which is the organising Committee in Brazil of the Congress; DR. ORESTES DINIZ, Secretary of COCIL; DR. J. ROSS INNES, Secretary-Treasurer of the International Leprosy Association.

The 8th International Congress of Leprosy Rio De Janeiro Sept. 1963

The editor of *Leprosy Review* had a 'ringside seat' at this Congress, and in addition to being Medical Secretary of the British Leprosy Relief Association and thus being able to represent that Association at the Congress, is Secretary-Treasurer of the International Leprosy Association which called the Congress and takes part in its organization, and the Secretary-Treasurer having personally attended the Congress and being Editor of *Leprosy Review*, offers to the readers of *Leprosy Review* this personal reporting of it in the form of a Supplement to the January issue.

It is perhaps hardly necessary to point out the importance of the Congresses of Leprology. They are held only at intervals of five years, the previous ones being:

[1] Berlin, 1897; [2] Bergen, 1909; [3] Strasbourg, 1933;
[4] Cairo, 1938; [5] Havana, 1948; [6] Madrid, 1953
[7] Tokyo, 1958;

and are attended by the leprologists of the world and scientists from other fields of work which touch on leprology, and by all who are genuinely interested in this difficult department of human activity, those who are able to come. Progress in science and technique is reviewed, and the path for the future is indicated. No one in the world can afford to ignore the international congresses of leprology, for leprosy occurs in the greater part of the known world, and is unconquered yet.

The spirit of the Rio Congress, 1963, might be said to be a choice between two attitudes to leprosy: (1) leprosy is with us yet and always will be with us; (2) leprosy can be got rid of in our own lifetime if only we used and fully applied such knowledge as has been revealed to us especially since 1943. The choice inclines strongly to the second.

The 8th International Congress of Leprology was held at Rio de Janeiro, 12–20 September, 1963, at the invitation of the Government of Brazil. As hosts to the Congress they provided the venue and considerable hospitality. They arranged an organizing committee called COCIL, headed by DR. FAUSTO GAYOSO CASTELO BRANCO as President, and DR. ORESTES DINIZ as General Secretary. The International Leprosy Association was represented by the Secretary-Treasurer (your editor) and a secretariat of two, and it must be remembered that most 'congresistas' or members attending the Congress were also members of the International Leprosy Association and in particular 13 members of the Council of that Association attended the Congress.

As for the 8th Congress, 400 attended, and it is worthwhile stating the countries or places from which they came. They were: Africa S.W., Angola, Argentina, Australia, Belgium, Bolivia, Brazil, Burma, Cameroun, Canada, Colombia, Congo, Cuba, Denmark, Ecuador, Egypt, Ethiopia,

Fiji, France, Germany, Gambia, Ghana, Hong Kong, India, Italy, Israel, Jamaica, Japan, Korea, Malaya, Mali; Malta, Morocco, Martinique, Mexico, Nigeria, New Guinea, Netherlands, Panama, Paraguay, Peru, Philippines, Portugal, Scotland, Senegal, Spain, Switzerland, Taiwan, Tanganyika, Thailand, Uruguay, United States of America, United Kingdom, Vietnam S., Venezuela, West Indies.

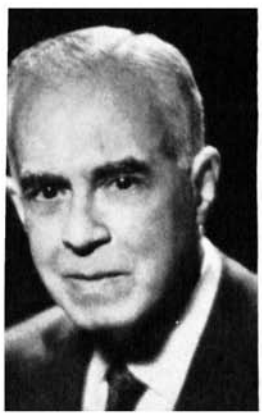
In addition to the main financial burden borne by Brazil, it is gratefully recorded that financial aid was given by various organizations who had the vision and the kindness to do it, such as the British Leprosy Relief Association, which gave £700 towards the fares and expenses of three members of the secretariat going to the Congress, plus the fare and expenses of one scientist of repute who had to attend as member of a scientific committee of the Congress (£300); CIOMS who contributed £250 and also have promised $300 (in Cruzeiros); Messrs. Geistlich & Sons Ltd., Switzerland, who gave £50. Many other organizations have also helped members to go to the Congress and in various ways. Important changes fall to be recorded in the high officials of the International Leprosy Association. These changes were approved at the Congress, and bear on the future of all international leprosy congresses. The ILA is the body who calls them, in conjunction with a host government who offers to hold the international congress in its territory, and in Brazil, as in all previous congresses, bears the major part of the financial burden.

The President of ILA at the time of the Brazil Congress in the event was not able to attend, and for medical reasons resigned his high office. He was DR. H. W. WADE, of USA, now resident in Culion, Philippines, who had been President for 17 years, and Editor of the International Journal of Leprosy for over 30 years. In fact the Secretary-Treasurer carried to Rio de Janeiro and handed over to MR. C. I. CROWTHER of the Leonard Wood Memorial for onward transmission to DR. WADE an illuminated address on vellum prepared by an artist in London. This framed ornamented parchment is in effect very beautiful and the text is as follows:

> '*We the undersigned Vice-Presidents and members of the Council of the International Leprosy Association desire to express to Dr. H. W. Wade our profound appreciation of the great services he has rendered to the Association since its foundation in 1931, as Councillor, and during the past seventeen years as its President. To this high office he brought great knowledge, wide experience, and sound judgment, and successive International Congresses have owed much to his counsel. His unusual editorial gifts exercised over thirty years have given the International Journal of Leprosy a world-wide reputation. Through its pages a generation of leprologists have found a forum for the sharing of new knowledge, and high standards have added dignity to the science of leprology.*
>
> *All leprosy workers are indebted to Dr. Wade for his scientific contributions, particularly in the sphere of pathology and immunology. A sincere and penetrating scientist, he is equally a kindly and genial colleague. His decision not to accept another term as President is*

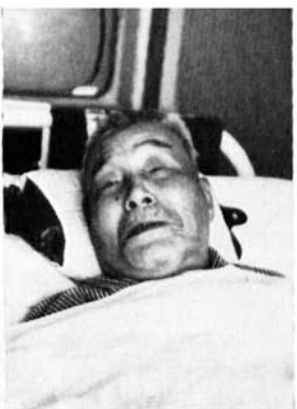
greeted by all members of the International Leprosy Association with profound regret. It is unanimously resolved to appoint Dr. Wade as President Emeritus in recognition of his great services to the International Leprosy Association and his outstanding devotion to the cause of leprosy eradication.'

At the Rio Congress the ILA first chose DR. J. M. M. FERNANDEZ of Rosario, Argentina, as acting President for the Congress and later confirmed his name as the new President of ILA. DR. H. W. WADE was elected President Emeritus, as indicated in the above text of the illuminated address, and DR. ESMOND LONG of USA was chosen editor of International



DR. ERNANI AGRICOLA
Vice-President for the Americas

DR. ERNEST MUIR
First Honorary Vice-President



DR. KENSUKE MITSUDA
Honorary Vice-President

DR. H. W. WADE
President Emeritus of International Leprosy Association

Journal of Leprosy. DR. ERNANI AGRICOLA of Brazil was elected Vice-President for the Americas. With acclamation and unanimity DR. ERNEST MUIR was elected the first Honorary Vice-President (there having been none before) and almost immediately, with the same acclamation and unanimity, DR. K. MITSUDA of Japan was elected an Honorary Vice-President. (It is hoped to publish photographs of all these gentlemen in this issue, if their photographs arrive before this issue goes to press.)

The hard core of this and all congresses is the meeting of the scientific committees or panels. In the 8th Congress there were eight. Chairmen were elected in advance and a limited number of members chosen, and much work of co-ordination and discussion was done long beforehand by correspondence, and the panels met daily during the Congress and in special sessions of the Congress. Two of the panels were called 'Round Tables', and given the added advantage of meeting at Rio for several days before the actual Congress. The two Round Tables were: (a) Pathology and Experimental Transmission; (b) Round Table on Borderline and Indeterminate Leprosy. The other panels were on: (c) Leprosy Reaction; (d) Therapy; (e) Epidemiology and Control; (f) Bacteriology and Immunology; (g) Education and Social Aspects; (h) Physical Medicine and Rehabilitation; (i) Surgery and Vocational Training.

It is proposed in the remainder of this supplement on the 8th Congress to report on the considered findings of the Round Tables and Panels, and on summarised statements of some papers given.

With a sense of loss, but of gratitude and inspiration, and of sincere sympathy with the relatives of the deceased, we record the names of eminent leprologists who have died since the Tokyo Congress, 1958:

DR. J. DOULL, USA
DR. DE SOUZA ARAUJO, Brazil
DR. OTAVIO TORRES, Brazil
DR. AND MRS. PERRY BURGESS, USA
DR. R. NAYLOR, England
SIR L. ROGERS, England
DR. BASOMBRIO, Argentina
DR. OLMOS CASTRO, Argentina
DR. A. BELTRAN ALONSO, Spain

PRESENTATION OF THE DAMIEN-DUTTO AWARD TO MRS. EUNICE WEAVER OF BRAZIL.

The Damien-Dutton Society of New York has the pleasant practice of making an award to a distinguished leprologist at the time of the International Congress. Last time it was to DR. H. W. WADE. This time the Society provided the function the most popular and pleasant in the Congress, when SISTER DE LA TRINITÉ at one of the sessions on Friday, 13 September, made the award to MRS. EUNICE WEAVER of Brazil. DR. J. M. M. FERNANDEZ, President of ILA, presided and spoke and DR. ORESTES DINIZ made an elogium. He described the unassuming and faithful and outstanding hard work done by MRS. WEAVER for many years in the social and preventive side of leprosy in Brazil and indicated how well-loved MRS. WEAVER was by them all. The honour done to MRS. WEAVER was an honour done to Brazil and all Brazilians were proud of her and much encouraged by the choice of her for this famous award.

SISTER DE LA TRINITÉ led the delegation from the Damien-Dutton Society and handed over the plaque of the award to MRS. WEAVER who replied suitably.

ANNOUNCEMENT

THE JAMES A. DOULL AWARDS

During the 8th International Congress of Leprosy, held in Rio de Janerio in September, 1963, MR. C. I. CROWTHER, President of the Leonard Wood Memorial for the Eradication of Leprosy, announced the James A. Doull Awards. They have been created to honour the memory and the significant scientific contributions of the late James A. Doull, who served for 15 years as Medical Director of the Leonard Wood Memorial.

The purpose of the Awards, whose donors remain anonymous, is to stimulate bacteriologists, biochemists, and others to undertake intensified investigations, including the exploitation of the new knowledge and techniques, that the cultivation of *Myco. leprae* and *Myco. l. muris* may be achieved. The inability to cultivate these organisms has been a source of

frustration for bacteriologists from the time these two species of the genus Mycobacterium were discovered.

The Award Committee consists of DR. R. J. W. REES of London; DR. CHARLES C. SHEPARD of Atlanta, Georgia; and DR. JOHN H. HANKS of Baltimore, Maryland.

Those desirous of obtaining more precise information regarding the Awards may communicate with:

MR. C. I. CROWTHER
President, Leonard Wood Memorial for the Control of Leprosy, Inc.,
79 Madison Avenue, ew York 16, New York.

Note: Should it seem desirable, the context of the above 'Announcement' may be revised by the addition of relevant material from Mr. Crowther's presentation at the Congress:

'I am grateful for this occasion. This is a moment when sorrow over the loss of a friend and associate is diminished by realization that his work in the Leonard Wood Memorial and in the field of leprosy continues to bear fruit.

One of the measures of a great man is the fact that his attitudes and determination inspire others even after he is gone.

The purposes of the JAMES A. DOULL AWARDS as described to me by the donors, are as follows:

1. To honour the memory of Dr. Doull's brilliant and untiring devotion to all aspects of the leprosy problem – both humanitarian and scientific.

2. To stimulate among biochemists and bacteriologists a wider recognition that, through exploitation of modern knowledge of metabolism, bacteriologic cultivation of rat and human leprosy bacilli could soon become a reality. As Dr. Hanks will explain in his paper, the existence of a major defect in respiratory mechanisms of these organisms has long been defined by the natural observation. This has since been confirmed by laboratory studies in several countries.

3. To provide a mechanism and occasion for giving early recognition to the person or group which succeeds in solving a most urgent and challenging problem.

CONDITIONS FOR THE AWARDS

As you know, many different types of mycobacteria have been cultivated from leprosy lesions. It is necessary, therefore, to state that the merits of applications for the Award must be judged by the terms to be outlined below.

Since judgment or confirmations will be required, the Awards can be made only after unanimous certification of three qualified microbiologists who know the pitfalls involved in such questions. Therefore, on behalf of the Leonard Wood Memorial, I wish to appoint, as an Award Committee, the following persons: DR. R. J. W. REES, DR. CHARLES SHEPARD, DR. JOHN H. HANKS. The arrangement is that, if any member of this committee should be lost, incapacitated or unwilling to serve, the two

remaining members will nominate a replacement. Upon recommendation by the Medical Director of the Leonard Wood Memorial, the President of that Institution will be in a position to appoint replacements as required.

CHARACTER OF THE AWARDS

Taking into account the possibility that succe
tion problem may occur in two steps, provision had been made for two separate awards.

1. For cultivation of three strains of *M. lepraemurium*, the rat leprosy bacillus, with fulfilment of KOCH's postulates:
   (a) A certificate, appropriately designed and inscribed for this purpose, and
   (b) A cash award of $500.00 in US currency.
2. For cultivation of *M. leprae* and satisfying the requirements of the 1963 report of the Panel on Bacteriology and Immunology:
   (a) A commemorative plaque, and
   (b) A cash award of $1,000.00 in US currency.

It is proposed that the respective awards will be made during a subsequent meeting of the International Leprosy Association while in session for an International Congress of Leprology.

I must hasten to comment on a fact that will be evident to all. The amount of the cash awards is not great. This is because the awards have been established by persons who are endowed only with a scientist's annual income. The true value of the awards arises from a desire to acknowledge and honour a great undertaking and to continue the power of Dr. Doull's influence.'

Report of the Round Table on Pathology and Experimental Transmission

Chairman: R. J. W. Rees (UK);
Secretary: H. M. Portugal (Brazil);
Members: M. Bergel (Argentina); C. H. Binford (USA); Y. T. Chang (USA); K. R. Chatterjee (India and UK); J. Convit (Venezuela); W. H. Feldman (USA); W. H. Hadler (Brazil); N. Nishimura (Japan); J. M. Robson (UK), Augusto Serial (Argentina); C. C. Shepard (USA); F. F. Wilkinson (Argentina).

This report has been prepared by members of the round table group on pathology and experimental transmission and summarises the discussions held by this group in Rio de Janeiro on September 9–11. Our members fully endorse the value of the introduction of round table discussion groups and particularly in allowing time for these discussions *before* the main Congress.

PATHOLOGY

Because pathology was included as a special subject for the first time at the 8th International Congress of Leprology, Tokyo, it was reviewed then very broadly by the Technical Committee on Bacteriology and Pathology. Therefore, our present report deals more specifically with aspects of pathology in which progress has been made in the last five years or where we consider views expressed by the previous Technical Committee should be reiterated.

Practical application of pathology

Histological examination of biopsy material is an essential examination for the proper diagnosis, classification and prognosis of the disease and for assessing the progress or regression of the disease in patients under treatment. Between the two polar groups of leprosy there is a wide spectrum of innumerable intermediate responses which are dependent on the host-parasite reaction. Histological examination provides an essential picture of this host-parasite relationship and should be given at least equal weighting with the clinical picture. In properly conducted chemotherapeutic trials it is important to select suitable cases based on both histological and clinical examination in order to exclude where possible patients with a more favourable prognosis. Because histology provides an overall picture of the cellular and bacillary elements the examination can be used to assess *both* the lesion size (area of cellular infiltration) and the concentration of acid-fast bacilli. Combination of these two assessments into a so-called 'histological' index provides a more accurate

assessment of the infection than the classical bacteriological index. Thus a series of biopsies taken from the same site or sites during the course of treatment can provide an additional important measure of progress. Pathologists are urged again to seek agreement on the application of this histological index for the careful assessment of progress of patients in chemotherapeutic trials.

ow that there is a considerable weight of evidence to support the view that irregularly stained bacilli are degenerate, the reporting of the morphological appearance (irregularly stained and solidly stained organisms) of bacilli in Ziehl-Neelsen stained sections has added importance. It has obvious applications in recording the progress to treatment in chemotherapeutic trials. More detailed knowledge of the proportions of irregularly and solidly staining bacilli in different types of leprosy, during reactions and in different sites in the body or in particular types of cells, would help in elucidating the pathogenesis of leprosy.

Attention is drawn to the value of using a simple histochemical test (Sudan III Stain) on frozen sections from diagnostic biopsies. Lipids are found in lepromatous and dimorphous lesions but not in tuberculoid.

The Committee appreciated the recent contribution of DR. WADE in sending to members of the panel and others a set of excellently prepared and stained slides illustrating the histopathology of 12 lesions of the 'Histioid variety of lepromatus leprosy'. There was insufficient time to adequately study the slides but the Committee urge those who received the slides to send their comments directly to DR. WADE.

Recent advances in pathology

A. *The identification of 'fuchsino*

given by Khanolkar to round and spindle-shaped cells containing acid-fast granules in sections stained by the Ziehl-Neelsen method. More recently it has been shown that these fuchsinophil cells are tissue mast cells commonly found in most tissues, including the dermis, of normal healthy subjects. Although the granules are acid-fast they show also the characteristic metachromasia of mast cells.

B. *Neuropathology*. Leprosy holds a special challenge to neuropathology because it is the only mycobacterial infection in man which involves nerves. Because, in fact, leprosy has a predilection for peripheral nerves it is more than likely that research in the field of neuropathology will throw new light on the pathogenesis of leprosy. Advances during the last five years based on careful observations (using light and electron microscopy) of human leprosy tissues and on experiments in animals indicate that *Myco. leprae* are found usually in the Schwann cells. These observations contradict the view of the pathogenesis of leprosy put forward by Khanolkar in which the nerve fibre is considered to be the site in which the bacilli multiply and in which the bacilli travel along the nerve pathway in the axoplasm of the nerve fibre.

Recent experimental studies in rats and in man have shown that Schwann cells behave as phagocytes capable of ingesting not only neural

debris but also foreign particles, such as carbon particles or mycobacteria, in their neighbourhood. It is significant that Schwann cells have been shown to have general phagocytic activity as well as the well recognised function of phagocytosing neural debris. The Schwann cells are most phagocytic at the time of nerve degeneration or regeneration. Since there is a physiological turnover of nerves all the time, particularly in the skin, there will always be some Schwann cells in an active phase. Some recent experiments(*) on patients with leprosy have shown that these activated Schwann cells have selective powers of ingesting mycobacteria since they actively phagocytosed heat-killed human leprosy but not heat-killed rat leprosy bacilli. This observation is of such fundamental importance that it must be confirmed. In addition to these basic observations on the nerve fibre-Schwann cell complex in man and experimental animals, it is of interest that nerve involvement has been observed also in some of the experimental mycobacterial infections in animals following the injection of *Myco. leprae.*

C. *Application of Electron Microscopy.* In addition to the value of electron microscopy for defining more precisely nerve involvement in leprosy it is a valuable tool for examining the host-bacillus relationship at the cellular level. Recent studies suggest that the intra-cellular reaction to *Myco. leprae* differs in lepromatous and borderline patients and furthermore degenerate bacilli predominate in Virchow cells.

EXPERIMENTAL TRANSMISSION

The members of this Round table committee are favourably impressed by the recent progress which has been made in the field of experimental transmission of *Myco. leprae.* At present some of the results obtained in different laboratories using different conditions or species of animals are not the same. It is considered that the more progressive and extensive experimental infections in animals need to be investigated further and particularly to be confirmed more consistently and in different laboratories, before finally accepting them as being caused by the human leprosy bacillus. Nevertheless the committee consider that the definite infection produced in the foot-pads of mice is presumably a human leprosy infection, particularly since it has now been reproduced consistently in several different laboratories and with *Myco. leprae* derived from patients all over the world.

In order to maintain progress in this most important field, to encourage exchange of data and materials and to stimulate others to undertake this type of work, this committee recommends that the ILA set up a working committee on Experimental Transmission.

APPENDIX

The members of this group considered that it was of the greatest importance at the present stage of transmission studies to summarize their views

*Weddell, Palmer, Rees and Jamison. In Ciba Symposium, 1963 p.3.

regarding the problems and methods in animal transmission experiments and the criteria for assessing successful claims.

