

LEPROSY REVIEW

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Principal Contents

Editorial

Leprosy Today

The Tasks Facing Scientific Research

Leprosy in Society

Studies on the Distribution of
Cholinesterases

Foot Drop in Leprosy

New Method of Nose Reconstruction

Letters to the Editor

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CONTENTS

	PAGE
EDITORIAL: Attempt at Leprosy Eradication	1
Leprosy Today by R. H. T. EDWARDS	3
Leprosy: The Tasks Facing Scientific Research by V. K. LOGINOV ..	14
Leprosy in Society: I. "Leprosy has Appeared on the Face" by OLAF K. SKINSNES	21
Studies on the Distribution of Cholinesterases in Relation to Neuro-Histological Changes in Specialized Sensory Nerve Endings in Leprosy Skin by A. PAUL JAYARAJ	36
Foot Drop in Leprosy, corrected with Transfer of Tibialis Posterior Tendon to Extensor Tendons at Dorsum Pedis by JOHS G. ANDERSEN	41
New Method of Nose Reconstruction by T. Wyss	47
Letters to the Editor: News Item	50
Pathogenesis of Leprosy	50
New Name for Leprosy	51

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EDITORIAL

Attempt at Leprosy Eradication

When the question of eradication of leprosy is considered there are three schools of thought.

1. Eradication is possible and should be attempted.
2. Eradication is not possible and nobody ever eradicates anything.
3. Eradication is possible and should be attempted, *but* before we begin we must plan and super-plan and insist on seeing every step of the way.

Of these three schools of thought, we are glad to say that the British Leprosy Relief Association is thinking of supporting actively the first, and also has given considerable attention to the third.

It is thought that sufficient knowledge about leprosy and its treatment has accumulated by now, under the faithful enquiries of a host of leprologists and research scientists, on which to act and to have a sporting chance of achieving eradication or something very near it in an offered geographical area where it would be welcomed—say for 10,000 known leprosy patients. This modern accumulation of knowledge is imperfect, but for practical purposes there is enough on which to work, because we already possess an effective drug and the recent revolutionary aid of physiotherapy allied to plastic and reconstructive surgery, which, though it does not stamp out the disease in itself, is a *sine qua non* for any modern leprosy control scheme. To put it quite simply, unless we make sure that the patient is seen to be cured, which for the lay mind definitely means removal or correction of deformities and removal of cosmetic stigmata, despondency settles on the patients and is reflected in their co-operation, so that the leprosy control schemes will soon falter and fail. We include surgery in our thinking not only because we want to bring this aid to the patients and rehabilitate them as well as try to cure them, but if we leave it out we face the fact, as we have said, that the whole attempt is in danger of failure.

An important and perhaps predominant factor for the success of a Pilot Eradication Unit is undoubtedly careful choice of personnel. It is thought that a unit or project designed to attempt eradication will stand or fall on the quality of the men and women chosen. The intention is to keep the number of these people down to 7 or 8—a physician-in-charge, a surgeon, a laboratory technician, a physio-therapist, and several nurses, and a practical administrative helper as well.

This point of choosing a team well, and providing housing and central working space, definitely visualises facing the fact that the majority of leprosy patients prefer to be treated in homes or villages, so transport will be supplied for the staff, and out-patient work

based on surveys and repeated surveys will be the main way of reaching the patients.

To emphasise this important recommendation, namely to be very careful about choosing a small but effective team, we refer to the ancient story of Gideon who, faced with the problem of overcoming the Midianites, cut down his army from 3,000 to 300, and even introduced a test for sincerity and eagerness by causing the army to drink water at a stream, and took for the assault only the 300 who lapped water. The result of Gideon's efforts was total victory, but the point is that there was a careful choice of personnel.

So then, it is possible to visualise the Pilot Eradication Unit as something offered by the Association to needy countries who like the idea, with the object of making a demonstrative assault on the old enemy, leprosy, with chosen personnel banded together as a happy band of brothers, tackling first a limited objective but being ready to train nationals in the process. Also they will carry out continued research on the field and incorporate the latest rehabilitative surgical measures with the ultimate aim, not only of relieving 10,000 patients in a chosen area, but with the hope that the plan would be extended by many such units operating in many places. It is, we think, a grand conception which comes down hard on the side of the idea that leprosy can be eradicated, and anyway is willing actively to try out the idea.

