LEPROSY REVIEW

Volume 44, Number 4, December 1973

Published Quarterly for the
British Leprosy Relief Association
by Academic Press

Leprosy Review

The Scientific and Research Quarterly of the British Leprosy Association LEPRA

Volume 44: 4 issues, March–December 1973; £4.00 + £0.30 postage inland and abroad.

Subscription orders should be addressed to Academic Press Inc. (London) Limited, 24/28 Oval Road, London NW1 7DX, except those originating in Canada, the U.S.A., and Central and South America, which should be sent to Academic Press Inc., 111 Fifth Avenue, New York, New York 10003. $9.60 + $0.75 postage abroad

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Editorial

SCIENCE AND COMPASSION

Both these overworked words are in danger of losing their lustre and their precision. They have come to include much that is meretricious and unworthy, and not a little that may be false and misleading. In leprosy they are good words still. And they together shine forth in the pages of this and other issues of *Leprosy Review*.

Though science and compassion may at times have been set in stark contrast, in a sort of unyielding polarity, each needs the other if science is not to become irredeemably materialistic and if compassion is not to degenerate into sentimentalism. Science is often less than scientific, and its brave rational façade may conceal unsuspected depths of "hunches" and serendipity. And compassion—if it is to be true to its finest ideals—must take cognizance of the new knowledge if it is to use its resources aright. In the laboratory as in the field, in the pursuit of immunological understanding or the objective appraisal of a drug trial, the scientific spirit of enquiry and the compassionate spirit of service are both needed.

Over the years, of course, the proportions of the scientific and the compassionate components of the struggle against leprosy have varied within wide limits. Time was when it was rather heretical and medically impertinent even to suggest that leprosy should, or could, be regarded as a disease, to be studied like any other disease. The humanitarian movement, which was the expression of the awakening social conscience of the West, at last embraced leprosy within its purview, and the whole world is indebted to the Wellesley Baileys and the Father Damiens of a century ago and subsequently. This was compassion, disinterested compassion, of a high order. At about the same time, individual pioneers, like Hansen himself, were striving to relate their social concern to their medical knowledge, and The Mission to Lepers of India was urging the state governments to create model institutions for the care of leprosy sufferers.

Organizations that more overtly espoused the combination of compassion and science—such as the British Empire Leprosy Relief Association and the Leonard Wood Memorial, with their filials and successors—then achieved a widespread acceptance that has persisted. But with the admission of leprosy into the halls of scientific respectability, and particularly with the many significant advances now being made in immunopathology and microbiology, compassion is in danger of being squeezed out. Uneasy bedfellows at the best of times, they sometimes seem to be incompatible and mutually incomprehensible. They don't speak the same language or appeal to the same audiences. In the recent International Congress at Bergen, despite the scintillating display of brilliant scientific achievements, some participants could not suppress the suspicion that the individual patient in his tiny village "at the back of beyond" was in danger of being left out in the cold. We need the science, we desperately need more

knowledge about leprosy—for the riddles and conundrums are still there—but we do also need the kindliness and consideration for the patient that are the hallmark of good medical practice.

It is perhaps here that the voluntary agencies can play their most useful rôle. This is certainly not to suggest either that they have a monopoly of altruistic concern or that they must eschew all suggestion of involvement in the scientific aspects of leprosy. Indeed, we may gladly pay tribute on the one hand to the deep humanitarian concern of many now engaged in leprosy research, and on the other hand to the increasing support given by voluntary agencies in such research. Complementary to the fine work of the World Health Organization and UNICEF, and the growing interest of governments, the agencies whose activities are described in this issue of *Leprosy Review* are not only very much alive today, but alive to the changing pattern and needs of the leprosy problem. They can supplement official programmes, and by their flexibility and initiative place significant emphasis at strategic points. They can also keep bright the ideals of altruistic service for the individual that have never been more needed than at present, and in the harsh sad world of the sufferer from leprosy.

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News and Notes

TENTH INTERNATIONAL LEPROSY CONGRESS BERGEN, 1973

To judge from the number of participants, the number and quality of the papers given, and the importance and significance of the progress reported, the Tenth International Leprosy Congress must be regarded as the most successful yet. It was a happy thought that prompted the Norwegian Government to invite the International Leprosy Association to hold its Tenth Congress in Bergen to coincide with the centenary of Hansen's discovery of the causative organism of leprosy.

His Majesty King Olav V took a warm personal interest in the Congress, gracing with his presence both the Opening Ceremony and the subsequent gathering at which fitting homage was paid to Hansen and floral tributes laid at his bust.

Eight small committees, each dealing with recent advances in different aspects of leprosy, had been at work by correspondence during many months preceding the Congress, and in Bergen itself for several days before the Congress. Their reports represent a consensus view of groups of experts. Concurrent sessions were held, at which simultaneous translation in English, French and Spanish was provided.

The number of participants exceeded all previous records. Leprosy is indeed proving a fascinating disease to the microbiologists and the immunologists, as the wealth of new work presented in the relevant sessions demonstrated. Member-Organizations of ELEP were well represented, both by leading officials and by sponsored participants from aided leprosy projects in many lands. The Association of French-speaking Leprologists held a meeting during the Congress.

The General Meeting of Members of the International Leprosy Association decided that the 11th Congress should be held in Mexico City five years hence, that is, in the autumn of 1978. Full announcement concerning the exact dates and all other relevant information will be published in *Leprosy Review* as soon as it becomes available. Dr J. Convit was elected as President of the Association for a further 5 years, and Dr S. G. Browne was asked to continue as Secretary-General.

TROPICAL DOCTOR

Each of the 3 (quarterly) issues of *Tropical Doctor* already published this year as part of Volume 3 contains matters of interest to readers of *Leprosy Review*.

No. 1 devoted no fewer than 25 pages to a symposium on leprosy, with articles on recognition and on management (both by S. G. Browne), on the treatment of leprosy and its acute complications (W. H. Jopling), the microscope and leprosy (D. J. Harman), blindness (D. P. Choyce), and surgical management (E. P. Fritschi).

A further article, on drugs for leprosy (by R. J. W. Rees), appeared in the next number, and two articles provoked by the symposium ("Leprosy—an alternative viewpoint", by C. L. Crawford, and "Management of Neuritis in Leprosy", by R. E. Pfaltzgraff), together with an Editorial entitled "Leprosy—a complementary contribution" were published in No. 3. The Editorial concluded with the words "let the debate continue". It may be that future issues of *Tropical Doctor* will contain further informative and stimulating articles on leprosy.

Tropical Doctor has firmly established itself as required reading for anyone concerned with the health problems of tropical countries. The articles are all commissioned, and are written by experts with first-hand knowledge of the real need of doctors working far from medical centres replete with investigative gadgetry and consultant skills.

We commend this publication to readers of *Leprosy Review*. Orders may be sent to: *Tropical Doctor*, International Relations Office, The Royal Society of Medicine, 2 Queen Anne Street, London W1M 0BR, England. The subscription rate is £4 stg. (or U.S. $10) *per annum*.

DAMIEN-DUTTON AWARD GOES TO DR J. CONVIT

During the closing ceremony of the Tenth International Leprosy Congress in Bergen, Mr Howard E. Crouch (Founder-Director of the Damien-Dutton Society) presented the 1973 award to Dr J. Convit, the President of the International Leprosy Association, for his outstanding work in directing the leprosy control programme in Venezuela. *Leprosy Review* adds its sincere congratulations to those that Dr Convit has already received from many quarters.

ALERT—RURAL AREA SUPERVISORS' COURSE, 1973

ALERT continues to provide much-appreciated courses for many different grades of medical workers, ranging from the high-powered specialists in immunopathology to the humble medical auxiliary involved in the leprosy programme in Ethopia itself.

Perhaps one of the most difficult courses to organize and carry through is that devoted to "teaching the teachers", the rural area supervisors' course. Previous systematic training and experience, and ability to profit from instruction given in English both vary within a wide range. Of the 28 students who remained throughout the 4 months of the course, 19 came from 10 African countries, and 9 were from 9 different countries outside the continent, only 4 of whom spoke English as their mother tongue.

Profiting from previous experience in organizing such courses, the staff of ALERT this time paid particular attention to the specific needs of practice in the rural areas, with emphasis on the quality and appropriateness of programmes, and supervision of trainees during the course.

A large part of the continually extending effectiveness of such courses lies in the preliminary screening of applicants, preference being given to those who will have teaching responsibility on their return home. It was found that certain desiderata were important: these are (1) previous experience (5 or 6 years) of practical and paramedical work; (2) a real desire to profit from the course, and subsequently to serve with dedication; and (3) the ability to understand and learn

through the medium of English. It was found to be better to have few instructors (each giving more time to the course), and to emphasize the skills and requirements of the actual work the area supervisors will be doing in their respective countries.

Future courses will incorporate lessons learned from participant-evaluation reports and observations by the staff on the practical tasks undertaken by the trainees.

WHO–LEPROSY PUBLICITY

As part of its 25th Anniversary publicity, the World Health Organization (WHO) is producing a series of press releases on major public health problems. Under the heading "Isolation unnecessary", an attractive and readable duplicated "hand-out" giving "25 facts about leprosy" has been prepared.

Nothing but good can come from this effort to get leprosy published in non-specialist journals and discussed at all levels of society. Leprosy is indeed one of the "major public health problems" in over 70 countries, principally in the developing part of the world. As the 25th fact declares: "activities with which WHO has been already concerned have succeeded in taking leprosy and the leprosy patient out of isolation, a situation that had lasted for many centuries. However, much remains to be done and WHO continues to search for better tools against this disease."

NEWS FROM ZAÏRE

Leprosy is said to be on the increase in the two Kasai Provinces of the Republic of Zaïre, there being no concerted effort at case-finding and control. At the Good Shepherd Hospital, Tshikaji, near Kananga, financed by the American Leprosy Missions, Inc., a rehabilitation wing is being built. Here patients whose disabilities are due to leprosy or other causes will be able to receive skilled help and treatment. In an integrated teaching and demonstration programme, leprosy treatment and control will form part of the wide-ranging public health programme consisting of medical services, the training of auxiliary workers, health education, research, and rehabilitation.

IRAN–AN INTERESTING EXPERIMENT

Five years ago Bekhadeh was a desert and deserted s
wastes extending over 100,000 acres (about 40,500 ha) some 60 miles (96 km) to the north of Bojnourd, not far from the border of the U.S.S.R. It was also a dream in the mind of His Excellency Dr A. H. Radji, the moving spirit behind the *Association d'Assistance aux Lépreux*.

Now, with the financial and technical backing of the French *Compagnie Internationale de Développement*, the desert of Bekhadeh is blossoming as the rose. Over 300 former leprosy patients from the sanatoria at Mashhad and Tabriz, many with their families, have been settled there. Water has been found and tapped. Valleys have been irrigated and planted with cereals, cash-crops, fruit-trees, and grape-vines. Fertilizers, tractors, selected seed, scientific farming methods, sheep farming, bees–together with expert advice, enthusiasm, and sheer hardwork–are transforming the wilderness. A small hospital (a gift of the German

Leprosy Relief Association, D.A.H.W.), a school, cinema, garage and workshops, and a stocking-knitting factory ensure interest and employment in a land where the stigma of leprosy is still a reality. Prejudice is being broken down as merchants and farmers see the quality of the crops, and as astute villagers see the advantage of marrying their daughters into this thriving community. Once a project declares its economic viability, it is taken over by a co-operative of the former patients.

Within its strictly limited aims, Bekhadeh may be regarded as a successful experiment in resettling former leprosy patients who cannot return to their homes or resume their former occupations. *"C'est magnifique, mais ce n'est pas la guerre"* against leprosy.

The leprosy problem in Iran was recently studied by Dr S. G. Browne, at the invitation of the Iranian Association. In addition to visiting the sanatoria at Mashhad and Tabriz, he inspected Bekhadeh, and lectured in the main university centres in Iran, emphasizing the need for early diagnosis, domiciliary treatment, and the examination of contacts of leprosy patients.

MYCOBACTERIUM ULCERANS

A working conference, with time for discussion, brought together interested experts for two days in July, 1973, at the Middlesex Hospital in London. Thanks to the support of the National Fund for Research into Crippling Diseases, several participants were able to travel from the U.S.A. and from various countries in Europe.

Mycobacterium ulcerans is of importance to those working in leprosy, not because the lesions it causes raise practical problems of differential diagnosis for the clinician, but rather because the organism itself has a special predilection for the dermis, and because its mode of transmission and transcutaneous implantation, when eventually worked out, may shed light on leprosy.

Now reported from more than a dozen tropical countries, in an environment characterized by certain types of traumatizing grasses growing in swampy ground near rivers or lakes, the chronic undermined ulcers have a peculiar epidemiological pattern that is becoming clearer as data accumulate from refugee camps in Uganda. Problems of pathology, immunology, skin sensitization and treatment were discussed. Links with swimming-bath granulomata, and tropical fish-tank granulomata were suggested, and indolent skin lesions caused by *Myco. tuberculosis*—now a rarity in the West—rounded off the clinical picture.

THIRD INTERNATIONAL COLLOQUIUM ON THE MYCOBACTERIA—"THE GENUS *MYCOBACTERIUM*"

This very successful Colloquium, held at the Institut de Médecine Tropicale in Antwerp from 1 to 3 December, 1972, attracted a large number of workers from several Western countries. Since international congresses dealing with leprosy and tuberculosis will be held during 1973, the causative organisms of these diseases and also *Myco. lepraemurium* were excluded from consideration at the Antwerp meeting.

To judge from the new work reported, and the novel investigative techniques now employed in the isolation, identification and culture of the very numerous mycobacteria at present known, this field shows a healthy activity in many respects. Interested readers will find the papers given at the Colloquium (mainly

in English and French, but also in German) published in the *Annales de la Société Belge de Médecine Tropicale*, 1973, 53(4).

MANGHOPIR HOSPITAL GETS MEDICINES FROM AUSTRIA

The Red Cross Society of Austria has recently presented, through the Austrian Ambassador to Pakistan, a gift of medicines valued at about Rs. 30,000 to the Leprosy Hospital at Manghopir, near Karachi, where excellent reconstructive surgery for leprosy patients has been done.

OUT-PATIENT TREATMENT IN OKINAWA

Dr Kazuo Saikawa, who was formerly medical director of the Taiwan Leprosy Relief Association and a World Health Organization Consultant in leprosy, announces that the Japanese Government has given official approval—and that for the first time—of a programme of out-patient treatment for people suffering from leprosy in Okinawa. Compulsory segregation is no longer enforced in Japan itself, but even so about 90% of leprosy sufferers are in institutions.

Dr Saikawa has inaugurated training courses in Okinawa for all nurses engaged in public health and in primary schools. So far, about 1000 leprosy patients are under treatment through the domiciliary programme of "skin clinics", and about the same number are in-patients in the two leprosaria in the Ryuku Islands.

PROGRESS IN VENEZUELA

An Internation Centre for Training and Research in Leprosy and Related Diseases was officially inaugurated in Caracas, Venezuela, in June, 1973. Dr J. Convit, President of the International Leprosy Association and Head of the National Institute of Dermatology in Caracas, is the Director of the new Centre. Among the main objects of the Centre is the encouragement of greater uniformity and effectiveness in control methods throughout the hemisphere.

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Congress Highlights and Reflections

STANLEY G. BROWNE

Secretary-General of the Tenth International Leprosy Congress

Highlights and Reflections—not a bird's-eye view gained from the vantage-point of one who has been looking down, but rather from the standpoint, or rather the wriggling point, of one who, like a worm, has been looking up. This summary might therefore be more suitably entitled, "A worm's-eye view of the week's work".

The worm may be a book-worm. Long before the Books of Abstracts saw the light of day, the Secretary-General was worming his way through the 378 abstracts in English, French, and Spanish. Like an earth-worm, too, he tried to ingest the "grounds" of new knowledge and then to evacuate or regurgitate them, adding perhaps a modicum of that indefinable something that enhances fertility and productivity. Now I have to be a kind of hook-worm, hooking on to, and catching hold of, the more important and succulent and nutritious morsels. I hope also now to act as a glow-worm, and to illuminate, however slightly, the obscurity and darkness of turgid scientific sessions.

We will leave the ultimate impact of this Congress to history and to objective discussion in places where leprologists and others foregather in treatment and control programmes, in immunological laboratories where synthetic compounds are prepared, tested, evaluated, oftentimes discarded or tentatively offered for clinical trial—in all these places I hope that the findings of this Congress will be critically appraised and reviewed, and then offered to those concerned with leprosy in the field and wherever leprosy patients congregate in their expectant thousands.

I shall, therefore, attempt to summarize, however briefly and superficially, the two concurrent sessions that have taken place during the past few days. I must express my indebtedness to the Chairmen who have furnished me with short reports of their sessions.

We begin with the patient suffering from leprosy today. The ordinary physician, in some of our sessions, may seem to have been almost forgotten amid the plethora of laboratory-orientated research reported. Field workers, of course, are primordial and paramount in the actual struggle against leprosy in the individual patient, and I dare to remind those working in laboratories of this fact. But the workers in the field would be the first to admit, when they have the chance to stand back and stare, that they are dependent upon other factors than clinical acumen, accurate observation and full and meticulous recording of the observed data—they are dependent more than ever upon research carried out in the laboratory.

I will juggle with the programme as prepared, so that we may start at the logical beginning and finish at the logical end, glancing briefly at the past and peering tentatively into the future.

Session 18: Clinical Aspects
Co-chairmen: Dr R. D. Azulay, Dr A. B. A. Karat

The clinical aspects come first in our range of thinking. Gone are the days, fortunately, of long and dreary and oft-times acrimonious discussion and debate over the niceties and the minutiae of classification. Everything now seems to be in reasonable order, or is rapidly becoming so. Thanks to our colleagues engaged in immunological research, things are far more orderly than they were. We can see the differences and the reasons, or partly see the reasons for the differences, between the extreme clinical manifestations of the host-parasite relation. We can see something of the meaning of the immunological spectrum, something of the wonderful orderliness of the pathological reaction to a very curious, almost unique, micro-organism. The clinical aspects of leprosy had a very small part in this Congress, because they are by now generally accepted. There is still much to learn, still much to record by leprologists who have eyes that see and perceive, but all our clinical observations must be subject to the severe arbitrament of independent histological examination. We saw this necessary juxtaposition in the papers and the discussion on indeterminate leprosy where, once again, it was the histopathologist in his laboratory who could suggest or confirm or reject, as he peered through serial sections, looking for indubitable evidence of mycobacterial infection in the tiny nerve fibrils.

And then, one step removed, the neurotropic predilection of this very curious micro-organism challenges both the clinician and the immunopathologist. Why does the organism do this? Why does it do it as it does? Why does it not do the same thing in other tissues? From this question of fundamental pathogenesis, this session proceeded to a study of the loss of sensation, which, of course, is a far more important factor in plantar ulceration than intrinsic motor paralysis.

To remind the clinicians that the last word has not yet been said about the clinical manifestations of leprosy, the question of lepromatous infiltration of the scalp was raised. "Leprosy lesions never occur in the scalp" we have been told. But they do, and when you look hard you can find them, and when you take out pieces of skin, fix, stain, cut and examine them you *can* find evidence of leprosy in the scalp. Do not, I beg you, repeat unthinkingly and uncritically what you learned from textbooks 30 years ago. Subject once again your clinical observations to the intensive arbitrament of objective histopathological examination. Do not copy statements made *ex cathedra* and surrounded by a hallowed, cloistered aura from the ancient past. Use your eyes, keep records, investigate histopathologically. Taste sensation has recently been investigated, and the techniques of electromyography are being utilized in the service of the leprosy patient.

History

Henry Ford, it is reported, once said that all history is bunk. Most remembered history is not only bunk—it is junk. The study of leprosy history, on the other hand, is a fascinating and extremely rewarding hobby, shedding light on the indubitable osteological evidence of leprosy in the ancient world. The buried past, excavated and minutely examined, indicates the spread of leprosy in the Western world in ancient times. Dry bones have indeed come alive under the penetrating eyes of modern osteo-archaeologists. The living counterparts of these long-buried leprosy sufferers, subjected to radioscopy in India and Thailand and South

America, furnish evidence that the old scourge is still eroding the anterior nasal spine and the alveolar process of the maxilla.

Session 3: Advances in Epidemiology
Co-chairmen: Professor M. F. Lechat, Dr R. S. Guinto

But we must hurry on to the present. Norway, with its wonderful records and its very convincing success story, intrigued us this week with accounts of the national leprosy registry, and the pioneering activities of percipient souls who not only studied leprosy in the laboratory but went into the field to find out more. This success story cannot unfortunately be repeated in other parts of the world for various good reasons, but some of the lessons learned from Norway are, indeed, applicable elsewhere, as we found when we turned our attention to epidemiology. Hansen himself has many worthy followers in many countries—men who demonstrate a happy combination between laboratory-orientated research and routine field-surveys, supported by meticulously kept records. How much more could we learn if more records of this type were available! The basic principles of epidemiological research today are reinforced by new investigative techniques, such as the lymphocyte transformation test, computer simulation, epidemiometric models, and the rest.

Sessions 5 and 7: Control
Chairmen: Dr L. M. Bechelli, Dr D. A. Russell

Epidemiology is frequently associated, of course, with control, and so it must be in our thinking today. A very interesting series of papers was presented in the session on Control. Historically we have passed through successive phases, with some amount of overlapping: there was the sheer hopeless pessimism of the pre-sulphone days when, despite chaulmoogra and hydnocarpus oils, gynocardate of sodium, Alepol, Graumanyl and many others, including diphtheria toxoid and methylene blue, we could do very little for the leprosy sufferer. Then came the sulphones, and what a wave of journalistic optimism we experienced! And then, sober realism, even pessimism—almost despair. Now, dare I say, some considerable confusion and perplexity. What help can BCG vaccination afford? How soon can we expect a vaccine, a specific vaccine, that will stimulate convincingly the development of an adequate cell-mediated immunity in the individual in danger of succumbing to the risk of lepromatous leprosy? And so, once again, hand in hand, we must go over to the analytical biochemists and the immunologists, to produce a specific vaccine from the highly bacilliferous tissue available from sacrificed armadillos. In the experimentally infected armadillo, with its close simulation of human lepromatoid leprosy, we now have available a model and a source of relatively huge amounts of material for biochemical fractionation and analysis, and immunological research.

Integration of leprosy into the general health services is an ideal to be aimed at—an accepted ideal, sometimes impossible of realization, often attainable if actively pursued. From integration it is a short but necessary step to chemoprophylaxis with acedapsone, as shown in the convincing demonstration in Micronesia and in Papua New Guinea, and in other parts of the world.

Session 15: Rehabilitation
Co-chairmen: Dr O. W. Hasselblad, Dr T. T. Arvello

From Epidemiology and Control, we pass to Rehabilitation. I find the accent shifting, subtly, from heroic and expensive attempts to rehabilitate a few individuals to serious large-scale efforts at prevention.

Primary patient care, we were reminded, is all-important, but far too often such care is either not available or is too little or comes too late. That is the tragedy of leprosy today—we know enough but we are not doing enough. A special rehabilitation team is an ideal scarcely attainable in most parts of the world, but every patient in danger of suffering from the results of peripheral nerve damage should have a minimum of preventive care. There must also be health education for the patient and his community; immobilization of limbs and soft parts in danger of damage from unappreciated traumata; care, especially, for early eye complications and their recognition, even by auxiliary workers; and protective footwear, so that patients with anaesthetic soles may safely go about their business or to their paddy fields or their offices. The importance of training was underlined as one of the most important contributions the Western world can make to the developing countries, to share with them know-how, experience, and staff.

These rehabilitation services must be integrated into general community services for the handicapped, making no distinction and perpetuating no stigma, so that the leprosy sufferer, whatever the stage of his leprosy, may be accorded the social rehabilitative and surgical services of which he, as a citizen, is in dire need, and to which he, as a citizen, has every right.

Sessions 17 and 19: Advances in Therapy
Co-chairmen: Dr K. Ramanujam, Dr J. Languillon

From Rehabilitation to Therapy. At the last Congress, you may remember, I stuck my neck out and said, "If only we could together apply existing knowledge, it is not beyond the realms of possibility that leprosy could be controlled in this generation and eradicated in the next". After five years, we must sadly confess that we did not apply the then existing knowledge, and now we are confronted with problems on many hands. We had the tools five years ago; perhaps we could have done the job. The tools are now getting blunt, and we are menaced by the problems of drug resistance, ineffective treatment programmes and lack of perseverance on the part of patients and staff. My words of five years ago are not as applicable now as they were then.