Inoculum: Suspensions of Myco. leprae *from man*

(a) Biopsy from untreated smear positive patients (to include all types of leprosy from lepromatous to reactional tuberculoid – classified, if possible, clinically and histologically.) Biopsies should not be taken from ulcerated lesions.

(b) Suspension of bacilli from biopsy to be prepared and inoculated into animals as soon as possible (if delay is unavoidable tissues to be kept in wet and *not* dry ice). Suspension to be prepared in saline or albumin/saline. Compare suspensions of bacilli prepared with and without separation of human tissue by differential centrifugation.

(c) Count number of acid-fast bacilli in suspension (Hanks'; Hilson and Elek, method) in order to inoculate animals with known numbers of bacilli and compare large and small inocula. Carry out a differential count of the proportion of uniformly and irregularly staining bacilli.

(d) Culture suspension on types of media suitable for isolating mycobacteria and incubate for not less than three months at two temperatures, 37°C and 30°C to 34°C. Suspensions to be cultured untreated and also after decontamination by a method used for treating sputum. (If culture positive mycobacteria are isolated they should be identified and inoculated into animals.)

Choice of animals and plan of animal experiments

(a) Present results suggest the use of the mouse and hamster, but as many different species of animals as possible should be compared. The use of very young animals was recommended. Because of the slow development of human leprosy animals with a long life span should be tried. It was particularly recommended that an attempt be made to inoculate a colony of young chimpanzees and follow these by annual biopsy throughout their life span. Where possible a study should be undertaken comparing results in different strains of in-bred and pure-line mice; although every route and site of inoculation should be studied, particular attention should be paid to colder sites, *i.e.*, ear, foot-pad and testis. (In order to compare results in different centres the animal house temperature and the type of diet should be recorded.)

In addition to the use of normal animals it was recommended that the effect of hormones, diet (particularly including pro-oxidant diets) X-irradiation and any other alterations which might increase susceptibility to infection should be studied.

(b) Controls:

1. Inoculation of living bacilli
2. Inoculation of heat-*killed* bacilli

*3. Group of uninoculated normal animals

*4. Group of uninoculated modified animals, *i.e.*, special diet, etc.

5. Where specially modified groups of animals are used they should be divided into two groups receiving living and heat-*killed* bacilli
6. Small group of standard diagnostic animals, *i.e.*, rabbit and guinea pig.

*These groups are of the greatest importance because of the observation that normal stocks of mice and hamsters have been shown to harbour non-culturable ('Murine leprosy type') mycobacteria.

Investigation of bacteria isolated from the animals

(a) Count the total number of acid-fast bacilli harvested from the animal or particular site of inoculation and determine the proportion of uniformly and irregularly stained bacilli.

(b) Culture bacilli isolated (as per section – Inoculum (d) above).

(c) Preparation of a standard type lepromin (Integral and/or Dharmendra type) from the bacilli harvested from the animals and to be compared with a similarly prepared human lepromin in patients with tuberculoid and lepromatous leprosy. The tests to be carried out and read 'blind'. (The 'animal' and human lepromins to be adjusted to contain the same number of acid-fast bacilli. Since the 'animal' lepromin will contain animal tissue antigen it is possible that this foreign antigen could produce a skin reaction in man and it may be necessary to skin test with a 'lepromin' prepared from normal animal tissue or add normal animal tissue to the standard human lepromin.)

(d) Enzymatic Studies.

(e) Serological Studies.

Histological examination of the animal tissues

This study should be undertaken by a histopathologist trained in leprosy who should not only look for alterations similar to those in man but also for any unusual findings, particularly those recurring in animals. Histological examination should be carried out as a routine on all animal tissues (Zenker type fixative recommended – H and E and ZN (Wade modifications). If tissues have to be sent away use formalin fixative).

Because acid-fast bacilli have been found associated with nerves in a number of the recent experimental leprosy infections these should be observed and where possible a special study be undertaken using light (including silver staining) and electron microscopy. Because in man leprosy is the only mycobacterial infection known to involve nerves and although it is stated that murine leprosy does not affect nerves, the Committee recommended that this question must be re-investigated in murine leprosy.

Response of the experimental infection to drugs

The pattern of response of the infection in animals to anti-mycobacterial drugs should be studied as a means of: (1) identifying the organism, and (2) screening new anti-leprosy drugs.

Interpretation of the results

All the above studies are undertaken in order to determine how far the experimental leprosy infection resembles the infection in man and to exclude where possible any other known mycobacterial infection, particularly the non-cultivatable murine leprosy infection.

It is important to include adequate controls and positive results should only be accepted if they are consistent and reproducable.

Round Table on Pathology and Experimental Transmission: Memorandum on the Examination of the Morphology of M. Leprae in the Study of Leprosy

One of the most characteristic features of a smear of human leprosy bacilli stained by the Ziehl-Neelsen method is the presence of a significant proportion of organisms which stain irregularly with carbol-fuchsin. Hansen was the first to suggest that irregular staining indicated a degenerative change in the bacilli. The use of sulphones, where clinical improvement is associated with a significant increase in the proportion of irregularly stained bacilli (5th Int. Congress Leprology, Havana, 1948), has strengthened Hansen's original suggestion.

More recently detailed studies, using electron microscopy, on the morphology of live and dead murine leprosy bacilli and other bacteria (including *E. coli*) have shown conclusively that death of these organisms leads to the loss of cytoplasmic content and that in the case of mycobacteria (including *M. lepraemurium* and *M. leprae*) these important morphological changes are manifest as irregular staining of the bacilli using the Ziehl-Neelsen method. It has been established in studies on *M. lepraemurium* that only the solid staining bacilli, the so-called 'solid staining' forms, are viable and all forms of irregularly stained bacilli whether defined as 'fragmented' or 'granular' are dead organisms. On this analogy, and on the evidence of electron microscopy, it is reasonable to assume that the same can be said of human leprosy bacilli, and this Committee wishes to draw the attention of the 8th International Congress of Leprology to the importance of studying the morphology of the bacilli as a routine procedure in assessing the progress of leprosy patients. In order to obtain uniform results the following suggestions are made:

1. Any of the standard Ziehl-Neelsen staining methods can be used and satisfactory definition is obtained by using an oil immersion lens with x 6 eye-piece for examining the smears.
2. It is important to prepare thin smears and to exclude red cells.
3. Morphology should be reported only on well defined single bacilli. Morphology should not be attempted on organisms in globi or in clumps.
4. Morphology, where possible, should be determined on 100 or more

organisms in fields picked at random over the smear, and reported as follows:

(a) Results given as the proportion of uniformly or 'solid' stained bacilli, *i.e.*, 10 'solid' staining bacilli in an examination of 100 organisms = 10/100, etc.

(b) Only organisms showing uniform staining with carbol-fuchsin down their length should be classified as uniformly or solid staining organisms. Bacilli containing dense bodies, often polar, and giving the appearance of a club are frequently seen in an otherwise uniformly stained organism. Such bacilli are classified with the uniformly stained forms.

(c) Every degree of irregular staining ('granular' or 'fragmented', etc.) with carbol-fuchsin should be classified as irregularly stained organisms. *Very short* uniformly stained bacilli are classified with the irregularly stained forms.

The examination of the morphology of human leprosy bacilli has several important applications:

1. For following the response to chemotherapy, particularly in the early phase and also for detecting deterioration, possibly indicating the emergence of drug resistance (indicated as an increase in the proportion of uniformly staining bacilli).

2. For studying the effect of 'reactions' on the progress of leprosy.

3. A general application of the method for all bacteriological studies on leprosy, particularly in those concerned in studies on the different types and stages of the disease and for determining the persistance of healthy bacilli in different tissues. Although the original observations were made on stained smears, the same technique can be applied also to stained sections of tissue.

Report of the Round Table on Borderline and Indeterminate Leprosy

Chairman: R. D. Azulay; *Secretary:* W. H. Jopling; *Members:* R. G. Cochrane; F. Contreras; Dharmendra; T. Imaeda; J. R. Puchol; W. F. Kirchheimer; K. Kitamura; Gay Prieto; F. Sagher; L. de Sousa Lima.

I – BORDERLINE LEPROSY

Definition. The Round Table agrees with the statement of the Madrid Congress that the Borderline (dimorphous; intermediate; bipolar)* group comprises a wide range of cases between the tuberculoid and lepromatous types; and is of the opinion that the position occupied by any borderline case in the spectrum between tuberculoid and lepro-

*Some of the members of the Board do not agree to the synonyms

matous leprosy depends on the host-parasite relationship, or, in other words, on the resistance of the patient to the infection.

Onset and Evolution. Borderline leprosy may start as borderline leprosy or may develop from the indeterminate group, rarely from the tuberculoid type or from the lepromatous type under treatment. This development may occur acutely or more gradually. It is generally agreed that it is an unstable form of leprosy, and although some cases remain borderline throughout, others move towards the lepromatous 'pole' of the spectrum or towards the tuberculoid 'pole'.

Clinical description. The question of resistance being fundamental, some cases will occupy a position nearer the tuberculoid 'pole' of the spectrum, some nearer the lepromatous 'pole', and others in between, hence a wide range of clinical manifestations may be encountered. The Round Table does not propose to describe all these, but wishes to draw attention to some characteristic clinical features. One takes the form of an oval or circular area of normal or hypochromic skin, sometimes atrophic, surrounded by a band of raised skin of variable width and irregular shape. The edge limiting the circular area is clearly marked, giving a 'punched-out' or 'Swiss cheese' appearance, whereas the outer edge tends to flatten and fade into the normal skin. These lesions vary in number, size and location, and some degree of anesthesia can be found in them. Plaques may stimulate those of tuberculoid or of lepromatous leprosy, the edges being well defined in some parts and indistinct in others. They are frequently succulent and have a shiny appearance, and their colour may vary considerably. Skin lesions usually have an asymmetrical distribution. The ear lobes are often involved, sometimes unilaterally. Oedema of the extremities may be present. Peripheral nerve involvement may occur, and gives rise to sensory disturbance of the extremities with or without palpable thickening of the affected nerves; muscle weakness may be present, with or without wasting.

Bacteriology. Skin lesions are usually bacteriologically positive, the degree of positivity depending largely on the position of the case in the above-mentioned spectrum, but globi are few or absent. The nasal mucosa may be negative.

Histology. As with bacteriological findings, histological appearances depend on the position of the case in the spectrum. An incomplete and loosely arranged tuberculoid structure may be found, the main feature of which is the epithelioid cell. There is usually a clear but narrow subepidermal zone. A not fully-developed lepromatous structure may be present, with large numbers of histiocytes many of which may contain lipid (vacuolated) cells, but in contrast to lepromatous leprosy there is a variable amount of cellular infiltration of cutaneous nerves. All these features may be found in the same lesion.

Immunology. The lepromin test (Mitsuda) is generally negative, but when positive is never strongly so. It may vary between negative and weakly positive during the course of the disease ('oscillatory phenomenon').

Prognosis and response to treatment. The prognosis is more favourable than in lepromatous leprosy and the response to treatment is more rapid.

II – INDETERMINATE LEPROSY

Definition. This is a form in which early leprosy usually manifests itself. It may evolve to any other form of the disease, but sometimes it may continue unchanged or may even regress.

Description. Indeterminate leprosy presents clinically with hypochromic and/or erythematous macules. These vary as regards number, size and location, and frequently show some impairment of sensation. The edges may or may not be well demarcated, and palpable thickening of peripheral nerves is not likely to be encountered in the early stages.

Bacteriology. Bacilli are usually absent on routine examination, and, when present, are scanty.

Histology. This shows scattered non-specific histiocytic and lymphocytic infiltration with some concentration around skin appendages and neurovascular bundles. Isolated bacilli may be found within cutaneous nerves.

Immunology. The lepromin test may be negative or positive.

Report of the Panel on Epidemiology and Control

Chairman: M. F. Lechat; *Secretary:* B. D. Molesworth; *Members:* E. Agricola; D. A. Akintonde ; L. M. Baliña; L. M. Bechelli; C. M. Brusco; W. M. Cantidio; O. Diniz, E. H. Hermans; C. Kettanurak; J. A. Madeira; M. Orusco; F. E. Rabello; A. Salazar Leite; H. Sansarricq; A. Saúl. Two members were invited but were unable to attend: Drs. D. L. Leiker and C. M. Ross. Drs. J. M. de Barros and R. Huerta attended the meetings of the Panel as observers.

EPIDEMIOLOGY

Epidemiology of leprosy deals more particularly with relationship between the incidence of leprosy or its various forms and determinants such as host factors or ecologic conditions which may affect either exposure to infection or resistance to the disease. By so doing, it is possible to develop and test sound measures for its control. It implies definitions, measurements, and research.

1. DEFINITIONS

Comparisons between frequencies of the morbid characteristic under investigation in different situations is one of the basic tools of epidemiology. It is therefore of the utmost importance that terminology, screening methods and procedures of diagnosis be clearly defined. It is particularly so for leprosy, because of the variations in the manifestations and evolution of the disease in different populations.

With regard to the screening of populations, records should indicate on which diagnostic criteria the epidemiological indices are based. It is a fact that in various parts of the world, and even in adjacent countries, leprologists give slightly different interpretations to the definition of the types of leprosy. In order to take into account these variations for epidemiological studies, methods should be clearly stated.

The personnel should use standard strategies in each area. In global reports, pooling of data reported by various types of personnel using different procedures should be avoided, or at least the methods indicated.

For correlation of findings on a world basis, terminology, methods and technics used for epidemiological study of leprosy should be uniform. Co-operation of WHO is sought in this respect.

2. MEASUREMENTS

(a) *Prevalence.* The importance of obtaining reliable estimates of prevalence of leprosy cannot be exaggerated. Only in this way can an adequate basis be provided for planning and implementing the anti-leprosy campaign and evaluating its results. Furthermore the Congress emphasizes the importance of prevalence in specific groups of the population.

In practice, due to the long time required for surveying a large population, prevalence rates as expressed in leprosy are period prevalence rates.

Due care should be exercised to distinguish adequately registered and discharged cases.

There are different surveying methods to secure prevalence data. Prior to describing these, it must be stressed that the final purpose of a leprosy survey is positively the control of the disease and its treatment, and not merely the collection of data. Therefore, it is emphasized that any type of survey must always and at once be followed by treatment.

Health education is essential to ensure the success of surveys.

(i) *Total population surveys.* The best measure of prevalence is obtained by a survey covering the whole population of the area under consideration. Such a method, however, is justified only if from previous experience it is known that the prevalance is high. Total population surveys for leprosy may sometimes be usefully combined with other mass operations, such as smallpox vaccination, yaws mass treatment, etc. It is generally better to concentrate systematically the efforts first on one selected area, and therefore to start by a pilot project which will later on be extended progressively to the whole country, taking advantage of the experience gained in the first location.

Whatever the efforts made to cover the whole population of an area, it is highly unlikely that 100 per cent of the individuals will be examined. Serious consideration must be given to the individuals who do not show up, because an association between non-response and the disease may introduce a considerable bias in the results of the survey. For example, non-response may be due to fear of the disease being discovered. Therean assessment of the magnitude and of the causes of non-response must be made. Special attention should be given to the allocation of patients hospitalized in leprosaria with regard to their place of origin. Total population surveys require an adequate census of the population.

(ii) *Sampling survey.* Often, however, total population surveys are not feasible. Physical examination of the whole population may be beyond the available resources in terms of budget or personnel. In some cases no previous estimate of the prevalence is available or demographic data are insufficient. In many countries, due to psychological or sociological reasons, such as systematic refusal of health measures, nomadism, physical examination of the whole population is not possible. In these cases, estimates must be made in other ways. The best method is a sampling survey. The sample can be constituted by individuals, by households or by villages randomly selected.

These questions demand, in every instance, joint planning by leprologists, epidemiologists and statisticians, in liaison with civil administrative officials, community leaders and persons experienced with the situation in the area.

If such surveys are feasible, their cost will be repaid many times by a sound planning of the campaign leading to a greater efficiency of the leprosy control.

(iii) *Selective survey.* When sampling surveys are not feasible, non-systematic operations dealing with villages or other population units may be useful for case-finding. Extreme caution must, however, be exercised to interpret their results because choice of the population surveyed as well as responsiveness of the individuals may be associated with the presence or absence of leprosy. In these cases, prevalence data are difficult to derive.

A most efficient method to detect new cases may be, instead of a survey, the systematic search for and supervision of contacts. This is especially useful when prevalence is low. What is understood by contact must then be clearly defined. In this case, the same caution must be exercised with respect to the derivation of epidemiological indices.

Surveys in selected groups, such as schoolchildren, may yield very useful information, but caution must be exercised not to extrapolate these results to the entire population.

It cannot be too strongly emphasized that in any case, when recording prevalence data, detailed explanation must be given as to the manner by which these data have been collected; by total survey, sample survey, selective survey, examination of contacts, spontaneous attendance, compilation of files, examination of inmates of leprosaria, or unsystematic

search. The denominator, *i.e.*, the population examined, must be accurately defined. A high proportion of children among the patients means one thing if the whole population has been examined, and quite another if, for reasons of easy accessibility, schools have been preferentially surveyed. No valid comparison, sound planning, or forecast for the future can be made unless due consideration is given to these matters. Description of the procedures employed to estimate prevalence is no less important than the figures reported.

Prevalence applies also to various characteristics of the disease. The prevalence of lepromatous leprosy in a population is expressed by

$$\frac{\text{number of lepromatous cases}}{\text{total population}} \times 1000$$ at a given time.

If active lepromatous patients only are under consideration, to the exclusion of negative cases who are discharged or residual, the prevalence of bacterioligically positive cases is a valuable rate.

The prevalence of deformities among leprosy patients is a useful measurement to assess the needs for rehabilitation, reconstructive surgery and social help. It has seldom been determined, and data are urgently needed in this respect. Care must be taken to base this rate on the examination of a representative group of patients, and not only on patients hospitalized in institutions.

(b) *Incidence*. This refers to the number of events occurring during a period of time.

The incidence of leprosy is expressed as

$$\frac{\text{new cases over a given interval of time}}{\text{total population at the beginning of the time interval}} \times 1000$$

It is a very useful concept, for it gives information on the trend, progression or regression, of the disease.

This rate does not necessarily refer to the whole population, and may apply to a specific group. If so, it must be clearly stated.

Incidence data for leprosy are few and difficult to derive. They may be obtained by two methods. One is to follow the population during a given time and to register the number of new cases. Another is to repeat prevalence surveys after an interval of time and compare the results with previous surveys, making provision for patients deceased or lost to observation during the interval. In places where leprosy activities are well developed, with early detection, the number of new cases registered gives a fair approximation of the incidence. In most of the situations, however, the number of new cases detected does not correspond to incidence, because a considerable lapse of time often occurs between the onset of the disease and its detection.

Incidence may apply to other characteristics of the disease, such as bacteriologically positive cases, deformities in treated or non-treated patients, lepra reaction or relapses. These rates are useful for the planning and allocation of specialized medical facilities.

(c) *Ratio lepromatous/total number of patients.* This ratio is expressed as

$$\frac{\text{number of cases of lepromatous leprosy}}{\text{total number of leprosy patients}} \times 100$$

It can be misleading, because experience has shown that during a mass campaign the rate of discovery is not the same for the different types of leprosy, under various conditions. This ratio should therefore always be followed by the prevalence figure for lepromatous leprosy as indicated above.

(d) *Other measurements.* Some other measurements may be useful for a better knowledge of the epidemiology of leprosy. Such are the distribution of ages at onset, the duration between onset and detection, and the attack rates among contacts. The proportion of indeterminate cases among the newly detected leprosy patients is also a useful index to assess the completeness of the detection and the earliness of diagnosis in a case-finding campaign.

(e) *Measurements needing researches.* Very little is known about the effect of leprosy, or of each type of leprosy on survival. Life-tables for leprosy patients, with life expectancy for each age of onset, should be developed.

3. RESEARCH

Epidemiological research in leprosy is considerably hampered by our present lack of fundamental knowledge.

The fact that *M. leprae* has not yet been cultivated nor routinely transmitted to animals has prevented any experimental study of the agent factors involved in the spread of the disease. Host-factors are difficult to investigate due to the absence of bacteriologic, serologic or skin-test methods for detecting latent or possibly non-apparent infections. The length of the silent period before clinical onset makes it often impossible to single out simple environmental factors.