ANAXIMANDER (611–547 B.C.) one of the Ionian school of philosophers, said in effect, “if you have a good idea and think it is good, try it out and demonstrate to yourself and others whether it works”.

LEPROSY TODAY

by R. H. T. EDWARDS, B.Sc.,
Student, Middlesex Hospital, London, W.1.

Leprosy can be a severely disfiguring and disabling disease but for most of the 15 million sufferers of leprosy in the world it is the stigma that is hardest to bear. The Shorter Oxford dictionary gives two relevant meanings for the word stigma: the first 'a distinguishing mark' (applied to the characteristic signs of the disease); the second (relevant to the almost universal contempt for the disease) is 'a mark of disgrace . . . a sign of severe condemnation'. It is interesting to trace the possible origins of the second namely the social stigma of leprosy.

The Origin of the Social Stigma

There would appear to be three closely related constituents; a Primitive Fear, a Rational Fear and a Religious Fear.

(a) *Primitive Fear*. According to RYRIE leprosy is the foremost example of a group of blemishing diseases which evoke the guilt complex in the sufferer and in the observer. FRAZER cites many examples of belief among primitive peoples of leprosy or other blemishing diseases affecting those guilty of violating certain taboos. How guilt is evoked in the observer is less clear but the complex nature of taboo discussed by FREUD would seem to make this possible. Perhaps related is dread of a 'living death' (associated with taboo on the dead) fear of disfigurement, and revulsion towards the unaesthetic.

(b) *Rational Fear*. That is fear of contagion. The Laws of Moses provide a rational basis for fear of the disease as they are sanitary laws, not superstitious taboos. Nevertheless because they occur amid sacred writings they assume Divine significance and can contribute to the Religious fear. It must be mentioned however that fear of contagion may not have been as important in the past as it is today. Leprosy has frequently been considered an hereditary disease and there are accounts which suggest that infection was not feared in parts of Britain (MACARTHUR) and Scandinavia (RICHARDS). A further example is the Chinese proverb quoted by MAXWELL 'Sleep with a leper but do not be a neighbour across the street to a man with itch (scabies)'.

(c) *Religious Fear*. Fear of divine punishment increases the primitive fear. In China and Japan, and India, and many other parts of the world leprosy is considered a punishment inflicted on the guilty by the gods. The mistaken identification of the Old Testament disease *zaraath* with leprosy today has added to this fear as there are examples of *zaraath* being punishment for sin (Numbers 12: 9-14; 2 Kings 5: 1-27; 2 Kings 15: 5; 2 Chronicles 26: 17-21, 23).

It is apparent that history and translation problems have contributed to the fear of leprosy. Identifying historical diseases with those today presents difficult historical, semantic and diagnostic problems as the ancients frequently omitted to record obvious features. According to DHARMENDRA the earliest accurate description of leprosy is to be found in the Sanskrit Sushruta Samhita (600 B.C.). Suggestions that earlier descriptions occur in Chinese and Egyptian literature have been discredited by LOWE. Aretaeus of Cappadocia (A.D. 100) wrote a detailed account of lepromatous leprosy. SCOTT quotes later accounts from Chinese (seventh century), Japanese (eighth century) and Mediaeval European literature.

Translation problems. In Leviticus (Chapters 13 and 14) there are diagnostic criteria of a condition termed *zaraath* in Hebrew. Three possibilities exist as to the nature of *zaraath*.

(i) It is modern leprosy, an assumption made in most translations and by earlier authors on the history of leprosy (quoted in *Leprosy and the Bible*).

(ii) It represents a group of blemishing diseases including leprosy (CHAUSSINAND).

(iii) It bears no relation to modern leprosy (COCHRANE, LENDRUM, LIE TAS). Not only are the lesions different from those of leprosy but there is no mention of cutaneous anaesthesia. LENDRUM suggests that *zaraath* is not a disease but a state of ceremonial uncleanness (comparable to the state of the 'untouchables' in Hindu society) as it can be shared by inanimate objects such as garments (Leviticus 13: 47) and house walls (Leviticus 14: 33-47).