What then is the outlook of treatment today? More is known about the effectiveness and the limitations of drugs long used in leprosy—dapsone, the long-acting sulphonamides and clofazimine, in particular. But in sulphone resistance, we have a spectre that looms ever larger across the world of leprosy. Some will object that we now have clofazimine and rifampicin to give the patients harbouring dapsone-resistant strains of *Myco. leprae*; but many developing countries, trying to "make do" on 6 to 10 Norwegian Crowns per head per year for all medical services, cannot afford rifampicin for the favoured few. Should they spread their resources thinly over large populations, running the risk of irregular treatment, of the development of sulphone resistance; or should we seek something better? We *must* seek something better, something more effective, more certain, and not very much dearer. Here we enter the possibilities of depot-

and slow-release drugs, like acedapsone, with the demonstration in the Philippines, in Micronesia and elsewhere, that these are an effective treatment, notwithstanding the low blood levels of sulphone registered in various investigations; and notwithstanding the risk of the development of drug-resistant strains and their emergence in a significant proportion of patients under treatment. More work is needed along these lines.

We now come to rifampicin and the 200 or more different semi-synthetic derivatives of the antibiotic produced by the mould *Streptomyces mediterranei*. Rifampicin has now been adequately investigated, and has been shown to have distinct bactericidal properties. We must explore ways of modifying the complex and expensive parent molecule to produce new compounds with ever-increasing specificity and effectiveness.

With the help of the controlled clinical trial and adequate laboratory cover, and the possibilities of mouse-footpad investigation, we should be doing more, more quickly and more effectively, in the search for new compounds for leprosy treatment. Somebody mentioned allergic nephropathy following rifampicin therapy, particularly after intermittent régimes, and also the ugly spectre of thrombocytopenia. Rifampicin is not the perfect or final answer; it is the latest, and seems to be, bactericidally speaking, the best. We long for a *therapia sterilisans magna*—something that will kill all the mycobacteria in the tissues without damaging the host. I commend this thought to the research biochemists.

Combined treatment may be theoretically desirable for the prevention of resistance and for the production of a synergistic effect, but practically, it is virtually impossible in the world with its scattered population suffering from leprosy, its very sketchy, even embryonic, medical services, and its half-trained and inadequately supervised personnel. Here again, the challenge is to do something more and something better.

For the complications of leprosy, particularly lepromatous leprosy, we have in our hands several very effective drugs: clofazimine, thalidomide and the corticosteroids. If only we had a non-teratogenic derivative of an active metabolite of thalidomide, many hundreds of thousands in the world would rejoice. We need something better and more dependable, without the possible teratogenicity and neuropathogenicity of this wonderful drug, thalidomide.

I have mentioned sulphone resistance. This came up once again in the session on Therapy. It is an increasingly serious problem in the world, to be counteracted, in theory at least, by adequate treatment given for an adequate length of time, adequately supervised. Here again, we come up against the hard facts of life—this is not being done throughout the world in adequate measure. We need to do more, and to do it better.

The value of chemoprophylaxis, however, in the prevention of lepromatous leprosy, in reducing its duration when it does eventually appear clinically, and the optimum dose and frequency of administration of the chemoprophylactic—all these are matters still to be determined with accuracy, a challenge to all who are faced by a considerable leprosy problem.

Sessions 13 and 15: Advances in Surgery
Co-chairmen: Dr A. G. Warren, Dr E. P. Fritschi

From medical treatment to surgery. Critical reviews of long-term follow-up of patients who have been operated on have rather tended to counteract the early

over-enthusiasm apparent in some quarters and, perhaps, a trace of hyper-optimism. These feelings are now replaced by a more sober appraisal. Applied reconstructive surgery may be wonderful and technically very challenging to the surgeon, but ideally it should not be necessary. It is never completely satisfactory; mechanical improvement is not accompanied by comparable functional, aesthetic or sensory improvement. It is very good, but it is not the best. We must *prevent*—and it is cheaper and better in all ways to prevent than to try to alleviate.

A very fruitful discussion took place on the matter of operating on the acutely inflamed peripheral nerve. Neurolysis of nerves gives sometimes dramatic relief of pain and prevents permanent damage, but there was some divergence of opinion concerning restoration of function in foot-drop, intrinsic and lumbrical paralysis. But the investigations of orthopaedic surgeons and neurohistopathologists—and of neurophysiologists, too—can do nothing but good in advancing knowledge in the fundamental realms of the physiology and pathology of nerves. I regard with great satisfaction this fruitful contact between the research physiologists and the orthopaedic surgeons in the field of leprosy.

With increasing knowledge of structure and function, the possibilities of new and novel procedures of tendon transfer are being actively explored by surgeons in South Africa, West Africa, Europe, the United States and South America.

The human hand is basically primitive phylogenetically, but wonderfully adapted to a whole range of delicate movements, and exquisitively sensitive to a wide range of stimuli. The hand deserves the best of surgery and preventive physiotherapy. And further back still, the individual leprosy patient exposed to the risk of damage to the nerves of the arm and forearm, and the unfortunate sequelae of such damage, should have the best of therapy and of care

Session 5: Ophthalmology
Chairman: Dr Margaret Brand

The sub-section on Ophthalmology provided interest out of proportion to the number of papers presented. Leprosy continues to stand high in the list of causes of blindness throughout the world, especially that due to unappreciated and painless iridocyclitis. All clinicians and physicians should be more aware of the importance of impaired corneal and iris sensation, not necessarily noticed by the patient himself or picked up during the superficial examination made by a para-medical worker. Good equipment is now available, at a reasonable price. Some centres needing a slit-lamp microscope should appeal to a voluntary agency to donate such an instrument and provide for a course of instruction in its use. The simple drugs are still the best—good old-fashioned atropine and good new-fashioned steroids can work wonders—slowly but surely—in preventing blindness. And then, of course, on the theoretical side, sophisticated, electronically operated, substitutes for visual and tactile sensation are being developed, particularly in the U.S.A.—a dream in the future for most people, and not an ever-present help in time of their present trouble.

Sessions 9 and 11: Advances in Pathology
Co-chairmen: Dr C. K. Job, Dr D. S. Ridley

And so to the consideration of the basic pathology of leprosy. Several interesting reviews were given of the histopathology of nerves in leprosy and new

findings in diseased nerves. The changes in the perineurium and blood vessels leading to invasion of the nerve by inflammatory exudate followed by nerve destruction, were examined in a series of papers, and the similarity of nerve changes in human leprosy and in experimental mouse leprosy was shown.

There were good demonstrations of demyelination and reduction of internodal lengths of individual nerve fibres, isolated from lepromatous nerves. Work with limited but interesting potential was presented concerning nerve grafts and the restoration of sensation.

But pathology is not what some of us studied years ago in medical school. We have to learn a new language if we would understand the microbiology and immunopathology and experimental therapeutics of today.

Sessions 8 and 10: Advances in Microbiology
Co-chairmen: Dr Y. Yoshie, Dr J. H. Hanks

Encouraging success and progress have been reported in many directions in microbiology. Expanding use of the mouse footpad, for instance, and pyridine extractions, lepromin testing, phenol oxidases and the rest show not only that many people are interested in this aspect of leprosy, but that they are doing good, reportable and reproducible work. *Myco. leprae* has been shown to undergo limited multiplication in human macrophages maintained *in vitro*. And cultivation trials in cell-free media are exploring the rôle of inorganic resources of energy, and of adjuvant factors culled from related mycobacteria and even from the soil. Claims are being made of the successful culture of *Myco. leprae* on softagar. Other reported investigations concerned the possible complex life cycle of *Myco. leprae* and the rôle of non-acid-fast forms.

Electronmicroscopy, too, is revealing real differences in susceptible hosts, and mycobacteria which, under the light microscope and ordinary staining, seemed very similar, even identical, are shown under the piercing glare of the electron microscope to have certain fundamental differences in surface and internal structure. To jump from the human being to the experimental mouse, some limited extra-cellular growth of *Myco. lepraemurium* was reported to occur in a liquid medium supplemented by certain compounds and monitored by scanning electronmicroscopy; and also in experimental diffusion chambers incubated in the peritoneal cavities of mice.

These glimpses into the future possibilities of this kind of experimental investigation are of intriguing interest. Certain serological studies showed close antigenic relations between *Myco. lepraemurium* and *Myco. avium*. These observations give point to further investigations into the whole range of mycobacteria.

Sessions 4 and 6: Advances in Experimental Leprosy
Co-chairmen: Dr R. J. W. Rees, Dr S. R. Pattyn

From the discussion on the microbiology of *Myco. leprae*, we turned to experimental leprosy; here, too, some tremendously exciting advances were reported, and significant progress is now in prospect. The mouse model is being increasingly utilized throughout the world, and footpad inoculation is routinely used for identification of *Myco. leprae*, for indications of viability, for immunological studies, for the assessment of drug resistance, for drug screening

and for many other procedures, such as, for instance, the pathogenesis of leprosy in the tissues, especially nerves. Another experimental model is now available, the neonatally thymectomized rat. This may be an even more reliable model than the mouse footpad, and with standardized techniques, the immunologically suppressed animal is now available for further use and exploitation.

From far-off Korea came the news that the little chipmunk is now being pressed into service for the cause of leprosy, being itself susceptible to experimental infection with *Myco. leprae*. Progress was reported in the systemic infection of the nine-banded armadillo, and more and more data are accumulating concerning infection and infectivity, lesions in the skin, the nasal mucosa, the nerves, and the deep organs. The rich source of *Myco. leprae* now available in quantity must be used speedily for fractionation, biochemical analysis, immunological investigations and, hopefully, therapeutic trials. Possible routes of infection, both natural and experimental, are being currently investigated on this model.

From the nose of the armadillo to the nose of the human being is but a small step, and half-forgotten studies stretching back many years are now being confirmed by painstaking specialist clinical examination backed by convincing histopathological demonstration. Once again, I would underline the importance of fruitful contact between the examining clinicians and the investigative laboratory.

The relation of these investigations to the transmission of leprosy, the site of exit and perhaps also the site of entry, give point to the need for clinical observations by field workers. The nose may very rarely be bacteriologically positive before the skin, yet it may be the last to shed viable and non-viable bacilli from the extensive infolded mucosa covering the septum and the inferior and middle turbinates. The output of *Myco. leprae* every day from such a nose is similar to that of patients with open tuberculosis of the lung, and is indeed colossal. Millions of *Myco. leprae*, a high proportion of which may be shown to be viable when injected into the mouse footpad, are being shed daily from the nasal mucosa of unsuspecting patients.

The persistence of viability of these *Myco. leprae*—up to nearly two days after discharge from the nasal mucosa—is a very interesting and potentially very important point when we consider the duration of infectivity of patients and re-examine the possible importance of fomites in the persistence of the leprosy endemic, or the occurrence of cases of leprosy many miles from the potential source of viable mycobacteria. There is experimental evidence that *Myco. leprae* in the ambient air may enter mice by a route not yet convincingly demonstrated, but possibly the respiratory tract.

Session 2: Advances in Experimental Therapeutics
Co-chairmen: Dr C. C. Shepard, Dr M. F. R. Waters

This section was concerned with the development of new drugs and the procedures to be followed in the biochemical development of new therapeutic agents, particularly the identification of enzyme systems that might at some point be susceptible to a drug that could be termed, loosely, lethal. Dehydropterocete and the dihydrofolate systems with the *de novo* folate pathways, are of extreme interest and importance in this connection. We have to hit *Myco. leprae* hard, and at one or two susceptible points in its multiplication and development, so that the

human being suffering from leprosy may have a better hope of rapid cure. He is not interested in the morphology of *Myco. leprae* or in their concentration. He wants to be cured of what he is suffering from, and he does not want to remain ostracized. Hence the importance of these rather sophisticated laboratory investigations, and of the trial of acedapsone which was also reported in this section.

Sessions 12, 14 and 16: Advances in Immunopathology
Co-chairmen: Dr O. K. Skinsnes, Dr T. Godal

Lastly, we come, after this brief and all-too-superficial worm's-eye view of this week's work, to those extremely interesting and important sessions on immunopathology—in many ways the most important of the week—the best reserved for the last. Since the London Congress in 1968, new methods have been developed that make it possible actually to measure cell-mediated immunity to leprosy infection *in vitro*. Studies undertaken throughout the whole of the clinical and histopathological spectrum of leprosy lend strong support to this conception of a unique host-determined immunological defect in lepromatous leprosy. These matters are being actively studied in many places, but particularly in the A.H.R.I. Institute, sponsored by the Scandinavians, in Addis Ababa. There is also a non-specific depression of cell-mediated immune processes in active lepromatous leprosy with both humoral and cellular aberrations. The early observations suggesting a link between hepatitis-associated antigenaemia and lepromatous leprosy have not been substantiated, to the surprise perhaps, of many participants. Nor is there any specific evidence today of the importance of a genetic factor in leprosy, though some reports suggest that this may be so. Cell-mediated immunity to *Myco. leprae* is an important mechanism of tissue damage in reversal reaction, and circulating immune complexes have been reported in *erythema nodosum leprosum*. This observation reinforces the real dangers inherent in the use of homologous lymphocytes for the treatment of human patients with leprosy: we must always remember our ethical responsibilities as we pursue laudable therapeutic aims and investigations.

Preliminary studies utilizing the lymphocyte transformation test and other new techniques give hope that the search for an effective vaccine may now progress more rapidly; it may not be "just around the corner"—and the corner may be longer than we hoped—but the possibility is there.

Before the worm turns and wriggles off to his secretarial burrow, he would emphasize that at the centre and heart of the International Leprosy Association lies the whole *raison d'être* of this Congress—the pursuit of new knowledge so that the individual sufferer from leprosy may be helped and the community spared the ravages of this disease. Amid the plethora of exciting new investigations, the leprosy sufferer provides the personal challenge to the research worker and the clinician. New knowledge must be incorporated into new dimensions of helpfulness towards the patient and the community of which he should continue to be an integral part.

We neglect at our peril the social aspects of this disease complex we are all trying, in our different ways, to overcome.

Lepr. Rev. (1973), **44**, 165-182

The Voluntary Agencies

1. LEPRA's Contribution to the World-wide Campaign Against Leprosy

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LEPRA, the successor to the British Empire Leprosy Relief Association (BELRA) which was founded in 1924, is now a world-wide organization. It works towards its objective, the control of leprosy, by running control schemes, supporting government and other agencies running similar schemes, encouraging and supporting leprosy research, and fostering the early diagnosis and regular treatment of young patients. The expenditure of money raised mainly in the United Kingdom is controlled by an Executive Committee; £286,600 was raised in 1972.

The British Empire Leprosy Relief Association (BELRA) was set up in 1924 with the object of ridding the Empire of leprosy. With the changing circumstances of the world surrounding a growing organization it was decided in 1967, that the Association's geographical boundaries should no longer be limited to the Empire and that the Association should be known as LEPRA.

The Association's object today is still the eradication of leprosy and LEPRA works towards its objective by employing what are currently considered to be the most effective methods. The Association, honoured by Her Majesty The Queen as its Patron, is managed by an Executive Committee, which is advised from time to time by LEPRA's Medical Committee. Funds are raised, mainly through small groups in the United Kingdom, from legacies, Press advertising etc., and in 1972 amounted to £286,600.

LEPRA uses its funds in operating its own Control Scheme in Malawi, participating in joint schemes in Sierra Leone, Zambia and elsewhere, running a special scheme for children, and supporting effective leprosy work by governments and by other voluntary organizations. LEPRA also supports research, especially at Oxford University, and encourages medical students to become interested in leprosy by sponsoring essay competitions, by sending selected students to work in Malawi, and by financing an annual lecture, the Clayton Memorial Lecture. LEPRA publishes *Leprosy Review* and has joined with other organizations in issuing booklets on various aspects of leprosy. In an effort to extend the knowledge of leprosy, LEPRA has arranged to make a new film which will summarize existing information on the subject and will be appropriate for showing to medical and lay audiences.

Malawi Control Project

LEPRA decided in the early 1960's that the then widely held idea that leprosy can be eradicated from a defined area should be demonstrated. Accordingly, an area of 2000 square miles with a population of 1.3 million was selected near Blantyre in Malawi. Treatment was to be mainly domiciliary, but a small hospital unit with 36 beds was included in the LEPRA block which catered for administration, training, record keeping and laboratory work. The block was situated in the grounds of a general hospital as a move towards the integration of leprosy treatment with other medical services.

The project was planned to run for 10 years, but already after 7 years there are indications of success, for the number of new cases of leprosy registered each month has fallen from over 350 to under 50, and all the new cases are early ones. At the end of 1975 the patients remaining will be able to obtain treatment from static government clinics. Two trained Leprosy Assistants will, however, be retained in the area to ensure that adequate supervision and treatment are maintained in an area where leprosy treatment has been fully integrated with general rural medicine. Detailed records of 12,500 patients are currently being coded so that they can be analysed by computer and thus provide valuable information.

The Government of Malawi has shown its confidence in LEPRA by inviting the Association, through its Director in Malawi, Dr David Molesworth, to become responsible for leprosy control throughout the whole country. This is now being planned on a progressive basis, another control project being started in the North working from an existing government hospital, and a pilot leprosy/tuberculosis control project started in the Centre, based on Lilongwe, the new capital of Malawi. This project, financed by the German Leprosy Relief Association (DAHW), is being advised by the World Health Organization, which has a deep interest in such work. Initially, a population of some 900,000 will be included in the pilot project.

In the South, outside the LEPRA Control Project area, the leprosy work undertaken by UMCA, the Seventh Day Adventists, and the Canadian Sisters of Wisdom is all being co-ordinated by LEPRA on behalf of the Malawian Government. In 1972 LEPRA spent £57,800 in Malawi.

Sierra Leone

For 15 years LEPRA has maintained lay workers in Sierra Leone. Recently, leprosy control in that country has been extended and there is a major nation-wide control scheme now in operation under the direction of Fr Rocco Serra, until recently Director of the Catholic Relief Service in Sierra Leone. LEPRA provided four experienced field workers and £27,000 in 1972. The scheme is also supported with staff and funds by the Government, the German Leprosy Relief Association (DAHW), the Seventh Day Adventists and, in the past, has received financial assistance from the Catholic Relief Service, OXFAM, CAFOD, Fame Pereo, and Friends of Leprosy Patients in Italy and the USA.

Zambia

Following the success of the Malawi Project, LEPRA was approached by the Government of Zambia to assist with out-patient control in that country. A very

successful out-patient control scheme was set up in the Eastern Region and run for 2 years by LEPRA, and is now run by the Government. A further scheme was introduced in the Luapula Valley with equal success. During 1972 LEPRA provided an experienced lay worker and contributed £5600 towards leprosy control in Zambia.

Among other countries which have benefited from LEPRA's support during 1972 were the following.

India

Most of the money given by LEPRA to voluntary agencies in India was in respect of children, but £4000 were provided to cover the salaries of local para-medical workers and for the provision of deep wells at one big settlement.

Nigeria

Grants of £10,500 were made towards the purchase of transport (including canoes), training, and the running expenses of various control schemes. Dr Wheatley concluded his very exacting task of being Leprosy Adviser to the East Central State and helping to re-establish leprosy control in the war torn area. Chief Lakin has been building up a modern self-supporting agricultural unit to absorb those former patients at Oji River and Uzuakoli who are the legacy of the outdated institutionalized methods of leprosy treatment.

Uganda

Two LEPRA workers have been stationed at Kumi, one in charge of out-patient control working very closely with local government personnel, and the other in charge of one of the only two leprosy training schools in the country. Grants of £2500 were made elsewhere in Uganda during 1972.

Peru

Following protracted negotiations after Dr Colin McDougall's report on the needs of Peru from the leprosy aspect, LEPRA financed the training of a Peruvian in Mexico and supplied some basic equipment. It is hoped that up-to-date methods of leprosy treatment will gradually emerge from this small but practical contribution to the leprosy problem facing Peru.

Children

LEPRA considers the early diagnosis and treatment of child sufferers from leprosy of paramount importance. Accordingly, under its Children's Fund, annual *per capita* grants are given following receipt of the patient's name. age. sex and the type of leprosy from which the child is suffering, supported by a medical certificate to the effect that the child needs, and is receiving, either domiciliary or in-patient treatment. The *per capita* grant is small, but 20,112 children benefited in 1972 at a cost of £62,000. Indian settlements received £30,000 of this sum, the balance going to 11 other countries ranging from Colombia to Ethopia.

Research

LEPRA is all the time supporting and encouraging research in the hope that better methods of detection, quicker acting drugs, and eventually a prophylactic will be found so that leprosy will at last be eradicated.

Conclusion

The World Health Organization has estimated that within the next 5 years there will be 1 million more people suffering from leprosy. LEPRA is therefore far from achieving its objective. While adequate drugs are available to cure the majority of cases, the main problem is one of administration, politics, and the availability of suitable reliable personnel to work in the field.

Some countries are reluctant to receive expatriates when they already have an unemployment problem; others have no facilities (such as housing) to offer. LEPRA sees a greater hope of success in controlling leprosy, thus preventing future generations from suffering from the disease, than in the rehabilitation of individual patients. It therefore concentrates its efforts overseas, apart from its children's work, on working in areas in which it is well received and supported by the local government so that it can achieve its objective in certain limited areas. Ideally, control projects should be set up and run for a few years during which time the local health staff should be trained to diagnose and treat leprosy so that expatriates can be gradually withdrawn, and once the leprosy problem has been reduced to controllable dimensions it should be integrated with the local health service.

2. The Leprosy Mission— A Crucial Dimension of Service

A. D. ASKEW

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A hundred years ago there took place three apparently unrelated, widely separated, events which were to be of considerable significance in widening the horizons of the world of leprosy. In Europe, Armauer Hansen was pondering the appearance under his microscope of the *Mycobacterium leprae*; in the Pacific, Father Damien was being drawn to his vocation on Molokai; from North India, Wellesley Cosby Bailey, a young Irish schoolmaster, came home to Dublin, having been confronted in his missionary work by the needs of neglected leprosy sufferers at Ambala, in the Punjab. His eloquent and passionate advocacy stimulated the first interest and financial support in Ireland for what was to become The Leprosy Mission, the oldest, and today still one of the largest, of the voluntary societies concerned with leprosy and the problems of those who suffer from it.

In 1974, The Leprosy Mission celebrates its centenary as an international and interdenominational Christian society, with its headquarters in London and its auxiliaries in many parts of the world; its members continue to educate, stimulate and increase interest in the cause of those who suffer, and to care for them at every level of need. Today The Leprosy Mission looks back to solid pioneering achievements, beginning at a time when it was the only organization in the field, and looks forward to an increasingly effective future rôle in cooperation with others.

Pioneer Contributions to the World of Leprosy

Through the concern of its founder and his co-workers, a conscience and a consciousness about the needs of leprosy sufferers were established and rapidly expanded. To mitigate the appalling sufferings of untreated and unchecked leprosy, the Mission established asylums and financially supported others, first in India, then in Burma, China, and other parts of the world. Its work acted as a catalyst to more general action, and the Mission, besides establishing centres of its own, soon became known as the source of encouragement, advice and funds to others interested in leprosy relief. "Relief" was a fair description of its activities. With no armoury of drugs and little scientific knowledge, leprosy centres could offer only shelter, food, sympathy and a restoration of some human dignity to men and women ignored or rejected by their own communities. Attitudes often mirrored those of the contemporary Western society to the underprivileged, and some of the help offered was paternalistic, but it was nonetheless sincere and constructive.

The expansion of its leprosy centres, in number and size, was accompanied by an essential expansion of interest in its work among Christian communities throughout the world. Following its beginnings in Ireland, support was quickly given by individuals and church groups in England, Scotland and India. With little delay, they were followed by the USA (1877), Canada (1892), Australia (1900), New Zealand (1909), and Switzerland (1912), the last named a portent of the greater support which was to come from Europe in more recent times.

From its work in the United States of America grew American Leprosy Missions, Inc., now and for many years past an independent organization in its own right, with valued links of friendship and cooperation. During the early 1920's The Leprosy Mission gave its willing support and experience to help in the founding of the British Empire Leprosy Relief Association (BELRA, now LEPRA) and also encouraged the development of the French Committee of Help (which established the centre at Valbonne), the Taiwan Leprosy Relief Association and the Nippon Leprosy Mission.

The Mission was never complacent. In faith, its workers sought better methods of treatment. Its early literature contains many references to new remedies which, unfortunately, came to nothing; but consistently the Mission widened its knowledge and experience, aimed for higher standards of medical work, responded to new knowledge with changes of practice, and encouraged research.