In these conditions, the prospects for epidemiological investigations in leprosy are heavily dependent upon achievements in the corresponding fields of microbiology and immunology. It is anticipated that extension and speeding-up of research in these fields will provide the epidemiologist with new baselines and new tools.

In the present state of knowledge, certain special problems should be studied:

(1) GENETICS. Several observations suggest a possible role of genetic factors in the susceptibility or resistance of individuals and populations to leprosy or to the lepromatous type of the disease.

The possibility of a genetic mechanism should be studied with respect: (a) to leprosy itself; (b) to the polar types of the disease; (c) to the occurrence of lepra reaction in lepromatous leprosy; (d) to reactivity to tuberculin associated with non-reactivity to lepromin; (e) to the non-version of the lepromin-reaction after BCG.

These problems could be studied in twins, in families, and in populations. In each case, they will require a joint planning by a statistician, an epidemiologist, a geneticist and a leprologist, for they call for highly elaborate methods of sampling and statistical interpretation.

For twins' study, a world central registrar of twins with leprosy should be set up, eventually with the help of WHO.

Studies of familial aggregation should be undertaken or expanded in areas where good demographic and clinical records have been available for several generations.

Methods of population genetics should be applied to leprosy. Studies of genetic polymorphisms associated with leprosy and with its manifestations should be expanded and co-ordinated, in order to proceed in various parts of the world among patients and controls to a large screening of the genetic markers known at present. The development of micro-methods for field use, shipment or storage has radically modified and enlarged the scope of possible investigations, and should be largely used in leprosy. Co-operation with serum banks should be sought, and blood samples collected and deposited for further investigations as new methods will be made available and new genetic markers discovered.

(2) LEPROMIN-REACTION. Studies on the relationship between lepromin-reactivity and other factors in populations have yielded valuable information. These studies should be continued, expanded and repeated.

Among the problems which deserve special interest are:

(a) The relationship between lepromin-reactivity and skin-reactivity to other antigens.

(b) The relationship between lepromin-reactivity in healthy persons and the further incidence of leprosy among them, with special reference to the type of leprosy they eventually develop.

(c) The incidence of leprosy, especially of lepromatous leprosy, among people having received BCG, in relationship with the effect of BCG on the conversion of their Mitsuda test.

(d) Determination of the proportion of poor reactors to lepromin under natural conditions.

Such studies are extremely difficult from a statistical point of view. Sampling has many pitfalls. Hence, the controversial aspects of the results.

Another difficulty comes from the lack of standardized antigen for skin-testing in leprosy, and from different criteria for the reading of the test, often making impossible the comparison or reproduction of the results.

(3) ATTACK RATES AMONG HOUSEHOLD CONTACTS. Attack rates among household contacts should be studied and compared in different parts of the world, wherever reliable data are available, keeping as a model of such investigation the studies of Doull and coll. in the Philippines. Life-table methods may be used, or other epidemiological methods could eventually be designed after consultation with mathematicians.

Special attention should be given to attack rates among contacts with respect to the type of leprosy in the index case. A point of particular importance is the role of tuberculoid cases in the transmission of the disease in areas of the world where open cases constitute only a small proportion of the cases.

(4) URBANIZATION. In some countries highly prevalent with leprosy, recent industrialization has resulted in a shift from a purely rural population to a partly urban population, often overcrowded and of a low economic level. That is, for example, the case in several cities of Africa and in South-east Asia. In order to provide baselines for subsequent studies of the environmental factors, it is recommended that data would be collected and assembled on the incidence of leprosy in these urban populations. This population being generally constituted of workers, hence selected, special attention should be given to avoid bias in sampling.

(5) LIMITED FOCI. Islands, ethnic minorities, displaced populations, isolated communities often offer peculiar patterns in the distribution of the disease. Inventory of these limited foci should be made, and their epidemiological study encouraged and given the necessary help.

(6) FIRST LESIONS. High frequencies of occurrence of the first lesions of leprosy at certain specific sites of the body, especially for tuberculoid leprosy, have been recorded. Differences in these sites are reported according to various countries and behaviour patterns. Further studies on this questions would be valuable, in order to bring light on the mechanism of transmission of leprosy and the portal of entry of the micro-organism.

(7) ARTHROPOD-VECTORS. The possible role of insects in the transmission of leprosy has been neglected for long. More data is needed relating to the cultivability of acid-fast bacilli found in various insects, and on the relative frequency of such findings in insects found in association with cases of leprosy as compared to these found in other places.

(8) CARRIER STAGE. Observations have been reported of acid-fast bacilli found by special concentration techniques in the skin of a high percentage of apparently healthy contacts of leprosy patients. If these observations are confirmed, this leads to the concept of a carrier stage in leprosy.

Due to the great importance of this question, it is suggested that this type of study be repeated on a large scale by different investigators.

(9) SPONTANEOUS HEALING. It has been reported that a large proportion of the children developing leprosy heal spontaneously. More information is needed on the diagnostic criteria available to recognize early lesions, on the frequency of spontaneous healing in adults, and on the immunological and possibly genetic factors associated with this favourable type of evolution.

(10) ASSOCIATION OF DISEASE. Little is known about the association between leprosy and other pathological conditions. Data should be collected on the respective incidence of other diseases, especially transmissible ones, among these tuberculosis, in persons with leprosy, in order to disentangle possible immunological relationships.

In the same line, cause-specific mortality rates should be collected in leprosy patients.

(11) DEFORMITIES. The problem of deformities in leprosy has been almost completely neglected until recently. It is well recognized today that it is probably one of the most important problems the leprologists have to deal with. Therefore, it seems timely to start collecting epidemiological data in this regard.

Epidemiological methods should be widely used for the study of deformities: prevalence and incidence rates, broken down by age, sex and type of leprosy, etc.; average delay before onset; rapidity of development; association with various factors such as previous occupation, ethnic group, occurrence of lepra reaction, etc. This could throw some light on the etiology of the various types of deformities encountered in leprosy.

(12) LEPRA REACTION. Epidemiological methods should be more extensively applied to the study of lepra reaction.

(13) NUTRITION. Nutrition requires detailed studies by nutritional workers in areas of high endemicity which may produce findings not obvious to casual untrained observers.

(14) MISCELLANEOUS. The various factors which may influence the epidemiology of leprosy are so many that here only a brief list is given for which data could be available or obtained.

(a) Prevalence and type of leprosy in relation to race, climate, altitude or living conditions.

(b) Information regarding relapses after treatment.

(c) Possible role of tuberculoid cases in the transmission of leprosy.

(d) Influence of puberty, pregnancy, severe illness, change of conditions or menopause on the development of leprosy.

(e) Modification in the epidemiology resulting from changes in control policies such as the replacement of compulsory segregation by outpatient treatment.

CONTROL

Due to its long duration and to the deformities it causes, leprosy constitutes a severe burden for the affected individual as well as for the community. In many countries, it is only one of the major health problems, consequently it must be dealt with in co-ordination with other public health programmes. Among these programmes, however, it deserves a high priority.

Control of leprosy has for objective the progressive reduction of its morbidity, in such a manner that it no longer constitutes a public health

problem. Its far-reaching goal is the eradication of the disease. It implies activities following three lines: prevention, early detection, and treatment. Rehabilitation is the necessary complement.

Measures to meet these objectives may be grouped under six headings: (i) administrative; (ii) medical; (iii) training of personnel; (iv) health education; (v) social; (vi) legal. Research to improve and to continuously adapt these measures are needed.

One must however, realise that in many circumstances there is a gap between what should be done and what can be done. Leprosy control is inseparable from the development of other health activities and of the potential of the whole nation. Difficulties may also be encountered as a result of previous leprosy campaigns, leading to the necessary acceptance of facilities, personnel and even methods which are not in accordance with present conditions or new concepts. In such cases, it is sometimes necessary to cope with the situation as it stands, making the best possible use of it and modifying it progressively, rather than to seek drastic changes.

(1) ADMINISTRATIVE MEASURES. Action must be in agreement with general principles of public health. Therefore it must include planning, programming, organisation and evaluation. Leprosy control programmes, as any public health programme, should have quantitative objectives and the various factors that define them should be weighed.

In countries where leprosy is considered as a problem of public health, there should be a service in charge of it, attached to the higher administrative level in charge of health. The Chief of the Service should have adequate training in leprosy and in public health administration.

Technical advice and the establishment of standards at central level as followed by administrative and executive decentralisation are the principles on which the structure of leprosy control should be based.

Gradual integration of the leprosy campaign into the general health services is highly desirable. Although such an integration may have to be delayed until those services are sufficiently developed as to make this integration possible, it should be started as soon as possible.

(2) MEDICAL MEASURES. The principal weapon of the anti-leprosy campaign is still chemotherapy with sulfone drugs. Regular and prolonged sulfone treatment, generally over several years, reduces infectiousness in the majority of cases. It follows that if a considerable proportion of bacteriologically positive patients are treated, the disease will decline. Sulfones, however, do not arrest the progress of deformities once these are initiated, and appropriate action must be taken to prevent and correct deformities.

For special cases, or in particular situations, other chemotherapeutic drugs are valuable.

Other means, either of a preventive nature, or of a therapeutic nature such as a rapidly effective bactericidal drug, are urgently needed. If these should become available, it would likely change our present approach and lead to a modification of the measures outlined in this report.

At present, therefore, in many countries, and as a result of the large number of patients and limited resources, control implies mass treatment by a form of sulfone therapy which can be administered safely and with standard methods by auxiliary workers supervised by highly qualified medical personnel. DDS administered either by mouth or by repository injections fulfills these requirements. The primary problem, thus, becomes largely a logistic one: to make the optimal use of medical facilities, budget and personnel in order to detect and to treat a maximum number of patients, especially those who are bacteriologically positive or likely to become positive, to detect and to treat patients early enough in the course of the disease, to apply therapy when it is most effective, to prevent the onset of deformities, and to secure regular attendance of the patients to a treatment prolonged over several years.

Medical measures therefore are threefold: (i) case finding; (ii) treatment; (iii) protection of healthy population with special reference to contacts.

Measures must be adapted to the region under consideration. To do this, the importance of a preliminary survey is stressed. The leprosy campaign should start first by a pilot project in a selected area. This pilot project should serve to adapt general principles of leprosy control to the local situation, in prospect to future development, as well as to train personnel. Expansion of the work to other areas should be progressive and systematic, in keeping with the development of the local health services.

Control measures must be continuously corrected and adapted as the campaign progresses and more experience is gained. Efficient control, therefore, implies evaluation of the results. Built-in methods of evaluating the results are mainly a matter of local conditions, and their use cannot be generalised at present. As a matter of principle, however, one should seek simplicity and avoid undue multiplications of forms and reports, whose only result is to harass the worker in the field and to yield loose information. A few accurate facts are better than a large number of inaccurate ones.

It is obvious that co-operation of any available adequate resources, in terms of medical facilities or manpower, governmental or voluntary, will be sought, following the lines laid down by the leprosy service.

(a) *Case finding.* Procedure for detecting cases of leprosy has been described in the first part of this report, dealing with prevalence estimates.

Depending on the estimated prevalence in the area, detection may be obtained by different methods.

In areas where prevalence is high, detection should be performed by periodic examination of the whole population because all the individuals have to be considered as possible contacts. Annual intervals, wherever possible, are recommended for these examinations.

In areas with low prevalence, detection should be based on periodic examination of contacts of known cases, and also on screening selected groups such as school children, job-seeking individuals, workers, etc.

Contacts exposed for many years who show no manifestation of the disease need only an occasional supervision.

In areas where the prevalence is between these two extremes, detection could be obtained by resorting to either of the methods above mentioned.

These surveys need not be for leprosy only, and it may be advantageous to perform multipurpose operations.

Methods of screening and criteria of diagnosis should be precisely defined. They should be adapted to conditions prevailing in each country, taking account of the skill of the personnel.

(b) *Ways of treatment.* In any and all cases, detection must be followed by treatment, either by the surveying team, or through referral to a leprosy treatment unit. If a multistep procedure is used for detection, with preliminary screening by auxiliary workers, treatment should not be withheld pending confirmation of the diagnosis. Emphasis should be placed on the necessity of early, regular and prolonged treatment. The possibility of reactions and other complications should be anticipated.

Methods will be different with regard to out-patients and in-patients.

(i) *Out-patient care.* Depending on the stage of development of the local health services, out-patient care should be carried on by fixed health centres, by mobile units, or both.

There should be an adequate number of such facilities, the number and distribution being related to the prevalence of the disease in various regions. Treatment centres should be conveniently accessible and so located as to serve the largest number of patients.

Fixed centres that are staffed and equipped for general public health services, such as health centres, rural polyclinics, and dispensaries, should be progressively adapted to carry out all functions essential to the anti-leprosy programme, integrating them in their basic activities of preventive and curative medicine. These leprosy functions include at least the recognition, treatment and follow-up of patients. Whenever and wherever possible they should extend to include examination of contacts, application of simple techniques of rehabilitation, surveys for leprosy in the local population, home nursing and social work.

In countries where dermatological clinics are well developed, these may collaborate to perform leprosy activities.

Wherever necessary, fixed centres should be supplemented by mobile units. Advantage should be taken of these mobile teams to launch other health activities in such a manner that it will constitute a nucleus for developing integrated services later on.

The best method to avoid disability is to prevent it. In both fixed centres and mobile units the need to prevent deformities should be stressed. Simple techniques for reaching this aim can in fact be performed by any member of the staff who has received the necessary instructions and this should be done in each centre and even in the field. Even for rehabilitation, it is desirable that it takes place in the environment in which the patient lives. Special rehabilitation centres should be con-

sidered only in countries where the control of the disease has reached a satisfactory level.

Special caution is advised because treatment may induce acute complications and these may result in turn in permanent damage for the patients, unmanageable situations for the para-medical workers and loss of confidence for treatment in other patients.

The major problem raised by the out-patient treatment is the poor attendance. In some countries this is especially noted in children. Because of the long duration of therapy many of the patients do not pursue treatment to completion. It must not be concealed that due to irregular treatment our present methods of control are in danger of failure.

Since many methods have been used for the administration of treatment: repository injections or distribution of tablets either for immediate intake or in the form of supply, the best means must be found and adapted to local conditions.

Punctuality in the schedules, health education, careful and comprehensive follow-up, care for disabilities and treatment of minor ailments, are essential to improve the attendance. An undue multiplication of the treatment centres is not necessarily efficient, since a point of diminishing return is reached where the neglectfulness of the patient becomes more important as a factor of non-attendance than the difficulty of access to the clinic. Regular inspection by the medical officer in charge, including examination of the patients and discharge of those for whom it is justified, is of prime importance. Patients cannot be expected to attend treatment regularly if they feel that no assessment of their condition is made.

Research is needed with respect to finding the causes of poor attendance and the measures to remedy it in various areas.

(ii) *In-patient care.* Indiscriminate and compulsory isolation for leprosy is condemned.

(a) Up-to-date facilities for in-patient care, however, are necessary for those in acute reactional phenomena, resistant to routine treatment, intolerant to drugs, or requiring reconstructive surgery and other rehabilitation measures. Construction of such small units may be advisable. These facilities should be located near, tied in or better integrated into a general hospital, in order to benefit from the services of various specialities.

(b) In countries with already existing adequate facilities, the most infectious cases could be induced to enter sanatoria on a voluntary basis. The period of hospitalization should be temporary, and only sufficient to effect clinical regression and to reduce infectiousness. A prolonged series of negative smears should not be required for discharge. A rapid turnover of the patients in sanatoria, with early transfer to out-patient treatment, will reduce the chance of social atrophy due to institutionalization.

Due consideration should be given to the care of burnt-out cases, indigent and irremediable invalids. Care should be taken, however, that this category of patients, and even more that reluctant negatives, do not jam the existing facilities.

These sanatoria form also the centres for research, for training of

professional personnel of all grades and for special surgery. A large part of the activities must be directed to rehabilitation.

Leprosaria should be adapted to perform these functions. The construction of new large institutions is positively not recommended.

Hospital facilities should co-exist with out-patient treatment and they should be complementary, but efforts at hospitalization should not be permitted to drain the budget and the efficiency of out-patient treatment centres, which form the core of leprosy control.

(c) A special type of set-up, in various parts of the world, is the segregation village, or agricultural colony, where patients assemble more or less spontaneously. These villages may be made up of infectious patients excluded from the community for social or cultural reasons, by out-patients from far away who assemble in the vicinity of an out-patient clinic, by burnt-out cases, or by patients discharged from a leprosarium who are unwilling or unprepared to reintegrate in their community. In many cases, the existence of these villages results from historical or cultural patterns, or points to some deficiency in the system, which will be corrected as the campaign develops. Therefore, it is recommended that the causes of these deficiencies be found and corrected. If these cannot readily be corrected, it is better to cope with the situation and to make the best possible use of these villages.

Villages for crippled patients who cannot be helped by restorative measures may be useful, if medical, social and psychological care are provided. Welfare services and voluntary agencies can be of great use in taking care of these patients.

Villages of discharged patients point to a lack of social rehabilitation and vocational training in the institutions and serious effort has to be made to prevent such a situation.

(c) *Protection of the healthy population with special reference to contacts and children*

(i) *Removal of children.* In many countries experience has shown that to remove an infant from its mother increases the mortality. The separation of a baby from its lepromatous parents is therefore not generally recommended and leprosy must be taken as a calculated risk and other methods of protection attempted.

A temporary separation, however, can be considered where adequate crèche facilities or willing relatives exist, until such time as the parent is negative. Psychological trauma is so important that the period should be reduced to the minimum.

There is no need of special institutions for children of leprous parents but, when institutional care is necessary, they should be admitted to establishments for general child care.

(ii) *BCG.* There is evidence that BCG may anticipate the conversion to positivity of the lepromin test in children and that with or without BCG there is a group of poor or slow responders in whom the lepromin reactivity cannot be achieved. Field studies are necessary to determine whether that anticipation is useful to individuals not yet exposed to *M.*

leprae and whether it may prevent leprosy in contacts and in those who are persistently lepromin negative. This study is difficult because of the relatively low incidence of leprosy and of the need of following up the studied group for some years.

At the same time, research should be continued to determine the relation between intensity of lepromin reaction and age, with oral and intradermal BCG, influence of larger doses, the behaviour of individuals of other age-groups especially 0–6 months and adults, the effect of BCG in children and adults previously exposed to *M. leprae* or not and persistently lepromin negative, and the eventual need of re-vaccination.

There is urgent need to continue research on the preventive value of BCG in leprosy and these studies are strongly recommended.

(iii) *Chemoprophylaxis.* Some research has been made on chemoprophylaxis but there is not yet a definate conclusion on its value as a preventive measure. Chemoprophylaxis trials are very important to ascertain whether it might be useful or not to household contacts and what would be its duration and the best dosage.

As data confirming or refuting the effectiveness of either of both methods of protection (BCG and chemoprophylaxis) are as yet insufficient, no recommendations can be made. It is hoped that the trials now in progress may lead to a definite conclusion.

3. TRAINING. Adequate carefully planned graded training should be given to all the different categories of personnel involved in a leprosy campaign, the length and content of this training being in accordance with the function they are to perform.

Clinical and didactic instruction should be given to medical students and it is recommended more time be allocated to leprosy in the curriculum.

Post-graduate courses for doctors coming to an endemic area, for general practitioners and health officers should be run at regular intervals, since all medical disciplines are likely to be consulted, often first, and their co-operation is of major importance.

Paramedical personnel: in many countries leprosy control rests with these workers and will do so for many years. Special consideration should be given to their selection and to their training which should be practical rather than academic, particularly with regard to complications which require to be referred to a doctor.

Selected people from this group may be given further training at a later stage to fit them for supervisory posts.

Other grades including nurses, midwives, social workers, in fact all those who may come into contact with leprosy in their routine duties should be able to recognise leprosy and take appropriate action.

4. HEALTH EDUCATION. Leprosy is a health problem and as such it should be dealt with in accordance with the principles that apply to other diseases. Health education is an instrument of the highest value in facilitating the application of control methods. It is sometimes best to link health

education for leprosy with other health education campaigns, in order not to single out leprosy as a peculiar problem.

In all countries where leprosy is endemic, efforts undertaken to explain to the public the nature of the disease and the steps taken to control it should be continued and expanded. The cause, early signs and effect of treatment, should be explained, and the information disseminated by all means available. Authorities as well as the public should be reached and it should be included as part of the health programme in schools. It should stress that early treatment and care may prevent deformity and that deformity itself is correctable.