When the Hebrew scriptures were translated into Greek (in the Septuagint 200 B.C.) there was the problem of translating the typically Hebrew idea into the Greek where it did not exist. *Lepra* was used for *zaraath* as it had been used for a skin condition in Hippocratic writing (400 B.C.) where it originally meant 'something which peels off' (MACARTHUR). *Lepra* in Greek medicine was used for scaling skin diseases such as psoriasis but never to leprosy which was called *elephantiasis*. It is under the title *elephantiasis graecorum* that historical descriptions of leprosy are to be found even as recently as 1847 when Danielssen and Boeck published their work which founded modern leprology. The Greek *lepra* became *leprosus* in the Vulgate, Jerome's Latin translation of the Bible about A.D. 400. In the translation of Isaiah 53: 4 foretelling Christ's suffering the Hebrew *naga* (stricken) was rendered, in keeping with ancient usage, *leprosus* which became *leprous* in John Wyclif's English translation (fourteenth century). This resulted in the belief that Christ died a 'leper' (MACARTHUR). The word *leprosy*, subsequently used in the plural by Pliny and Macaulay, according to INNES included syphilis, scabies, dermatophytosis, psoriasis, bubonic plague and destitution so that a beggar could be called a 'leper', the word also used for the disease

itself in some manuscripts. *Leprosy* and *leprous* were also used for diseases of animals and plants. The examples cited by MACARTHUR are '... the cankered mangelasse called Leprossie' and 'Myst and fog... make graine leprous'.

It is tradition that Job had leprosy though LIE believes that he suffered with scabies crustosa. The disease suffered by Lazarus (whose name means without help) was identified as *lepra* by the Church Fathers though this is described as *ulceribus plenus* similar to the name given to Job's disease in the Vulgate. It is very unlikely therefore that the Hebrew *zaraath*, the *lepra* of Hippocrates, the diseases of Job and Lazarus or the many conditions included in the mediaeval meaning of the word bear any relation to modern leprosy. LENDRUM points out that it is only since Armauer Hansen described the causative organism in 1874 that the word has its present official meaning.

The Reaction of Society to the Sufferer

This has been ambivalent. The commoner reaction has been ostracization. The methods vary from an African one of simply driving him into the bush to die to the more complex but no less effective measures of Religious and Civic legislation evident in Hebrew, Chinese, Indian and European history depriving him of his home, his citizenship, his freedom, and all but depriving him of his life; frequently this too was taken. In China sufferers have been burnt alive if rich, and buried alive if poor (MAXWELL) and shot (KELLERSBURGER) and in Mexico they have been burnt as sacrifices (FRAZER). It is likely that guilt motivates this attitude, certainly one of the ways of dealing with guilt is projection of the guilt onto a scapegoat. For centuries sufferers from leprosy have been scapegoats for society but in this role have not differed from the many other scapegoats in history, witches, Jews or any other religious, political or racial groups. It may be significant that the stigma of leprosy is greatest in the more sophisticated forms of society. Certainly some of the most pathetic examples of the stigma come from the United States. In India similarly the stigma is strongest in the higher stratum of society (SURTJ).

Less commonly sufferers from leprosy have been shown great compassion, as from the Franciscans and other religious orders when leprosy was endemic in Europe in the Middle Ages. Undoubtedly most was zealous Christian service partly based, perhaps, on the mistaken belief that Christ died a 'leper' but RYRIE suggests that contributory was an over compensation for guilt. The dread of the disease and the over-compensation is well recorded in GOUDGE's life of St. Francis of Assisi. A similar over-compensation may have contributed in motivating Father Damien (whose great work and sacrifice is well recorded by FARROW) and other workers

since (RYRIE.) Motives founded on compensation for guilt or gaining personal merit (exemplified in the Mohammedan or Hindu obligation to almsgiving) rather than improving the lot of the sufferer are incompatible however with the modern scientific approach aimed at eradicating leprosy.

The Psychological Reactions of the sufferer to his disease

Leprosy is a severe and prolonged mental stress but there are no specific changes. At the onset the patient shares with society a confused horror of the disease and reacts with strong feelings of guilt which may drive him to suicide. The suicides occurring in Carville, U.S.A., have received great publicity suggesting they are a common occurrence which they are not. In Japan KAMIYA claims that the suicide rate among leprosy patients is no higher than among the general population.