With the widening use of sulphones in the early 1950's, the prevalent asylum-orientation gave way to the development of the Mission's centres as efficient long-term hospitals, with treatment leading to real hope of rehabilitation. The problems of rehabilitation stimulated Paul Brand—for long associated with The Leprosy Mission—and others, to develop the use of the techniques of plastic and orthopaedic surgery in remedying the deformities of leprosy sufferers. The

Mission actively encouraged the training of its medical workers, as well as those of other societies, in reconstructive surgery, physiotherapy, and the prevention of deformity.

At the same time, under the stimulus of men like Muir and Cochrane, the Mission increasingly turned its attention to the untreated mass of patients beyond the walls of its hospitals. The development of pioneer S.E.T. (Survey, Education and Treatment) programmes was increasingly emphasized as the significance of early diagnosis and regular sulphone therapy was realized, both in controlling the disease in the patient and in limiting its spread through the community.

Since its earliest days, the Mission has stressed the value of the individual patient, rather than seeing them *en masse*. There were times in the development of control work when the Mission was criticized for moving too slowly, and thinking too small, by the advocates of mass distribution of dapsone. Now the Mission's emphasis is perhaps appreciated a little more, as experience shows that adequate case-holding depends on the development of the patient's confidence in his treatment, which in turn partly depends on the acknowledgement of his individual personality and response to his needs.

Training of national workers for responsibility has long been an important part of the work of the Mission. For many years medical scholarships have been granted to selected students, particularly in India. A number of senior leprologists can look back to such support in early days, and national leadership today far outweighs the still valued contribution of expatriates. Training has included conferences and workshops for many years. The activities of the Mission in this sphere go back to conferences of "Leper Asylum Superintendents" in the early years of the 20th century. Coupled with its training programme, the Mission has published technical and popular literature, both for leprosy workers, patients and supporters.

To promote further training and research the Mission, in full partnership with American Leprosy Missions Inc., financed, built, and still maintains the Schieffelin Leprosy Research Sanatorium in Karigiri, South India. In celebration of its 90th Anniversary, the Mission installed an electron microscope in the nearby Christian Medical College (CMC) Hospital, Vellore, for leprosy research purposes. Significant support is given to The Leprosy Study Centre, London, and the Mission is a founder member of ALERT, in Ethiopia.

As an international Mission, it has encouraged and supported efforts to draw together leprosy workers in closer cooperation. It was a founder member of the Federation of European Leprosy Associations (ELEP), is a long-standing supporter of the International Leprosy Association and its Journal, and took a leading part in the formation of the United Leprosy Aid Committee in Great Britain.

The Future Rôle of The Leprosy Mission

The Mission recognizes clearly that the ultimate responsibility for leprosy control measures lies with governments, which have both the right and the duty to co-ordinate and control all leprosy work within their jurisdiction; but it also recognizes the practical difficulties which in many areas make this a long-term hope, rather than a present reality.

The Mission continues then to have a rôle of significance. First, in continuing to share in the development of medical services to leprosy sufferers, in co-operation with governments and other voluntary agencies. This will include

working within integrated medical facilities or separate services where appropriate. (It is of some interest that in 1973 the Mission's International General Council made an addition to its Constitution, empowering it to undertake general medical work, beyond the needs of leprosy sufferers, where this is necessary or desirable to meet the needs of the local community or to encourage the integration of leprosy treatment into general medicine.)

Secondly, in developing and maintaining a wide awareness of the needs of leprosy sufferers and acting as a voice to proclaim their right to health, social justice, freedom, and acceptance within the community.

Thirdly, in encouraging a diversified approach to the many problems of the disease of leprosy, and of its human victims.

Lastly, in demonstrating that Christian compassion and concern for the individual add a crucial dimension to the service of humanity. The Leprosy Mission is a Christian organization. It does not use its medical services as a tool for pressurized or indiscriminate evangelism, but believes that the effectiveness of modern treatment is increased when it is allied with a concern for the total personality of each patient, whose true happiness demands physical, mental, and spiritual fulfilment.

3. American Leprosy Missions, Inc.

OLIVER W. HASSELBLAD

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American Leprosy Missions (ALM) was established in 1906 as a committee of The Leprosy Mission. Its founder and chairman for 43 years was a prominent businessman and philanthropist, William Jay Schieffelin, and its membership was made up largely of Christian businessmen. Until 1917, when the Committee was separately incorporated, its sole function was to raise money for The Leprosy Mission to send to institutions in Asia, many of which had been established by American missionaries.

From the beginning, ALM's policy was that of an enabling, not a sending, agency nor an owner or administrator of institutions. In 1935, the General Secretary, William Mason Danner, made this policy clear in a letter granting funds for a hospital in Africa: "We wish it to be clearly understood that our responsibility begins and ends with this grant of funds."

While Dr Eugene R. Kellersberger was General Secretary from 1941 to 1954, a new dimension was added. Feeling that money given without any responsibility for its use did not ensure work of good quality, the Board of Directors drew up clearly defined priorities for the use of resources. And it required close direct contact with responsible administrators in the field in working out and agreeing upon objectives.

More than any other person, Dr Robert G. Cochrane, ALM's technical medical adviser from 1952 to 1965, laid the foundation for ALM's present policies. He

was convinced that the rôle of a voluntary agency was to upgrade strategic institutions as a demonstration of the best methods of leprosy control, training, and research.

Earlier, while he was Principal of Vellore Christian Medical College in India, he and Dr Herbert Gass, Professor of Dermatology, together with leaders of The Leprosy Mission and American Leprosy Missions, developed the concept of such a demonstration centre in close proximity to a medical college. And in 1952, with Dr Gass as its first director, the Wm. Jay Schieffelin Leprosy Research Sanatorium was built at Karigiri, with a grant from ALM's Post War Fund. Here and at Vellore, Dr Paul W. Brand did his early pioneering work in surgical rehabilitation. Many significant contributions in leprosy research have come from the scientists at the Schieffelin centre, and its excellent training programme has included hundreds of workers in various medical disciplines from all parts of the world.

Another important world centre for training and research arose from the vision of ALM's Dr Kellersberger back in the nineteen-forties. In a letter to the Ethiopian Ministry of Health he expressed the hope that the Princess Zenebework Hospital in Addis Ababa, built by American Leprosy Missions in 1933, "might well become not only a central leprosy hospital for the country, but also a training centre where doctors, nurses, teachers, public health workers would receive special training in social and clinical aspects of leprosy."

By 1965 this prophetic vision came to fruition with the establishment at the Princess Zenebework Hospital of the All Africa Leprosy Research and Training Centre (ALERT), with ALM as one of the five original sponsors. With the generous support of many other voluntary agencies, ALERT serves not only all African countries, but also serves internationally as an increasingly important demonstration, training, and research centre.

One of the most important aspects of American Leprosy Missions' training programme began in 1960 with the establishment of annual leprosy-orientation seminars in cooperation with the United States Public Health Service (USPHS). Held every spring at the USPHS Hospital at Carville, Louisiana, these annual courses give a basic grounding in all aspects of the treatment and management of leprosy to medical personnel in all disciplines, both national and expatriate, Catholic and Protestant, who work or plan to work in countries where leprosy is a serious public health problem. Since the inauguration of the series more than 600 workers have attended the seminars, and many have been responsible for the improvement of existing programmes and the establishment of new ones in line with modern concepts of leprosy management.

In 1970 the ALM Leprosy Atelier was established by Dr Olaf K. Skinsnes with ALM funding. Located in the Department of Pathology of the University of Hawaii School of Medicine, it is equipped with an electron microscope and other facilities for advanced research. In July 1973 Dr Wayne M. Meyers was seconded by ALM as a Professor in the University of Hawaii to collaborate with Dr Skinsnes and other university medical scientists. The relationship to the University opens opportunity for training, as do projected developments in the management of leprosy in Hawaii.

Under development is the International Center for Training and Research on Leprosy and Related Diseases at Caracas, Venezuela, with the sponsorship of the Pan-American Health Organization. ALM has committed itself to financial support and participation on the Advisory Board of the Center.

The greatest share of American Leprosy Missions' resources are used for the

delivery of health services to patients, individually and in the aggregate, with special consideration for the patient in relation to others and to the community. Support is also given to the movement towards integration of leprosy into general health services, and to comprehensive community health planning which includes leprosy.

ALM's present priorities governing the use of its resources are based upon its nearly 70 years' experience. They are:

(1) Meeting individual needs as a continuing commitment. There is an equal commitment to help change programmes to conform with accepted principles of control and management.
(2) Assisting traditional custodial institutions to become centres of leprosy control.
(3) Providing training grants to medical workers in the necessary disciplines.
(4) Helping those programmes that are moving toward integration, whether at the level of general hospital or of the village dispensary.
(5) Developing pilot projects with social science and public health personnel, to help solve the serious problem of the tremendous numbers of severely dehabilitated patients, both within and outside institutions.
(6) Providing funds for new buildings and equipment in programmes that contribute to effective leprosy control.
(7) Providing consultative services of outstanding specialists to assist in the implementation of priorities.
(8) Responding positively to governmental and intergovernmental agency requests to develop leprosy control programmes.

American Leprosy Missions' support comes from individuals, churches, and church groups. It is not officially related to any sect or denomination. It maintains its inherent freedom t act independently but in cooperation with other leprosy or related agencies.

4. Hind Kusht Nivaran Sangh (Indian Leprosy Association)

S. S. MAITRA

Honorary Secretary

The dawn of the twentieth century flashed a silver lining on the horizon for the dreaded, stigmatized and ostracized leprosy patient. Compassion had taken root in the hearts of men, though horror and prejudice were still slow to die. Father Damien had lit a torch. Colonel Bailey had trailed a luminous path. The formation of the British Empire Leprosy Relief Association (BELRA) had its ripples in India also. The Indian Council of BELRA was formed in the year 1925, with the Viceroy and Governor-General of India as its President, while Governors of Provinces and leading Indian Princes became its Vice-Presidents. The Indian

Council concentrated its attention on (1) research; (2) training of medical men in the diagnosis and treatment of leprosy; and (3) propaganda. The Indian Council continued to do good work till 1950.

Independence brought about changes in the set-up of the Indian Council of BELRA also. In 1950, the Hind Kusht Nivaran Sangh (Indian Leprosy Association) was formed, taking over the assets and liabilities of the former organization. The important avowed objects of the Sangh are: the control of leprosy, relief to leprosy patients, and the eradication of leprosy in India. The Sangh endeavours to achieve these objects through health education programmes, and programmes of leprosy control and treatment. These programmes are initiated at the headquarters in New Delhi and implemented through its branches, which today are 16 in number. The State branches in turn organize district and local branches.

The Sangh has the President of India as its President. In order that concerted and co-ordinated efforts may be made in the direction of eradication of leprosy in India, the Sangh has a broad-based constitution, under which the Government, voluntary organizations, distinguished leprologists, medical scientists and social workers are brought together on one platform by giving them representation in the governing body of the Sangh.

As years rolled by, the Government and the voluntary organizations have increasingly involved themselves in the treatment of leprosy, and the Sangh gradually retreated from direct participation in these programmes. So, also, the Indian Council of Medical Research took over in 1956 the research work which until then had been conducted by the Sangh at the School of Tropical Medicine, Calcutta, with the cooperation of the Endowment Fund of the School and the Indian Council of Medical Research. Consequently, the Sangh began to concentrate on health education, rehabilitation of leprosy patients and publicity aimed at creating a national awareness of the problems of these patients, and ultimately the eradication of leprosy in India.

Health Education

An effective health education programme in leprosy should be aimed at the public at large, the medical profession, and the leprosy patients themselves. Real facts about leprosy have to be disseminated to the general public to dispel the age-old ignorance, horror and prejudice about the disease. Even today many medical practitioners not only keep themselves aloof from the treatment of leprosy but also place leprosy on a different footing from that of other diseases. Health education in leprosy, therefore, should strive to integrate the treatment of leprosy with general medical practice. So also, the leprosy patient needs encouragement and an awareness that the disease is curable.

This three-pronged approach to health education in leprosy is ably handled by the Sangh today, by means of posters, pamphlets and brochures. One of the first steps the Sangh took was to publish a set of 20 coloured wall posters in English, Hindi and some regional languages. These posters help to dispel old fears and prejudices about leprosy. As the old set became obsolete, new sets of posters were designed in consultation with the Central Health Education Bureau and were exhibited and popularized through the State branches. A selected set of these posters in English, Hindi and regional languages has been displayed in 2000 railway stations.

Our pamphlets and booklets on the facts about leprosy written by leading leprologists are very popular both with the general public and the medical profession. The pamphlets are revised periodically, and new ones are added to the list from time to time.

Leprosy in India

The Sangh publishes in English a scientific quarterly journal, *Leprosy in India,* which is the official organ of the Sangh. Through this medium, we publish original articles, research reports, reviews, comments, abstracts from current literature, etc., which reflect the work done in the field of leprosy in India and in other countries. This journal is at present edited by Dr Dharmendra, an eminent leprologist of international standing.

World Leprosy Day

In India, World Leprosy Day is celebrated on the 30 January, to coincide with the day of the martyrdom of Mahatma Gandhi, who had an abiding interest in leprosy work. The Sangh organizes the celebration of this day in all parts of the country through its State branches, voluntary organizations, and Leprosy Control Units. The programmes for the celebration of Leprosy Day are directed towards the goal of health education and the raising of funds for leprosy work. Public meetings, processions, the sale of leprosy seals, essay and elocution competitions for school-children, and organizing of exhibitions are some of the activities in connection with the observance of the day.

Rehabilitation

Rehabilitation of leprosy patients is a task with which the Sangh is very much concerned. Rehabilitation is a process that should begin from the day the disease is diagnosed. The patient should be relieved of the mental strain that results from the shock to which he is exposed by the realization that he has contracted a dreaded disease. Also, he should not be allowed to develop any deformity by reason of carelessness and ignorance, and above all he should be returned to society as a self-reliant, self-respecting citizen, an asset to himself and to his fellow men. To this end, the Sangh conducts Physiotherapy Technicians' Training Courses to help para-medical workers to educate and train the patients. Refresher Courses are also conducted for trained physiotherapists to acquaint them with new knowledge on physiotherapy and to give them an opportunity to exchange experiences. In addition to this, the Sangh conducts Orientation Courses for medical practitioners engaged in leprosy work, who in turn can thus give scientific guidance to trained physiotherapists.

Shanti Illam

In furtherance of the programme of rehabilitation, the Sangh maintains a home known as Shanti Illam at the Christian Medical College (CMC) and Hospital, Vellore. This home is intended for short-stay destitute leprosy patients undergoing pre- or post-operative treatment at the CMC Hospital. During the period 1968 to 1972, 3140 leprosy patients were admitted to Shanti Illam, and a total of

1766 operations were performed on them. During their stay at Shanti Illam, the patients are trained and encouraged to do some useful work, which not only serves as occupational therapy, but also helps them to learn a new trade which in turn encourages their self-reliance and also helps them to earn some money during their stay at the home.

Scholarship and Awards

The Sangh realizes that incentives should be provided to promising medical practitioners and research workers in leprosy, so that they may contribute their best in the very important task of eradicating leprosy in India. With this end in view, the Sangh has instituted a scholarship which will be awarded every alternate year to a medical graduate engaged in leprosy work for specialized training in leprosy at the Central Leprosy Teaching and Research Institute, Chingleput, for one year. The selected candidate receives Rs. 500 per month for the duration of his training. In the same way, the Sangh has instituted the Dr Keshab Chandra Sahu Memorial Gold Medal for the promotion of research into the causes and treatment of leprosy; the Medal is awarded once in every three years to a senior research scholar who has to his credit more than 10 years of outstanding work in leprosy.

All-India Leprosy Workers' Conference

From its inception in 1950, the Sangh took over the organization of the All-India Leprosy Workers' Conference. The first conference was held in 1947 at Wardha, with the blessings of Mahatma Gandhi, and continued to meet thereafter every two years. The central body of the Sangh is responsible for the policies and programmes of the conference, while the actual running of the conference is the responsibility of the State branch under whose auspices the conference is being held. These conferences have reflected the progress of leprosy work in India and have reviewed the working of leprosy programmes in the country. They have also been helpful in bringing together workers in the field of leprosy from the various parts of the country and to enrich these workers by pooling their knowledge and experience. This has helped to provide stimulus and inspiration to the workers and also guide-lines to administrators.

It is a happy augury that this year we are celebrating the Silver Jubilee of the Conference, together with the Centenary of Dr Armauer Hansen's discovery of the leprosy bacillus. The combined celebrations are being held at Sevagram with a 5-day seminar, which will be attended by leprologists and leprosy workers in India and to which invitations have also been extended to leprologists and leprosy institutions in other countries.

Conclusion

In the context of the expansion of leprosy work in India by the Government and by the increasing number of voluntary organizations, the rôle of the Hind Kusht Nivaran Singh has become selective. With its long tradition of pioneering service, it constantly seeks to explore the further unmet needs of patients and pass on the suggestions crystallized through its past experience to the Government and to the voluntary organizations.

The Sangh's emphasis on health education and rehabilitation has paid rich dividends. Facts about leprosy are widely known today and the attitude of society, the medical profession, and the patients themselves has undergone vast changes in the right direction. The Sangh's rôle as a catalyst and co-ordinator in leprosy work is being increasingly accepted. Its essential function, namely, to promote the voluntary spirit, is receiving adequate attention. For, in the words of our late President, Dr Rajendra Prasad, "The quality of government work will rise in proportion to the growth of voluntary work.

5. The German Leprosy Relief Association

HERMANN KOBER and S. G. BROWNE

Although the German Leprosy Relief Association or Deutsches Aussätzigen Hilfswerk (DAHW), was founded as recently as 1957, in the course of the last 16 years it has raised over 100 million D.M. (or over £12 million) for leprosy work, to be used mainly in Africa, Asia, and South America.

DAHW began almost by accident. Two young Germans, a theological student and a journalist, in the course of a visit to Ethiopia, called at an old-style leprosy centre (St Antoine, near Harrar) where a Dr Feron was trying almost single-handed to cope with an unbelievable amount of suffering due to leprosy. The two men saw the end-results of neglected leprosy, and were deeply affected. Back again in Würzburg, Germany, they spread the news and, together with their friends and a group of co-workers, began to collect money. They wanted to help; they wanted their friends to help. Thus was DAHW born.

At first, all its energies and efforts were bent towards assisting this one institution and this one doctor, but before a year was out cries for help reached them from other parts of Africa. At the same time, the response from the German population was unexpectedly eager. Thanks to articles in the press, the need was widely publicized, and money began to pour in.

Year by year, the financial response of the German people has increased *pari passu* with the requests for help. In 1958, 1.2 million D.M. was raised, and 5 centres abroad were helped; in 1964, the amount increased to 4 million D.M., and no fewer than 90 centres were helped. In 1972, the huge sum of 14 million D.M. was collected, which helped to support 180 centres. Among the contributors to DAHW we find businessmen who give generously, manual workers, and ordinary folk living on small fixed incomes. Youth groups raise money by staging theatrical plays, organizing football matches, etc. The mass media—radio, television and the press—have shown a great interest in DAHW and have been very generous in their coverage. Journalistic flair and professional connections have been harnessed to the task of disseminating information and arousing interest.

Up to the present, the funds collected have been used to support some 345 centres, schemes, and field projects in Africa (mainly Ethiopia, Uganda, Tanzania, Sierra Leone and Nigeria), a total of 147 projects in 29 countries; in Asia (especially India, Pakistan, Thailand and Korea), 160 in 18 countries; and in South America (Paraguay, Argentina, Brazil and Bolivia), 38 in 10 countries. About 600,000 leprosy patients in all have been helped in this way through these various projects of DAHW.

Reviewing the past decade, it is possible to discern a gradual change in the way funds are allocated. At first, single centres and hospitals were supported, but the tendency now is to help subsidize field work and programmes in which leprosy is integrated into the general medical services, in accordance with the plans and ideals of the Ministries of Health of the various countries. Medical and social rehabilitation is by no means neglected.

DAHW assists training programmes in Addis Ababa, Caracas and Karigiri, channelling its support through staff, buildings and equipment. It also sponsors field workers, and has an impressive record in the comparatively short time of its existence—a total staff in the field of 145, comprising doctors, nurses, teachers, artisans, farmers and social workers. The large leprosy centre in Bisidimo near Harrar carries out extensive field work.

DAHW was one of the founder-members of ELEP, the Federation of European Anti-Leprosy Associations, and is a very active participant in the deliberations of its 16 member-associations. It works happily with other similar bodies in other continents, and also with the World Health Organization.

Although DAHW assists without distinction many religious bodies that are engaged in leprosy work, its basis is non-religious and non-sectarian; and although it cooperates with governments in their anti-leprosy campaigns, it is not a government institution. It has, however, links with the German Foreign Office and the Ministry of Economic Co-operation.

Conscious of the many serious gaps in our knowledge of leprosy, DAHW devotes a gratifying proportion of its resources to research, especially emphasizing the need for efficacious measures for preventing leprosy and for treating the disease as rapidly and completely as possible. DAHW helps to finance leprosy research at the Borstel Research Institute, and sponsored the International Symposium held in Borstel in 1970, the proceedings of which were published in a special fascicule of the *International Journal of Leprosy*. Research activities at other centres are also assisted by DAHW, such as the work of Dr Tore Godal at the Armauer Hansen Research Institute, Addis Ababa. In addition, DAHW not only itself produces a fine range of literature, but subsidizes the publication of theses and makes a substantial grant to the *International Journal of Leprosy*.

Last, but not least, mention must be made of the financial help given by DAHW for the work of Dr Eleanor Storrs on the armadillo at Indian Camp, Louisiana, an important project that has captured the imagination and opened the purse-strings of the outward-looking and forward-looking West Germans who, at ridiculously low cost and with such good effect, direct the affairs of the Deutsches Aussätzigen Hilfswerk.

6. The Raoul Follereau Foundation

ANDRÉ RECIPON

President, 42 Rue Laugier, 75017 Paris, France

It was on 14 February 1968, that Raoul Follereau requested me (by a duly-attested declaration) to continue the "fight against leprosy and against all 'leprosies' " that he been waging for 40 years. Five years later is a kind of

anniversary, an anniversary that provides an opportunity to take a look at the whole organization which, with the help of the many friends of Raoul Follereau throughout the world, I have brought into being to continue the work of one who is still called the "Vagabond of Charity".

In 1968, I began by forming the "Association of Raoul Follereau Foundations" to unite everybody and every Committee which in France and other countries responded to my appeal. It soon became necessary to make a distinction between the national organizations and the international grouping. It was thus that, in 1971, the "International Association of the Raoul Follereau Foundations" was established, with a Council of 3 members named by Raoul Follereau who, each in turn, assumes the rôle of President of the Association for one year. The 2 members (in addition to myself) are: The Reverend Father Corti, ex-President of the *Amici dei Lebbrosi* (Italy), and Monsieur René Henrion, the General Director of the *Amis du Père Damien* (Belgium)—the President for this year.

The principal national associations now linked in the International Association are organized in the following countries: France, Belgium, Italy, Luxembourg, Spain, Great Britain, Malta, Canada, Senegal, Mali, Ivory Coast, Upper Volta, Dahomey, Togo, Chad, Madagascar, Vietnam and Mauritius. All these national committees are responsible for organizating every year the World Leprosy Day, which was inaugurated in 1954 by Raoul Follereau, and whose 20th anniversary was observed on 28 January 1973, in over 125 countries. As its Founder hoped, this Day has become a significant focal-point for feelings of compassion towards the victims of leprosy, and it is by no means unknown in Africa on this Day for a Head of State to visit leprosy sufferers, thus showing by this act that these unfortunates are human beings just like the rest of us. Some of the national associations send doctors, nurses and nuns to the centres they support, but the greatest means of assistance adopted by the Raoul Follereau Foundations is by granting financial help to centres—both privately run and governmental—that are concerned with the campaign against leprosy.

I may be permitted in this connection to indicate that the best results hitherto achieved—in the Central African Republic, where 75% of leprosy patients have been discharged "disease arrested, or placed on observation without treatment", or in Upper Volta, where the figure is 60%—are due to the close cooperation between the local Raoul Follereau Foundation and the respective Ministry of Health, and this in countries that are, incidentally, among the poorest in the world. Every year, the member-associations distribute for the care and rehabilitation of leprosy sufferers over 10 million French francs (the equivalent of nearly £900,000), which is the sum total of a multitude of gifts from generous ordinary folk.

The Raoul Follereau Foundations, however, are not unmindful of their supreme objective, to wage "Raoul Follereau's struggle", which is really the "struggle against leprosy and against all the 'leprosies' "—which are selfishness, meanness, indifference, and the rest—to upset the complacency of the well-off who, because they eat 3 times a day, imagine that the rest of the world does too; and to awaken in men's hearts that spark of love which will overcome self-centredness.