However, it is by personal contact that health education is best attained. Co-operation of the government officials, various influential bodies and persons, such as churches or unions, should be sought.

Organised community efforts to promote leprosy control and to help the patients should be stimulated through the leaders of the community. On the village level, health and social workers, school teachers and other authorities should assume leadership in this matter. Health workers should be made aware that their responsibility is actively to promote health in the community, not merely by distributing tablets and filling in reports. Information on leprosy should be included in the curriculum of teachers' training school.

The co-operation of persons familiar with the local conditions should be sought.

With respect to education of the patients and contacts, it is essential that the patient and his family understand the nature of the illness and the reasons for the precautions involved. The risk of injury and the results of neglect must be explained to the patient and he must be alert for the possible development of deformity and report it. His whole training, be it in hospital or at home, must emphasise that, with regular treatment, his place in the community is not lost and he must be prepared to resume his responsibilities.

5. SOCIAL MEASURES. Although noticeable progress has been accomplished in the last several years, erroneous concepts regarding the disease continue to impose harsh and unjustifiable penalities upon the leprosy patient and his family. The obligation of society to render assistance, education, medical care and social help are complementary in public health.

In addition to free medical care and drugs, various types of social assistance are directly related to control, and apply to the leprosy patients in general, viz:

(a) Assistance for travel to and from the clinics.

(b) Help for families in which the breadwinner is unable to work, in order to prevent misery and social disintegration.

(c) When advisable for medical or social reasons, removal of young children from the home and their placement elsewhere.

(d) Aid in preserving family ties when the patient is removed to an institution.

(e) Job placement for discharged patients.

Leprosy patients should never be refused medical care or admission to health centres or general hospitals when suffering from another disease. If lepromatous and infectious, they could be hospitalized in a special ward. The same applies to women for delivery.

Mental patients affected with leprosy and who require hospitalization for either one of the diseases should get care for both, regardless, of the type of institution they are in. Co-operation of the leprologist and the psychiatrist is necessary.

Imprisonment should not be a bar to obtaining treatment.

Children with leprosy should never be denied the right to education. For lepromatous children, however, it may be necessary that special school facilities be provided.

6. LEGAL MEASURES. Leprosy must be classified among other transmissible diseases, and special legislation directed to the disease should be abolished. In the meantime, where extravagant legislation is not yet repealed, the application of the existing laws must be brought into line with present knowledge.

Reporting of the disease to the health department, however, is a necessity and should be required on the part of the physicians or other professional personnel in charge. The importance of professional secrecy in doctors and auxiliaries is stressed.

Indiscriminate compulsory segregation is an anachronism and has to be abolished. Discretionary authority could in certain circumstances be given to health officials to require isolation of lepromatous patients discharging bacilli in those instances in which sulfone therapy is neglected or ineffective.

The only desirable compulsory measure is the medical examination for transmissible diseases.

On the international level, special attention should be paid to nomadic populations, especially when campaigns are unequally developed on two sides of a border.

7. RESEARCH. The control of leprosy is closely dependent on the present state of knowledge concerning the epidemiology of the disease. For example, a better understanding of the mechanism of transmission may bring about basic changes in our present methods of control.

There is, however, another type of research directly related to the procedures of control. This may be called research in the field of management and administration of public health.

The evaluation of the best methods for the integration of leprosy control in general public health activities is one example. Combination of a leprosy campaign with other health campaigns is advantageous, but not all are likely to yield the same returns and to display the same efficiency. The possible psychological effect of one-shot, fast acting campaigns, such as a dramatically effective yaws' campaign, on the co-operation of the patients of the same community engaged in a treatment

of long duration such as leprosy, should be studied.

The problem of the poor attendance to treatment and of the very high rate of drop-out should be studied on a large scale. There seems to be different patterns of drop-out; they should be identified, their cause found, and remedies proposed.

The relationship between the methods employed for giving the drugs and the co-operation of the patients, should be stressed.

The methods for training of paramedical personnel require special consideration, in order to develop teaching methods to stimulate their interest, promote their initiative, and prepare them in a practical way for the task that faces them.

The choice of the best strategy for the detection of the maximum number of cases with the resources available, as well as the organization of the out-patient treatment, including allocation of time, budget and personnel, location of the clinics, determination of areas of priority, and fixation of mobile teams' itineraries and schedules, could benefit by methods developed in the field of operational research and system analysis.

Leprosy control should take advantage of the collaboration of specialists from other disciplines not only epidemiologists, biostatisticians and health educators, but also psychologists, cultural anthropologists, economists, management scientists and research analysts.

It is hoped that researches on these problems will be conducted during the next few years, eventually under the auspices of WHO, and results made available for the 9th International Congress.

* * * *

At present, the whole body of measures recommended against leprosy is mainly directed at the recognised patients. With the progress of knowledge in microbiology and epidemiology leading to a better understanding of the ecology of *M. leprae* and its transmission among populations, also with the progress in therapy and the possible development of immunising agents, it is hoped that a more rational and better control of leprosy will be achieved.

Report of the Panel on Therapy

Chairman: S. G. Browne (Nigeria); *Secretary:* M. F. R. Waters (UK);
Members: A. M. Alonso (Brazil); A. Baccareda Boy (Italy); J. Barba Rubio (Mexico); T. F. Davey (UK); K. F. Schaller (Ethiopia); S. Schujman (Argentina); Gloria Pérez-Suárez (Mexico); J. Aguiar Pupo (Brazil);

Rodolphe A. Bréchet (Angola); J. Languillon (France); W. O. Opromolla (Brazil); René Rollier (Marrocos); Manuel S. Silva (Portugal); A. T. Roy (India); J. Carlos Gatti (Argentina).

The following members of the Panel contributed by correspondence to its deliberations, but were not present at the meetings of the Panel:

P. Laviron (France); H. Floch (France); Latif K. Hanna (Egypt); Y. Hayashi (Japan); K. Ramanujani (India).

In presenting this Report of the Panel on Therapy, we must state at the outset that in spite of much good work at various centres on several new drugs, there is no spectacular progress to record in the therapy of leprosy since the last Congress. No one drug seems to be outstanding in its action, or likely to supplant dapsone on the grounds of therapeutic efficacity or cost or ease of administration.

1. SULPHONE THERAPY. We consider that dapsone (DDS) is still the drug of choice for general use in active leprosy. Its well-known advantages and disadvantages have been stated in previous reports. We wish, however, to draw attention to the following points:

(a) *The main shortcoming* of dapsone is its slow effect (clinical, bacteriological and histological) in the serious forms of leprosy. This is probably related to such factors as the essential chronicity of the infection and the long generation time of *M. leprae*. While dapsone may produce bacterial negativity and clinical arrest in lepromatous leprosy in from three to six years, up to 50 per cent of patients in some countries may still be bacteriologically positive at the end of that time. Whatever their proportion to the total number of patients who respond satisfactorily, these 'persistent positive cases' constitute a therapeutic challenge. Poor absorpsion from the intestine for one reason of another is a possible explanation, but bacterial resistance may occur. Further investigation is required. Moreover, the removal of non-viable acid-fast debris may be abnormally protracted in some patients, and the tissues in others may be persistently hypersenstitive to acid-fast material.

(b) *The duration of treatment.* Previous Congresses have given general guidance, and there has been no great departure from former practice. There is now, however, a greater readiness to advise that treatment should continue for life after clinical and bacteriological arrest of lepromatous or borderline disease, with half the standard therapeutic dose. After arrest of the disease, regular bacteriological examinations are advocated as the best and earliest means of detecting relapse.

(c) *Dosage.* In an attempt to reduce the incidence of neuritis and of all types of reaction, many workers have been using a smaller initial oral dose, and a lower maximum dose than has been recommended in the past. Although we consider that each area must individually decide its own optimum dosage schedule, we note that many workers have obtained *excellent* results with 25 mg. twice weekly initially, rising to a maximum of

200 mg. twice weekly. For mass treatment by medical auxiliaries, we do not recommend different dosage schedules for the different types of leprosy, though we would add that the initial dose should be small and the increments made slowly.

(d) *Injectable repository dapsone.* Various preparations which give adequate blood levels for two weeks are in general use, but as yet no suspension of dapsone for injection once every four weeks has been forthcoming.

(e) *Prophylaxis.* There is insufficient evidence to enable us at this stage to advise either on the efficacity of the prophylactic use of sulphones or on the advisability of giving sulphones prophylactically.

2. THIAMBUTOSINE (DPT, CIBA 1906) has won widespread acceptance as a useful alternative drug to dapsone, though the development of resistance after two years has been reported from many countries. It has in particular proved useful in patients intolerant to dapsone. An injectable preparation of thiambutosine is under investigation.

3. DITOPHAL (ETISUL) continues to evoke contradictory comments. The consensus of opinion would, however, seem to be that while ditophal has an undoubted action in leprosy when given alone (though resistance may develop), its addition to standard dapsone therapy for a longer or shorter time, in an untreated or in a treated patient in a stationary condition, does not generally result either in a more rapid clinical or bacteriological improvement than with dapsone alone, or in a material shortening of the total length of treatment required. Notwithstanding good reports from some centres, ditophal has not received consistent acclaim. Its odour is a disadvantage in most countries, and its cost makes it an uneconomic drug when its use is not followed by a definite shortening of the period of treatment. Local dermatitis or a generalised cutaneous hypersenstitivity precipitated by its use varies in incidence from negligible to very high. Where the clinical forms of leprosy are most severe, the opinions concerning the drug are least commendatory. Its future sphere of usefulness may well be limited.

4. THE LONG-ACTING SULPHONAMIDES have been studied now for five years. Early reports indicated that sulphamethoxypyrazine (also known as sulphamethoxypyridazine) sulphadimethoine gave uniformly good results in small series of patients with tuberculoid leprosy, but that the bacteriological improvement in patients with lepromatous leprosy was not consistently good.

More recently, other long-acting sulphonamides have been tried at a few centres, and preliminary reports covering up to two years suggest that these compounds may have a definite place in anti-leprosy therapy. Mention may be made of acetylsulphamethoxypyrazine (acetyl-Kelfizine, or 11,589 R.P.), and Ro 4-4393. In lepromatous leprosy, their action seems to be comparable to that of the sulphones. No adverse side-effects have been reported to date, and the incidence of drug-induced reaction is not greater than with the sulphones. According to some workers, but not to

others, the action of these drugs in tuberculoid leprosy may be more rapid than that of the sulphones. Expanded trials are indicated in this promising series of drugs. While those at present under trial cannot be expected to replace dapsone in mass therapy, the advantages of a drug that is given orally, once a week, are evident.

5. OTHER DRUGS

(a) *Diaminodephenyl sulphoxide* (*DDSO*) has been found too nephotoxic for general use.

(b) *Thiacetazone* (*thiosemicarbazone*, *TB*-1). In certain hands thiacetazone continues to give satisfactory results, although the emergence of drug resistance must be borne in mind.

(c) *Streptomycin* and *Isioniazed* (INH, isonicotinic hydrazide). Insufficient new information has been gained during the past five years for any addition to be made to the last Congress report.

(d) *B*663, *a rimino-compound* (apo*safranin*), has given good results both alone and in combination with dapsone in a small series of patients. Further trials are indicated.

(e) *Rifamycin*. This drug has been studied in only a very few patients. Further reports are required before it can be evaluated.

(f) Vadrine, cycloserine, kanamycin, and many other compounds reported on by different centres may, for various reasons, have a limited sphere of usefulness, but none appears to be sufficiently promising for widespread use to be recommended.

6. GENERAL CONSIDERATIONS. A therapeutic agent capable of several diverse actions is required in leprosy. This ideal agent should be rapidly bactericidal, it should facilitate the clearance and removal from the body of bacterial debris, and it should minimise or abolish the pathological effects of the presence of living or dead acid-fast material in the tissues. Several drugs are either bactericidal to *M. leprae* in nine months or so, or prevent their multiplication, but all workers are agreed that this desirable result is not equivalent to clinical cure of leprosy. The main kinds of leprosy for which such an agent is urgently required are the long-standing lepromatous, the severe and rapidly-advancing lepromatous, the reactional tuberculoid, the reactional borderline, and all kinds of leprosy characterised by severe neuritis. Perhaps the concurrent use of more than one agent will eventually be the answer to the problem.

7. BACTERIOLOGY. The Panel considers that uniformity in expressing the Bacterial Index is desirable in all reports of thereapeutic trials. Some members were of opinion that a logarithmic scale such as Ridley's should be studied with a view to its eventual adoption. Meanwhile, we are strongly of opinion that all reports should include information concerning the morphology of *M. leprae* as seen in smear preparations made according to standard techniques, expressing as percentages 'normal solid-staining rods' and 'non-solid forms' of all kinds.

Report of the Panel on Leprosy Reaction

Chairman: F. Latapí (Mexico); *Secretary:* D. S. Ridley (UK); *Members:* J. Ramos e Silva (Brazil); A. R. Mercau (Argentine); J. H. Frenken (Dutch Antilles); D. Peryassú (Brazil); A. Aguirre de González (Paraguay); C. Sisiruca (Venezuela); C. K. Job (India); E. A. Carboni (Argentine); J. C. Tolentino (Phillippines); J. T. De las Aguas (Spain).

The subject is very important. There is confusion in terminology.

Definition

In a broad sense the word reaction comprises all acute and subacute manifestations of leprosy. Leprologists are aware of the damages left by reactions in other forms of leprosy, but consider as more frequent and important acute and subacute episodes in lepromatous leprosy.

Classification

On this point the Madrid Congress classified as follows:

1. Lepra reaction
2. Erythema nodosum.

This panel considers that the true lepra reaction is erythema nodosum and that the so-called 'lepra reaction' of the Madrid Congress should be called 'lepromatous exacerbation'.

It is recognised that there are objections to these terms. But it is suggested that in view of their long usage they should be retained until an improvement in the state of our knowledge makes it possible to adopt a rational nomenclature.

It is proposed therefore:

1. *Lepra reaction (lepromatous)*

An acute or subacute clinicopathological syndrome which appears during the chronic course of lepromatous leprosy with systemic symptoms and local lesions in the skin and other organs. They are related to varying degrees of vasculitis of an inflammatory non-granulomatous nature, which are produced by some mechanism of hypersensitivity whose pathogenesis needs to be clarified.

Lepra reaction presents a variety of clinical and histological manifestations which are broadly distinct but which frequently occur in combination – (*e.g.*, erythema nodosum necrotisans).

(a) Erythema nodosum: Disseminated and painful nodosities, which appear in sites apparently not affected previously by the lepromatous process.

(b) Erythema multiforme: The typical appearance is of flat and extensive reddish lesions.

(c) Erythema necrotisans: (Lucio phenomenon). Multiple red and painful capriciously shaped spots with a tendency to dry or bullous necrosis. This cutaneous lesion of lepra reaction is more common in diffuse lepromatous leprosy but may appear in the nodular form.

2. *Lepromatous exacerbation*

This term applies to a rapid extension of lepromatous lesions, with possible appearance of new ones of the same nature.

HISTOLOGY

1. *Lepra reaction:*

(a) Erythema nodosum

(b) Erythema multiforme.

The characteristic of these reactions, which are histologically similar, is the focalised accumulation of polymorphs in the dermis or subcutaneous tissue. The lepromatous granuloma, usually small, is regressive with much foamy degeneration. The dermis is otherwise normal.

(c) Erythema nodosum necrotisans.

The extensive polymorph infiltration sometimes proceeds to abscess formation. It is more diffuse than in other types of lepra reaction. Capillaries frequently show endothelial swelling and sometimes necrosis. Towards the end of the reaction there is an increase of plasma cells.

Oedema is a prominent feature of this reaction. The dermis shows evidence of collagen and elastic damage, with fibroblastic increase.

(d) Lucio phenomenon.

Polymorph infiltration is intense. It is diffuse or multi-focal. The reaction is characterised by vasculitis, the vessels affected being of larger calibre than in necrotising ENL. The dermis is not much affected.

2. *Lepromatous exacerbation*

The reaction is mild. There is some *oedema*. The dermis shows a slight increase of fibroblasts. The lepromatous granuloma differs from that of lepra reaction: it is active, with an increase of histiocytes and early macrophages.

BACTERIOLOGY

1. *Lepra reaction*

Bacilli are usually few in the areas of polymorph infiltration. In the surrounding lepromatous foci the number of bacilli is comparable to that in the non-reacting lepromatous lesions.

The bacilli are already granular before the onset of the reaction.

2. *Lepromatous exacerbation*

There is an increase in the number of bacilli in the lesions at the time of the reaction, and an increase in the percentage of solid-staining forms.

PATHOGENESIS

The acute and subacute episodes are closely linked with the immunological process which in turn determines the various clinical forms of leprosy. The disturbance of the immunological equilibrium may precipitate an acute attack with the appearance of disseminated lesions. The disease itself may become better or worse.

There are several factors that may disturb the equilibrium between the host and the bacilli. Physical and mental stress, endocrine imbalance, intercurrent infections, specific antileprosy therapy, are some of the more important ones.

Some others think that these acute and subacute episodes are part of the natural history of the disease independent of external factors.

It is suggested that intensive research in immunology be undertaken to elucidate the pathogenesis of this complex process.

TREATMENT

Bearing in mind the various factors liable to intervene in the pathogenesis of leprosy reaction, rational therapy should be mainly designed to eliminate or interfere with the constant or repeated action of the determining or 'trigger' causes referred to above.

Likewise, treatment shall be conditioned in each case to the severity of the reactional episodes.

To this end, therapy will be directed as follows:

(a) Basic general treatment, intended to central systemic symptoms.

In such cases, emphasis is laid on the restoration of the blood picture, which is nearly always disturbed by a severe lepromatous reaction, by means of blood transfusion.

(b) Symptomatic treatment, specially designed to act on the acute, focal or regional manifestations, such as ocular, neural, articular, testicular and visceral reactions.

In such cases it is advisable to call in the corresponding specialists for consultation.

In the circumstances indicated above, as in others not specified, benefits can be secured by the use of the antimonials, certain antibiotics, the antimalarials, antihistaminics, etc.

Only when acute attacks are severe can the administration of corticoids or ACTH, under strict medical control, be considered. We advise against their routine use.

Specific treatment of leprosy shall be maintained, lessened or stopped altogether according to the severity of the reactional state.

PROPHYLAXIS

In this connection, we would make the following recommendations:

(1) Every patient, before specific treatment is started, shall be submitted to a comprehensive clinical examination.

The presence of any intercurrent affection of a general (infectious, metabolic, hormonal) or local (septic, foci, parasites, etc.) nature shall be discarded.

A record shall be made of nutritional state, and also of any stress that might disturb his psychosomatic balance.

(2) A detailed laboratory examination, specially of blood and serum, shall likewise be made.

(3) Specific treatment shall not be started until the patient is found to be in good condition.

(4) Initial doses shall be minimal, reaching the effective dosage only after a suitable period.

(5) Periodical clinical and laboratory examination will be made as frequently as required in each particular case.

(6) The unsuitability of iodide medication should be borne in mind.

Report of the Panel on Bacteriology and Immunology

Chairman: J. H. Hanks (USA); *Secretary:*
Members: J. O. Almeida (Brazil); N. Souza Campos (Brazil); R. S. Guinto (Philippines); S. W. A. Kuper (UK); E. Montestruc (France); A. Rotberg (Brazil); Candido Silva (Brazil); K. Yanagisawa (Japan); Y. Yoshie (Japan); G. P. Youmans (USA).

The report from DR. J. H. HANKS not being available, DR. S. W. A. KUPER, a member of the Panel, has contributed the following appraisement.

A full written report was not available at the time the Chairman, DR. HANKS, made his address but he read an account of the proceedings of the three Sub-Committees, namely, Bacteriology, Immunology and Serology. In the findings of each Sub-Committee, the comments were roughly divided into a review of existing knowledge, and recommendations for standards and for future research. The Chairman stressed the difficulties which exist when there is inadequate International liaison. He appealed for some permanent body to be set up to provide this liaison and to attempt standardisation of such substances as lepromin.

(a) *Bacteriology.* The cultural requirements of *Mycobacterium leprae* were briefly reviewed and their complexity discussed. Scales were suggested for recording the number of bacilli seen in smears and a further plea was made for standardisation to be effected by constant international co-operation instead of spasmodic five-year attempts.