Isolation is traditional in the management of leprosy patients and this can have profound psychological effects. LOWINGER claims that 10% of leprosy patients at Carville develop psychosis against approximately 1.25% in the normal American population. A similar incidence was found in England by JOPLING who points out that he has not found psychosis in outpatients. KAMIYA, however, found the incidence of psychosis similar to that in the normal Japanese population. Schizophrenia was the commonest functional psychosis in Carville. It is doubtful whether there exists a true organic psychosis in leprosy as there is no histological evidence of brain involvement though KAMIYA describes delirious states and amentia like pictures occurring in some cases of acute exacerbation of leprosy. Sulphones have long been accused of causing psychosis but it is likely that they can now be exonerated. It is likely that those patients developing psychosis possessed a constitutional predisposition to psychosis though the psychosis frequently improves with treatment of the leprosy. Leprosy naturally occurs occasionally in mental patients but according to VERMA it does not change the mental picture. Overt psychoneurosis is not often found in psychiatric studies. LOWINGER suggests the reason for this is fear of psychiatric referral, the unavailability of psychotherapy, the reduction of anxiety by work assignments and religion (PEDLEY) and general medical management.

In the absence of clinical mental illness leprosy nevertheless produces profound mental changes. Group Rorschach tests on hospitalised patients in Japan (KAMIYA), Molokai (LORD) and Africa (PEIFFER) show the typical effects of hospitalisation, immaturity, withdrawal, narrowed mental horizons and a reduced capacity of thinking in line with community thought. The Need Inventory revealed to KAMIYA a clear picture of over-compensation; the needs of autonomy, aggression, achievement, affiliation, nurturance and understanding appeared significantly stronger than in the control

normal group. KAMIYA also found that the Rosenzweig Picture Frustration test revealed repression and resignation (which increased in institutionalised patients as age, period of residency and degree of physical disability increased) in both hospital patients and out-patients who in addition showed guilt feelings and a reduced power of self assertion. Boredom, a sense of the futility of life and lack of future aims and hopes were also common in institutionalised patients who may be classified, according to KAMIYA into two types: the resigned and the aggressive. LOWINGER describes the atmosphere at Carville as suspicious and depressed and paranoid tendencies are evident in autobiographies of leprosy patients such as MARTIN. The above tests have also shown disturbances of body imagery and LORD cites the example that leprosy patients may fail to notice the absence of the nose in a drawing of a face. It is interesting to speculate with LOWINGER that leprosy may precipitate psychosis in susceptible individuals because of disturbance of body imagery resulting from auto-amputation and seeing deformities in others, and from social and psychological isolation (from blindness and cutaneous anaesthesia), both features of schizophrenia. The degree of withdrawal attained by the patient may be considerable even in the absence of psychosis that the patient cannot or will not return to society outside their institution and this is becoming a major problem in Cullion Sanatorium (LARA and TIONG) and elsewhere.

This is not to suggest that all leprosy patients are so affected to the degree described and rather than being struck with the observed changes one is impressed (as pointed out by LORD) by the relatively healthy overall picture suggesting a certain flexibility and adaptation of the human personality under conditions of rather extreme long-standing physical and environmental stresses. Much of the mental suffering described can be prevented by a rehabilitation policy starting on the day of diagnosis. Further, mental rehabilitation must precede and thus determine the degree of physical rehabilitation.

Modern Management

Rehabilitation. 'By rehabilitation is meant the physical and mental restoration, as far as possible, of all treated patients to normal activity, so that they may be able to resume their place in the home, society and industry. To achieve this, treatment of their physical disability is obviously a necessity, but it must be accompanied by the education of the patient, his family and the public so that not only can he take his normal place, but society will also accept him and assist in his complete rehabilitation' (World Health Organisation). It is estimated that more than 25% of all leprosy patients have some disability, mostly paralysis and injuries to anaesthetic limbs, many requiring physical rehabilitation. This is aimed at preventing deformity by methods pioneered by BRAND and easily explained to

the patient, enabling him to earn his living. These principles of rehabilitation are of great importance in the surgery of leprosy.

The Surgery of Leprosy. For the small percentage of patients to whom it is available surgery has much to offer because of the residual disfigurement and disability after cessation of active disease. Eyebrow alopecia, a collapsed nose, lagophthalmos and the claw hand all indicate active disease evoking fear and guilt in the mind of a superstitious and ignorant public. Surgical correction of these stigmata not only increases the patient's self confidence but also make his future employment more likely. Orthopaedic operations designed to correct physical disability are based on the fact that only certain nerves are affected by the disease (BRAND). Tendons from normal muscles can be transformed to perform the actions of those paralysed. The success of these operations depends on physiotherapy: oil massage, wax baths, splints, exercises are methods used in the preoperative preparation of the patient and the re-education of muscles after tendon transplantation.