With these objects in mind, the Raoul Follereau Foundations have spread all over the world the writings and the message of Raoul Follereau, and in particular the "Small Book of Love" (*Petit Livre d'Amour*) in which we have brought together the main lines of thought from his books and his well-known lectures.

We are proud that in the year 1973, when our Founder has celebrated his 70th birthday, the circulation of this little book has reached 5 million copies in 22 languages. Copies, in the principal languages, may be obtained free of charge from: *l'Association Française des Fondations Raoul Follereau*, 42 rue Laugier, 75017 Paris, France.

7. ELEP—The European Federation of Anti-leprosy Associations

PIERRE VAN DEN WIJNGAERT

Founder of "Les Amis du Père Damien" and General Secretary, ELEP, 4 Rue Saint-Geoffroy, 4, F-80 Amiens, France

Raoul Follereau, the Founder of World Leprosy Day, had for many years nurtured the hope that one day the various organizations having as their object the channelling of help for leprosy sufferers should present a united front within the framework of an international body. The Belgian association, "Les Amis du Père Damien", gave him the opportunity of fulfilling this wish when it organized in Brussels on 2 October, 1965, the first meeting of the European Associations engaged in the fight against leprosy. Raoul Follereau's idea met a real need, and less than a year later, on 25 September, 1966, the European Co-ordinating Committee of the Anti-Leprosy Associations came into being, adopting the name ELEP, signifying "Europe (*E*) against leprosy (*LEP*)". At last, on 19 April, 1969, in Paris, ELEP was constituted as The European Federation of Anti-Leprosy Associations, which obtained legal recognition in France on 25 October, 1971. Raoul Follereau was elected Honorary Life-President.

Today, ELEP brings together 20 national anti-leprosy associations, based in 14 Western countries—12 in Europe and 2 in North America. Its field of action extends to some 600 centres in 75 countries, and to over 900,000 leprosy patients. The total of financial help provided by the Member-Organizations of ELEP amounted in 1972 to U.S. $7,237,996 (before devaluation) of which $3,135,791 went to 33 African countries, and $2,923,916 to 22 Asian countries; $534,045 was shared between 16 countries of Latin America the Pacific Islands and Europe; and $452,217 was devoted to research.

ELEP thus represents an important section of the voluntary agencies engaged in the world-wide anti-leprosy campaign. The internal resources of countries in which leprosy is a problem are quite inadequate, but they are helped in the organization of their anti-leprosy programmes by WHO, UNICEF, missionary societies, and numerous private agencies, national or foreign-based. Among the latter, ELEP is included; its Member-Organizations raise funds in countries not themselves facing a leprosy problem. These funds, accompanied by material in kind and sometimes by expatriate staff, are despatched to countries where leprosy constitutes a problem. Therein lies a fact almost unique, namely, aid offered by voluntary organizations in Western countries to assist in the fight against a disease that ravages the countries of the Third World. In the past, the heroic example of Father Damien and the no less remarkable example of Wellesley Bailey provided the inspiration; today we hear the voice of Raoul Follereau.

The very multiplicity of these anti-leprosy associations, and the fact that their work lay overseas, made imperative some kind of union that would co-ordinate their activities and increase their usefulness, while at the same time safeguarding their individual interests by respecting their autonomy. Thus, ELEP has developed into an agency for co-ordination that brings together the Member-Organizations into a community of co-workers.

The Member-Organizations of ELEP are in essence working groups. The various aspects of the anti-leprosy programme—as much medical and scientific as social and humanitarian—are to be found among their activities. These range from eradication programmes to the maintenance of leprosaria, taking within their scope ambulatory treatment by mobile circuits, reconstructive surgery, physiotherapy, vocational therapy, manufacture of orthopaedic footwear, prosthesis-making, health education, and professional and social rehabilitation, as well as extending help to those victims of leprosy who are without resources, having been abandoned, or are suffering from irremediable deformities. On the other hand, members of ELEP have agreed to devote a sizeable proportion of their budget (over 5%) to the financing of research projects. The training of staff in leprosy is also one of ELEP's priorities. The medico-social activities of ELEP thus differ distinctly from those of WHO, to which ELEP nevertheless may be regarded as complementary.

n order to assure the fullest cooperation between partners who are completely autonomous, ELEP is a co-ordinating body, which collects and collates information. The Office takes its cue in matters of general policy from the Medical Commission, and maintains close contact with Member-Organizations by regularly distributing such documents as the following:

(1) Applications for assistance from centres abroad, together with their Annual Reports; (2) a list of such centres, classified according to a decimal system by country and sometimes by province; (3) the Co-ordinated Budget, whose object is to avoid overlapping and to ensure a more equitable allocation of resources; and (4) an analytical summary of the diverse activities of all aided centres.

Contacts between the Member-Organizations of ELEP are constantly maintained, since their representatives have come to know each other and are now bound by strong ties of friendship. The working sessions held twice a year bring them together to discuss the budget, the aided projects and programmes, and to examine certain organizational and administrative problems. It is here that ideas for combined operations are developed, and temporary partnerships of Member-Organizations for specific projects are worked out. When several associations are helping a single centre, they may agree that one of the partners assumes the rôle of "co-ordinator". Under this title it undertakes to obtain all the necessary information about the activities of the centre so as to co-ordinate the financial help accorded, and to supervise the execution of the agreed programme, on behalf of the various partner-bodies and with their agreement. This system of co-ordination is sometimes extended to the whole of a country.

When a project includes an important programme, important in the sense of being financially costly, an appeal is sometimes made to Member-Organizations of ELEP to participate in financing a Joint Project. The overall responsibility of organizing and supervising this kind of project is entrusted to one of the participating partners. It was along these lines that the Dhamapuri Project, in Tamil Nadu (India), was financed by seven associations, one of which assumed the rôle of Co-ordinator. Some 40,000 leprosy patients live in the area of this Project.

This co-ordination of the work of the Centres and the Joint Projects constitute a very definite success of the policy of ELEP.

The Medical Commission has for its major task the elaboration of the guide-lines of the antileprosy campaign, and thus to determine the common medical policy of ELEP Members. This policy constitutes the inspiration of all the co-ordinating activities of ELEP. The Commission comprises eminent leprologists and specialists with long experience of public health problems in tropical countries. The Commission examines certain important projects that are submitted to it by Member-Organizations, especially joint projects and research programmes. The Commisssion gives its advice in the light of the most recent medical and scientific knowledge of leprosy. From time to time it makes a study of the leprosy situation in a given country, and then gives its opinion on one or other aspect of the application of general principles, already enunciated and accepted, to the situation in question. Its members are invited to take part, as medical advisers, in all the meetings of ELEP. It is obvious that the Medical Co nmission plays a fundamental rôle within the heart of ELEP.

Thanks to the ever-increasing participation of the Member-Organizations in its activities, to the competence and judicious opinions expressed by its Medical Commission, and to the fund of information available through its Co-ordinating Office, ELEP is moving more and more towards a long-term planning of its activities, which today embrace practically one-third of those leprosy patients now under treatment throughout the world and which in the course of the next few years will exert an even greater impact on the world-wide campaign against leprosy.

Lepr. Rev. (1973), **44**, 183-185

The Bacterial Load in the Nasal Mucosa of Chinese Patients

A. GRACE WARREN

Hay Ling Chau Leprosarium, Hong Kong

In Chinese patients it is not possible to rely on the presence or absence of *Myco. leprae* in the nasal mucosa to confirm or deny a diagnosis of leprosy. Although the load of bacteria in the nose may be high in some untreated patients, during treatment it falls more rapidly there than elsewhere in the body.

Examination of the nasal mucosa for bacterial load has been suggested as a means of diagnosis of leprosy and for the determination of the degree of infectivity. Browne (1966) found in Nigeria that the bacillary index (B.I.) of the nasal mucosa was frequently higher than that of the routine skin smears and that bacilli may persist in the nasal mucosa after the skin sites have become negative. Goodwin (1967) implied that examination of nasal smears was not a reliable means of diagnosis or for following the patient's progress. He correlated the level of the bacillary concentration in the nose with the type of leprosy.

Nasal smears have been examined in this institution, Hay Ling Chau, from time to time, but not regularly, since the procedure is not pleasant and we feel that the extra information that it provides is not enough to offset the discomfort it causes and the risk of losing the patient's future co-operation.

Checking our records, we have found 85 patients who have had nasal smears examined since Dr Stanley Browne checked the technique of our technician in 1967. All the smears were taken and examined by the same technician, who also does the routine skin smears. As well as taking smears from the nasal septum, as described by Browne (1966), he also examined swabs of the nasal mucosa in some patients. Attempts at examination of nose "blows" did not yield any useful information, as the bacillary load was always much lower than that in the nasal smears. The load in the nasal swab was also lower than that in the skin smear, but did show acid-fast bacteria which were occasionally of normal morphology.

The group included 49 patients whose nasal smears were examined within 4 weeks of starting regular anti-leprotic therapy. In this group there were 19 newly diagnosed patients with lepromatous-type leprosy whose skin smear B.I. varied from 5.3 to 2.0. There were also 4 lepromatous patients who had relapsed because of discontinuation of regular therapy. The highest morphological index (M.I.) was 30% (patient no. 2113), but in most cases the M.I. was between 2% and 10%, and in 10 patients the skin M.I. was already 0%. In most of the patients the nasal B.I. and M.I. were equal to, or slightly lower than, the skin smear, and the concentration of bacilli recovered from the nose fell at a rate similar to that for the skin. One patient (no. 2113) had a skin smear of 455455 (4.7), with a M.I. of

30% and a nasal B.I. of 6, with 60% M.I., and a nasal mucosa swab also showed a B.I. of 2. 27 months later, the nasal B.I. was still 2, but the M.I. was 0% and all swabs were negative. After a further 3 months, all nasal smears were free from acid-fast organisms; by that time the skin smear was 3.2 and the patient's general progress was slow but satisfactory. In no patient examined was a negative skin smear found in the presence of a positive nasal smear.

Of the other patients examined on admission, there were 10 in the BL or near lepromatous groups. All except one showed a nasal M.I. of 0% initially, though several did have morphologically normal bacilli in their skin smears, and in one patient the skin smear M.I. was 30%. The exception was a patient (no. 2107) who had been taking dapsone irregularly for years. On admission both skin and nasal M.I. were 20% and a nasal mucosa swab showed a B.I. of 3. He was later given clofazimine (Lamprene, Geigy) for presumed dapsone resistance and acute neuritis.

Of the patients with BB-BT type leprosy, 13 showed negative nasal smears, though skin smears varied from 0.7 to 4.0; 3 others had positive nasal smears. One patient (no. 1936) had a skin smear of 2.5 and a nasal B.I. of 3, with an M.I. of 3%. He developed an upgrading reaction, during which the bacillary load fell rapidly, though his leprosy may well have initially been of BL type.

The other patients were not examined within the first few weeks of commencing anti-leprosy treatment, but results of irregular examination of the nasal bacilli agreed in general with the findings in the main group. Since we cannot do serial examinations on negative patients to watch for early signs of bacterial relapse, we cannot make any statement about the time of reappearance of bacilli in the nose of relapsing patients. However, one patient (no. 1449) was re-admitted in April 1972, in relapse with skin smear showing a B.I. of 4.8 and M.I. of 10%. Nasal smears were not done then. It was suspected that he was resistant to both dapsone and thiambutosine, since he had been taking treatment irregularly for some years. A biopsy specimen was taken for mouse-footpad sensitivity tests, and the patient was advised to take Lamprene. He refused this, and was given injectable dapsone on which he appeared to make slow progress for 4 months, his smear falling to B.I. 4.3 and M.I. 0%, and then becoming stationary. His nasal smears were done in March 1973, and were all negative for acid-fast organisms.

In May 1973, the mouse-footpad test results indicated dapsone resistance. He still refuses to take Lamprene, saying he will wait until his skin smear shows definite deterioration. However, his last nasal smear in June 1973 was positive, with a B.I. of 2 but M.I. 0%. The nasal mucosa swabs were negative. It may be that this patient is showing the first definite signs of resistance by increase in the nasal bacterial load and a careful watch will be kept on him.

Conclusions

In Chinese patients it is apparent that:

(1) The bacillary index of the nasal mucosa is similar to that of the skin in untreated patients with lepromatous type leprosy, but it becomes negative sooner; (2) the morphological index in the nose is equal to, or less than, that of the skin, and usually becomes negative before the M.I. of the skin becomes negative; (3) in patients with a greater immunological response, e.g. BB-BT type, the nasal mucosa is usually bacillary negative, unless a lesion occurs across the nose; and (4) nasal

smears do little to help confirm the diagnosis of leprosy, and if this is the only site examined may well lead to an incorrect diagnosis, especially in the borderline groups of patients.

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Lepr. Rev. (1973), **44**, 186-191

The Management of Leprous Rhinitis

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The management of leprous rhinitis is discussed. In patients with early changes in the nose it is thought that local treatment is of psychological rather than of any great physical value. There is, however, a group of patients with early lepromatous leprosy whose nasal involvement is severe and out of all proportion to their general clinical state. It is possible that intensive local treatment of the nose in these patients may help to prevent deformity. Patients with advanced nasal changes giving rise to atrophic rhinitis and external deformities gain much physical, as well as psychological, relief from regular local care of the nose, and this is described below.

Introduction

It is well known that the nose is commonly involved in lepromatous leprosy, and it has been shown recently (Barton *et al.*, 1973) that this involvement occurs early in the disease process. Furthermore, the changes that are seen, both clinically and histologically, are frequently more severe than might be expected from the systemic state of the patient. The detailed description of these changes is presented elsewhere, but for the purpose of this paper they may be summarized as follows.

In early lepromatous leprosy the nose is involved in an inflammatory, granulomatous process which initially causes obstruction of the nasal airways, increased discharge of mucus or muco-purulent matter, occasional bleeding and, under dry atmospheric conditions, crust formation.

If this process is allowed to continue without treatment it will eventually lead to destruction of the normal anatomical and physiological state of the nose, with these consequences: (a) *Internal changes.* The classic picture of atrophic rhinitis appears (Reynaud and Languillon, 1961) with erosion of the lateral nasal walls, septal perforation, ozaena, cacosmia and hyposmia (Barton, 1973). (b) *External deformity.* The loss of the supporting nasal septum, particularly superiorly and anteriorly (the columella), and also of the anterior nasal spine leads to the typical deformity seen in advanced lepromatous leprosy.

The Importance of Treatment

It would be all too easy to dismiss these changes as an unimportant aspect of leprosy work. However, while working on other projects at Victoria Hospital, Dichpalli, in central southern India, the writer was fortunate enough to be able not only to treat the nasal lesions in leprosy patients but also to see just how important the patients themselves considered their nasal symptoms to be. It became very obvious that local treatment of the nose was a most important and valuable part of the overall care of these patients.

Lest it should be thought that nasal care is too time-consuming or too specialized a subject for the leprologist to tackle without training in the methods of the ear, nose and throat surgeon, it is worth pointing out that, with a little practice, it should be possible to treat between 35 and 40 patients per hour.

Rationale of Treatment

Patients whose nose was still in the early stage of involvement often had quite severe symptoms. They were able, in the hospital situation, to observe and talk to others with more advanced illness who had already developed nasal deformity and this, quite naturally, caused concern that they too would suffer the same fate. While the patients often realized that the medicine which they received by mouth (normally dapsone) was in fact doing them good, it became clear on talking to them that they found it hard to relate the state of their nose to the tablets that they were getting. Therefore, although the clinical state of the nose and the bacilli present in the nasal mucosa show a favourable response to dapsone therapy within a matter of weeks (Barton *et al.*, 1973), it was often difficult to convince these patients that their noses would get better without any local treatment.

Patients with more advanced changes present a different problem: basically their nasal treatment is that of atrophic rhinitis. Much has been written in the E.N.T. literature on this subject and it may be briefly summarized as follows.

Local Treatment

Removal of crusts, either mechanically or by irrigation with warm isotonic solutions, is followed by painting or spraying of the nasal cavities with some suitable medicament. Many substances have been used, but a 25% solution of glucose in glycerine has been, perhaps, the most widely favoured. This is said to prevent the adherence of fresh crusts and to inhibit colonization of the nose by saprophytic organisms. Mukarji (1973), in a review of some of the earlier leprosy literature, notes several references to local treatment of the nose. A wide variety of preparations are mentioned, these including various borax solutions, iodized glycerine, 5% aqueous chromic acid, and iodized hydnocarpus oil.

Medical Treatment

Many authors have postulated a hormonal factor in the causation of atrophic rhinitis. Certainly it is more common in females and exacerbations are often associated with puberty and pregnancy. Oestrogens have been of value in treating this condition, although Taylor and Young (1961) suggested that their efficacy may be due to their vasodilator effect on the nasal mucosa rather than to any systemic hormonal action. Other vasodilators, such as nicotinic acid, and drugs intended to increase the nasal secretions, such as potassium iodide, have also been tried.

Many bacteria have been isolated from the noses of patients with atrophic rhinitis, but there is little evidence that any specific organism causes the disease (Foxen, 1971). For this reason it is not surprising that antibiotics are of limited use, even when the sensitivity of any bacteria in the nose can be determined. Generally speaking, however, it is fair to say that the present medical treatment of atrophic rhinitis is disappointing and that further work is needed to discover more efficacious drugs.

Surgical Treatment

Young (1967) recommended closure of the nostrils for periods of up to 4 years, and stated that when the nose was re-opened the mucosa was seen to have a normal appearance. Previously he had found that partial closure or narrowing of the nose gave palliation in some cases but was not actually curative. Narrowing of the nasal cavities to help atrophic rhinitis was tried as long ago as 1916 by Lautenschlager. He, using a trans-antral approach, mobilized the nasal wall of the maxillary antra medially in order to decrease the size of the nasal cavities. Wittmaach modified this operation to include re-routing of the parotid salivary duct into the antrum—unfortunately this manoeuvre resulted in salivation from the nose at mealtimes!

Autografts of bone or cartilage placed submucosally have the disadvantage of undergoing resorption, while foreign material runs the risk of extrusion and rejection. This risk has been reduced since the introduction of relatively inert substances such as teflon and Silastic. Attempts to improve the blood supply to the nasal mucosa by stellate ganglion block (Sharma and Sardana 1966) require repeated injections into the neck. If stellate ganglion block is successful, then logically cervical sympathectomy should be considered.

Recently, Ssalli (1973) has recommended amputation of the middle turbinates, and claims good results from this procedure (91% of a small series were said to have improved). However, in many cases of atrophic rhinitis resulting from advanced lepromatous leprosy, personally observed, it was striking how often the upper part of the nasal cavities, at the level of the middle turbinates and above, appeared to be normal, even when gross atrophic changes were present lower in the nose. Middle turbinectomy can only serve to increase the already pathologically enlarged nasal cavities of atrophic rhinitis. As such it is difficult to see why this line of treatment should be effective.

Mention having been made both of patients with early changes in the nose and the very large group with atrophic rhinitis, it is worth considering briefly a small but extremely interesting group. These are the patients who, early in their illness or when their leprosy is rapidly "down-grading", suffer a very acute nasal infection which, together with their general systemic state, continues to deteriorate temporarily after the institution of dapsone or other anti-lepromatous chemotherapy. In this group it is quite probable that careful local treatment of the nose helps to prevent those changes that lead to nasal deformity, in that the inflammation may be controlled until such time as the systemic chemotherapy begins to reverse the intranasal pathology. If treatment is begun early enough, deformity can undoubtedly be prevented or arrested.

Details of Treatment

Various methods were experimented with, but in the time available for developing an efficient and effective treatment plan it was not possible to undertake adequately controlled trials of the different methods used. Therefore, the following scheme was arrived at as a result of favourable subjective impressions gained by both patients and doctor.

(A) EARLY CASES

It has already been observed that it is the systemic therapy that is of prime importance—no lepromatous nose will be cured by local treatment alone.

However, careful local treatment will never harm the nose and therefore, as the psychological factor is of such importance in the overall management of these patients, anyone with nasal symptoms, provided there was some intranasal pathology, was accepted for regular care.

What was considered to be of great importance was to instruct the patients firmly that they must not attempt to "pick" or in any way traumatize their nose. In a consecutive series, personally observed, of patients with all forms of leprosy, over half (78 out of 150; or 52%) had some degree of sensory loss in the nose. This is probably an important aetiological factor with regard to ulceration of the mucosa over the nasal septum and thence in perforation of the septum and eventual external deformity.

(B) LATE CASES–(including those with rapidly advancing infection)

Surgical intervention along any of the lines previously mentioned was not possible at the time of this investigation. Similarly the various forms of systemic medical treatment recommended for non-lepromatous atrophic rhinitis–the results of which are in any case frequently disappointing–was not considered worth exploring in the time available. The treatment employed was, therefore, entirely local in nature, and the procedure eventually chosen is outlined below.

(1) *Removal of crusts.* This was considered to be the most important single part of treatment. Removal of crusts must be both careful and meticulous, as any small pieces remaining act as a nidus for further crust formation. Any trauma to the delicate nasal mucosa will aggravate the local condition and could increase the risk of nasal deformity. Two hands are needed for removing crusts–one to hold a nasal speculum in order to dilate the nostrils, and the other to hold a pair of nasal dressing forceps (Tilley's or Heath's patterns are suitable). It is, therefore, clear that a good independent light source is required, and the author favours a convex head-mirror used to reflect light from a "bull's eye" or other strong lamp placed behind the patient. Alternatively, a battery- or mains-operated headlamp may be used; a torch held by an assistant was found to be not satisfactory for fully illuminating the whole of the nasal cavities. When hard adherent crusts were encountered patients were shown how to irrigate the nose so as to soften and loosen the crusts before mechanical removal was attempted. An effective solution was found to be equal parts, by weight, of sodium bicarbonate, sodium borate and sodium chloride, 1 5 g to be dissolved in 500 ml of warm water.

(2) *Local medicament.* Immediately after removal of all the crusts, the nose was carefully painted with a liberal amount of an ointment composed of:

Vaseline	1 kg
Glycerine	200 g
Vioform	300 g
Crystal violet	5 g

This ointment was applied to all accessible parts of the nasal cavities on cotton-wool-tipped sticks, a plentiful supply of which is needed. Several different ointments were tried and discarded for various reasons, before this particular one was chosen. A preparation of 25% glucose in glycerine, contrary to what is generally accepted, resulted in several cases in the colonization of the patient's nasal cavities by a dry, white fungal growth. It was not possible to identify this growth further and, while it did not appear to cause any local symptoms or distress, the use of glucose in glycerine was abandoned.

Various types of oily nasal drops were of some value, but it was found that they tended to dry rather rapidly and they were not employed in routine in-patient care. Supplies were gratefully accepted by many of the hospital's out-patients, but the efficacy of their action was not fully assessed. A simple paste of Vaseline and Vioform was originally used, but the disadvantage of this preparation was that it tended to dry out and so became more difficult to apply to the nasal mucosa as it seemed to lose its "stickiness". This problem was overcome by adding glycerine; the ointment then became easy to apply to the mucosa and became pleasant to handle in all respects.

Vaseline, which was used elsewhere in the hospital in the care of hands and feet, helped to keep the crusts, which in many patients reformed very quickly, soft and easy to remove. Vioform (iodochlorhydroxyquinolone) is an antiseptic that is bactericidal and also active against many fungi: it does not cause sensitivity reactions, nor do organisms become resistant to it. It has the added advantage of being cheap and easily available in the form of Enterovioform tablets which may be crushed and incorporated in the ointment. (Each Enterovioform tablet contains 250 mg of the active principle.) The ointment was used in this form (i.e. Vaseline, Vioform and glycerine) for some time before it was decided to add crystal violet. This also has antiseptic properties and has the additional advantage of giving the ointment an impressive deep blue colour. Apart from its psychological value (the patients were unanimously in favour of the new colour when this was added) it had the additional advantage of acting as a marker, and thus enabling one to see how long the ointment remained present, and therefore presumably effective, in the noses of different patients.

(3) *Frequency of treatment.* Initially treatment was given on a daily basis, but many patients failed to attend regularly; also the crystal violet which remained in the nose showed that in many patients traces of ointment could be detected even after five to seven days. Eventually the Nose Clinic at Victoria Hospital functioned on Mondays, Wednesdays and Fridays. Patients were given cards to be signed at each attendance, and this improved both the regularity of attendance and the results obtained.

It was most gratifying to see the improvement in the noses of our patients: it was sometimes dramatic, and frequently very good. A few patients did badly despite what was considered to be adequate local and systemic treatment, and the reasons for this are not altogether clear. Though there was not time for full investigation, it is possible that those whose nasal condition deteriorated were patients infected with bacilli resistant to dapsone.