(b) *Serology*. The Chairman stressed the different nature of skin reactivity and antibody formation in mycobacterial disease. It is clearly not surprising that antibody formation (a serological phenomenon) and skin reactivity seldom coincide. Research into serological investigations is in hand in the Americas but *some* patients with lepromatous leprosy have circulating antibodies and antigen-antibody complexes. The latter have been shown to produce periodic depletions of circulating complement. Consideration is being given to the question of identifying bacteriologically positive individuals before they develop lesions.

(c) *Immunology*. The importance of genetic factors is being realised. Populations appear to consist of three groups of people which are evident even in infancy (a) average responders, which includes the bulk of the population; (b) slow and modest responders, who, if they become infected, get non-lepromatous disease; (c) poor responders; in the event of infection these people develop 'borderline' leprosy which may continue to dimorphous and finally lepromatous disease.

ACQUIRED RESISTANCE

It has been shown that this is not due to antibody production. It is suggested that acquired resistance may be due to an improved capacity of mesenchyme to digest the cell walls and hydrolyse the proteins of the cells. (The sensitivity of patients to freed toxin from the cells may vary from case to case.) It may be that immunised people are able to break down cells more rapidly than other persons; the cell walls are very toxic. This ability of patients to digest bacilli may well be a more important factor in mycobacterial disease than the patient's capacity to produce antibodies.

IMMUNISATION

It should be our aim to immunise the small sector of the population that is poorly equipped genetically to deal with *M. leprae*. The average responders, it is contended, do not need help and at this juncture we have no mechanism for helping the poor responders. The intermediate group, however, may perhaps be assisted by BCG vaccination, if this agent can be shown to have any immunising power at all in leprosy. Cutaneous reactivity to antibacterial antigens rises with age and if this group can be helped, it must be done very early in life.

STANDARDISATION

Fernandez: As stated in Madrid and Tokyo.

Mitsuda: It is desirable to read reactions at weekly intervals for six weeks or even eight to ten weeks if the full prognostic value is to be obtained. It is suggested that the Wade phenomenon may be due to children not having had a previous challenge by similar antigens, so that their reactivity develops slowly. The Castro phenomenon, an accelerated reaction, may be due to previous experience of the antigens.

Reading of Mitsuda: If the antigen contains 160 million bacilli per ml. (this concentration is suggested by the similar results obtained in the Japanese and Philippine lepromin experiments) the following criteria should be used:

0 mm. induration	= 0	(Negative)
5 mm. induration	= ±	(Doubtful)
5–9 mm. induration (inclusive)	= +	(Positive)
10 mm. induration or more	= ++	(Strongly positive)

It was suggested that trials should be carried out with lepromin diluted eight-fold. Some evidence was produced to show that this would eliminate 'non-specific' reactions and greatly extend world supplies of lepromin.

The Sub-Committee of the World Health Organisation will attempt the standardisation of lepromin at centres set up for the purpose.

In the discussion that followed the Chairman's report, it became clear that some members had misunderstood the guarded remarks about BCG vaccination and thought the Chairman had given the Sub-Committee's approval of its use. This was clarified and it was pointed out that all the comments relating to the use of BCG should be cautiously regarded, because the Sub-Committee had not found any real proof of the efficacy of BCG vaccination in the prophylaxis of leprosy.

PERSONAL REMARKS

I think the concept of cell breakdown causing local allergy, and the completely different phenomenon of antibody formation are useful. As far as my own personal knowledge is concerned, many of the theses put forward seem speculative but they do provide a reasonable approach to the subject. I do not like the form in which we have categorically stated the details of these mechanisms, as though they were widely accepted and experimentally proved.

The gravest criticism I feel, concerns the form in which BCG vaccination has been advocated. I know most members of the Panel shared my uneasiness. Though the efficacy of BCG is not explicitly claimed, the form of question and answer tacitly assumes its efficacy. To me it seems that asking the question 'With what to immunise?' is exactly analogous to the question 'Have you stopped beating your wife? Answer yes or no'.

To sum up, I think Hanks's suggestion of attempted standardisation of lepromin is an excellent one. On the other hand, I think the advocacy of BCG vaccination has no proved basis, and leprosy workers should be quite clear if they use BCG that they are using it to produce some immunity to tuberculosis (even this is small enough in all conscience). *There is* some evidence of 'overlapping' of allergic reaction to lepromin and tuberculin but in terms of Hanks's own recommendations these local allergic reactions must not be confused with the development of antibodies. Much more work would be necessary (and I think it will have to be epidemiological) to ascertain whether BCG has any prophylactic effect against leprosy. Personally I know of no evidence that it has and my own opinion is that it has not.

Report of the Panel on Physical Medicine and Rehabilitation

Chairman: P. W. Brand (India and UK); *Secretary:* J. Arvelo (Venezuela);
Members: N. H. Antia (India); Margaret Brand (India and UK); J. E. Faggin (Brazil); M. Itoh (USA); M. Nakita (Japan); K. Nimbkar (India); D. E. Paterson (India and UK); E. W. Price (Nigeria and UK); D. C. Riordan (USA); Linneu Silveira (Brazil); D. Ward (India); E. Zamudio (Mexico).

By rehabilitation we mean the return of a patient to normal social life and economic independence with the fullest possible restoration of his own physical and mental well-being.

The greatest barrier to rehabilitation from leprosy has been the difficulty of cure of the disease. The second barrier is public ignorance and prejudice. Both of these are being considered by other panels, and we are glad to note improved methods of medical treatment, and the measures proposed for the education of the public.

In this panel we are concerned with the third great barrier to rehabilitation, the presence of physical deformity and disability. This is particularly serious because it continues after the disease is cured and makes a return to normal life difficult even when public prejudice is absent.

Since the last Congress in Tokyo, some important advances have been made both in the understanding of the pathology of deformity and in improved methods of correction by physical medicine and by surgical operation. An important event was the study group sponsored by the World Health Organisation ISRD & CWM which met in 1960 to evaluate progress in prevention and treatment of deformity in leprosy. The report of this study group emphasised that the great majority of the deformities and disabilities of leprosy are preventable and that those which cannot be prevented can be corrected by reconstructive surgery.

Unfortunately the surgical correction of deformities demands specially trained personnel and special equipment, neither of which is readily available in most of the countries where leprosy is common. It may be many years before enough surgeons and physiotherapists are available to help more than a fraction of the millions of deformed leprosy patients. This panel therefore wishes to emphasise that the prevention of deformity is much easier than its correction. With very little training and with inexpensive equipment it is possible for every doctor and para-medical worker to prevent the development of deformities in many of his patients.

It is disturbing to realise that at the present time progressive deformity is taking place, and eyesight is being lost, not only in untreated patients, but in patients who are receiving regular medical treatment. Most of this deformity and blindness could be prevented if the doctors and para-

medical personnel were given the training and allowed the time to advise and help those patients in whom they recognise the danger signs of early deformity.

Rehabilitation is often thought of as something which begins after the disease is cured. In the case of leprosy, if rehabilitation is to be effective it must begin as soon as the disease is diagnosed, and persist throughout treatment, otherwise psychological changes in the patient, and prejudices among his friends may develop to a point when they are hard to change.

We recommend that leprosy rehabilitation services should be closely integrated with other rehabilitation programmes in general hospitals and clinics even in countries where the anti-leprosy campaign as a whole still has to be organised as a separate unit.

By this means also help may be obtained from other Government departments and from many organisations, and professional groups which until now have used their skills for all diseases but leprosy.

As a first step it is good to obtain the interest of orthopaedic, plastic, and ophthalmic surgeons from medical schools or general hospitals. They may be appointed as consultants to a leprosy service, and should accept patients for reconstructive surgery in their own hospitals. Even though the amount of help they can give may be small, the influence of their position and their action will be great. Simultaneously, physiotherapists, occupational therapists, and medical social workers and those who can give vocational guidance must be drawn into the programme.

When the leprosy problem in a country is very large, it will be necessary to employ some physiotherapists and social workers whole-time on leprosy work alone, but even these should maintain links with general rehabilitation, and should endeavour to treat their leprosy patients either in their own homes or in institutions where non-leprosy patients are also admitted.

While this panel seeks to encourage every leprosy worker to participate in the preventive aspects of deformity, it must strongly discourage attempts at reconstructive surgery by medical officers who have no special training, who have to work in centres where aseptic conditions are doubtful, and who are not assisted by trained physiotherapeutic help in the preparation and re-education of their patients.

It is indeed tragic that in so many countries where the need is greatest there are no surgeons or physiotherapists available, nor training programmes to prepare them. There does not seem to be any immediate prospect of Governmental action to change this.

This panel recommends that in these circumstances this Congress should call on voluntary agencies to co-operate to meet this need. The rehabilitation agency of the World Health Organisation and the International Society for the Rehabilitation of the Disabled should call together some of the charitable and mission organisations already interested in leprosy work, and also societies dedicated to work among the crippled and the blind. Strategic centres, perhaps in medical schools, could be selected for the establishment of Reconstructive and Rehabilitation Units. Such units would treat patients referred from any leprosy

service in any nearby country, and could also begin to train young surgeons and physiotherapists for other centres as each country begins to shoulder its own burden and send its own staff for training.

THE EYE

Blindness in a person with normal tactile sensation is a severe disability. To the man who has lost sensation it is a disaster.

It is doubtful whether such a person can be fully rehabilitated.

Even slight impairment of vision is a far more serious handicap to the patient without sensation than to the normal person.

It is fundamental that we do everything possible to prevent impairment or loss of sight in leprosy patients.

Eye involvement in leprosy, though not necessarily causing symptoms, is exceedingly common. In lepromatous patients from the fifth year of the disease, it is about 90 per cent.

Once an eye has become involved, directly or indirectly, it may at any time become seriously affected and sight permanently damaged.

Most blindness in leprosy is avoidable. Far more people lose sight because of *neglect* than because there really is no treatment for their condition. Patients neglect their symptoms.

Leprosy workers, including doctors, neglect to look for signs. While it is important to remind the patients to report eye trouble at once, leprosy workers must not rely upon their doing so but must organise a time and a place where every patient can have a *regular* examination.

The paramedical worker in the village must be able to check visual acuity in each eye separately and do a brief examination with a torchlight in some indoor room (away from sunlight). The doctor in charge of an institution or clinic must, in addition, be able to examine in a dark room using a well focussing light and a magnifying loupe (x 10). He may have to dilate the pupil with homatropine or to stain the cornea with fluorescene or check the potency of the duct.

It would be of great help if doctors who have to take responsibility for the care of their patients' eyes could be given a full month's training in an ophthalmological institution where they can receive advice from an ophthalmologist and become familiar with special procedures such as tarsorrhaphy, anterior chamber puncture, subconjunctival injection, etc.

Paramedical workers must have special classes and demonstrations in the course of their training so that they can be constantly on the watch for early eye lesions and see that the patient is referred promptly to the doctor.

Broadly speaking, leprosy causes blindness in three ways:

(a) By damage to the facial (7th cranial) nerve causing partial or complete paralysis of the lids. The exposed cornea is liable to drying, to trauma and infection. Corneal ulcer may develop and lead to total destruction of the eye. Impairment of corneal sensation, found particularly in conjunction with chronic lepromatous lesions of the eyes, adds most seriously to the dangers of lagophthalmos.

(b) Sensitisation of the tissues of the eye to substances produced by the bacilli or their breakdown products.

The most serious manifestation of this is acute plastic iridocyclitis, characterised by early formation of dense synaechiae and sometimes complicated by secondary glaucoma.

(c) By direct invasion of the anterior segment of the eye by lepra bacilli. Low-grade keratitis and later irido-cyclitis develop. The latter may flare up with acute symptoms from time to time. Complicated cataract frequently develops. Sight is gradually lost as the ciliary body is destroyed by the lepromatous granulomata.

Where the tissues of the eye are sensitised acute inflammation occurs. Nodules, resembling erythema nodosum lep. develop at the limbus; simultaneously acute irido-cyclitis develops. Left untreated, there is very little spontaneous regression. This condition constitutes a serious threat to sight.

While the majority of patients can be diagnosed under one of these three groups, there will be several cases where all three factors, exposure, sensitivity and lepromatous invasion are together implicated.

ESSENTIAL PRINCIPLES IN THE CARE OF EYE LESIONS:

1. *Lagophthalmos*

Early cases often lose their symptoms and some definitely improve lid function by:

(a) Exercise of lids daily.

(b) Prevention of drying especially during sleep by bland oil.

(c) Minimising infection by mild bacteriostatic agent, ex. 1/2 per cent Zinc sulph.

(d) Use of dark glasses to reduce glare and protect from damage to some degree.

Where the corneal sensation is impaired, where the cornea cannot be covered or where there is already some exposure keratitis, the palpebral fissure *must* be reduced. The best operation for this is the temporalis transfer. If a surgeon is not available, a tarsorrhaphy should be done pending the better operation. Various other procedures have been devised for reducing the palpebral fissure, *e.g.*, a simple sling of silk or nylon around the lid margin or a similar technique using a fascial strip. While not being as effective as the temporalis transfer, they are simpler to perform and the results are less unsightly than a tarsorrhaphy.

If keratitis or a frank ulcer develops, full treatment for these must be instituted. Atropine, cauterisation with iodine, frequent local antibiotic drops and for severe cases parenteral antiobiotics, must be given. Between treatments the eye is carefully bandaged shut.

2. *Acute plastic irido-cyclitis and acute phases of the chronic granulomatous form demand:*

(a) That we stop anti-leprosy drugs and restart very cautiously after the inflammation has subsided.

(b) Full dilatation of the pupil with atropine or other mydriatics.

(c) Countering inflammation by local heat, local corticosteroids and where necessary by anti-inflammatory drugs such as aspirin, irgapyrin, etc. If glaucoma is present, Diamox 250 mgs. t.i.d. for three days usually reduces intra-ocular tension. Full iritis treatment is instituted at the same time. Anterior chamber puncture may be necessary.

These principles hold also for the eye which develops erythema nodosum nodules. In addition we may:

(a) Shave localised nodules from off the cornea and cauterise the limbal vessels.

(b) Where there is any lid weakness and a nodule on the lower lateral limbus a tarsorrhaphy to give protection is indicated. Exposure seems to exacerbate acute lepromata of the cornea.

Suggestions – ask International Society for Blind to come in on this problem.

Finally, in any apparently inflamed eye paramedical workers should stop antileprosy treatment and refer the case at once to the doctor.

Surgical Aspects of Rehabilitation

THE FOOT

The following lesions may delay rehabilitation, and are amenable to modern treatment.

(a) PLANTAR ULCER. Damage to the neuropathic foot may occur superficially between skin and ground, or deep between bony skeleton and soft tissues as a result of pressure and shear stresses during walking.

The deep damage proceeds by necrosis (pre-ulcerative state) to subcutaneous blister and finally ulceration. Ulceration can be avoided by early recognition and treatment, but if it threatens or has recently occurred, healing can be obtained by the avoidance of the stresses of walking. The simplest is bed-rest with elevation of the foot; but rigid-soled footwear, firmly attached to the foot, is as effective. So also is a walking plaster cast, and uncomplicated ulcers will heal within six weeks. Bone involvement may also delay healing, but will not prevent it if immobilisation is prolonged. Removal of sequestra may accelerate healing, but operative interference should not be attempted except by experienced surgeons, and should aim at producing a plantigrade foot. If the deformity is too severe to obtain this, amputation may be needed in preparation for an artificial limb (simple plastic prostheses are becoming available).

Recurrence of plantar ulcer is avoided by footwear and a simple soft insole is adequate in many cases; more severe ones need footwear with

the following criteria: rigid sole, soft insole (microcellular rubber 15 degrees 'Shore'), a rocker or rocker-shaped sole, and firm strapping of heel to footwear. A moulded shoe may be useful for severe deformity, and walking should be limited. Education of the patient is an essential part of treatment.

(b) NEUROPATHIC BONE AND JOINT. Bone and joint damage follows repeated microtraumata at any anesthetic joint of the foot; it often accompanies, but is not caused by, plantar ulcer. The lesion should be suspected whenever a painless swelling is present and X-ray should be done. *Treatment* of the neuropathic joint is essentially the achievement of undeformed stability by surgical or non-surgical methods.

(c) DROP-FOOT. Paralysis of dorsiflexion and eversion of the foot follows latual popliteal neuritis. In acute cases, immediate plaster immobilisation, including the knee in slight flexion, may succeed in preventing permanent palsy. Failing this, the effect of gravity rapidly produces permanent foot-drops in eversion. *Permanent foot-drops* if mobile, should be corrected to prevent toe and plantar damage; footwear with foot-drop stop, or surgical transplant of tibialis posterior is used. Long standing foot-drops, with bony changes and joint-contractures, demands corrective arthrodesis of the mid-tarsus with lengthening of tende achilles.

(d) CLAW-TOES. Claw-toes result from posterior tibial neuritis; they expose toe-tips and the sole to possible damage, and make shoe-fitting difficult. The deformity can be corrected by tendon transplant or by arthrodesis at the interphalangeal joint. Amputation of single toes is useful, but removal of the big toe should be avoided.

(e) INFECTIVE VASCULAR LESIONS. Infection of blood and lymph vessels of the foot and lower-leg is common during repeated and uncontrolled septic episodes of the foot. Intractable conditions of post-phlebitic syndrome or of chronic lymphoedema may result. Early recognition and treatment is important; regular hygiene of the foot, with compressive bandages, will arrest the development of the developed lesions.

CONCLUSION. With modern treatment, no complication of leprosy in the foot should hinder the rehabilitation of a patient recovering from the disease.

DEFORMITIES OF THE FACE

All the deformities of the face are amenable to correction by surgery. As visible stigma of leprosy, their correction is important in the general problem of rehabilitation for the lay person often associates deformity with active disease.

The operative treatment for deformities of the face is based on the principles and techniques of plastic surgery. Any doctor undertaking this type of surgery must be adequately trained in this speciality if satisfactory results are to be achieved.

The deformities of the face in leprosy comprise of:

(a) The depressed nose.
(b) Loss of eyebrows.
(c) Deformity of th ears.
(d) Wrinkling of the facial skin.
(e) Lagophthalmos.

Except lagophthalmos, all these deformities are the result of lepromatous disease and correction should be preferably deferred till the disease is arrested.

NOSE. This is the most prominent stigma of this disease. The saddle nose deformity is the result of primary ulceration of the mucous membrane followed by exposure necrosis of the underlying cartilage and bony framework. In general the skin, though infiltrated, is not ulcerated though this is possible in some cases.

It was formerly the general practice to encise the remains of the nose and reconstruct a new nose by a forehead skin flap. This is not necessary in th majority of cases where the skin and tip of the nose are present intact though displaced. The missing lining is replaced by a forehead flap of a free skin graft introduced into the cavity behind the nose which is produced by freeing the skin from its anchorage to the underlying bone. The skin graft is carried on a mould which is later replaced by a dental prothesis or if the patient desires permanent support may be given by a bone graft.

In minor nasal depression an implant of cartilage or bone may be undertaken without a preliminary skin graft. Inner implants may also be employed.

In the rare cases of total destruction of the nose, a forehead rhinoplasty is undertaken.

EYEBROWS. The correction of this deformity is of psychological importance. This may be done by grafting hair bearing scalp as a free graft or as a pedicle graft.

EARS. The deformity may be in the form of an elongated lobule or an irregular destruction of the pinna of the ear. This can be readily corrected by suitable incisions.

FACIAL WRINKLES. This is the result of loss of normal skin elasticity and produces an appearance of premature ageing. It is corrected by incision of the redundant skin.

Gynaecomastia is a common deformity and may be associated with pain. This is corrected by removing the excess fat and breast tissue through an incision in the margin of the areola.

THE HAND

In leprosy, the common defects of claw-hand and paralysed thumb are often complicated by contracture, lepra reaction and absorption of the

phalanges. It should be emphasised that it is useless to attempt most surgical reconstruction before the hand has been fully mobilised, and it is equally important post-operatively to train the patient in re-education of his transferred muscles if anything like satisfactory results are desired. Moreoever, because of severe disasters that can follow ill-advised surgery or post-operative sepsis it is strongly advised that such reconstructive surgery should only be done where there is a surgeon trained in this work, and also where there is provision for adequate physiotherapy.

CLAW-HAND. Where there is pre-operative mobility with intact tendons (*i.e.*, where there is no dorsal expansion damage), the best treatment for claw-hand is to provide a new motor for the paralysed intrinsic muscles.

Those commonly used are:

(a) Extensor carpi radialis longus with a free graft.

(b) Flexor digitorum sublimis from one finger.

(c) Extensor indicis and extensor digiti minimi.

Capsuloplasty is also sometimes practised.

For those cases in which passive mobility is unobtainable pre-operatively so that passive extension of the proximal interphalangeal joints is limited by 45 degrees or more, it is usually advisable to arthrodese the interphalangeal joints at approximately 25 degrees short of full extension.

THE THUMB. The commonest complication of paralysis in the thumb is thumb web contracture. If the thumb cannot be brought into full opposition passively, it is necessary to do some form of web-plasty before providing a motor tendon to the thumb. A web-plasty with a full thickness skin graft on the dorsum, and sometimes a Z-plasty can be used.

An accepted operation for correction of the paralysis is transfer of the flexor digitorum sublimis from the 4th finger, re-routed from a position near the pisiform or distal to the transverse carpal ligament, in two slips to the thumb, one into the extensor over the proximal phalanx and the other into the adductor insertion. Difficulty in extension of the terminal phalanx is common in ulnar – median paralysis which readily provokes a chronic flexion of the phalanx. If this disability is not corrected even after tendon transfer or if there is post-operative instability of the metacarpo-phalangeal joint, then arthrodesis of the MP joint is advisable. Interphalangeal arthrodesis of the thumb is only used in cases in which there is fixed flexion of the joint. Where the lesion is purely ulnar, the sublimis from the 4th finger may be re-routed directly from the centre of the palm as a single slip to be inserted into the dorsal expansion over the proximal phalan of the thumb. Another method that has been used is that of passing the extensor indicis proprius through the 2nd interosseous space to the mid-palm and thus to the thumb.

RADIAL PALSY. Radial palsy is uncommon and occurs only with ulnar and low median palsy. Although arthrodesis of the wrist was recommended in the Tokyo report, the panel now recommends muscle transfers as used in poliomyelitis.

WASTING IN THE THUMB WEB. The unsightly wasting in the thumb web hollow can be filled with dermis grafts or IVALON for cosmetic purposes.

ADVANCED ABSORPTION OF THE FINGERS AND THE THUMB. Even where there is severe absorption of the fingers the hand may still be useful if the thumb is good. Where there is advanced absorption of the thumb, a deep web-plasty can provide further function.

It is disappointing to attempt to lengthen the fingers with bone grafts or pedicles.

In very advanced absorption and where it is technically possible, consideration may be given to use of the artificial articulated hand.

1ST RESOLUTION OF THE PANEL

This Congress is gravely concerned that under the very eyes of doctors and para-medical workers in many anti-leprosy campaigns deformity and blindness are being allowed to develop, which could be prevented by simple advice and inexpensive treatment. The development of such deformities not only makes the ultimate rehabilitation of such cases very difficult, but causes lack of confidence and co-operation of patients in the medical treatment.

This Congress therefore *resolves* that in every anti-leprosy campaign the doctors and para-medical workers should be trained to look for danger signs in hands and feet and eyes, and should give advice and simple treatment to prevent deformity and blindness. The ratio of patients to workers should not become so high as to make this impossible.

2ND RESOLUTION OF THE PANEL

Whereas in many countries where leprosy is common there are no rehabilitation services and no trained personnel, and whereas the governmental anti-leprosy programmes are unable to develop adequate rehabilitation services, this Congress

Resolves to call upon international and voluntary rehabilitation agencies to establish pilot projects for reconstructive surgery and physical rehabilitation at strategic centres, preferably in association with medical schools, to which staff from any country could be sent for training.

This Congress suggests that the United Nations Rehabilitation Agency and the International Society for the Rehabilitation of the Disabled should call a group of voluntary societies together to consider means of implementing this resolution.

Report of the Panel on Educational and Social Aspects

Chairman: T. N. Jagadisan (India); *Secretary:* Luiza Keffer (Brazil);
Members: E. Weaver (Brazil); C. Costa Neves (Brazil); C. I. Crowther (USA); M. C. Estrada (Mexico); R. Follereau (France); N. D. Fraser (UK); K. Hamano (Japan); O. W. Hasselblad (USA); J. R. Trautman (USA); R. V. Wardekar (India).

IMPORTANCE OF EDUCATIONAL AND SOCIAL ASPECTS

Conditions governing leprosy are so varied, sometimes even in one country or one region, that there can be no one formula for dealing with the problems raised by the disease. Our approach to the various methods prevalent in different regions of the world has to be tolerant and understanding.

In the past the absence of proved remedies and lack of methods of prevention of deformity cast a gloom over the whole subject of leprosy which was illumined only by charitable missionary endeavour. Leprosy suffered from professional isolation and the leprosy patients from social isolation. With the effectiveness of modern treatment the medical and public health aspects of the leprosy problem naturally assumed a priority.

The education and social aspects of leprosy, however, are so closely related to the medical and preventive aspects that it will be a grave mistake to underestimate them. It is essential that they should form an integral part of the leprosy campaign and adequate budgetary provision for these activities should be made in leprosy control campaigns. Else, the very success of our treatment and control programmes may be retarded.

THE NEED TO IMPROVE STANDARDS OF LIVING

Though there appears to be no clear relation between leprosy prevalence and state of nutrition, climate, social customs, etc., the important contributing factor appears to be the low economic status and the level of hygiene as reflected particularly in overcrowded and insanitary housing. It becomes important therefore that while we should do everything in our power to diagnose cases early and bring them under treatment, we should also side by side endeavour to improve the standard of living of the endemic regions, and especially to improve the housing and to inculcate the hygienic habits amongst the general public, the patients and their contacts.

PREJUDICE AND IGNORANCE SHOULD BE COMBATED ACTIVELY

While prejudices against leprosy and discrimination against leprosy patients seem to have declined in some measure, especially in areas where planned leprosy control activities have been in progress over a

length of time, the deep-rooted prejudice against leprosy are very slow to die. These prejudices, besides causing mental pain to the patient, hinder his early and willing resort to treatment. This is so especially in the more sophisticated levels of society. On the other hand there is also the fact that in many of the areas where leprosy is more prevalent, one meets with a total indifference to the presence of leprosy in the community. Such indifference is equally harmful to successful leprosy control measures. Our educational objective should therefore be to evoke in the public at large, the patients and their families, a reasoned attitude towards leprosy which neither exaggerates the dangers of leprosy nor minimises it.

EDUCATION SHOULD COVER MANY ASPECTS AND MANY GROUPS

Education with regard to leprosy has to cover many aspects and has to be directed towards many sections and groups of the public including the patient and his family. First and foremost, the medical student should receive adequate teaching in leprosy. Hospitals attached to medical colleges and schools should promote active interest in leprosy and a reasoned attitude towards it amongst medical students by making leprosy treatment an integral part of the work of the hospital. Health officials should also be reorientated in the modern concepts of leprosy so that they bring in its handling an outlook similar to that upon other communicable diseases. Since the leaders of the society have largely to influence the action of Government and the community in matters relating to social affairs, it becomes necessary to inform them of the modern approach to leprosy and get their influential support for forward policies with regard to leprosy. Frequently, the educated are as ignorant as the uneducated with regard to leprosy. In fact their prejudices may be more deep-rooted and act as a hindrance to intelligent measures of leprosy control. Persistent attempts should therefore be made to educate the educated and to win the co-operation of leaders of society at all levels and also of the administrators. Such an attempt is most essential especially in highly endemic regions where special efforts to control and eradicate leprosy are needed.

IMPORTANCE OF EDUCATING TEACHERS, SOCIAL WORKERS, ETC.

Teachers should be enlightened about the facts of leprosy and how they can help by disseminating information amongst their pupils, their parents and the general public. All social workers should be given an orientation in the modern approach to leprosy with particular reference to the social problems arising in leprosy. Curricula for schools and colleges of social work should include instruction in leprosy. Leprosy workers should constantly be seeking opportunities to make contacts with the general run of social workers and also to address groups of them. For, some of the social problems created by the indigence of the leprosy patients can be solved only when the social workers come to regard leprosy without fear and with understanding and are prepared to bring those disabled by leprosy or rendered destitute by it and the uninfected children of leprosy

patients within the scope of the general welfare services for the handicapped, the children, etc.

EDUCATION OF THE GENERAL PUBLIC

With regard to the general public, our approach has to be one of providing the right type of information and education and the correct attitude to leprosy rather than one of publicity. Every medium of education should be employed. Newspapers can be very helpful. But due care has to be taken to see that they refrain from sensational presentation of news relating to leprosy. Else newspaper publicity may be a hindrance rather than a help. Persistent attempts should be made to approach the press and to get them to view leprosy in the right perspective, as a preventable and curable disease. It should be impressed upon them that news, stories and pictures regarding leprosy that appear in the press should dwell on the more hopeful aspects which have emerged in recent days and that in whatever they say they should not add to the prevailing ignorance and misunderstanding of the disease. We should also urge that magazines, novels, movies, etc., should refrain from exploiting the theme of leprosy by undue dramatisation and sensational presentation. They should constantly be urged to avoid the use of the word 'leper' which carries an ancient stigma with it and to refer to those who suffer from leprosy as leprosy patients.

Providing information on leprosy to the public at large is a task that has to be approached with caution. Theoretical and speculative information, no matter how thrilling to the research worker, should be withheld from the public. For, newspapers are apt to give undue prominence to these items and the public who are already full of doubts and fears regarding leprosy are apt to get more confused in their approach to leprosy and more confirmed in their old time notions. Although there is still much to be known about leprosy, this limitation should not prevent our working out a realistic leprosy education programme. The educational programmes must take into account the 'knowns' and 'unknowns' and present these to the public in a way that is understandable and reasonable. They should aim at promoting a leprosy control policy which will be based on what is known, what can be deduced and what can be carried out humanely.

EDUCATION OF THE PATIENT AND HIS FAMILY

The education of the patient and his family is very important. Our aim should be to get them to view leprosy without fear, but with the respect due to it, as a communicable disease from which their families and the community at large have to be protected. The patient must be encouraged to take a hopeful attitude to his condition, to persist in his treatment, to co-operate in preventive measures and to learn to look after himself in such a way that he can avoid and overcome deformity. The family should also be instructed in such a way that they will help in keeping the morale of the patient, give him the necessary sympathy and at the same time take preventive precautions to control the spread of infection.

PROTECTION OF CHILDREN

In many endemic countries, infection occurs more commonly in childhood and it becomes necessary to pay special attention to the protection of children. Often, children constantly exposed to infection need special attention. Insistence on regular treatment by the patient and the observance of prophylactic measures within the household is the most practical means to protection. Uninfected children who find themselves cut off from parents or relatives who are in hospital or whose parents or relations are unable to care for them satisfactorily should be admitted to general child care institutions. But arrangements should be made to get them periodically examined. This should be done without any publicity that may mark them from other children. Perhaps the best procedure would be to arrange their examination for leprosy as part of the medical check-up of school children. In the case of infected children except where their condition warrants otherwise, the school authorities should be made to co-operate in letting them take treatment in an out-patient and attending school. These children may need special help for their education where their parents or relatives are too poor to pay for it. Under some circumstances, preventoria or healthy children's homes may have to be run. But with the education of social service organisations and social workers in the correct approach to leprosy, it should be possible to arrange for the care and education of these children in general child care institutions. As far as possible, the family unit should be maintained and attempts should be made for the protection and care of the children in family surroundings.

NO NEED FOR SPECIAL LEGISLATION ON LEPROSY

In the light of modern knowledge, there is really no need for any special legislation on leprosy, and any legal measures dealing with leprosy should form part of general public health regulations. Wherever there is legislation on leprosy which is not in conformity with the modern approach to the disease, Governments should be urged to revise such legislations suitably. It is recommended that where Governments still enforce a policy of compulsory segregation, this should be totally abandoned.

SOCIAL AND ECONOMIC ASSISTANCE TO PATIENTS – ITS IMPORTANCE

Due attention should be paid to the social and economic difficulties of the patients and their families and attempts should be made to relieve them. The methods to be adopted for such relief will depend on the particular circumstances of a country or a region. In countries where public assistance of various types are available to the unemployed, the sick, the disabled, the destitute, etc., the leprosy patient and his family should be eligible for such assistance. Though in countries with a low economic standard priority has to be given to treatment and control measures, the social and economic difficulties of the patient should not be ignored. They have to be attended to, if only because assistance to patients to relieve their difficulties will win their co-operation in treatment and control measures. In these countries the problem of the disabled and the destitute patient

is a serious one. Governments should encourage the care of these patients by voluntary institutions by making suitable grants to them and also promote their care through social welfare departments.

RECOMMENDATIONS

(1) In view of the urgency and importance of combating the ignorance and prejudice that exists amongst the members of the public, an active programme to educate all sections of the public should be promoted. Popular ignorance is a great hindrance to leprosy control campaigns, and therefore health education through every available media should form an integral part of leprosy control campaigns. Moreover the goal of integration of leprosy services with public health services will be achieved only when there is an enlightened and active participation of the community in leprosy control programmes. It is therefore recommended that adequate budgetary provision for health education be made in leprosy control programmes.

(2) Health education should cover all sections of the community, and it is most important that school teachers, social workers, and community leaders should receive orientation in the modern approach to leprosy so that they spread knowledge in their respective spheres and promote right action with regard to the control of leprosy and the problems of the leprosy patient.

(3) It is of the utmost importance that medical undergraduates should receive adequate teaching in leprosy so that the general medical practitioner is able and willing to take an active part in leprosy control programmes which should become more and more integrated with public health services. It is recommended that instruction on leprosy be linked with instruction on Dermatology, Neurology, public health handling of communicable diseases, etc., so that the age-old professional isolation of leprosy may be broken and leprosy may be regarded as one disease among many, entitled to the interest of all doctors and capable of being of deep interest to them.

Refresher post-graduate courses should be frequently arranged for the medical profession.

(4) The social and economic difficulties of leprosy patients should be relieved in ways appropriate to each region so that the patients, feeling happier, are better able to co-operate with treatment and control measures. Moreover, it is important to remember that the needs of the 'individual' should not be forgotten in our concentration on the 'mass' of the problem for purposes of planning.

(5) Special attention is needed to the children constantly exposed to infection by leprosy patients. Uninfected children cut off from parents or relatives unable to care for them satisfactorily, should normally be admitted to child care institutions. In some areas, however, prevention or healthy childrens' homes may still have to be run.

(6) Considering that lack of personnel of various types hinders greatly the advance of leprosy control programmes, it is important that governments and all those interested in promoting leprosy control should finance and

encourage training programmes, preferably in medical institutions and medical research centres or in association with them. In areas where such institutions do not exist a well-staffed and well-equipped leprosy centre or institution should be recognised as a training centre, these training centres being adequately supported by Governments.

(7) The Congress invites increasing and a more active and enlightened interest in the problems of leprosy on the part of newspapers, the radio, the cinema, and other media of communication. We would emphasise that, in doing so, they should adhere to concepts of leprosy consistent with present scientific knowledge of leprosy and refrain from an undue sensational approach to the disease based on mediaeval notions, and also from undue dramatisation of situations and episodes in stories with a leprosy background lest they should, by doing so, increase the existing misunderstanding concerning leprosy.

(8) We endorse the Report of the Panel on Physical Medicine, Rehabilitation, Surgery and Vocational Training, in so far as it relates to educational and social aspects. In doing so we would stress the importance of social and psychological rehabilitation of the patient, as well as that of physical rehabilitation and vocational training. For the ultimate goal of rehabilitation is not only economic self-sufficiency but social and moral welfare leading to the wider opportunities and responsibilities of normal life.

Abstracts of some Papers

NOTE. COCIL, *the organising committee of the 8th Congress at Rio, provided two books which recorded the abstracts of all papers. The first book gave a Portuguese, Spanish, French and English version of each of the 171 abstracts. The second booklet provided 35 additional abstracts, each in its original language, whether Portuguese, Spanish, French, or English. There are 82 pages in the first book dealing with the English abstracts. In the circumstances it has seemed a more useful piece of work to report here the* second *booklet, with the Portuguese, French, Spanish abstracts personally translated into English, and the few English abstracts of the booklet also reported, and it is the intention to report the first book of abstracts in a later, perhaps the next issue of* "Leprosy Review." *If this does not turn out to be possible, readers in English should not be disappointed, as the first book of abstracts can be obtained from Dr. Fausto Gayoso Castelo Branco, Presidente da* COCIL, *1298 Rua São Cristovão, Rio de Janerio, Brasil, and in this, 82 pages of the abstracts in English will be found. The name of the book when referring to it is 'Resumos dos Trabalhos, VIII Congresso Internacional de Leprologia, Rio de Janeiro, 1963'. As for the second book of abstracts, the substance of it is reported in English here.*

EDITOR

Reconstruction of the Face in Leprosy

N. H. ANTIA, F.R.C.S.

The stigma of leprosy is a visible deformity which persists even after cure of the infection. Surgical correction is essential for social and economic rehabilitation of these patients.

The deformities are fairly stereotyped and affect the face, hands and feet.

This paper is based on work in connection with 300 in-patients at the Kondhwa Leprosy Hospital near Poona. Emphasis has been laid on elucidating the cause of facial deformities and devising operations for their correction. Wherever possible, the procedures evolved have been simplified and standardised so that they can be put into practice under the conditions usually available for leprosy surgery.

The deformities of the face are the result of lepromatous infiltration of the skin, subcutaneous tissue and mucous membrane except for lagophthalmos which is the result of nerve paralysis. They include the following:

(1) Depressed nose.
(2) Lagophthalmos.
(3) Loss of eyebrows.
(4) Leonine facies.
(5) Sagging face.
(6) Ear deformities.
(7) Destruction of the palate.

DEPRESSED NOSE. The primary lesion is mucous membrane ulceration followed by exposure necrosis of the cartiligenous and bony framework. The alar cartileges, protected by skin on both sides are rarely destroyed.

The operation of post-nasal epithelial inlay as now employed is that of choice in the majority of cases. In the absence of dental aid the skin graft is carried on a mould anchored by wires to the teeth. Later the support is provided by a retrograde bone graft taken from the olecranon. This is essential when the fingers are absorbed. The oronasal fistula is closed. This can be undertaken under local anaesthesia in an ambulant patient.

LAGOPHTHALMOS. Caused by selective paralysis of the zygomatic branch of the facial nerve. This is one of the commonest

causes of loss of sight from 'exposure keratitis'. Lower lid ectropion besides being unsightly also produces conjunctivitis and constant watering of the eye.

The previous operations of tarsorraphy and static sling, besides being unsightly, cannot completely protect the eye and result in recurrent ectropion.

By transposing an innervated slip of the adjacent unparalysed temporalis muscle and with fascial extension – the 'temporalis' musculo-fascial sling operation' – the eye can be opened and closed at will. It also gives a normal appearance and there is no risk of recurrence of ectropion.

EYEBROWS. In a leprosy endemic area loss of eyebrows is a stigma of the disease. The methods of replacing them are:

(1) Temporal artery island scalp flap.

(2) Transposition scalp flap without artery pedicle.

(3) Free graft of post mastoid hair-bearing skin.

The last is the simplest and safest procedure, but its success depends on adequate 'defatting' of the graft.

LEONINE FACIES. Shaving and dermabrasion helps.

SAGGING FACE. Face lift results in psychological rejuvenation. The technique has to be varied and requires further study.

EAR DEFORMITIES. Need trimming.

PALATE. Perforation and destruction need repair by local flaps or by skin tube pedicle.

Deformities of the face in leprosy lend themselves readily to surgical correction and hence plastic surgery can play a great part in the world-wide rehabilitation of the patient.

This work can also be carried out in most leprosaria with the facilities at their disposal and without the aid of complicated dental and accessory help. These operations have been performed under local or block anaesthesia owing to a lack of facilities for general anaesthesia. Post-operative nursing care has been left to the patients themselves in the absence of a nurse. This paper is based on the experience of three hundred operations.

Transplanting the Posterior Tibial Muscle to the Dorsum of the Foot in Leprosy Patients with Paralysis of the External Popliteal Nerve

by R. SANCHEZ BEAUJON,
presented by J. J. ARVELO
(Original in Spanish: translated by DR. J. ROSS INNES)

The paralysis of the external popliteal nerve determines a muscular imbalance in the foot, which in most cases allows to survive the important muscular forces in the posterior part, namely in the group represented by the muscles which work the Achilles tendon and the long common flexor of the digits, and in the internal part, the posterior tibial muscle which, as we know, is inserted in the scaphoid tubercle. This results in an equino-varus deformity.