Conclusions

It is hoped that these observations and suggestions on the treatment of the nasal lesions in leprosy will stimulate those who have, or can develop, the facilities to use them as widely as possible. While careful removal of crusts is of great importance, there is still much scope for the further development of local preparations to be used intranasally. Initially it was thought that an anti-lepromatous drug could be incorporated in to the ointment used, but in patients with late nasal lesions the degree of infectivity is not high. In patients with early lepromatous leprosy it is the oral drugs that are important in producing both general and nasal improvement. However, in the group of patients already mentioned with very rapidly advancing nasal infection, it is possible that the

intranasal use of anti-lepromatous drugs may prove to be of value. Certainly further work is needed.

In the present study no surgical treatment was attempted in the time available, and it is doubtful if Young's operation of total closure of the nostrils would be tolerated by leprosy patients. It is possible that the likely palliation resulting from the insertion of teflon implants under the mucosa of the lateral walls and floor of the nasal cavities would be worthwhile and this method could profitably be explored.

Acknowledgements

My grateful thanks are due to Dr Frank Davey for his initial encouragement and help in this work; to Dr L. M. Hogerzeil and staff at Victoria Hospital, Dichpalli, for granting all facilities, and especially to Mr B. Deena Dayalu whose assistance was invaluable. My thanks are also due to the Board of Governors of St Mary's Hospital, London, for allowing me leave of absence, and to the British Leprosy Relief Association (LEPRA) for their generous support.

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Lepr. Rev. (1973), **44**, 192-195

Acedapsone in the Preventive Treatment of Leprosy

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Well designed and carefully executed trials of dapsone in the preventive treatment of children with household exposure to leprosy in India have shown only a partial success in reducing the subsequent incidence of leprosy among the children in the study (Nordeen, 1969; Wardekar, 1969). The difficulty of ensuring consistent dosage of oral medication over a period of 3 years may have been a factor in these results. When acedapsone [diacetyl-diamino-diphenyl sulphone (DADDS; Hansolar)] became available for experimental use in the late 1960's it then became possible to repeat the trial, with the certainty of a low, consistent blood level of DDS, through 5 intramuscular injections of acedapsone per year (Ozawa, Shepard and Karat, 1971).

Methods

The history of leprosy in this population and of our earlier work has been described elsewhere (Sloan *et al.*, 1972). Leprosy had been first introduced into Pingelap in 1918 via an immigrant case from Nauru, and is known to have been at high prevalence in this population since at least 1950. In the autumn of 1967 the entire population (except for some 20 persons who were out of the district at the time) of approximately 1500 highly in-bred people of Pingelap atoll origin were examined for leprosy in three villages in the Ponape District of the Eastern Caroline Islands. This complete examination by one highly experienced leprologist, Dr Norman Sloan, plus a careful review of existing records, revealed a total of 99 cases of leprosy confirmed by biopsy, 62 of which were clinically

* Requests for reprints should be sent to Dr Worth.

active in 1967. The remaining 37 were treated, inactive cases. The experience of this population during the 5-year period 1963 to 1967 inclusive led to an estimate of an incidence of about 11 new cases per year.

Beginning in October 1967. the entire population of these three villages, including the known cases of leprosy, were placed under the following DADDS treatment or preventive treatment programme:

Age 6 years or more: 1.5 ml (225 mg) i.m. every 75 days
Age 6 months to 5 years: 1.0 ml (150 mg) i.m. every 75 days
Age 0 to 5 months: if born before October 1968. started on DADDS at age 6 months; if born October 1968, or later, not started on DADDS.

Dr Sloan returned to Ponape each year in the autumn of 1968, 1969, and 1970 to re-examine the entire population, to take a biopsy specimen from all known cases, to follow the response to treatment, and to look for any new cases arising in the population. Any suspicious skin lesion was biopsied. Every time a person was given his DADDS he was questioned and given a superficial examination by a nurse for signs and symptoms of leprosy. This intensive surveillance continued until preventive treatment was halted in the autumn of 1970, but the diagnosed cases of leprosy continued under DADDS therapy Since that time. passive surveillance of this population has been continued by the personnel of the Ponape Health Department, supplemented by an annual leprosy examination given to each member of this population by an experienced leprologist. All biopsy specimens since 1967 have been examined by the same leprologist in San Francisco, and all mouse foot-pad inoculations have been performed in the same laboratory in Atlanta.

Results

Figure 1 is a summary of the results of the surveillance of this population from 1968 through January, 1973.

It is clear that after a 6-month lag period, during which incidence was unaffected, the level of DADDS used in this population was sufficient to suppress the clinical onset of new cases of leprosy. This effect lasted for 3 years, until about 6 months after the preventive treatment with DADDS was halted.

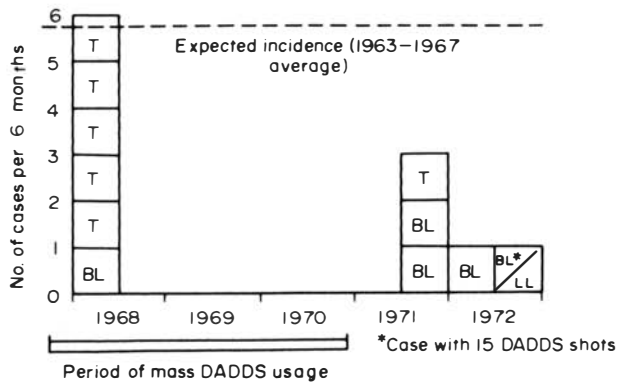

Fig. 1. Leprosy incidence among Pingelapese people, 1968-1972, by six-month interval and by histological types.

TABLE 1

Distribution of 1571[a] Pingelapese people who were born before 1969 and who did not have leprosy at the end of 1970, by history of DADDS preventive treatment and by subsequent leprosy incidence

Status of population at risk	No. of DADDS shots during 1967-70				Total
	0-3	4-6	7-13	14-15	
Alive at end of 1970	234	173	241	923	1571
Died 1971-72	−12	−4	−4	−6	−26
New cases 1971-72	−1	−0	−3	−1	−5
Without leprosy in January 1973	221	169	234	916	1540[b]
Average annual leprosy incidence 1971-72		3.1/1000		0.5/1000	

[a] There are 232 additional Pingelapese children born during 1969-72, who have survived infancy, have received no DADDS, and who have not yet produced any cases of leprosy.
[b] All but 40 of these people were examined in January 1973.

Table 1 is a distribution of the population at risk at the end of 1970 by the number of DADDS injections received, and shows the subsequent leprosy incidence; 4 of the new cases had received 10 or fewer injections of DADDS as preventive treatment. One of these persons developed tuberculoid leprosy, and the other 3 developed BL leprosy. The remaining new case is in a young boy who had received all 15 injections between the ages of 2 and 5 years and who developed BL-LL leprosy during the autumn of 1972. He comes from a family containing several other leprosy patients.

Of the 56 cases with an onset between 1963 and 1967,
classified as borderline or lepromatous leprosy. Of the 6 cases with an onset early in 1968, one (18%) was BL in classification. Of the 5 cases with an onset after 1970 all but one have been classified as having BL or LL disease; the exception is the daughter of an old patient with lepromatous disease due to a proven sulphone-resistant strain of *Myco. leprae*.

Of the 68 cases that were clinically active in 1967-68, all are doing well on DADDS (the sulphone-resistant case is on B663), except for 6 whose disease has recently reactivated or undergone a TT to BL shift, associated with irregular therapy.

Discussion

If the appearance of new cases ceases in the next few years, then it is possible that all the cases appearing in 1971-72 represent infections that took place prior to 1968, and that we have managed to stop the transmission of all sulphone-sensitive strains of *Myco. leprae* in this population.

It seems probable from the data that have thus far been obtained that:

(1) Two or three injections of DADDS will not suppress the development of clinically recognizable leprosy in those who are about to develop it, but more than 2 or 3 injections will apparently suppress the development of further new cases in the population for the duration of the preventive treatment.

(2) There appears to be some, as yet, ill-defined threshold of DADDS injections (perhaps less than 15 injections) sufficient to prevent (or at least delay for several years) the onset of tuberculoid or indeterminate leprosy lesions in

those who had been infected and whose immunological status is such that they would have developed these forms of leprosy.

(3) When a preventive treatment course of DADDS (15 injections) is stopped among those who had been infected and whose immunological status is such that they would have developed borderline or lepromatous leprosy, the incidence of these forms of leprosy will return from zero, but to a much lower rate than formerly. Among those who received less than a full course of DADDS, the incidence will return to a higher, but not yet clearly defined rate.

Several more years of careful surveillance of this population will be required to confirm the reliability of these observations, but if they are true, the implications for the successful use of DADDS preventive treatment are fairly clear:

(1) Fifteen injections of DADDS in heavily exposed groups (such as household contacts of infectious cases, etc.) can reduce the subsequent load of clinical cases of leprosy to a level far below what it would have been, but will not *immediately* lead to a break in the chain of transmission in that population, since new cases of infectious leprosy will continue to appear for several years, but at a rate considerably lower than before.

(2) Because of the reappearance of new infectious cases, a good control programme would have to include a careful surveillance of household contacts for several years after the end of their DADDS preventive treatment, a prompt and thorough treatment of any new infectious case that appears, and a re-institution of preventive treatment for all those who had been exposed to the new infectious case *before* this patient was placed under treatment (Worth and Wong, 1971).

(3) A leprosy control programme based on the above principles, with combined therapy of DADDS and one other drug in those "bacilliferous" cases with a bacillary index of 2+ or more (Shepard, 1973) holds the possibility of a practical, economical, and fairly rapid eradication of leprosy in any population. This approach will be tested for the next few years in this Pingelapese population, and it should also be tested in other populations.

Acknowledgement

The work upon which this publication is based was performed pursuant to Contract No. NIH-NIAID-72-2075 with the U.S. National Institutes of Health, Department of Health, Washington, D.C., U.S.A.

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Lepr. Rev. (1973), **44**, 196-202

Restoration of Hypothenar Muscle Function in Ulnar Nerve Paralysis*

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Insufficient attention has been given to the loss of hypothenar function in ulnar nerve paralysis. While restoration of a normal sequence of grasp and a strong pinch are of paramount importance in all patients, it is also important in certain cases to give a cosmetically acceptable shape to the hand for purposes of communication–a long-neglected function of the hand. Reference is made to a new technique using the extensor digiti minimi which, by reconstructing the transverse metacarpal arch not only has cosmetic value, but also produces a useful 5-finger pinch. Being an extensor, it cannot *improve* strength of grip–a third function of the hypothenar muscles–but increased grip strength *per se* is not necessarily desirable in anaesthetic hands. Finally, the complex interrelationship between the mobility of the transverse metacarpal arch and the effect of lumbrical replacement procedures is briefly discussed.

Grasp and pinch are the two most useful functions of the hand. The hand is also a sense organ. But an oft forgotten use of the hand is in communication (Table 1).

TABLE 1

Four functions of the hand

1.	Grasp
2.	Pinch–digits 2, 3, and 5
3.	As a sense organ
4.	Communication of ideas

For this purpose the hand must have graceful mobility and a pleasing shape. A badly-shaped hand has limited function as a means of communication. This fact is particularly important in countries where there is still a serious degree of social rejection of leprosy sufferers, for the shape of the hand may communicate the fact that the speaker has leprosy. Therefore, it is essential that in the practice of leprosy reconstructive surgery we should direct our efforts toward the elimination of such cosmetic defects, while at the same time restoring a normal sequence of grasp and a strong pinch.

We cannot speak of form as distinct from function, for in order to function well as a means of communication the hand must have a cosmetically acceptable form. The value of this particular function will vary according to the rôle of the

* Paper read at the Tenth International Leprosy Congress, Bergen, Norway, 1973.

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patient in society and the degree of acceptance or rejection he is likely to experience. It will therefore be of so little value to a farmer in a society that accepts leprosy patients as not to matter; but to one who is daily exhibiting his hands to a more hostile society, e.g. a bank clerk in an urban area, the shape of his hands will determine whether or not he is accepted for employment.

Standard operations are available for lumbrical replacement and for restoration of thumb action. In those operations designed to improve grasp and pinch, the importance of cosmesis is generally recognized. Efforts are also being made to restore sensation where possible—although much more remains to be done in this field. But in all our operations we neglect the important functions of the hypothenar muscles (Table 2). The restoration of hypothenar function is important in attempting to restore the function of grasp and pinch as well as to improve appearance. Perhaps a too brief account of the reason for this is given above, but a more adequate description will be published shortly (Ranney, 1973*b*).

TABLE 2

Four functions of hypothenar muscles

1.	Cosmesis—Shape of the hand
2.	Opposition—Little finger to thumb
3.	Grasp—Increased pressure
4.	Grasp—Augmented lumbrical action

Function of the Hypothenars

COSMESIS

One of the cosmetic defects in ulnar paralysis is flattening of the transverse metacarpal arch due to paralysis of the hypothenar muscles. This can be usually aggravated by surgical correction of clawing of the fingers. The reason for this is given below (Fig. 1).

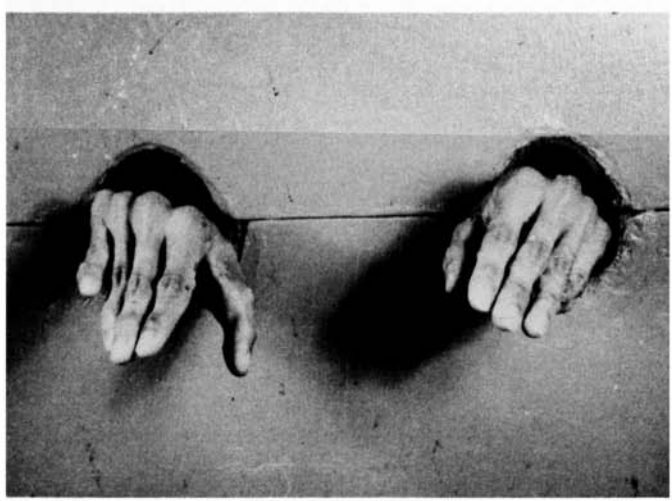

Fig. 1. A normal left hand and a right hand with arch reversal following a satisfactory extensor-flexor many-tailed operation.

Normal appearance can be restored by a new operation to reconstruct the transverse metacarpal arch (Fig. 2) (Ranney, 1973*a*).

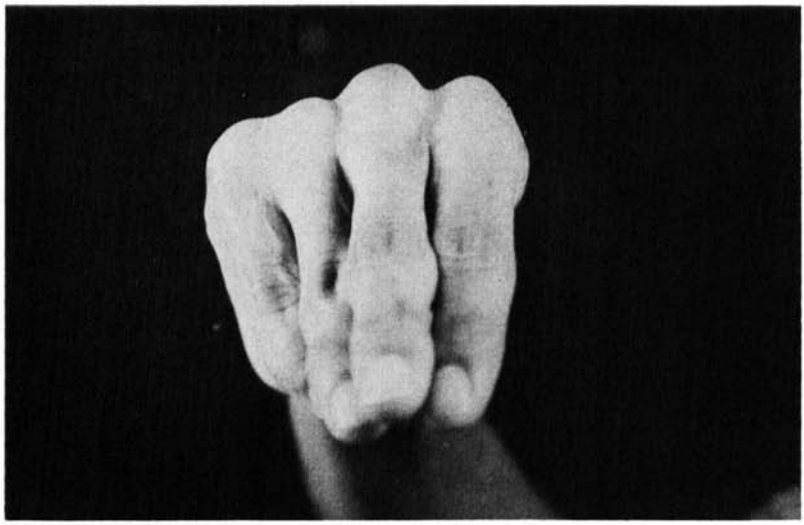

Fig. 2. Appearance of the arch after tendon transfer to restore hypothenar function—normal appearance restored.

PINCH

Cosmesis is not the only reason for wanting to restore the function of the hypothenar muscles. Any operation which increases the curvature of the transverse metacarpal arch simulates the action of opponens digiti minimi muscle by bringing the little finger into a functional relationship with the thumb (Fig. 3).

As Antia pointed out at the International Leprosy Colloquium held in Borstel (Antia, 1971) the possession of a 5-finger pinch is most important. Not only is it useful in Eastern countries while eating rice, but is also helpful in any society in picking up objects which approximate to the size of the palm.

GRIP PRESSURE

A third function of the hypothenar muscles is to improve grip pressure by protraction of the fifth metacarpal. Increase in grip pressure has not so far been achieved. Increase in pressure in the anaesthetic hand is not necessarily a good thing, but a more equitable distribution of pressure might be At present we are studying patterns of grip pressure, but it is too early to comment on this as yet.

AUGMENTATION OF LUMBRICAL ACTION

Fourthly, the hypothenar muscles augment the lumbrical action of the ring and little fingers. It is noteworthy that in cases of recurrent clawing, of which there are many possible causes, recurrence is most often seen in these two fingers that have mobile CMC joints. In any multiple-joint system it is necessary to have each mobile joint under control to prevent development of a zig-zag deformity (Landsmeer, 1958; Stack and Vaughan-Jackson, 1971). For instance, in lumbrical

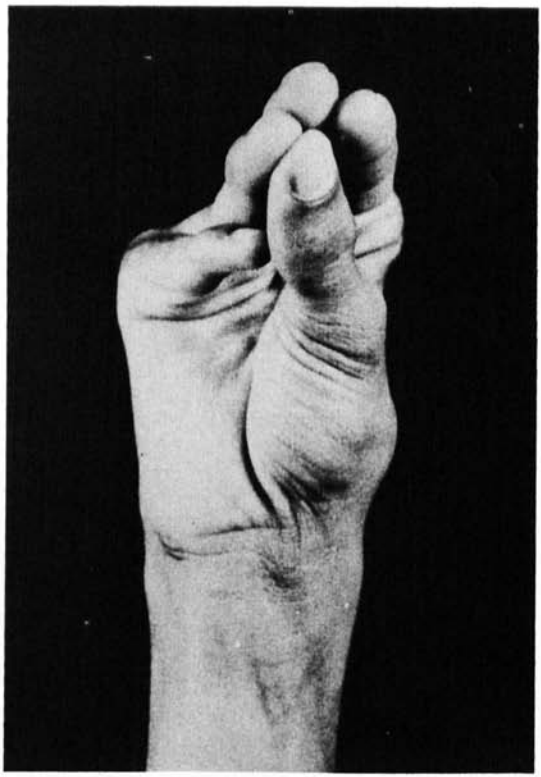

Fig. 3. The achievement of the 5-finger pinch after operation to restore the transverse metacarpal arch.

paralysis the metacarpo-phalangeal joint goes into hyperextension since there is no independent flexor of this joint (Fig. 4). The secondary result of this is flexion of the interphalangeal joints, and clawing results. By restricting metacarpo-phalangeal hyperextension, either with a tendon transfer (F3) or by passive means, the pull of the finger extensor is transferred to the interphalangeal joints and the zig-zag phenomenon is eliminated. However, this extensor force may be dissipated in extending the carpo-metacarpal joints if these joints are mobile.

Of course, we all know that, with "sufficient" tension on the lumbrical grafts to the little and ring fingers, recurrent clawing can be prevented, even in hands with a very mobile arch. But in so doing the arch is flattened or even reversed. This is a passive means of controlling the arch–permanently reversing it and keeping it that way. I believe there is a way which *in some cases* (not all) may be better and that is to add Landsmeer's third force, a tendon transfer to control mobility of the arch.

Figure 5 illustrates the fact that even passive restriction of metacarpo-phalangeal joint extension can cause arch reversal. This patient, a boy, had a Zancolli capsulorrhaphy of the little finger. He had had clawing of the other 3 fingers when I saw him for the first time. Note that in the open hand position he has a considerable degree of limitation of extension.

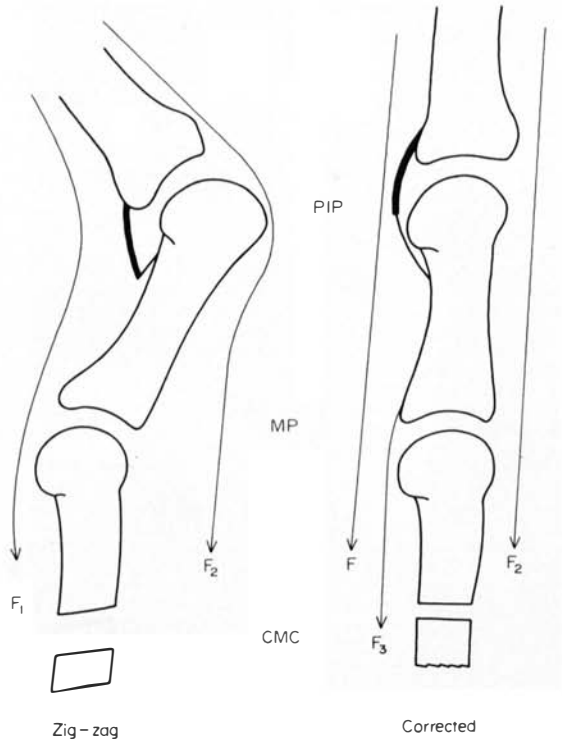

Fig. 4. When a third force is added the zig-zag deformity, in this case clawing of the finger, is corrected.

Note that he has also developed a severe arch reversal (Fig. 6). This is due to the fact that the extensor digiti minimi is so severely restricted in its ability to extend the metacarpo-phalangeal joint. The unused force is transferred to the fifth carpo-metacarpal joint, extending it and reversing the arch. Srinivasan reports a similar case.

It was this case that led the present author to consider using the extensor digiti minimi as a corrective force, while at the same time removing its deforming action on the transverse metacarpal arch. A detailed description of the technique is reported elsewhere (Ranney, 1973*a*) and it is important to follow these details in the performance of this operation.

INTERRELATIONSHIP BETWEEN ARCH AND LUMBRICAL REPLACEMENT

Operations to reconstruct the transverse metacarpal arch have yet to be tried on a large scale prior to lumbrical replacement. Theoretically, at least, it should help to prevent recurrent clawing (Ranney, 1973*b*). In the surgically corrected ulnar claw hand, the extensor expansion is drawn proximally by the combined action of the finger extensor tendons and the lumbrical replacement grafts. This effectively straightens the interphalangeal joints and prevents hyperextension of the metacarpo-phaleangeal joints in the index and long finger. But the motor to these fingers is shared in common with the ring and little fingers. Since the

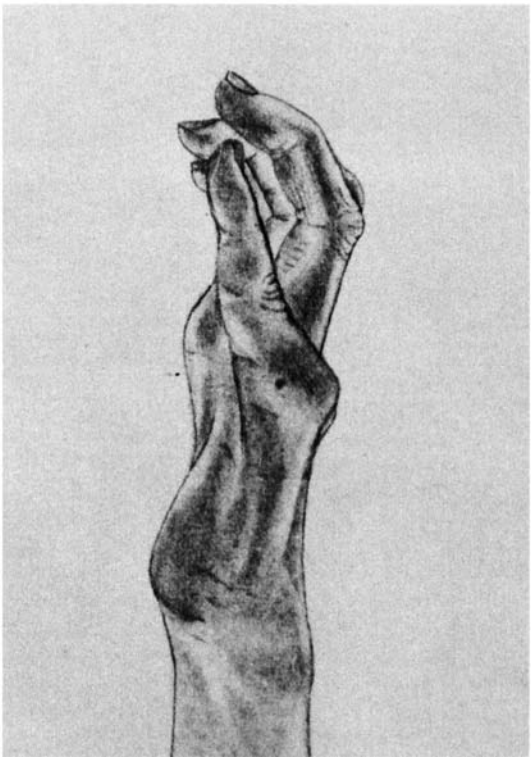

Fig. 5. Open hand position showing a considerable degree of extension limitation following Zancolli Capsulorrhaphy with the metacarpo-phalangeal joint.

metacarpals of the ring and little finger are mobile they can move backward into extension at the carpo-metacarpal joints. The result is that instead of pulling the sleeve-like extensor apparatus (Littler, 1967) proximally on them, the medial 2 fingers and their metacarpals are pulled backwards without sufficient extension of the interphalangeal joints taking place. This can occur after the extensor-flexor many-tailed operation as well as after the extensor-extensor procedure, although the reversal is greater in the latter situation because a second factor is operating (Ranney, 1973*b*).

There are two possibilities for remedying this situation, as Landsmeer pointed out many years ago—either supply a third force, or restrict the mobility of the extra joint by passive means (Landsmeer, 1958). The fifth metacarpal can be pulled forward with an active transfer, dragging the fourth in its wake. For this purpose I prefer the extensor-digiti-minimi transfer. The alternative is to put sufficient tension on the medial two slips so that the fourth and fifth carpo-metacarpal joints are permanently extended and the arch permanently reversed.