For effective treatment one needs to make a distinction in this deformity between subjects whose paralysis occurs during or after the period of growth. In the first case there is osseous structural deformity, and the foot gets fixed in the deformity and cannot be corrected by passive manipulations. In the second case the deformity is more of a functional nature, and by passive manipulations the foot can be returned to normal position. Therefore in order in the first group to carry out the procedure which we shall describe, a surgical intervention in the bones is required which permits the correction of the deformity. In the second group intervention in the bones is not needed.

The procedure to which we refer is contra-indicated when osseous destruction occurs due to repeated plantar ulcers which have modified the osseous structures, since the surgical intervention reactivates the infectious processes, which not only cause the loss of the benefits of the procedure but also compromise the existence of the foot and even of the leg. In the degenerative processes of Charcot type there may be an acceleration which leads to disintegration of the joints.

PROCEDURE:

The operation consists in freeing the insertion of the tendon of the posterior

tibial muscle, passing it across the interosseous septum and re-inserting it in the dorsum of the foot in its new seating. For that a small incision is made in the medial border of the foot, where the tendon of the posterior tibial is inserted on the seaphoid tubercle, and a section is made in the bone, trying to obtain the greatest possible length. A second incision is made in the internal surface of the leg, where the dis-inserted tendon is brought out. At the same level as the incision in the internal surface of the leg, a third incision is made in the external surface, and through that the interosseous septum is exposed. Then the tendon is tunnelled to this site and the subperiosteum exposed in order to resect a fragment of fibula 3 to 4 cm. in length. Finally an incision is made in the dorsal surface of the foot above the site of the second bedding of the tendon, and after broad exposition, a tunnel is perforated of sufficient breadth to receive the distal extremity of the tendon. According to the technique of BUNNELL, the distal end of the tendon is interlaced with inoxidizable steel wires, and the tendon is placed in its new insertion, passing the wires towards the sole of the foot with a straight needle, and knotting them there on a button protected with a rubber sponge. All the wounds are sutured and a plaster is applied, maintaining the foot in dorsal flexion and the knee in 46° to 60° flexion.

The removal of a fragment of fibula has as its object the avoidance of fixation in the interosseous septum, favouring its functioning, and allowing it to act freely as an active motor force.

Recently we have made some modifications directed at the diminution of tension in the transplanted tendon and at not extracting the maximum of dorsiflexion possible from the foot.

The analysis of cases subjected to operation by this technique has given us the following conclusions:

(1) It is desirable to correct the steppage gait and re-establish the gait of 'heel to point of foot'.

(2) It is best to aim at limitation of the movements of the tibio-tarsal joint, and this chiefly depends on the degree of tension used during the transplant.

(3) This technique does not avoid the production or reproduction of plantar ulcers.

(4) It is contra-indicated in feet with marked osseous destruction through infection, or with degenerative processes of the Charcot type.

(5) It produces a valgus deviation in the foot, the degree depending on tendon tension.

(6) The resection of a fragment of fibula increases the amplitude of the movements.

Multiplication and Behaviour of the Bacillus of Hansen in Tissue Cultures

by J. P. DELVILLE

(Original in French: translated by DR. J. ROSS INNES)

Inocula of Hansen bacilli obtained from lepromatous tissue have been made in human amniotic cells. These bacilli have been rapidly phagocytised, and at the end of four weeks a multiplication of acid-resistant bacilli was observed, such as never develops in the usual bacteriological media.

Certain cells are stuffed with bacilli, but the number of cells showing abundant multiplication is quite small.

Subcultures made from the original cultures on new amniotic cells have not given any positive result.

Trypsinized lepromatous tissue submitted to culture gave in one case an abundant culture in about 10 cells. After 51 days of culture at 36°C, 50% of the cells were parasitized.

A good number of cells contained numerous bacilli and the culture showed a microcolony made up of a gross mass of bacilli.

We have thus obtained a significant multiplication of bacilli of Hansen where the control of ordinary bacteriological media has given no culture.

The Kaposi cells inoculated with the bacilli of Hansen derived from lepro-

matous tissue showed a significant bacillary multiplication after 123 days, and 64% of the cells were parasitized with a good number.

Cultures aged more than 6 months are always under observation and successful subculture.

In old cultures bacilli, especially the isolated ones, seem to undergo a degeneration which is plainly less accentuated than the subcultures.

The National Campaign against Leprosy in Brazil

by DR. FELIX PLASENCIA FILHO

(Translated from the original Portuguese by DR. J. ROSS INNES)

(1) The fight against the leprosy endemic in Brazil, in the way instituted by SNL and carried out by CNCL, showed in seven years of progressive activities, some of them unforeseen, that it was superior in various ways, to the prophylactic system based mainly on the tripod of leprosarium, dispensary, and home for the protection of children.

(2) Some advantages observed were:

(a) It was more human, practical, economic, and receptive.

(b) There was a reduction in unadjusted mental states, prejudices, and tabus and a lack of stigmatizing.

(c) It made possible the control of a greater number of leprosy foci and contacts.

(d) It created in fact a leprologic conscience outside the teams of specialists.

(e) It obtained in an appreciable proportion of cases an early diagnosis and an early treatment.

(3) It showed the possibility of eradication of this particularly incapacitating disease, and showed that those responsible for collective public health favour the use of resources which are indispensable to attain the objective visualized by SNL.

(4) The advice and opportunity to carry out the programme of CNC by means of projects well planned and adjusted to the local and regional features of the endemic, avoiding being involved in a very rigid stage, had the result that US has taken on, as soon as possible, the whole responsbility for leprosy control in the various fields of action.

Infantile Nodular Tuberculoid Leprosy and BCG

by G. MANGEON

(Translated from the original Portuguese by DR. J. ROSS INNES)

The author presents three cases of infantile nodular tuberculoid leprosy in patients of ages 1 to 2 years and 10 months. Two were given BCG at birth, by a single dose. All three made contact with the clinical form of lepromatous leprosy, shortly after birth. The author thinks that there was a latent period of a few months, and that also there was penetration of the Hansen bacillus, in the anti-allergic period, before premunition by BCG. He thinks that BCG should be used in the premunition of leprosy because it is one of the two probable agents in the changing of the Mitsuda test, on which it is shown that one dose may be sufficient.

Anti-Leprosy Campaign in Mexico: training of staff

by DR. JOSÉ BARBA RUBIO

(Translated from the original Spanish by DR. J. ROSS INNES)

The activities stand out, and the philosophic and humanistic spirit of the programme for control of chronic diseases of the skin, recently established in 1960 by the Ministry of Health.

The Mexican School of Dermatoleprology reveals in the said programme its philosophic and social ideas, namely (1) Prophyiaxis is based on early diagnosis and opportune treatment; (2) the campaign should be based on persuasion and conviction and never on drastic systems; (3) it should be made attractive by personal skill following the training of doctors and nurses in dermatology and leprology, and not exclusively in dermatology; (4) besides the Dermatological Centres of the campaign, the number of mobile teams should be increased, which would tour ranches and small communities in the endemic zones, giving dermatological consultations and not using the word leprosy, discovering leprosy cases

and controlling them as well as their contacts.

The training should be given in groups not greater than 20 doctors and nurses separately, and a theoretical and practical education given, a complete scientific education in dermatology, leprology, epidemiology, health, hygiene, sanitary work, social anthroploogy, psychology, statistics and biostatistics. This theoretic and practical teaching of not less than three months should be completed with one or two months of field work before beginning the active official activities.

Dimorphous Leprosy

by DR. FÉLIX CONTRERAS

(Translated from the original Spanish by DR. J. ROSS INNES)

In the strict sense, dimorphous is not the same as borderline which when translated into Castilian is *limitante* or *fronterizo*, and in our country we have not seen cases which indubitably could be considered as dimorphous, nor even as *limitantes* or *fronterizos*. Our pathologists learned in leprology have never met with undoubted forms of tuberculoid and lepromatous granulomata which coincide in time and space with these borderline forms.

In our environment, in which the great majority of patients are treated and controlled, the mutation between the two polar types is most rare, and perhaps this is the reason for the few cases which come under discussion in this matter.

We have met with some patients who clinically make us suspect dimorphous leprosy, but histologically they turn out clearly lepromatous or clearly reactional tuberculoid. At the same time, patients clinically lepromatous or reactional tuberculoid, do present a certain difficulty in their histological classification in some of their lesions.

We believe that in order to classify a patient as dimorphous, the histological proof is indispensable which shows specific tuberculoid and lepromatous characters in the same lesion or in different lesions, but at the same moment. In this respect we understand that the band of UNNA, the features of the conjunctiva histiochemical changes, and even the nervous lesions, are histological characteristics with little specificity, since they represent quantitative changes which are difficult to evaluate in doubtful cases. The presence of giant cells and cellular vacuolization are characteristics which do not deserve taking into account, because easily they can be brought about by error. Specific histological characteristics are then only the presence of epithelioid cells and the presence of Virchow cells. It is possible that the error in histological diagnosis takes place in interpreting as epithelioid cells the histiocytic cells in hyperplasia which are noted in the reactivation of lepromata, or in general in young lepromata.

Histologically difficult cases should be studied carefully with all useful techniques, and therefore frozen sections should be made to study lipids and ferments, and silver impregnations, and paraffin sections for routine staining made.

With this plan of action, from the histological point of view, lesions can always be grouped inside lepromatous or reactional tuberculoid leprosy.

To admit that dimorphous leprosy exists, depends entirely on the importance that we give to reactional tuberculoid leprosy. In effect, cases which are doubtful clinically are histologically reactional tuberculoid. Nevertheless on occasion the histological diagnosis of reactional tuberculoid leprosy does not fit perfectly into the clinical picture. These cases in our way of looking at it form those who could make up the dimorphous group. The proposal made by various authors in the Symposium at Brazil does not seem very acceptable; they considered two varieties inside reactional tuberculoid, namely a typical one for the cases who clinically and histologically can be grouped in it, and an atypical one (which by our way of thinking would be dimorphous leprosy) and those who enter it would be those cases who histologically are reactional tuberculoid, but clinically are difficult to place precisely in their classification.

These forms which we are coming to consider as atypical reactional tuberculoid are rare among us and in our judgment do not represent a sure transition

towards the lepromatous type. Rather we are dealing with an instability phase, more or less lasting, which solely on rare occasions can transform into lepromatous leprosy.

In Fontilles Sanatorium we have seen 1,046 patients, and in all of them we have studied completely the four aspects of clinical, bacteriological, immunological, and anatomopathological. In most and at several times we have followed the evolutive process in all its aspects. Of the 1,046 patients, 79 were classified as indeterminate leprosy and 69 as tuberculoid leprosy. Of the 898 lepromatous patients, only in 6 were there any doubts whether they were dimorphous or not. Of the 69 tuberculoid, 27 were reactional tuberculoid and of these 27 remaining, 9 were atypical or in periods of instability which could make us think of dimorphous leprosy. In conformity with these data, the doubt whether we were dealing with dimorphous leprosy presented in 0.66% of the lepromatous and in 13.04% of the tuberculoid.

In the Spanish campaign among 3,751 classified patients, 594 were indeterminate, 1,063 tuberculoid, and 2,094 lepromatous, and we are not able to be precise about the frequency of reactional tuberculoid nor of dimorphous.

Indeterminate Leprosy

by Dr. FÉLIX CONTRERAS

(Translated from the original Spanish by DR. J. ROSS INNES)

As its name indicates, it is the form in which leprosy is obliged to begin. Sometimes it is of fleeting duration, until the time comes when there is a definite change to one or other polar type, and even mistakenly makes one think that the disease has begun by one of these types. At other times the duration is longer, and it can even maintain itself immutable, as indeterminate leprosy, during the whole course of the disease, or regress to cure.

Our concept of it has not changed since 1953 and we continue to include in the indeterminate group those relatively unstable benign cases, almost always negative for bacilli, which have flat skin lesions. Sometimes these skin lesions are lightly erythematous but almost always hypochromic. The lepromin reaction is usually negative, though in some cases it is positive. There are evident changes in sensitivity and changes in reflexes due to impairment of conductivity of nerve fibres (the histamine reaction). When it remains immutable for a sufficient time, more or less extensive forms of neuritis can appear, and we even should accept the possibility that pure neural forms exist within this group, which will be very difficult to place in diagnosis. We should only consider as cases of indeterminate leprosy those in which, besides the facts previously pointed out, an absolutely non-specific histology is established. In the moment in which histologically there is noted some sign of specificity, at least that one of some epithelioid cells of Virchow, the decision is plain and such cases should be classified as tuberculoid or lepromatous, without admitting the names 'pretuberculoid' or 'prelepromatous'.

Neither should be considered as indeterminate leprosy those residual non-specific lesions which precede the cure of both polar forms, since clearly they have a very different biological meaning and their characteristics are very different.

The proportion in which we have encountered in determinate leprosy has been 99 (7.5%) indeterminate among 1,046 classified in the Fontilles Sanatorium. There have been 594 indeterminate among 3,751 in the whole of Spain (about 15.9%) among those classified in Spain by different services.

The diagnosis of indeterminate leprosy is first thought of clinically in the simple macular cases, especially when one is dealing with hypochromic or very lightly erythematous macules. It can also be thought of in pure neural cases with very little symptomatology. Intensely positive bacilloscopy leads in the possibility that we are dealing with the lepromatous variety. Immunological reactions do not have diagnostic value in these cases. The diagnosis of the cases of this group should be confirmed histologically, even when the pathological anatomy cannot ratify the specificity of the leprosy. When the other clinical, bacteriological, and histological data are known, only the histology will be able to exclude the possibility that we are dealing with one of the subsequent polar types.

Our Judgement on Indeterminate Leprosy

by J. R. PUCHOL

(Translated from the original Spanish by DR. J. ROSS INNES)

(1) It is a macular form of leprosy which generally precedes one of the other forms and which can develop towards them, remain as such, or regress towards cure. It is then a form generally initial, unstable, benign.

(2) We have studied 1,603 biopsies classed as follows:

Lepromatous, 828 cases or 50.8%
Tuberculoid, 509 cases or 31.2%
Indeterminate, 281 cases or 17.2%
Reactional Tuberculoid (Borderline), 12 cases or 0.8%

(3) We found hypochromic or erythematous macular lesions of irregular distribution. They generally had well-defined borders, sometimes not very precise borders, with upsets of sensitivity. There could be involvement of nerve trunks, usually in the cases of long duration.

In the histology there were non-specific inflammatory infiltrates. These were banal and predominantly lymphocytic, chiefly around the vessels and at times the sweat glands. Sometimes there was perineuritis in the nerves of the deep dermis. There were not epithelioid cells nor Virchow cells. When this happens the case should be classified in the corresponding polar type.

Bacteriologically the cases were mostly negative, or weak positive.

(4) The most important data for correct classification are:

(a) *Clinical.* Strictly macular lesions, that is to say, without any infiltration in the lesions.

(b) *Histological.* A single inflammatory structure. The finding of small groups of cells of epithelioid type or of Virchow cells implies exclusion from the group.

The bacteriological and immunological data in this form of leprosy are chiefly of prognostic value, since they indicate a tendency or possibility of evolution.

Purely neuritic cases, in which rarely histological data are available and which only sometimes are indeterminate, we should classify according to the rules proposed by the Ibero-American group in the Madrid Congress.

(5) Usually slow insidious onset, with rare symptoms or none at all, are rarely in the form of an eruption. Evolution is variable: (a) cases of spontaneous involution; (b) persistent cases; (c) cases which transform into lepromatous; (d) cases which transform into tuberculoid; (e) cases which transform into borderline.

The transformation into lepromatous or tuberculoid can be slow or by means of successive attacks.

The transformation into borderline comes about as consequence of a special outbreak of soft plaques, which are very erythematous, and oedematous and succulent, and the general condition is good. The attacks are repeated, and at the beginning regress without leaving marks. After several attacks a final lepromatous type is apt to establish itself.

(6) The residual macular lesions should not be classified in the indeterminate group, but keep their popular primitive label as 'residual'.

The macular atypical lesions, such as have especially been noted by DAVEY, BROWNE, and ROSS INNES, are certainly transition phases of indeterminate forms to one of the polar types. These intermediary forms of macular leprosy correspond to the older 'pre-lepromatous' or 'pre-tuberculoid' which generally we classify in the polar types.

Note on Borderline Leprosy

by J. R. PUCHOL

(Translated from the original Spanish by DR. J. ROSS INNES)

(1) It seems that we are dealing with an unstable form of the disease, which corresponds to a stage or phase of transition from one polar type to another, surprised in an intermediary evolutive stage, nearer to one than the other pole, and therefore with variable characteristics.

(2) Possibly there are important geographical differences which influence the frequency which is distinct in one or another country. In Spain the number of

cases seems very small. If, as we think, reactional tuberculoid leprosy is at least one of the forms of borderline, our classified cases provide 0.8% of all patients seen by us in a total of 1,630 cases.

(3) In our opinion, the cases classified up to now as reactional tuberculoid leprosy correspond to a form of borderline. We have studied 12 well-controlled cases and some isolated biopsies, of patients in the Far East, received through PROF. GAY PRIETO. They were diagnosed there as borderline, and we have catalogued some as lepromatous, and others as reactional tuberculoid.

Clinically there were outbreaks of usually great plaques which were erythematous and sometimes almost violaceous, with great infiltration and oedema. The localisation was very arbitrary, but very often on the face and extremities. The oedema was intense in the hands, feet, and pavilions of the ears, especially in the lobules, where it can simulate lepromata. At times there were circular plaques with diffuse external border and the internal border very sharp in contrast. The general state is apt to be insignificantly affected. There can be neuritis, generally not very intense at the beginning.

The bacteriology is positive, more so in the lesions than in the nasal mucosa. The lepromin reaction is generally negative.

The histology is that of a granuloma, with contradictory characteristics between the polar types, as often has been said. This granuloma is deformed by the exudative features proper to a reactional attack. In our opinion, none of the histological characters described, such as the persistence or not of the band of UNNA, the existence or not of small globi, the more or less vacuolization of the cells, the presence of giant cells, etc., always evaluated quantitatively, are constant. In consequence we are dealing with a depersonalized histological image.

We have never seen to co-exist in one patient the two polar granulomata, neither in the same biopsy, nor in biopsies from different territories of skin.

(4) In this form of leprosy the histology does not form a solid basis for classificative diagnosis. In our opinion the fundamental cause of discrepancies between leprologists about the borderline form, resides in the desire to meet a defined morphological picture, which allows the giving of character and expression to some clinical awkward points pertaining to the disease.

It appears to us very difficult to obtain strictly histological differentiation between a lepra reaction of a quiescent tuberculoid, reactional tuberculoid, or borderline. If a polar form can change into another, there will be intermediate degrees in the exudative reactional episodes, which will produce variable pictures, with quantitative differences in certain limits, and this could explain the divergent judgments of different leprologists.

If we consider that the data of bacteriology and immunology which almost always incline us towards the lepromatous form, are not decisive from the point of view of classification, it will be grasped that *the basis of diagnosis must be essentially clinical*, and reliance will be placed on the general characteristic of the attack. Naturally, when the histology demonstrates an evidently polar structure in spite of the clinical appearance, the classification will be the polar type corresponding.

So understood, borderline leprosy comprises unstable cases in evolution, transforming between polar types, with reactional tuberculoid in one extremity, and possibly the phenomena of reactional reversion of WADE in the opposite extreme (Pseudo-exacerbation of USO ZA LIMA?).

(5) In our opinion it is not possible to speak of borderline macular forms (please see our report on indeterminate leprosy).

Indeterminate and Borderline Leprosy

by DHARMENDRA, IYER, C.G.S.
RAMANUJAM, K. & RAMU, G.

Herein is reported a study of eleven Indeterminate and twenty-two Borderline cases. The classification of these cases into the two categories was purely on clinico-bacteriological grounds. Be-

sides, the study included immunological and histopathological investigations.

INDETERMINATE LEPROSY

The age of the patients varied from 8 to 27 years, and the duration of the disease according to the history was from 10 months to 11 years.

Clinically all the cases presented multiple, widely and bilaterally distributed lesions. In all the cases the lesions were flat and in most instances poorly defined. Surface of the lesions was smooth in some and dry in others. All cases showed loss or impairment of fine touch at least in some of the patches. The peripheral nerve trunks were thickened in all, but there was no thickening of cutaneous nerves in association with the patches.

Bacteriologically all the cases but one were positive for lepra bacilli from an occasional to a few bacilli in their skin smears taken by the 'slit and scrape' method. Smears from apparently normal skin were negative.

Lepromin test: The results of the test, using Dharmendra antigen were mildly 'positive' (1+) in one case, 'doubtful' in five and 'negative' in the remaining five cases.

Histopathology: Roughly half of these cases showed only a chronic non-specific inflammation. In the others small groups of epithelioid cells were found in relation to appendages and nerves. Bacilli were found in sections in single and small groups predominantly in nerves.

BORDERLINE LEPROSY

The age of the patients varied from 8 to 55 years. The duration of leprosy ranged from 3 months to 13 years, and the duration of the presenting clinical condition (infiltration, etc.) from 1 week to 3 years.

The onset in most cases was abrupt. In the majority of cases it followed administration of DDS for varying periods. According to history, some originated from erythematous thick lesions and some other from hypopigmented flat lesions.

Clinically the lesions were multiple and widely distributed, bilateral and sometimes symmetrical. All the cases had infiltrated, erythematous, and mostly succulent lesions; a small number, in addition, had hypopigmented flat lesions. In a majority of cases the edge of the lesions was sloping and in some there were both well demarcated and sloping edged lesions. Some of the thickened lesions showed an apparently normal looking centre.

Sensory changes, varying from impairment to loss of fine touch, were seen in at least some of the lesions of all the cases. Involvement of peripheral nerve trunks was observed in all cases; in addition there was thickening of cutaneous nerves in relation to patches in about half the cases.

Bacteriologically all the cases were mildly to moderately positive than in the Indeterminate group reported above. Smears from the unaffected normal skin away from the patches were negative.

The lepromin test using Dharmendra antigen gave 'negative' results in 6 cases, 'doubtful' in 9 and 'mildly positive' (1+) in 7.

Histopathology. The histological features encountered in these cases can be broadly grouped into the following three categories:

(1) The 'tuberculoid' type with some atypical features, such as a variable admixture of polymorphonuclears and vacuolation both intercellular and intracellular.

(2) In some cases exudates were generally larger and both focal and continuous. The predominant cell was a polygonal element with ample granular or vacuolated cytoplasm, a clear vesicular nucleus, and cell outline that varied from oval to elongated. As in the previous group, inflammatory cells were found admixed in variable numbers. The subepidermal zone was not infrequently spared.

(3) In the remaining cases the histological picture was a combination in various proportions of the above two types.

In all the above categories nerves were affected and the involvement took the form of infiltration, fragmentation, total replacement or prominence of the mesenchymal investment of the nerves. All these cases showed acid fast bacilli predominantly within the nerves and frequently in the cells also, in singles and in small groups; in a few cases larger groups resembling globi were also seen.

Chemical Aspects of the Chemotherapy of Leprosy

by QUINTINO MINGÓIA

(Translated from the original Portuguese by DR. J. ROSS INNES)

The author describes the antileprosy medicaments introduced in the last 20 years in the field of chemotherapy or of antibiotic therapy, dividing them according to their origin and chemical constitution into the following groups: (1) sulphones; (2) thioureas; (3) thiosemicarbazones; (4) thiolesters, and thioamides; (5) antibacterial sulphamides; (6) non-sulphurated compounds; (7) antibiotics.

He brings evidence of the superiority of the sulphurated synthetic compounds in their different forms (sulphones, thioureas, sulphamides) and the importance of associated treatments.

He supports the study of new chemotherapeutic agents, some of them recently employed in the chemotherapeutic treatment of tuberculosis, which show new chemical characteristics (geometric isometry, polynitrogenated heterocyclic molecules, thiouronic-S, etc.).

Lepromin Reaction of the Population of an Endemic Area of Leprosy and Evaluation of the Anergic Band of Incidence

by J. C. DE SOUZA CARVALHO, WAGNER DE MOURA HILDEBRAND, AND EURICO A SERÓDIO

(Translated from the original Portuguese by DR. J. ROSS INNES)

The authors who have worked in the national campaign against leprosy (SNL) since 1958, have been verifying the low percentage of positive Mitsuda reactions among contacts, in Araras region in the state of São Paulo. Impressed by the high anergic band in the region, that is to say, the negative lepromin reactions, they decided to carry a general test of the population of the municipality of Araras, which has 39,398 inhabitants.

Because of the impossibility of making inoculation of lepromin (MITSUDA-HAYASHI antigen) in the whole population, we chose seasonal population groups of all social strata in urban and rural zones.

So we have carried out 1,365 inoculations of lepromin, reaching school groups, gymnasium groups, shooting range groups, makers of high quality goods such as Nestle, haciendas, sugar, factories (the São João Factory), sail stores, etc.

The 1,365 inoculations of lepromin involved the reading of the results on 1,088 individuals. The reading was made at 48 hours (Fernandez reaction) and at the 4th week (the Mitsuda reaction. For the reading of the reaction as a rule collaboration was given by the National Leprosy Service inspired by ORESTES DINIZ.

Psychological Repercussion in Child Leprosy Patients

by DR. ESTRADA SILOS

(Translated from the original Spanish by DR. J. ROSS INNES)

'*We do not know the child.*'

This lack of knowledge reaches its supreme point when it is in the doctor before whom a little leprosy patient presents, and he is given attention as a patient, forgotten that it is a *child* who above everything should be considered.

We refer to the child, about whom we are intending to concern ourselves in this paper, because he is the human being whose psychic state is found in the most delicate and susceptible state of all. Of the child we can make what we wish. It is the opportune moment to inculcate in his spirit the principles by which he can rule his whole life, and this is the reason why we should avoid every hurt to his soul and mind.

These children are like all children, cheerful or sad, silent or talkative, but always docile and affectionate, when they have been conquered with the art of love.

How is this done? In Mexico, in the Pascua dermatological centre a team labours, called the Social Worker, of Sisters of Charity, who receive the patient in their Medico-Social Department, and from the first moment establish human relations with the child and his relatives.

It is a delicate medical and social work to care for these children, but above all it is human. These children will be men tomorrow and quickly like all men

demand their rights, and of course the 'freedom to live', which should not be truncated, and least of all by the doctor.

The object of this paper is to follow the aspects of the child leprosy patient from the psychosocial point of view. We made a study of 100 child leprosy patients cared for medically and socially in the Pascua Centre in the period between 1951 and 1962, and give the following data:

Clinically lepromatous patients predominated at 49%, tuberculoid 27%, and indeterminate 24%.

In 44% of them, the fountain of infection as antecedent case was the parents. All these were given sulphone treatment in dosage of 25 and 50 mg. per diem, with favourable result except in diffuse lepromatous cases. At the present time 65% continue their treatment and 8% are without medical supervision because they have gone astray.

From the social point of view and remembering the principles expounded, and considering the patient first of all as a human person with all his problems, we find that all these children continue their normal life and hence are able to pursue their studies and occupy their place in society. Of the children 90% are of school and pre-school age, say from 5 to 14 years of age, and of the children 35 were illiterate.

Concerning social class and all which pertains to that, we have adopted a special classification and have formed two groups, Normal Social and Weak Social, and the latter classification has three grades, Weak Social 1, Weak Social 2, and Weak Social 3, which record social weakness in progressive grades.

Among the 100 children studied we found:

Normal Social	25%
Weak Social	75%
Weak Social 1	28%
Weak Social 2	17%
Weak Social 3	30%

It has been said among us that leprosy sometimes has been for us an opportunity to go forward, to get inside patients in effect and someone then is able to give them an impulse, so that at the present time we already have 52 normal social children and 27% may be able to succeed further, and be useful to themselves and to society.

Borderline and Indeterminate Leprosy

V. R. KHANOLKAR

The 'indeterminate' phase of leprosy is a stage when the disease has not yet disclosed itself to the type or variety into which it is going to evolve. Clinically this phase is marked by the appearance of weal-like papules, or pale pink macules with an irregular wrinkled surface. There is often a spontaneous and permanent recovery in about three-quarters of infected persons but in the remaining the disease may progress to dimorphous, tuberculoid or lepromatous leprosy depending upon the natural susceptibility and racial proclivity of the persons affected. There is very little clinical or histopathological indication of probable course which the disease is going to follow. Occasionally the 'indeterminate' phase may be by-passed and the silent phase may blossom out either into a lepromatous or into the tuberculoid type.

Histologically the skin biopsy shows foci of chronic inflammatory exudate, mainly around the fine nerves in the dermis. The exudate consists of lymphocytes, histiocytis, plasma cells and occasionally polymorphonuclear leucocytes. It is possible to demonstrate small numbers of acid-fast bacilli by the concentration technique in some cases. In some of the histological sections acid-fast bacilli are seen either in the reticular tissue of the dermis or in the finest cutaneous nerve twigs. The lepromin test at this stage of the disease is variable, ranging from negative to faintly or strongly positive.

Contribution to the Study of Borderline and Indeterminate Leprosy

R. D. AZULAY

The classification of the clinical forms of leprosy should be closely linked to the degree of resistance, and hence to heredity. To be reactional, all and any classification must be based on the concept of polarity. The interpolar zone, owing to the instability of resistance therein, ad-

mits of divergence of opinion. This band covers the forms: reactional tuberculoid, borderline and indeterminate.

I. BORDERLINE LEPROSY

A study is made of 35 cases from a clinical, immunological, bacterioscopic and histopathological angle. The frequency of borderline leprosy varies with the interest in, and the extent of the resources available for diagnosis; it is probably far more frequent than is suspected. The highest frequency, in comparison with other forms of leprosy in the statistics presented up to date, is 6.4%.

Considering the matter from a clinical viewpoint, the author draws attention to: hollowed or Swiss cheese lesions; the infiltrated lesions peculiar to the TR form; oedema of the extremities; hyprochromic and erythematous patches with uncertain edges; infiltration of the ear lobes; on one or both sides; the greatest number of lesions, less symmetrical than in L; lesser nerve involvent than in L; frequent absence of general symptoms and fever; finally, negative data, *e.g.*, absence of ocular involvement, gynaecomastia, madarosis, orchitis, adenopathy and visceral disorders. Histologically, the author stresses the concomitance of the two structures L and T, either in a single lesion or in different lesions, required to make a reliable diagnostic of B, and also insists on the fact that the T and L structures are by no means typical; on the contrary, they are confused and upset. Out of 25 cases, the diagnostic of B was made from the first biopsy in 19 cases.

Bacilli determination was 100% positive in the sections, as compared with sloughing (positivity: 75% in the skins and 73% in the nasal mucus). Negativity was 86% in the early and 59% in the late lepromin reaction. The author draws attention to the frequency of the fluctuating or oscillatory phenomenon in the lepromin reaction (22% of late reactions fluctuated). As to the onset, this was slow in most of the author's borderline cases, in contrasts with the findings of certain other authors. Furthermore it seemed to the author that the cases started with the I form. The evolution of the case generally followed the chronic course, but sometimes, more rarely, it was acute. Specific treatment brings about a rapid improvement of the patients as a result of the disappearance of the T fraction (not really lepromatization), which, in fact, may regress somewhat more rapidly than lepromatous cases.

II. INDETERMINATE LEPROSY

The author confirms the initial views of Brazilian leprologists with regard to this form of leprosy. I leprosy cases are identifiable by hypochromic patches, often with loss of sensitivity and a change in the histamine and pilocarpine reactions.

Bacterioscopy is frequently negative and, when positive, few bacilli are to be found. The lepromin reaction may be positive, negative or oscillating.

The frequency as compared with the other forms of leprosy is according to the efficiency in carrying out the work, increasing with the efficiency. In Candelas there were 26.1% I cases compared with the other forms of leprosy, but an intensive census brought this figure up to 57.5%. The importance of the I form lies in the early diagnosis of leprosy. I cases may remain as such for many years and even involve or transmute to B, L or T. Periodically repeated bacterioscopic examinations and lepromin tests serve to forecast (though not categorically) the possible evolution of I cases. The points at issue as regards the independence of the I form are concerned with the conception of maculo-anaesthetic, neuritic and macular dimorphous forms. Maculo-anaesthetic cases should be considered as I; when biopsy reveals tuberculoid granuloma, they should be reclassified as macular T. As to pure neuritic cases, they may be distributed over the three forms of leprosy (L. T or I), according to the clinical and bacterioscopical characteristics observed. In its initial stage, macular dimorphous leprosy exactly corresponds to the I form.

The Five Year Progress of Leprosy Control in Korea

JOON LEW, M.D., PH.D.

This is the progress report of 'The Epidemiological Studies of Leprosy in Korea' reported at the 7th International Congress of Leprology.

About 20,000 institutionalized and 8,000 O.P.D. patients were examined and analysed as to bacteriology, appearance, deformity and physical capability, and classified into five categories of bacteriologically negative and positive for their social rehabilitation.

To accommodate each category of the patients, 5 hospitals for positive cases, 4 special hospitals for far advanced crippled cases, 2 special hospitals for corrective surgery, 20 leprosy out-patients clinics, 8 mobile clinics and one pilot project area are in operation.

Programme of the resettlement project for negative, arrested and physically capable cases for their social rehabilitation are actively carried out and a total of 7,658 cases have been resettled in 57 villages.

Health education and propaganda campaign are actively carried on through leprosy training courses in medical and nursing school curricula, lectures to college – and high school-level students and extensive propaganda for the general public.

Many specialists for leprosy control and corrective surgery are sent abroad. Special leprosy training courses are given to more than 2,000 public doctors and 1,500 public health nurses. A leprosy journal and a bi-monthly magazine for the general public are published.

The birth control campaign during the positive stage and separation of children from parents with active leprosy and preventive measure with BCG and DDS are conducted.

The compulsory segregation law has been abolished.

The sample random survey is done twice, and a nation-wide survey of military conscripts is being carried out.

Reconstructive Surgery in Leprosy

ROBERT R. SCHENCK, M.D.

Anaesthesia, paralysis and deformity in leprosy have as etiology the reactional response in nerves following infection with the causative organism, *Mycobacterium leprae*. Reconstructive surgery can help to a varying degree almost all leprosy patients with a deformity.

Both social and economic factors present a strong case for including reconstructive surgery as an integral part of the total public health measures advocated in treatment and control of leprosy in countries with a relatively high incidence. Surgical results will encourage all patients and the medical approach will have greater effectiveness.

Basic principles of reconstructive surgery in leprosy include the adequate use of physical therapy, pre- and post-operatively, the use of proper surgical materials and techniques, the substitution of non-paralysed muscles as motor power to replace paralysed muscles, and the use of free tendon grafts if necessary between muscles being transposed and the desired site of insertion. Selected surgical procedures in leprosy patients are described, with emphasis upon operations designed to replace the action of intrinsic hand muscles on the fingers and thumb. Surgery is useful in treating anterior tibial and hand extensor paralyses, neurotrophic joints, and skin contractures. Prevention of deformity as a programme of education can be carried out during the rehabilitation period.

Reconstructive surgery offers *hope* in leprosy.

Experimental Inoculation of Human Leprosy in Laboratory Animals

DR. J. CONVIT
DR. P. LAPENTA
DR. A. ILUKEVICH
DR. T. IMAEDA

In a previously prepared paper presented for publication in the International Journal of Leprosy and now in press, the authors have reported the results obtained in laboratory animals inoculated with material from cases of human leprosy.

The present report condenses the net experience gained during the four years that this work has been carried on.

Experimental inoculations with human material were made in 65 groups of animals. In 27 groups the material used

was from LL cases. Borderline material was used in 21; material from the indeterminate type was used in 6 and tuberculoid, especially from reactional stages, in 11 groups.

Control groups were injected with material sterilized at 120°C. A total of 2,502 animals were hamsters and the rest white and black mice, rats, guinea pigs, rabbits and swine.

The inoculum was prepared in two ways, either by triturating the material in normal saline as soon as removed from the patient to obtain a suspension to be injected in its fresh state, or by treating material, similarly triturated, with trypsin to obtain a nearly pure suspension of bacilli to be injected as soon as prepared.

The animals were inoculated intradermally; sites chosen were the ear, footpad, testicles, peritoneum or the cheek pouches (hamster). All animals that died were autopsied with careful attention to the skin and the viscera.

The examinations included microscopy of smears prepared with the Ziehl-Neelsen stain, as well as histopathological and electron microscopic studies. Cultures were attempted in the Löwestein-Jensen medium. The observations were the following: In three groups, inoculated with borderline material, lesions appeared after 8–10 months. Material from these lesions was used in subsequent passages in which the period of inoculation was shortened to 3 or 4 months and even less. Ten passages have been made to date. Smears from the lesions showed an abundance of acid-fast bacilli, as did also the histiocytes composing the granuloma.

The electron microscope gave evidence of lesions that reminded of the human leprous granuloma.

Our repeated attempts to cultivate the bacilli originating in borderline lesions were negative. In the 27 groups inoculated with LL material only one animal, a hamster, produced lesions with acid-fast bacilli. When these were inoculated into the Löwestein-Jensen medium a culture was obtained of an acid-fast, 'non-photochromogenic' bacillus.

An antigen was prepared from the lesions produced in the hamster with material of borderline origin. The reactions produced in lepromatous patients in tests with that antigen are subject to discussion.

Leprosy in the Netherlands

E. H. HERMANS

Before the second World War the leprosy problem in the Netherlands was of but little importance, because there were only a few tens of sufferers from leprosy, mainly ex-soldiers from the former Dutch East Indies.

After the war the situation changed as within a short time some hundreds of leprosy patients came from Indonesia to the Netherlands, especially Dutch people of mixed parentage and Amboyneses, who needed treatment and for whom provisions had to be made.

At the beginning this work was confronted with great difficulties, but after a special organisation for helping those who suffered from leprosy was founded with the help of the Government, matters greatly improved.

A Central Administration together with a Medical Service and an Office for social help were established and a special health-resort was opened for this kind of patient. In some hospitals these patients could be admitted without any difficulties. In this way we succeeded in curing a considerable percentage of these patients and also owing to the help of the authorities we succeeded in revalidating them, so that they could resume their place in society.

Though no compulsory measures were taken and a considerable percentage of the sufferers from leprosy could live entirely free, no new infections originating from these people from Indonesia were seen.

The Histoid Variety of Lepromatous Leprosy

H. W. WADE, M.D.
AND
JOSÉ G. TOLENTINO, M.D.

1. The 'histoid' variety of lepromatous leprosy is so named because the typical lesions resemble a tissue-forming process

rather than a granuloma. The condition is commonly mistaken for fibrosis.

2. The essential clinical feature is nodule formation, notably subcutaneous but also cutaneous. The nodules are well vascularised, but, being primarily expansible, they contain no nerve branches. Variations of appearance are many.

3. Histologically the variations from the typical are legion, particularly those involved in activity of the process. Besides (a) the tissue-like character of the lesions, essential features include: (b) a primarily expansile rather than infiltrative manner of growth of the nodules, although certain of the skin lesions are in effect infiltrative, and secondary restricted infiltrative additions often complicate the picture of the nodules; (c) the typical *absence of globus formation*; (d) the spindle-shaped nature of the characteristic cells (not of epithelioid type); (e) the common occurrence of undifferentiated large round macrophages (histiocytes) in the more active areas; (f) the frequent occurrence of area of breakdown in subcutaneous nodules (local reactional 'abscess' formation), usually without polymorphonuclear leucocytes.

4. Extraneous to the histoid areas in sections of cutaneous lesions, inactive foamy-cell areas (relics of the previously-existing ordinary lepromatous process) may be found; and, also extraneous, there may be more or less active areas of co-existing lepromatous infiltrates.

5. Bacteriologically, the striking features are: (a) the extraordinary abundance of the bacilli in most lesions, especially in the more active areas; and (b) the large size of the bacilli (conspicuously in contrast with those of any ordinary lepromatous foci that may be present).

6. In the spindle-shaped cells the bacilli are characteristically in groups or larger packets conforming to the shape of the cells in which they are located, and in the large macrophages of the more active areas they tend to produce solid round masses which obscure the containing cells. These features constitute the 'histoid habitus', in striking contrast with what occurs in ordinary lepromatous lesions.

7. Finally, but important, is the occurrence of definite tuberculoid foci of true epithelioid cells located in ('contaminating') histoid lesions, not infrequent in the subcutaneous nodules but rare in the cutaneous lesions.