Conclusion

It is nonsense to think that, in a completely denervated hand, we can with 2 tendon transfers completely replace all the more useful functions of 19 intrinsic

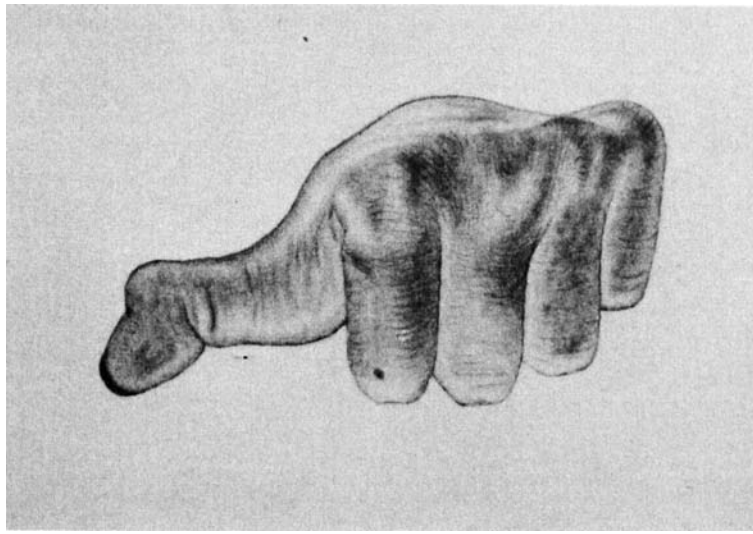

Fig. 6. View of the arch after Zancolli capsulorrhaphy; same patient as in Fig. 5.

muscles. Restoration of thumb opposition and lumbrical action in the fingers is of paramount importance. But, in addition to this, at least three of the functions of the hypothenar muscles can and sometimes should be restored by an operation to control transverse metacarpal arch mobility. Anterior transposition of the extensor digiti minimi can do this. The author has not been entirely satisfied with this procedure in all cases. Perhaps better operations can be devised. The improved appearance and achievement of a 5-finger pinch are useful in those whose occupational status require it. However, the operation is not needed in all cases, as the majority of the patients are rural labourers. But if two of these functions of the hypothenars, namely cosmesis and a 5-finger pinch, are not required, it should be realized that some type of stabilization of the mobile metacarpals must be achieved in order to prevent recurrent clawing of the little and ring fingers. Such stabilization can be achieved by applying more tension on the two medial lumbrical grafts and accepting the inevitable flattening, or even frank reversal, of the arch that will result.

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A Study of the Incidence and Outcome of Foot Weakness in Leprosy

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The permanency of paralysis in the foot of a patient with borderline leprosy should not be considered inevitable. Spontaneous functional recovery does occur in a proportion of patients, and the percentage of those recovering can be increased by correct medication and other therapeutic means. Careful observation of 300 patients under treatment has shown that thiambutosine as the initial drug does reduce the incidence of acute paralysis and also appears to encourage recovery of function.

Disability in leprosy is usually due to paralysis and the resultant deformity. The skin lesions will subside with adequate antileprotic therapy and, unless they are gross, do not result in much disability.

Paralysis may occur in all types of leprosy. It may be an acute process in those with high immunological response (TT-BT-BB) and slowly progressive in those with a poor immunological response (BL-LL). The BT-BB-BL group are frequently of unstable immunological type and may develop an acute paralysis at one stage and a chronic neuropathy at another time. Classification of leprosy types is according to Ridley and Jopling (1962).

It has often been suggested that once a complete paralysis has occurred it cannot be reversed, and early operation has been recommended. A review of patients under our treatment has shown that some recovery does spontaneously occur, especially in patients receiving antileprotic drug treatment and simple physiotherapy (Furness, 1972) with a support, to prevent the occurrence of contractures and the overstretching of the affected muscle and tendon as recommended by Price (1964). Where normal locomotion is not possible. this includes the use of a toe-raising spring, except when the patient is immobilized by plaster of Paris or some other splint. We have consistently used a simple home-made device for our patients (Warren, 1970).

Impressions have been gained that recovery of leg paralysis is especially common (Fritschi, 1971), and a study was undertaken to determine the incidence. The contributing factors which may influence the recovery and the interval during which recovery may occur were also investigated.

Material and Method

The records of 200 patients selected by consecutive admission number, were examined to determine the number who had some significant degree of muscle weakness of the leg, and the final outcome of therapy. The history given of the severity and duration of the disease and any paralysis before admission is often unreliable, partly due to the traditional desire in this area to hide the disease. However, patients' statements have been used here for lack of other information.

The group examined were those admitted in the period October 1963 to July 1965, at which time no routine for treatment of an acute paralysis had been established, except simple physiotherapy to maintain mobility and the provision of a toe-raising spring to be worn at all times until full strength was recovered or surgery performed. Since that time, various regimes of treatment have been tried.

The 200 selected patients included 170 males and 30 females (normal ratio is 1 female to 2.6 males in this institution). The feet affected were 46 left feet and 44 right feet. Most of the patients were admitted because of positive skin smears, though 12 with a negative skin smear (BI negative) were admitted for reconstructive surgery, and 4 of these because of foot problems.

The leprosy types of the whole group (by clinical classification on admission) were:

Lepromatous (LL)	81 patients
Borderline lepromatous (BL)	48 patients
Borderline (BB)	48 patients
Borderline tuberculoid (BT)	16 patients
Tuberculoid (TT)	7 patients.

Most patients at that time (1963-65) were treated with dapsone or Sulphetrone initially, with routine supportive medication.

If reaction was a problem, sulphones were given in very low dosage or completely stopped, but rarely were corticosteroids used. However, all patients with any weakness or deformity of the foot were encouraged to wear suitable shoes and to use a toe-raising spring until full recovery had been present for six months or surgery was performed.

As part of routine medication, most patients received calcium lactate tablets, multivitamins (especially the B group) and iron when needed; more recently Chloroquin, Phenergan and Largactil have been used with increasing frequency, since these seem to improve the patients' general feeling of well-being and to reduce reaction. Stibophen was freely used at that time and ACTH only rarely.

In this institution, muscle assessment is according to a modification of the 0-5 Voluntary Muscle Testing System given in the M.R.C. Report of 1943. This modification was described by Goodwin in 1968. Grading is from 1 for a muscle flicker to 5 for normal strength and range of movement. If functional movement exists a muscle will be graded 4 or 5 depending on its strength against resistance. In this article "marked paresis" implies that the tibialis anterior muscle and usually the extensors of the toes are graded 2 or less.

Results

Of the 200 patients reviewed (400 feet) it was found that:

29 feet had complete paralysis on admission
15 feet developed complete paralysis during treatment.

44 feet had had complete paralysis at some time.
30 feet had definite muscle weakness on admission.
16 feet developed definite muscle weakness during treatment.
46 feet had definite muscle weakness at some time

In both of these groups, some patients showed recovery of muscle power. Out of the 56 patients affected, 34 had bilateral involvement, giving a total of 90 feet; these may also be divided into the following two groups:

Group 1 Patients who had marked paresis or paralysis and recovered functional power, a total of 51 feet (42 patients).

(a) Feet with acute complete loss:
(i) 3 developed paralysis before admission (3 patients).
(ii) 16 developed paralysis while under treatment (13 patients).

(b) Feet with some weakness but which adequately recovered so that surgery was not required.
(i) 17 weak on admission (15 patients).
(ii) 15 became weak after admission (11 patients).

Group 2 Patients advised to have surgery for foot-drop correction, a total of 39 feet (31 patients).

(a) 23 feet (19 patients) with complete drop undergoing foot-drop correction.
(b) 3 feet (3 patients) with weakness on admission who eventually had foot-drop correction surgery.
(c) 5 feet (3 patients) who had foot-drop surgery but who might not have required it if observed for a longer period.
(d) 8 feet (6 patients). These were patients who, though it was probably needed, did not have surgery for various reasons.

Group 1(a)(i). There were 19 feet (16 patients) in this group; 3 had paralysis on admission, 16 developed paralysis or marked paresis while under treatment. These included 2 of LL, 7 of BL, 9 of BB, 1 of BT type leprosy, in 12 males with 15 feet affected and 4 females with 4 feet affected. The age range was 17 to 53 years.

The details of the 3 patients with paralysis when treatment was started, in whom recovery occurred (Group 1(a)i) are shown in Table 1. All were given toe-raising springs.

Group 1(a)(ii). The 16 feet (13 patients) which developed paralysis after the commencment of therapy can be divided into two groups. First, 9 feet (9 patients) in whom the acute paralysis occurred within 8 months of commencement of treatment and was usually associated with an upgrading reaction of BL to

TABLE 1

Patients with paralysis on admission in whom recovery occurred

Patient's number	1700	1743	1789
Duration of paralysis on admission	2 years	1 year	2 months
Recovery complete in	8 months	2 years	1 year
Leprosy type	BB	BB	BB
Sex	M	F	M
Antileprotic drug	DDS	DDS	DDS
Special therapy	ACTH		
Foot affected	Left	Right	Left

BB type. These patients were usually given initially low dosage sulphone therapy, but in some patients this had been discontinued because of the severity of the reaction. In 2 patients no appreciable amount of sulphone was given before the paralysis; they were then given thiambutosine soon after the paralysis occurred. Second, a group of 7 feet (4 patients) in which the paralysis occurred between 18 months and 4 years after the commencement of antileprotic drug therapy in patients of LL-BL type leprosy who had chronic lepra reaction for which many supportive drugs had been tried. Two patients (3 feet affected) were taking both dapsone and thiambutosine at the time, but the others were on sulphones only at the time of the acute paralysis. In one patient the episode may have been precipitated by an infected foot and in another by physical exhaustion. Another patient was known to have treated himself on several occasions with prednisolone, causing acute withdrawal symptoms which may have predisposed to his paralysis. The 3 patients in whom both feet were affected fall into the second group, and a period of at least 10 months separated the two acute paralytic episodes.

There was no correlation between the time taken for recovery and the relation of paralysis to the commencement of drug therapy or the leprosy type. The first signs of recovery appeared as early as 1 month, although it was delayed as long as one year in several feet. Usually there was some return of function within 3 to 6 months. Functional recovery occurred as early as 2 months, but was delayed to 2 years in 2 feet, the average being 12 months. The earliest full recovery was at 8 months, but one patient showed slow improvement in power for 6 years.

All patients were provided with foot-drop springs, which appear to aid recovery; 9 patients (11 feet) were given bed rest, plaster of Paris gutter splints, and daily passive exercises. In 2 cases walking plaster of Paris casts were applied, but these procedures did not seem to influence the final outcome.

No patient received corticosteroids in the period immediately following the foot-drop. ACTH in small doses was given to 7 patients at the time of the foot drop. Stibophen injections were also given to these and other patients in the group. Other supportive drugs were prescribed for most of the patients, but it is difficult to discover any relation between the drugs given and the time taken for recovery.

Group 1(b). This is the group of patients who developed some degree of muscle weakness and proceeded to functional recovery.

They included 22 males with 28 feet affected, and 4 females with 4 feet affected, 10 feet of LL type, 11 of BL, 9 of BB, 2 of BT. In most of these cases, the weakness was not complained of as the foot was still functional due to a tibialis anterior muscle power of over 3, or hyperaction of the toe extensors. The maximum duration of weakness, as stated, was 12 months.

All these patients were supplied with toe-raising springs, several had complete drop of the other foot at the same time and were hospitalized because of generalized reaction. Most of the patients were taking dapsone, but to some, thiambutosine was given once the foot weakness had occurred. It is not easy to define the time of occurrence, but 5 patients (6 feet) showed the loss of muscle power within the first 6 months of treatment and definite improvement occurred within the next 6 months; 4 patients (5 feet) showed continued slow loss over a period of up to 12 months, but later showed recovery.

From this study of these 51 feet in Group 1, it is obvious that acute muscle weakness is most common with the BT-BB-BL type of leprosy although the LL group formed the highest proportion of the cases in the whole group under

review. Also, the paralysis is most likely to occur prior to, or within, 6 months of starting antileprotic therapy.

Group 2(a). There were 19 patients with 23 feet showing complete foot drop on admission. The duration of paralysis was at least 9 months with a maximum of 10 years.

The group includes 13 left feet and 10 right feet, 16 males (19 feet) and 3 females (4 feet). Leprosy types of the 23 feet were 4 of LL, 5 of BL, 12 of BB, 2 of BT. Age range 12 to 58 years. All of these patients underwent surgery for foot drop correction; some were skin-smear-negative on admission to Hay Ling Chau, and 4 were admitted for treatment of foot problems.

Group 2(b) consisted of 3 patients who had only foot weakness on admission, but later required surgery for foot-drop correction.

(i) A male of 14 years (no. 1655) of BL type of leprosy. On admission he gave a history of 18 months leprosy with right foot weakness for 12 months. Further acute loss occurred during up-grading lepra reaction while on dapsone therapy (100 mg weekly). In spite of a full-length walking plaster cast for 6 weeks, no recovery occurred. Surgery was performed 11 months after the onset of the acute paralysis.

(ii) A female, aged 49 years (no. 1611), with BT type leprosy of many years' duration and already BI negative, was admitted with weakness of the right foot and paralysis with infection of the left foot associated with bone disintegration. No attempt was made to support the right foot or give physiotherapy while she was on bed rest for the left foot. A complete right foot drop which may have been aggravated by disuse atrophy occurred. This patient was receiving dapsone.

(iii) A female patient, aged 38 years (no. 1726), with BL type leprosy of 3 to 4 years' duration. The right foot was weak on admission and all superficial nerves were tender. She was given small doses of sulphones because of recurrent reaction of the upgrading type, with rapid fall in BI. She developed complete foot drop in both feet 7 months after admission. At that time she was not receiving any antileprotic drug and was suffering from hepatitis. She had been given a 3-week course of prednisolone 3 months earlier for acute ulnar neuritis. The patient was given toe-raising springs for use by day and gutter splints at night and was admitted to hospital. Low dosage dapsone was resumed 2 months later. The left foot showed good recovery. The right foot showed no sign of recovery for 12 months, but then tibialis anterior muscle strength returned to Grade 2 only. Surgery for right foot-drop correction was performed 27 months after the foot-drop had occurred.

Group 2(c). This consisted of 3 patients (5 feet affected) in whom muscle weakness was present; surgery was performed early in their course of therapy.

(i) A male of 43 years (no. 1705) with BB type leprosy. He had a history of right foot weakness for 1 year prior to admission. Nine months after admission a complete foot-drop occurred, the patient suffered much reaction and only received small doses of dapsone and Sulphetrone over this period. Twelve months after the foot-drop the tibialis anterior muscle showed strength 2; after a further 6 months, without further improvement, operation for foot-drop correction was performed.

(ii) A male aged 21 years (no. 1695) with LL type leprosy. On admission the feet muscles were apparently of normal strength, but during the following year he showed slight weakness of both tibialis anterior muscles (strength 4). During the next 10 months the right foot had further loss of power down to 1 and a

foot-drop correction operation was performed on both feet over the next 9 months, although the left tibialis anterior was then strength 4. Surgery was probably performed as the patient was already BI negative and asking for discharge, and unlikely to continue foot care at home. The patient had received dapsone and Sulphetrone in small doses for the first year during which the loss occurred, followed by thiambutosine during which time some recovery of power in the left foot was noted.

(iii) A male of 14 years (no. 1656) with BB type leprosy. On admission, a voluntary-muscle test showed left ulnar paralysis and tibialis anterior muscle power of 4 in the right foot and 2 in the left foot. The duration of weakness was unknown, but over the following 5 months little change was noted and foot-drop correction surgery was carried out on both feet, in the hope of enabling him to return to school soon. The patient was receiving thiambutosine. Several years later he developed ulnar paralysis of the other hand.

It would appear in the light of this study that these 5 feet might have shown more recovery had surgery been delayed, and might eventually not have required surgery at all.

Group 2(d) consisted of 6 patients (8 feet affected) in whom surgery would probably have been advisable but was not performed for various reasons; the group included 5 males (6 feet) and 1 female (2 feet); 3 patients (5 feet) with LL type leprosy, 2 of BL type, and 1 of BT type. Three of these patients refused surgery and 2 of them absconded before they were fit for surgery. One died from intercurrent disease.

Discussion

In summarizing the above, it is interesting to note that there were only 7 patients with a total of 9 feet who, while under treatment, developed paralysis to a degree where surgery was recommended. Of this group, 3 patients (5 feet) might in fact have recovered if they had been observed for a longer period, while 2 patients (2 feet) refused surgery. Of the feet with marked or complete paresis in Group 1, which recovered all or some power, there were 17 of the Borderline type and only 2 of the Lepromatous type. Those with partial muscle weakness included 22 of Borderline type leprosy and 10 of Lepromatous type. Hence out of the 400 feet examined, 39 of the Borderline type and 12 of the Lepromatous type developed motor nerve deficit during treatment, but proceeded to recovery of functional power. This represents 17.5% of the Borderline and 7% of the Lepromatous-type feet surveyed.

Of the feet in Group 2, with complete paralysis, usually of longer duration, there were 28 of Borderline and 11 of Lepromatous type. This represents 12.5% of the Borderline and 7% of the Lepromatous feet in the whole group.

Therefore, a total of 14% of the Lepromatous feet and 30% of the Borderline feet surveyed were affected with some clinically detectable degree of muscle weakness or paralysis.

Hence it is obvious that patients with the unstable BL-BB-BT forms of leprosy are the most likely to develop acute paralysis, and this is often in association with reaction. A large proportion of these acute neuropathies will occur before, or in the early stages of, antileprotic therapy. But the majority of patients who commence therapy within a few months of acute paralysis can expect functional recovery. It is noticed that, especially in the BB group of patients this acute

episode frequently occurs within 3 to 6 months of commencing antileprosy drug therapy, but may also be precipitated by intercurrent diseases or even inoculations such as anti-cholera, smallpox and T.A.B. vaccine. Although the use of a toe-raising spring is accepted as aiding recovery, other forms of splinting or complete immobilization do not seem to make much difference in the mobile patient. If, however, the patient is confined to bed for some reason. the use of a gutter splint, with the ankle held at 90° to prevent contracture of the tendo Achilles, is advisable. This also prevents development of fixed inversion of the foot due to muscle imbalance.

Development of New Treatment Regimes

This incidence of paralysis seemed high, especially the proportion of patients who developed a neural deficit after commencing antileprotic treatment. Various different drug regimes were tried, especially when other workers confirmed the impression that nerve lesions were less common in Borderline patients treated with drugs other than dapsone, than occurred in those treated with any of the sulphones. Karat (1966) states that Borderline-type patients have a particular predilection to develop acute multiple paralyses while taking dapsone.

Second Group for Review

A review of more recent patients showed interesting contrasting results. The selected group was 100 consecutive admissions who were admitted between September 1970, and January 1972. Of these. 37 (10 women and 27 men) were admitted for reconstructive surgery, and for those patients a total of 25 foot-drop corrections were performed. The remaining 63 patients included:

	Male	Female	Total	% of active patients
Lepromatous (LL)	19	4	23	36
BL	16	4	20	32
Borderline (BB)	8	4	12	19
BT	7	1	8	13

The practice had developed that any patient who was Borderline in type and had tender nerves would begin treatment with thiambutosine. These borderline patients included those near lepromatous (BL and LI) unless they were relapsed cases or were suspected of having dapsone resistant organisms and it was desirable to test clinically for dapsone resistance as laboratory tests are difficult to arrange.

Following this practice, 32 of the 40 patients in this BL-BB-BT group were started on treatment with thiambutosine, 7 continued dapsone, and one commenced with Lamprene. The routine now is to give thiambutosine in full dosage (1 g weekly) by intramuscular injection for a minimum of 3 months or until all signs of nerve lesions have been quiescent for 3 months, and then to add dapsone in an attempt to change over for maintenance.

Supplementary "anti-reactive therapy" is also given. Largactil 50 mg one to three times daily according to need, Phenargan 25 mg at night, and chloroquine 400 mg at night together with vitamins and calcium routinely, and supplements of iron as indicated. Stibophen is also given for more acute episodes, and sometimes 20 units of ACTH. Corticosteroids are reserved for the really acute episodes, especially paralysis occurring in the BB-BT-TT group, but they are now used more frequently for this group than previously.

Patients in reaction may continue thiambutosine for 15 to 18 months; if, after that time, the BI is still high and they cannot tolerate dapsone without reaction, they are advised to take Lamprene. These are usually the patients in the BL-LL category in whom the BI fall is slow. The aim to change over by 18 months is because of the fear of thiambutosine resistance, which has been proved already in a number of our patients.

Of this group of 40 patients, a total of 24 had definite neural deficits on admission. In all but 2 of the patients taking thiambutosine this deficit remained stationary or diminished while on thiambutosine, and in 10 some clinical recovery occurred. In some cases this was functional recovery. Definite improvement was noted in 9 patients who were admitted with recent deficit; in 5 of these a 3-week course of prednisolone was given as the paralysis had occurred within the 2 months previous to the start of intramuscular thiambutosine therapy. In the other 4, no corticosteroids were used since the paralysis was of longer duration. But all showed definite clinical improvement, usually proportional to the duration of the paralysis.

One male patient (no. 2161) developed bilateral acute foot-drop 3 months after commencing intramuscular thiambutosine and was given a 3-week course of corticosteroids. Recovery was first evident within one month, functionally adequate within 4 months, and complete within 18 months. The patient had a triple palsy of the left arm which had been present for many years, but the condition of this remained unchanged.

One exception was patient no. 2177, a male aged 30 with BL type leprosy, who absconded twice from the institution, so that therapy was irregular. He also attempted suicide on several occasions. A few weeks after one suicidal attempt, when he ingested some unidentified drug and was admitted to hospital in a coma he developed an acute paralysis of both feet which had already been weak on admission. Since the patient had to be transferred to a psychiatric hospital a few weeks later no adequate follow-up is available.

Another exception was patient no. 2121, a male aged 53 years, who suffered an acute paralysis of one leg 3 months after commencing thiambutosine. The patient died 6 weeks later from cerebral syphilis.

Of the other patients in the BL-BB-BT group with neural deficit there was no deterioration clinically while they were taking thiambutosine, but several did complain of neurological symptoms when dapsone was added to the thiambutosine. In these cases, dapsone was stopped and thiambutosine alone given for a further 3 months, usually with rapid cessation of the nerve symptoms. In some of these patients there was apparently reduction in the size and degree of areas of anaesthesia. The patient who began with Lamprene had considerable involvement of his hands on admission with tender nerves and much E.N.L. No previous antileprotic therapy had been given. He was apparently of the down-grading BL-LL type and was elderly. He developed foot drop 3 months after commencement of treatment, but proceeded to complete recovery within 9 months and also showed some improvement in the power of his hands.

Of the 7 patients taking dapsone, one was BT type who had previously had dapsone without ill effect and had evidence of nerve damage in the skin lesions only. The other 6 on dapsone were BL type but mostly tending to LL. Of the 2 who showed increased loss of nerve function, one was patient no. 2103 who on admission had had a left claw hand for 8 months and continued to show slow loss of right ulnar and median function over the following 12 months. The other was

patient no. 2107 who had been receiving irregular treatment for 5 or 6 years and was suspected of showing resistance to both dapsone and thiambutosine. On admission he was given dapsone by injection, when he already showed some weakness of the right foot and both hands; 6 months later he suffered a complete foot drop. Prednisolone was given and the patient then agreed to take Lamprene. We assume by his lack of clinical response that he is now resistant to dapsone. Twelve months later the foot showed no recovery.

In this group the incidence of increasing neural deficit in patients receiving thiambutosine was 3 patients (5 feet) out of 32 patients in the groups considered at risk, as shown by the first survey. This represents 7% of the feet at risk, which compares favourably with the incidences of 17.5% and 30% for the two classifications in the previously surveyed group. It is interesting to note that of these 3 patients the only one with a reasonable follow-up regained full use of his feet within 18 months. No patient in the group who received thiambutosine as initial therapy, who was admitted with functional feet and received the full routine of medical and physiotherapy care, has required a foot-drop correction.

The other interesting point is that some of the BL-LL patients were initially treated with thiambutosine with good progress until attempts to change to dapsone were made. In a number of cases this was rapidly followed by neurological symptoms which abated on withdrawal of the dapsone and continuation of thiambutosine.

Discussion

The mode of action of thiambutosine has not been fully determined, but in Chinese patients at least it does seem to spare nerve function, especially in the initial stages of treatment, as suggested by Karat (1966).

In the first group studied, the incidence of acute paralysis in the unstable Borderline patients was high in the first 6 months of treatment, and this rate can apparently be lowered by the use of thiambutosine as the initial drug for antileprotic therapy assisted by corticosteroids for 3 weeks in the BB-BT-TT patients when acute paralysis does occur. However, by the first study it is obvious that spontaneous recovery of nerve function does occur in a large proportion of these patients, provided they are given antileprotic drugs and adequate supportive treatment in the form of physiotherapy, splints and any other necessary medication.

Even in simple clinics where sophisticated treatment is not possible, recovery should occur in a large proportion of the patients who are seen early after paralysis has occurred. Where such treatment as thiambutosine is available it should be possible to achieve functional recovery in almost 100% of Borderline patients seen within one month of the onset of the acute paralysis. This is very encouraging, and with proper application could result in a definite reduction in the number of patients with permanent disability.

Conclusions

(1) Acute paralysis in Borderline-type leprosy tends to spontaneous recovery.

(2) Recovery can be assisted by supportive therapy, especially antileprotic therapy, physiotherapy and use of active splints.

(3) Thiambutosine as the drug of choice reduces the incidence of severity of acute nerve lesions in these patients and appears to aid recovery.

(4) Full-length plaster casts or splints do not appear to assist recovery, providing the patient is mobile and using a toe-raising spring, but they have a definite place in preventing deformity if the patient is confined to bed or is uncooperative.

(5) Corticosteroids appear to assist recovery if given within the first 2 months of an acute paralysis. A 3-week course seems adequate; it is not necessary to continue until recovery is complete.

(6) Earliest signs of recovery may be detected within a few weeks of the initial paralysis, but may be delayed for up to 12 months and occasionally even longer. Increasing muscle power has been observed for up to 6 years after an acute paralysis, but usually has reached its maximum strength within 2 years.

(7) In foot-drop the beginning of antileprotic therapy even 6 months after the acute loss, with the use of a toe-raising spring, has resulted in return of muscle power.

(8) Surgical foot-drop correction should not usually be considered until at least 6 months of treatment has been given after an acute paralysis, and should if possible and practical be postponed for even longer if there is definite evidence of returning muscle power.

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Lepr. Rev. (1973), **44**, 213-214

Querying the Absolute Need for either Faradic or Galvanic Stimulation in the Physical Treatment of Leprosy

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Electrical stimulation is commonly used in the re-education of muscles for two reasons, or in leprosy, perhaps three:

(1) For muscle testing, i.e. to trace which motor nerve or nerves are damaged, as following direct trauma, or as the result of a disease which affects the lower motor neurones indiscriminately, e.g. poliomyelitis.

(2) For stimulating a weak muscle to contract or a muscle whose motor nerve has been injured. This treatment is used only until a damaged motor nerve has recovered sufficiently so that the muscle can be self-activated. From this point, electrical stimulation is stopped and active exercise takes over. Only the latter can further increase muscle strength, electrical stimulation being a maintenance treatment only under this heading.

In leprosy, the lepra bacillus being so selective, the need for Reason No. 1, that is muscle testing to determine which nerve is damaged, is hardly necessary, the clinical signs being self-evident. As for Reason No. 2. in leprosy the cases in which electrical stimulation may be of value for a short period are those of tuberculoid leprosy, which are diagnosed before a peripheral nerve is damaged to any great extent. Unfortunately, many patients are inclined to wait far too long before coming for treatment to the leprosy clinics. In those cases in which an anti-leprosy drug has been given in time so that the nerve lesion remains partial and, it may be hoped, reversible, active exercise and the activities of daily living are the quickest way to strengthen weak muscles.

In the latter cases, the patients (particularly those in the 16 to 30 years age-group) frequently wish to return to their own social environment before their absence there has been noted and so are lost to further physical treatment. Again it is easy for them to exercise actively at home, provided they are taught a simple way of supporting the unstable joints while exercising, until the muscles are strong enough for normal joint stability, at which stage their normal daily activities are sufficient to carry on the good work.

From this brief sketch it may be reasoned that in leprosy, re-education by the usual electrical stimulation is not essential, although a few patients are helped by it. Unfortunately, in leprosy a nerve lesion in an untreated case can progress so quickly that it is soon past the stage where electrical stimulation can be of any assistance.

The third situation in leprosy where electrical stimulation might be used is after reconstructive surgery. Here, it may be argued that such stimulation is

unnecessary, even contra-indicated—although there may be one exception (mentioned below).

In reconstructive surgery of the hand or foot the muscle commonly used for transfer is normally strong and normally innervated. This means that from the beginning of post-operative re-education it will have the power of active movement (even after 3 weeks of joint immobilization in plaster of Paris); with active movement correctly maintained, no electrical stimulation is necessary.

Being a normally innervated muscle, it in itself does not need to re-learn to contract. It is the motor cortex which must recognize the new pattern of movement, so that the correct order may be given for the changed action of the muscle. It is found that with carefully correct and strict re-education it takes only one week for the cortex to master this new pattern. With this speed and accuracy, it seems unnecessary to use electrical stimulation which, in effect, by-passes the motor cortex, the very place where the new recognition needs to be gained.

The exception (mentioned above) is that of a patient who, following reconstructive surgery, is not for some unfortunate reason taught the correct method of re-education (i.e. through the "mental pathway" of muscle action before its transferal). When this correct primary action is missing, a transferred muscle may be wasted, the new pattern of movement can be lost, and the normal muscle which has been transferred can atrophy from disuse. In this case, electrical stimulation may be able to pick up the muscle again, for a renewed attempt at correct re-education.

Conclusion

Without negating all possible good from electrical stimulation in leprosy—from the lack of essential need, and also taking into account the time spent in giving one treatment of electrical stimulation against the hundreds of patients waiting for help—it may be justifiable to say that it is not altogether warranted or necessary to include this special equipment in the leprosy clinic.

Lepr. Rev. (1973), **44**, 215

Wax Baths in Leprosy

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In the physical treatment of leprosy, when dealing with the clawed hand and contractures of the individual fingers, the important factor to consider is the abnormally dry skin where sweat glands have been damaged. When a patient has not been taught that he must regularly straighten his fingers while stabilizing his metacarpo-phalangeal joints, then the dry skin over the flexor angles at the interphalangeal joints seems to precipitate the deformity so commonly seen in the physically untreated leprosy patient. The wax bath that has proved beneficial in rheumatoid arthritis and other diseases affecting the joints, helps very little in the prevention or remobilizing of the clawed fingers in leprosy because it (or other local oils) fails to make the dry skin moist.

However, soaking in cool water does appear to make the skin more elastic for a short period. If the water soaking is done daily just before supervised exercise, the patient is able to extend his fingers just that little bit more which makes the progressive improvement that much quicker.

Basins and buckets of cool water are easy to come by, and soaking of the hand and foot can be done at home daily with safety whereas wax baths need to be supervised for temperature and specific contraindications. Water soaking appears to be effective for temporarily softening skin, whereas wax baths do not seem to have this effect. It would therefore appear that soaking the hand (or foot) in cool water meets a need for the leprosy patient that the wax bath cannot meet, and that, therefore, a wax bath in a leprosy clinic is not an essential piece of apparatus.

There may be exceptions to cool water soaking, e.g. in cases of acute nerve pain. However, for these patients the physical treatment is rest, with daily passive joint movement, and also warmth, which may be given by applying a linament noccluded by a bandage, or by bandages only, or by a woollen covering. Although the wax bath can give comfort in the subacute stage of nerve pain, it is not in the author's opinion an essential in the leprosy clinic.

Lepr. Rev. (1973), **44**, 216-219

Ocular Manifestations of Leprosy

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In this survey of leprosy patients in Nepal, half the patients examined were found to have some ocular abnormality associated with leprosy. However, many did not have marked ocular signs, and might have been passed as normal in the absence of a more detailed examination. This paper is intended to demonstrate the importance of regular examination of the eyes of every leprosy patient.

Introduction

A 3-month elective period during the fourth year of the undergraduate medical course, at St Mary's Hospital Medical School, London, gave me the opportunity to investigate, at the suggestion of Mr Kennerley Bankes, the prevalence of ocular complications of leprosy in Nepal. Previous surveys in other areas of the world have given widely varying estimates of the number of patients so affected, the figures ranging from 6.3% in Malawi (Ticho & Ben Sira, 1970) to 100% in Malaysia (Kirwan, 1955). Possible causes for this wide variation have been attributed to climate, race, and skin pigmentation. The proportion of cases of lepromatous to tuberculoid leprosy is also important, as ocular problems are more common in the former. A further factor is the method of examination used by the surveyor (Hobbs & Choyce, 1971).

The Survey

THE PATIENTS

The patients studied were either out-patients at Shanta Bhawan Hospital, a general hospital in Kathmandu, or in-patients at Anandaban, a hospital for leprosy patients near Kathmandu run by The Leprosy Mission.

The age of the patients varied from 11 to 74 years; 32 of the 57 patients were aged under 30 years and 15 were under 20. The younger boys and girls were mainly in-patients at Anandaban so that they could learn the essentials of foot-care, and how to protect themselves from some of the crippling effects of the disease.

THE EXAMINATION

The age of the patient was first recorded and the face was examined for any obvious leprosy lesions. The eyelids particularly were examined in detail for any evidence of disease.

The patient was asked if he had noticed any watering or burning in his eyes. Then he was asked to shut his eyes gently and keep them closed for 10 seconds,

to determine whether there was any lagophthalmos. Ocular movements were elicited and the condition of the conjunctiva, sclera, cornea, iris, and lens respectively was examined, using the hand-held combined loupe and slit-lamp (Hobbs, 1963). The fundi were examined, and finally corneal sensation was tested, using a fine strand of cotton wool and lightly touching the cornea.

Results

A summary of the results is given in Table 1.

TABLE 1

Total number of patients examined	57
No facial or ocular symptoms	25
Facial, but no ocular symptoms	4
Ocular, but no facial symptoms	14
Both facial and ocular symptoms	14
Ocular symptoms	
Total number with ocular symptoms	28
Burning or watering eyes	22
Lagophthalmos	10
Conjunctivitis	1
Diminished corneal sensation	12
Corneal ulceration	5
Anterior synechiae	4
Posterior synechiae	1
Keratic precipitates	1
Anterior chamber flare	4
Leprous deposits on iris	1

FACIAL AND OCULAR SYMPTOMS

Of the 57 patients 32 either complained of ocular symptoms or had visible facial or ocular lesions, and 28 of these had ocular problems.

BURNING AND WATERING EYES

In answer to direct questioning 22 of the patients admitted that their eyes were watering or burning; 9 of them had demonstrable lagophthalmos and 5 of these showed corneal ulceration. This is ulceration visible with the combined loupe and slit-lamp, without the use of fluorescin to stain the cornea.

The remaining patients included 9 with signs of old and active iritis, the signs including 4 with anterior synechiae, 1 with posterior synechiae, 5 with aqueous flare, and 1 with keratic precipitates. One of the 5 patients with aqueous flare had a visible pale yellow leprous nodule on the iris, near the pupil margin. Another patient who complained of watering eyes had conjunctivitis, and 3 were normal.

LAGOPHTHALMOS

Lagophthalmos was noted in 10 patients. In half of these there were no leprosy lesions on the face at all, and in one the lesion was on the upper lip, well away from the eyes; 9 of the 10 patients had complained of burning or watering eyes.

DIMINISHED CORNEAL SENSATION

Diminished corneal sensation was demonstrated in 12 patients, in 7 of whom it was bilateral; 8 of the patients had no visible facial lesions, though 3 of them had slight lagophthalmos. Altogether 5 patients suffered from both conditions, but in 2 there were obvious facial lesions.

Discussion

The results given above show that care of the eyes in leprosy is no small problem. About half the patients examined had ocular symptoms.

The complaint of burning or watering eyes is mentioned by Brand (1969) as being an important pointer to the presence of lagophthalmos and its complications. In many of the present cases it was the only symptom.

The fact that only 3 of the 22 patients with this symptom had normal eyes shows that it is extremely important to regard a report of watering eyes seriously. In many cases this may be the first sign of a potentially blinding complication. It is also especially important to treat iritis as soon as possible in order to prevent the severe complications of this condition.

Lagophthalmos and diminished corneal sensation should be discovered as soon as possible. These two conditions may occur together and with no signs to point to any abnormality in the eyes at all; these patients are especially vulnerable since the complications may in turn lead to corneal ulceration. During this process the patient may have complained only of mildly watering eyes, and that only on direct questioning. It is only too easy to observe deep ulcers on the feet, or clawing of the hands, and to be concerned only with these, while potentially blinding ocular symptoms and signs are overlooked or not elicited.

Conclusions

Half the patients seen in this survey in Nepal had some ocular pathology. The fact that many had no obvious facial lesions makes it even more important for all who treat leprosy patients to examine the eyes as a matter of routine.

All patients should be examined for lagophthalmos and the state of corneal sensation when first seen, regardless of the site of their skin lesions. These examinations should be repeated each time the hands and feet are checked. In addition, it is recommended that all leprosy patients should be asked routinely whether they have burning or watering eyes. Any patient who does so complain should undergo a full ophthalmic examination. This will rarely be a waste of time, and certainly will not be considered so by the patients themselves.

Acknowledgements

I should like to thank Mr J. Kennerley Bankes for his stimulating suggestions both before and after my elective period. Also I gratefully acknowledge the help and kindness shown to me by Dr J. Harris at Anandaban and for the interest he showed in my project. Finally, I should like to mention Mr I. Paine of Keeler Instruments Ltd, London, who very kindly lent me the instruments necessary for this survey, and then presented the Hobbs combined focal illuminator and slit bulb to The Leprosy Mission hospital at Anandaban.

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Lepr. Rev. (1973), **44**, 220-222

Letters to the Editor

I should like to place on record two interesting clinical observations that may be relevant in other of the more sophisticated societies.

Miss L. K. B., aged 28 years, was admitted to our care in 1965. On admission she denied previous anti-leprosy treatment, but it was later discovered that she had been treated for 6 years in China and had discontinued treatment for 3 years before coming to us. Her leprosy was BL-LL in type, appearing to be more LL, with a Bacterial Index (B.I.) of 4.7 and a Morphological Index (M.I.) of 5%. Progress was satisfactory until 1967, when she began to develop neuritis of both ulnar nerves at the elbow. She experienced crops of *erythema nodosum leprosum* (ENL), and was being treated with dapsone at the time, but this was changed to Vadrine and later to thiambutosine. However, the neuritis had certain atypical features, and responded to none of the usual medications nor to rest.

In November 1968, her clinical state was very bad, her face being more infiltrated and showing many ENL lesions. The numbness and pain in her arms were increasing. It was then discovered that she was treating herself with vitamin A and D tablets which, she had been told, would do her good and increase her energy. She was taking 120,000 units of vitamin A daily, but stopped taking this after being given an explanation of its side-effects. The arm pain gradually diminished and did not return. When she discharged herself at the end of 1971, there was no obvious neural deficit of her hands except slight anaesthesia of left ulnar distribution.

At the time, two articles had appeared in the *Medical Journal of Australia* (Cleland and Southcott, 1969*a*, *b*), indicating that hypervitaminosis-A might in certain circumstances induce peripheral neuropathy. Reading these articles led to the suspicion that a grossly high intake of vitamin A by this patient might be playing a part in the production of the signs of peripheral neuropathy.

The possibility is also mentioned in a standard textbook (Cecil and Loeb, 1971) as causing bone and joint pain and neurological signs, especially in children, as well as other signs that were not present in our patient. However, in a patient who already has inflammation in the nerve, an excess of vitamin A might produce definite pain and discomfort.

Little more attention was paid to this possibility until a second similar case occurred. Mr S. Y. was aged 24 years on first admission in 1962, with BL-type leprosy and a B.I. of 4.0. He discharged himself against advice in 1965, and had no treatment for 2 years. On his return in April 1967, the B.I. in his skin smear had risen to 2.8, the M.I. being 0%. In February 1968, he complained of auricular nerve pain, and had slight ENL while receiving thiambutosine by injection. The neuritis and ENL continued on and off through the year. He had left ulnar neuritis in January 1969; at that time he was found to be taking vitamin A, 10,000 units daily (possibly more), in addition to the prescribed dose of multivitamins (vitamin A x 5000 units). He was advised to stop his self-medication; within a month the pain had disappeared, and he had no further

nerve pain for the next 6 months. He did, however, continue to have ENL and occasional bouts of mild nerve pain for the next 18 months till he again discharged himself against advice.

Since there was no other real change in the medication of either of these patients, it would appear that the extra dosage of vitamin A may well have been the relevant factor in the production of the neuritis. In countries where drugs are freely available and widely advertised, the problem of self-medication must always be considered in the presence of bizarre symptoms. I wonder if any of your readers have met similar situations or are interested in investigating the problem further?

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Cecil-Loeb Textbook of Medicine. 13th Ed. Saunders, Philadelphia, 1971.

How many medical workers interested in the physical treatment of leprosy would agree that the inclusion of electrical stimulation, either galvanic or faradic, is not of primary importance in the leprosy clinic or physiotherapy department?

Firstly, for diagnosis of the extent of a motor nerve lesion, it is not needed, since the selectivity of the *Myco. leprae* in its place of attack presents the same recurring patterns that tell their own story.

Secondly, for treatment. The premise is that electrical stimulation of a muscle, either directly or through its motor nerve, can only maintain muscle tone that is not already lost, and cannot increase muscle power. Only active contractions of a muscle will lead to an increase in muscle strength. Therefore, the electrical muscle stimulator is discarded when even weak active contractions are present. Among those patients who attend leprosy clinics regularly, the proportion of patients who would be helped by electrical stimulation is low—either they are still at home hoping for self-healing, or they come to a clinic only once or twice monthly to obtain their anti-leprosy medicine.

Thirdly, for post-operative re-education following tendon transfer. Is it not better to work through the motor cortex, so that the cortex registers the changed action of a transferred muscle (by working through the "thought pattern" of the muscle movement prior to its transfer) than to use a by-pass in an attempt to stimulate the muscle itself?

Another point—wax baths versus water soaking. Why spend time and money on wax baths, when cool water—available in most homes, and in field work—is more efficient in softening dry skin? Leprosy patients whose sweat glands in hands or feet have been destroyed need rehydration.

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JEAN GARDINER

After reading Miss Gardiner's provocative letters *Leprosy Review* asked her to amplify her remarks. This she has done in her articles entitled "Wax Baths in Leprosy" and "Querying the Absolute Need for either Faradic or Galvanic Stimulation in the Physical Treatment of Leprosy" in this issue (pages 215 and 213).—*Ed.*

Leprosy in the Republic of South Africa

Our previous publication (Schultz and Pentz, 1970) dealt with statistics up to the end of 1968, when the incidence of new cases was 2.0 per 100,000.

The number of new cases diagnosed since then is shown in Table 1.

TABLE 1

Year	Bantu	Coloured	Asiatic	White	Total
1969	373	5	2	1	381
1970	301	2	0	1	304
1971	312	6	1	3	322
1972	323	3	0	1	327

It is of interest that one of the three "white" patients diagnosed in 1971 was then a recent immigrant from Spain.

The incidence of new cases of leprosy per 100,000 of the population for the years 1969, 1970, 1971 and 1972 was 1.9, 1.5, 1.4 and 1.4 respectively.

In a recent report on Leprosy in the Republic of South Africa (*Leprosy Review*, News and Notes, 1972), it was stated that 749 notifications of leprosy were received during 1970. We would draw attention to the fact that this figure does not represent new patients only, but includes old patients admitted to the Institution for various treatments.

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Book Reviews

Leprosy—Diagnosis and Management by Harry L. Arnold and Paul Fasal, 93 pp. 2nd edition. 1973. Charles C. Thomas, Springfield, Illinois, U.S.A. Price $14.75 (U.S.).

Much aqueous carbol fuchsin has flowed over many microscope slides in the 20 years since the first edition of this book appeared under the title, *Modern Concepts of Leprosy*. The new knowledge—of contagiousness, immunology, bactericidal activity and domiciliary treatment—is reflected throughout the book, in the stance adopted, the clinical descriptions given, and the advice furnished on problems of diagnosis and management.

Written for the non-specialist physician who needs more than a medical student's nodding acquaintance with the barest rudiments of leprosy, the present book—with its excellent black-and-white and good colour illustration—should be a helpful addition to his library of brief handbooks that are taken down from the shelf from time to time and actually handled.

Auxiliaries in Health Care—Programmes in Developing Countries, by N. R. E. Fendall. 196 pp. and index. 1972. Josiah Macy Jr. Foundation, The Johns Hopkins Press, Baltimore and London. Price £4.30.

Professor Fendall is an enthusiast. He is more: he is a convinced, and convincing enthusiast. He writes as a practical man who sees that the "medicine of poverty" demands a radical rethinking of our Western ways if any impact at all is to be made on the mass of ill-health and morbidity in the developing countries. The only practicable method of combating the disease and malnutrition, the parasitic and infectious endemics, is to deploy trained and supervised auxiliary staff.

The value of this book to practising leprosy field-workers lies in its useful discussions on selection, training, and utilization of the health auxiliary. For us, the great need will be either to inculcate concern for leprosy in the polycompetent auxiliaries, or to train the leprosy paramedical worker so that he can play a larger rôle in the promotion of community health.

Speaking at Medical Meetings, by James Calnan and Andras Barabas, 111 pp. and index. 1972. William Heinemann Medical Books Ltd., London. Price £1.25.

This unpretentious little book should be read and pondered and heeded by every reader of *Leprosy Review* who is ever called upon to stand up in public and share some of his knowledge or experiences with colleagues. It is devastatingly candid, even scathing in places. We "see ourselves as other see us"—perhaps for the first time—as we splutter and mumble inaudibly, fumble over illegible transparencies, or commit any of the thousand sins far too common among speakers at medical meetings. It is also amusingly written, doubtless on the principle that truth rammed home in humour tends to stick.

There are chapters on demonstrating a patient, the short scientific communication, the 50-minute lecture, and the symposium. Then come some enlightening and illuminating sections on the techniques, the mechanics, of good speaking—how to speak well and how to use visual aids effectively.

The concluding sentence of the foreword runs like this: "If its precepts are followed, all medical meetings will become enjoyable and educational occasions". Leprosy workers, please note. *Verb. sap.*

S. G. Browne

Lepr. Rev. (1973), 44, 224-232

Abstracts

1. **Leprosy in Norway: an interplay of research and public health work**, by L. M. IRGENS. *Int. J. Epidem.* 1973, 2, 81-89.

This historically important and interesting investigation should be required reading of all who would write on "modern" methods of leprosy control by domiciliary treatment of patients. Long before any effective bacteriostatic drug was thought of or even imagined, the Norwegian physicians of last century advocated the adoption of methods that reduced the considerable leprosy endemic to vanishing point. The fascinating story is revealed, step by step, in this paper. The measures eventually adopted were based upon scanty but accurate epidemiological data, a co-operative population, and a general awareness of the importance of taking seriously the increasing incidence of leprosy in parts of Norway. During this period, more knowledge about leprosy and its transmission was becoming available, and the authorities showed a commendable willingness to take advantage of the new knowledge and to apply it in the field.

After a brief backward look into the history of leprosy in Norway, the author shows how leprosy became the focal point of measures of general public health concern. A National Leprosy Register was established, and a Research Hospital was founded. The names of C. W. Boeck (1805-1875) and D. C. Danielssen (1815-1894) are, of course, outstanding in this regard, and the seminal publication *On leprosy* (1847) in which they collaborated, separated leprosy as a distinct clinical entity from all other diseases. It was in this Research Centre in Bergen that Armauer Hansen carried out the work that led to the discovery of the leprosy bacillus.

It is, however, the control programme that is the main theme of this paper, but the programme would have been futile had it not been based on accurate knowledge of the dimensions of the leprosy problem and a distinct assumption that the disease was transmissible and not hereditary. In 1869, the anthrax bacillus had been discovered, and chains of cocci on heart valves had been suspected to be pathogenic organisms.

The rôle of Hansen in applying to the control of leprosy the results of his laboratory research is described in fascinating detail by Irgens—the prohibition of the "boarding-out" of poor leprosy sufferers, and the nocturnal isolation of the majority of those found to be infected. Such isolation was not strictly or penally enforced, but it was effective. Concurrently, the rising standards of housing and hygiene may also have played a contributory rôle in the control of the leprosy endemic and the reduction in the number of victims from about 3000 in mid-century (of whom about 930 were in hospital) to only 3 today.

S. G. Browne

2. **Familial associations in Sarcoidosis**, by the BRITISH THORACIC AND TUBERCULOSIS ASSOCIATION. *Tubercle, Lond.* 1973, 54, 87-98.

This report to the Research Committee of the British Thoracic and Tuberculosis Association by a team led by Professor J. G. Scadding may be read with interest by those whose main concern is leprosy. The findings are not definitive, but suggestive, and indicate the desirability of further enquiries.

The survey produced a further 62 instances of familial associations of sarcoidosis, including 5 examples of concordance in twins, 4 of which were monozygotic. Other features were the large proportion of like-sex pairs, and the greater frequency of mother-child than of father-child associations. This observation may imply either a genetic susceptibility or an unidentified

infective agent; the former suggestion seems to be supported by the preponderance of monozygotic over dizygotic twins.

In leprosy, parent-child associations are evenly distributed between mothers and fathers, and depend predominantly upon the infectiousness of the index case.

S. G. Browne

3. **Researches on *Myco. leprae* and other mycobacteria,** by Yvette PARES, *Annales de la Faculté des Sciences, Université de Dakar, Numéro spécial (1972), Tome* **25**, 5-78.

This monograph (in French) summarizes the author's extensive studies on the cultivation of *Myco. leprae*. Starting from the demonstration of aberrant forms among diverse mycobacteria (by Delville, Alexander-Jackson, Chatterjee, Jadin, Kato and others), she proceeds to report her own investigations. She has found a wide variety of abnormal forms of mycobacteria, of diverse morphology and staining properties, in old cultures, especially when grown in an atmosphere enriched by CO_2. The existence of a complex biological life-cycle is deduced from the behaviour of these mycobacteria in culture media.

The technique of Nakamura (half-immersed microscope slides) not only permitted the study of *Myco. leprae* in different nutritive media, but also revealed the transformation of the acid-fast bacilli into elements designated by the term "Form 2". A further step was taken when, with the same techniques, the author used a (sterile) extract of earth as the culture medium. After 2 months, an abundant growth of "Form 2" mycobacteria was obtained. She favours staining with Ziehl-Gram.

Confirming the observation that *Myco. leprae* may often be found in the circulating blood, the author also demonstrated the presence of "Form 2" in the blood of patients with lepromatous leprosy "in reaction". Previously called streptothrix, coccoid forms, diphtheroids, actinomycoides, etc., she suggests that these aberrant forms may be a stage in the complicated life-cycle of *Myco. leprae*.

When *Myco. leprae* is sown in various nutritive media, and left for months or years at 30 to 32°C, about 19% of the inoculated tubes show "Form 2" elements. By changing the environmental conditions, the author found diverse morphological elements in media inoculated from lepromata–rods, spores, non-segmented and segmented filaments, mycelial elements typical of the actinomyces, etc. When filtrate from autoclaved *Aspergillus fumigatus* cultures was added to nutritive media, multiplication of *Myco. leprae* occurred, ranging from 10- to 40-fold. "Form 2" elements were found to be sensitive to various anti-leprosy and anti-tuberculosis drugs. By the use of various complex culture media, enriched with extracts of earth or potato, and in an atmosphere of CO_2, she was able to isolate "Form 2" mycobacteria from tuberculoid lesions.

This study is far from complete, and many loose ends remain to be tidied up and tied up, such as reversion of aberrant to classical forms, the viability of "Form 2" bacilli, and electron microscopical appearances. When dealing with a disease like leprosy in which minimal cell-mediated potential may be nullified by the infection, all precautions must be taken to exclude (by disinfection) organisms that are not mycobacteria and to demonstrate specific lesions in the mouse footpad.

S. G. Browne

4. **The prevalence of leprosy at the coast of Kenya,** by A. HARTMAN, *East Afr. med. J.* 1973, **50**, 181-188.

This paper reports the findings of 21 random-sample surveys conducted in typical villages along the coastal belt of Kenya. Note was taken of tribal and linguistic affiliations, as well as of location and the presence of other morbid conditions besides leprosy.

The author found 62 sufferers from leprosy in a population of 8011 examined, representing

about 1% of the total at risk, which gives a figure of 6700 for the estimated total of leprosy patients. The diagnosis was mainly on clinical grounds, with some help from biopsy examinations. The age at onset showed the widest divergence. The highest prevalence rates were found among the isolated rural areas, and in predominantly Bantu tribes. Although the prevalence rates were distinctly lower than elsewhere in Africa, the proportion of progressive clinical types was higher, and one-third of those registered already had mutilations.

Recommendations are made for the better control of the endemic.

S. G. Browne

5. **Subclinical infection in leprosy**, by T. GODAL and K. NEGASSI. *Brit. med. J.* 1973, **iii**, 557-559.

By the use of the lymphocyte transformation test the authors found evidence of exposure to infection by *Myco. leprae* in over 50% of individuals who had some occupational contact with leprosy for a year or more, and in the same proportion of contacts of patients suffering from tuberculoid leprosy or from lepromatous leprosy under treatment. Nobody who had been in an endemic area for less than 2 months had evidence of exposure to leprosy.

According to the authors, these figures suggest that "subclinical forms" of leprosy infection may exist in a far higher proportion of exposed persons than hitherto suspected. A curious supplementary finding was that a lower proportion (4 out of 18) of subjects exposed to patients with lepromatous leprosy which had been treated for less than 6 months gave evidence of such exposure.

S. G. Browne

6. **BCG vaccination of children against leprosy: seven-year findings of the controlled WHO trial in Burma**, by L. M. BECHELLI *et al. Bull. Wld Hlth Org.* 1973. **48**, 323-334.

The results reported in this paper provide factual data for the continuing debate on the possible efficacy of BCG vaccination in conferring protection against leprosy. The total number of children concerned was 28,220, almost equally divided between the BCG-vaccinated and the non-vaccinated groups.

The groups have now been followed for periods of up to 7 years. Up to June 1971, 285 and 325 new cases of leprosy were detected in the BCG and control groups respectively, representing incidence rates of 5.2 and 6.0 per 1000 patient-years of observation. The report provides useful analytical tables relating to the various aspects of the trial, e.g. leprosy incidence according to household contacts, tuberculin status, and age at intake, and the (late) lepromin reaction in new cases of leprosy.

The results so far obtained in this trial indicate that BCG vaccination confers no protection on household contacts of open cases of leprosy, nor would it have benefited lepromin-negative contacts of cases of leprosy. The relative infectiousness of multi-bacillary and pauci-bacillary index cases—virtually unaffected by BCG vaccination of contacts—was about 3 to 1 in this trial. The incidence of leprosy in BCG-vaccinated children aged 0-4 years at intake was somewhat lower than that of children in the control group.

It is concluded that this slight reduction in incidence in one age-group would not substantially affect the pattern of the disease in an area comparable to that in Burma where the trial is being conducted. In an area where the prevalence rate is low, i.e. of the order of 1 or 2 per 1000 or less, BCG vaccination would probably not affect the incidence of leprosy. It is considered premature to recommend BCG vaccination, even to children 0-4 years of age, for the sole purpose of conferring protection against leprosy. To recommend BCG vaccination on the grounds of its proven value in protecting against tuberculosis, and its possible protective value against leprosy, would be to induce a false sense of security and perhaps lead to neglect of important leprosy control measures.

S. G. Browne

7. **Acta Leprologica**, 1973, Nos. **51-52**, 1-98.

This entire number is devoted to scientific papers emanating from the *Pavillon de Malte* at the Saint-Louis Hospital in Paris, and reflects great credit not only on the work and workers themselves but also on the initiative of *Acta Leprologica* in assembling and publishing these valuable reviews. Professor Merklen inaugurated the symposium with a general review of the history and activities of the Malta annexe, accompanied with plans of the buildings which were erected with funds provided by the Order of Malta.

The well-known research projects that have been the especial concern of the Paris team over the years are prominently summarized. Thus, the use of *Myco. lepraemurium* for immunological research into human leprosy is the subject of an informative paper by Merklen, Cottenot and Potier, with its special application in the sero-diagnosis of human leprosy by means of immuno-fluorescent tests using *Myco. lepraemurium*. Staining techniques (modified Ziehl-Neelsen procedures) are described that demonstrate acid-fast organisms in pauci-bacillary forms of leprosy, and fluorescent microscopy discloses such organisms in up to 45% of cases of tuberculoid leprosy, and in a further 20% only acid-fast granules are seen by this method.

The drug treatment of leprosy, and of reactional episodes in leprosy, progressive relapses despite treatment, and indigenous cases of leprosy in France are all dealt with in well-written and informative articles.

The last chapter describes the curriculum of the course of study provided in accordance with governmental decree, which leads to the "*Certificat de Léprologie*" granted to successful candidates. Facilities are provided for postgraduate students to pursue approved research projects in leprosy. Information on these courses may be obtained from: Professor M. F.-P. Merklen, Pavillon de Malte, Hôpital Saint-Louis, 2 Place Alfred-Fournier, Paris X, France.

S. G. Browne

8. **New and simple test of nerve function in the hand**, by SEAMUS O'RIAIN, *Br. med. J.* 1973, **iii**, 615-616.

When a normally innervated hand is immersed in water at a temperature of about 40° C for 30 minutes, the skin of the fingers shrinks. If the nerve supply is impaired, this shrinking does not occur. The author suggests that this simple objective test is reliable. It might well be that leprosy workers should use it in the investigation of ulnar- and median-nerve damage in their patients.

S. G. Browne

9. **Late lepromin reaction in untreated patients with indeterminate leprosy under 21 years old in Burma**, by L. M. BECHELLI, P. GALLEGO GARBAJOSA, MG MG GYI, J. WALTER and C. TAMONDONG. *Bull. Wld Hlth Org.* 1973, **48**, 113.

This paper records the findings in 209 individuals in Burma who had had indeterminate leprosy for less than 12 months and who were under 21 years of age. Only about 7% of these (untreated) patients had a negative or doubtful lepromin reaction, a result that indicates that in the population studied a very small proportion ran the risk of developing non-tuberculoid forms of leprosy. No less than 61.5% showed positive reactions classed as 2+ or 3+. Thus, most of the patients in the latter groups could be expected to limit or localize the leprosy infection.

S. G. Browne

10. **Site of early skin lesions in children with leprosy**, by L. M. BECHELLI, P. GALLEGO GARBAJOSA, MG MG GYI, V. MATTINEZ DOMINGUEZ and R. QUAGLIATO. *Bull. Wld Hlth Org.* 1973, **48**, 107.

A careful clinical study by a WHO team in an area in Burma where leprosy is highly prevalent was undertaken to determine the site of the initial lesion in 469 children with leprosy, out of a

total child population under surveillance of 28,220. The site most frequently affected was the thighs or the buttocks, followed by the arms, forearms, legs and lumbar region.

These findings are of epidemiological interest as well as clinical importance, since they have a bearing on the vexed questions of the portal of entry of the organism, and the possibility of the implanted bacilli remaining localized to a given skin area, exposed or covered by clothing. It is emphasized that if leprosy is diagnosed early, then in the great majority of patients the lesion will be single. The skin at the sites of the lesions was usually intact, and typically was covered by clothing. The authors conclude that it was most unlikely that the majority of such lesions developed at the point of entry of *Myco. leprae.*

S. G. Browne

11. **Leprotic inflammation of the gums in children,** by RUI PAULO G. MIRANDA. *Publicaçoes do Centro de Estudos Leprológicos,* Univ. Fed. Parana, 1972, **12**, 23.

The author reports the finding of acid-fast organisms in the inter-gum material obtained from 3 children suffering from lepromatous leprosy. Examination of sections from the underlying soft tissue revealed a heavy bacillary infection at all levels of the dermis, from the epithelium itself, the submucosa and down to the deeper layers. It was noted that bacilli were present in the superficial cells of the mucosa, and that there was no sub-epidermal zone exempt from bacilli or infiltrate. The clinical and epidemiological importance of these findings will not be overlooked.

S. G. Browne

12. **Protection conferred by BCG during the 20 years following vaccination,** by C. GERNEZ-RIEUX and M. GERVOIS. *Bull. Wld Hlth Org.* 1973, **48**, 139.

This important review (in French) of a follow-up study of an extensive BCG trial in France of the persistent protection afforded against tuberculosis in an exposed community will be of interest also to leprosy workers.

The protection conferred against tuberculosis was 73.2% over the 20 years of post-vaccinal observation, the figures being 54.5% against tuberculosis of the lungs and 83.6% against other forms of tuberculosis. The overall percentage of protection showed a progressive decline from 89.1% to 51.4% in the course of the enquiry. Children who were under 10 years of age when vaccinated had a higher degree of protection than those vaccinated later in childhood. It was found that the degree of post-vaccinal tuberculin sensitivity was not significantly correlated with the protection rate.

S. G. Browne

13. **Percutaneous BCG immunization trial using the WHO bifurcated needle,** by J. P. VAUGHAN, J. P. MENU, K. J. LINDQVIST and A. VENNEMA, *J. trop. Med. Hyg.* 1973, **76**, 143.

The bifurcated needle recommended by the World Health Organization for smallpox vaccination has now been used, in a controlled trial in Dar-es-Salaam, for BCG vaccination of children between the ages of 7 and 10 years. A somewhat lower tuberculin sensitivity conversion rate was obtained with the bifurcated-needle technique than with the standard intradermal method, but the simplicity, low cost, and easy sterilization of the needle combine to make this method attractive to field workers who may become involved in mass BCG vaccination campaigns. Further research is needed into possible ways of increasing the effectiveness of this technique, for example by increasing the number of vertical punctures,

augmenting the strength of the standard concentration of BCG used for intradermal inoculation, or using a more virulent strain of BCG.

S. G. Browne

14. **Primeiros resultados do tratamento da lepra com kanamicina (Treatment of leprosy with kanamycin: preliminary results),** by D. V. A. OPROMOLLA and S. C. DE ALMEIDA. *Rev. Brasil Leprol.* 1970, **87**, 17-39.

Ten patients were treated with one gram of kanamycin daily for 90 days. The results were similar to those obtained with rifampicin or other antibiotics, but improvement was observed as early as 30 days. In 3 cases bacteriological negativity was obtained, and evidence of the bactericidal effect of kanamycin was noted both in smears and histologic sections. *Erythema nodosum* was not a problem, but the authors encountered some deafness, and recommend careful audiometric control with this drug. While not suitable for mass treatment of leprosy, especially on an out-patient basis, kanamycin was thought to have significant value in the treatment of cases refractory to further improvement with other medications. Further work is suggested, to establish minimal effective doses, or those free of ototoxicity.

G. L. Fite

15. **Does entrapment neuropathy contribute to nerve damage in leprosy?** by H. SRINIVASAN and P. R. NAMASIVAYAM. *Indian J. Med. Res.* 1971, **59**, 1385-1391.

One hundred and ninety-two adult male patients with established lepromatous leprosy were examined to find out whether increased or diminished possibility of entrapment of the ulnar nerve influenced the occurrence of damage to the nerve. This was done in order to get an estimate of the contribution of entrapment neuropathy to nerve trunk damage in leprosy. The condition of recurrent dislocation of the ulnar nerve was equated with diminished possibility of entrapment of the nerve. Nerve damage was seen to the same extent in the dislocating and normal (not dislocating) nerves. The olecranon-medial epicondyle interval was used as the second parameter. Significant increase in the occurrence of nerve damage was seen when this interval was small (25 mm or less) when the elbow was straight and when this interval increased by 50% or more after elbow flexion, suggesting that increased possibilities of entrapment led to increased occurrence of nerve damage. It is pointed out that routine extraneural decompression of the ulnar nerve as a prophylactic measure to significantly lower the frequency of nerve damage is not likely to be successful in view of the finding that limbs at high risk formed only a small minority of the total.

Authors' Summary

16. **Epidemiology of *Mycobacterium ulcerans* infection (Buruli ulcer) at Kinyara, Uganda,** by THE UGANDA BURULI GROUP. *Trans Roy. Soc. Trop. Med. Hyg.* 1971, **65**, 763-775.

The epidemiology of lesions due to *Mycobacterium ulcerans* was studied in an almost closed community of 2500 Rwandan refugees living near the Nile in central Uganda over a period of years during which 220 of them showed the disease. The incidence was greatest in children aged 5-14 years, in those living nearer the Nile, and during the months of September to November. In adults it was greater in women than in men. The geographical gradient in incidence was more apparent among women, whereas temporal variation mainly affected the men. Direct contact with the Nile was not necessary for transmission. The disease gave no evidence of spread from person to person and the incidence fell to zero when the people moved to a new locality. The incubation period was usually under 3 months. Lesions were usually single; they occurred on

any part of the body in children, but were largely confined to the limbs in adults. In men, lesions were almost restricted to the lower leg, whereas in women the arms were also often affected. Hypotheses of transmission are discussed in relation to these observations.

Authors' Summary

17. **The changes of Bacillary and Granularity Indices of *Mycobacterium leprae* under DDS therapy**, by C. K. SHU, S. L. CHUNG and S. I. LEE. *Kor. J. Derm.* 1971, **9**, 3-8.

The authors investigated serial changes of Bacillary and Granularity Indices from 49 previously non-treated lepromatous leprosy patients under DDS therapy during a 24-month period, and the following results were obtained.

(1) The pre-treatment Bacillary Index was highest on the eyebrows, chin, ear lobes, arms, legs, and backs, in decreasing order. The proportion of fall of B.I. during therapy showed similar tendencies in each site of smears; the average decrease being 1.2 in the first year and 0.8 in the second year.

(2) The average Granularity Index before therapy was 2.5, the rise of G.I. was rapid during the first 12 months, slower during the next 6 months, and no significant changes were seen during the last 6 months.

(3) The changes in the G.I. were faster and more sensitive to therapy than that of B.I. Therefore, it seems more valuable for assessing the response of therapy, drug resistance, prognosis, etc.

(4) Three hundred milligrams of DDS per week appear to be sufficient for maintaining the therapeutic dosage.

Adapted from Kor. Med. Abstr.

The following abstracts are reprinted, with permission, from *Trop. Dis. Bull.* 1973, **70**.

18. **Symposium on leprosy**. *Trop. Doctor*, 1973, **3** (1), 3-27.

This group of six papers covers nearly all the clinical aspects of leprosy, and would be very useful as a booklet. *Recognition of leprosy* by S. G. Browne (p. 3) mentions that "the usual presenting signs are in the skin", and then describes later signs, acute exacerbation, and differential diagnosis.

The scraped-incision smear, and biopsy of skin and nerve are detailed by D. J. Harman in *The microscope and leprosy* (p. 11).

In *Management of leprosy in the community* (p. 5), S. G. Browne gives authoritative advice on such questions as when and where to treat patients with leprosy, the few precautions required among contacts of patients, whether contacts should be treated, advice to the patient, and leprosy control. He emphasizes simple drug regimens, "with regular inspection of the patients for early or threatened nerve damage", and full training of auxiliaries.

The treatment of leprosy and its acute complications by W. H. Jopling (p. 8) includes details of anti-leprosy drugs, but the dose regime of dapsone is vague; "100-200 mg/week is advocated . . . starting with 25 mg/week and slowly increasing". (That some patients cannot tolerate more than 10-25 mg per day, and so should be given daily doses of dapsone, is not mentioned.) The length of treatment advised for dapsone is slightly arbitrary; patients with a "weakly positive" lepromin reaction and "few bacilli" in skin smears he recommends should be treated for 10 years. For nerve pain, he recommends an intraneural injection of lignocaine and hyaluronidase, but whether this benefits or impairs nerve function is not mentioned, neither is the treatment of "early or threatened nerve damage" referred to in an earlier paper.

19. **A simple method for the differentiation of *Mycobacterium leprae* from other mycobacteria through staining technics**, by J. CONVIT and M. E. PINARDI. *Int. J. Lepr.* 1972, **40** (2), 130-132.

It would be a boon to bacteriologists, histologists and other interested workers to have available a staining technique which will specifically stain *Mycobacterium leprae.*

In this paper the authors record their observations that, after a 2-h fixation period and pre-treatment with pyrimidine, *Myco. leprae* loses its characteristic properties of staining by carbol-fuchsin, fluorescent and phospholipid methods (adapted Baker's stain–see *Trop. Dis. Bull.* 1969, **66** (v), abstr. 1038). The control mycobacteria (BCG, *Myco. smegmatis, Myco. lepraemurium,* and two other cultivable mycobacteria isolated from patients with leprosy) stain normally. (See also Fischer and Barksdale, *J. Bact.* 1971, **106** (v), 707.)

The authors offer the hypotheses that the components in *Myco. leprae* which combine with the usual staining methods are either sited more superficially or their chemical bonding is weaker than those of other mycobacteria.

E. E. Vella

20. **Manifestations articulaires, musculaires et cutanées des états réactionnels au niveau de la main du lépreux. (The articular, muscular and cutaneous manifestations of reactional states in the hands of patients with leprosy)**, by A. CARAYON and J. BIOT. *Méd. Trop.* 1973, **33** (1), 25-41. English summary.

The authors review summarily the broad pathology of damage to the soft tissues and bones of the hand resulting both from the acute inflammation of the reactional state and from peripheral nerve damage. Their main emphasis is on the structural damage sustained by the skin and subcutaneous tissues and the small joints during "reaction". These clinically observed complications are illustrated by helpful radiographs, which show osteoarthritic changes, periarticular decalcification, progressive destruction of articular surfaces, spontaneous arthrodesis in various positions, and the "intrinsic-plus" (swan-neck) deformity of the fingers. Consequential paralysis and fibrotic contractures of the intrinsic musculature of the hand lead to bony absorption and dislocation of the interphalangeal joints. The skin over the dorsum of the hand, becoming fibrosed, retracts and binds skin and tendon to bone.

The authors provide detailed operative directions for the correction of established deformity, and some useful, but all-too-brief, hints on the prevention of the disabling and stigmatizing conditions they describe so well.

Orthopaedic surgeons interested in leprosy and its surgical pathology will find this paper of stimulating interest.

S. G. Browne

21. **Renal manifestations of leprosy: impaired acidification and concentration of urine in patients with leprosy**, by R. A. GUTMAN, W. H. LU and D. J. DRUTZ. *Am. J. Trop. Med. Hyg.* 1973, **22** (2), 223-228.

A careful study was made of renal tubular functions in 47 patients with leprosy. Impairment of urinary concentration in 9 cases and acidification following ammonium chloride administration in 7 cases indicated a defective function of the distal renal tubules that was not related to the type of leprosy, to serum globulin levels, to *erythema nodosum leprosum,* to the presence of rheumatoid factor or to dapsone treatment. There was no evidence of urinary infection. The results of renal biopsy studies in 6 patients were normal. It was concluded that this tubular dysfunction might be a non-specific phenomenon.

D. S. Ridley

22. **Amyloidosis in leprosy**, by B. V. SATYANARAYANA, P. S. RAJU, K. R. KUMARI and C. R. R. M. REDDY. *Int. J. Lepr.* 1972, **40** (3), 278-280.

"In a study of the incidence of amyloidosis in 79 cases of lepromatous leprosy it was found that in only 6 cases amyloidosis was present. This confirms previous findings of a low incidence of amyloidosis in leprosy patients in South India."

23. **Autoantibodies in leprosy among Thai patients**, by B. PETCHCLAI, R. CHUTHANONDH, S. RUNGRUONG and T. RAMASOOTA. *Lancet* 1973, June 30, 1481-1482.

"Rheumatoid factor, antithyroglobulin antibody, and antinuclear antibody were studied in Thai leprosy patients. The prevalence of autoantibodies among these patients was higher than that found in the control population, and most positive results were found in lepromatous leprosy; but the percentage of positive results and the titres were lower than those recorded elsewhere. This is suspected to be due to a difference in immune response among Thais."

24. **Prevalence of deformities and disabilities among leprosy patients in an endemic area. Part II. Nerve involvement in the limbs**, by S. KARAT, P. S. S. RAO and A. B. A. KARAT. *Int. J. Lepr.* 1972, **40** (3), 265-270.

In the region of south India 1721 patients suffering from various types of leprosy were assessed for evidence of nerve involvement. Such evidence was found in 622 (36%), and in 614 of these patients the limbs alone were affected. There was a significantly higher incidence of disability among those patients with bacillated types of leprosy, and upper limbs were much more commonly involved than lower limbs. Of 129 patients with all four limbs affected, 69 (53%) had lepromatous leprosy. There was no instance in which motor paralysis occurred alone without anaesthesia, and of all motor nerves showing signs of damage the ulnar nerves were by far the most commonly affected.

The authors stress the importance of regular and routine examination for early neurological changes.

(For Part I of this paper see *Int. J. Lepr.* 1970, **38** (v), 1.

W. H. Jopling

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Printed in Great Britain by the Whitefriars Press Ltd., London and Tonbridge