Of greater importance because of its wider application and prophylaxis is the chemotherapy of leprosy.

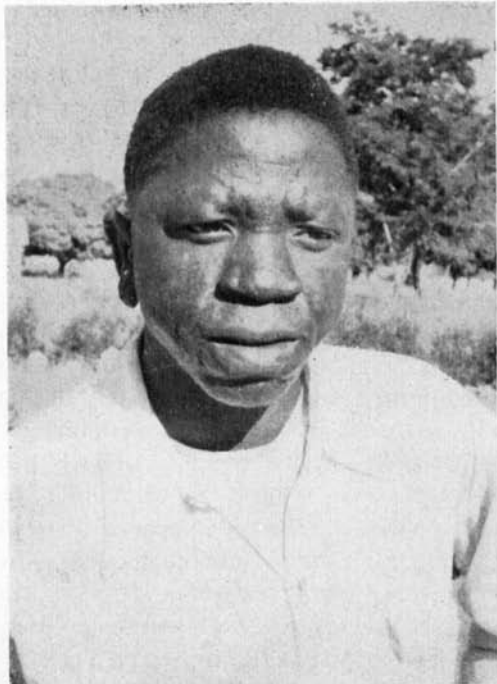
Chemotherapy. Although chaulmoogra oil was after many years treatment able to render a patient bacteriologically negative it was the introduction of the sulphones twenty years ago that caused the present revolution in the treatment of leprosy.

The Sulphones. Chemically related to the sulphonamides the sulphones are derivatives of Diamino Diphenyl Sulphonic Acid (DDS), an incomplete antimetabolite (BROWNE (a)). Full treatment must be continued (JOPLING (b)) for two years or until all signs of activity have disappeared for eighteen months in tuberculoid and indeterminate forms, and for more than two years after all signs of activity have disappeared in lepromatous and dimorphous leprosy, the treatment lasting as long as ten years in some lepromatous patients. A few fail to respond, others relapse after apparent cure and in others resistance develops and others manifest toxic actions, anaemia, nausea, iritis dermatitis and hepatitis. For these reasons sulphones are not ideal and other compounds are being tried in the search for a drug which will cure leprosy in a few months and so prevent deformities developing. Sulphones possess one advantage over all subsequent drugs in that they are cheap and can be used in mass schemes aimed at eradicating leprosy from endemic areas. Mass schemes today operate from a central institution where the most infectious and debilitated patients can be treated and where drug trials, research and surgery can be done. Ambulatory patients are supplied with sulphones from dispensaries and itinerant leprosy workers who search for new cases and educate the public about leprosy, important because it is estimated that not more than 20% of all leprosy patients are receiving treatment of any kind.

LEPROSY REVIEW



An advanced lepromatous patient from Sikonge leprosarium Tanganyika, before treatment.



The same patient, showing dramatic improvement after four years' treatment.

Thanks and acknowledgement to the Mission to Lepers for permission to reproduce these photographs.—AUTHOR.

The results of such schemes, conducted for only two decades, are to be seen already. In Eastern Nigeria the incidence of leprosy is declining steadily at the rate of 15 % per annum (BROWNE (b)).

Other drugs. These include Diphenylthiourea (Ciba 1906), Thiosemicarbazone (Conteben Bayer) Diethyldithiolisophthalate (Etisul I.C.I.) B663 (Geigy), Vadrine (Geistlich), Methimazole Cycloserine, Isonicotinic Acid Hydrazide, Sulphamethoxypyridine, Macrocydon and Etoxid. Not one of these compounds has had the same popularity as sulphones because of toxicity, early development of resistance, expense, or relative ineffectiveness. Some such as Diphenylthiourea and Diethyldithiolisophthalate are initially more effective than sulphones in reducing the bacterial index but resistance soon develops, nevertheless they can be useful in conjunction with sulphones. Thiosemicarbazone, Diphenylthiourea, and Vadrine may be used as alternatives to sulphone therapy when resistance or hypersensitivity have developed to the latter. The literature related to these substances and their effectiveness in treating leprosy is to be found in past numbers of *Leprosy Review*.

The importance of carefully planned clinical trial of new compounds cannot be over emphasised. Clinical trials of antileprotic agents need to be based on the general principles outlined by BRADFORD HILL. Difficulties inherent in planning any clinical trial (CROMBIE), those of individual susceptibility, choosing dosage, side effects, presentation and assessment of the significance of the results, are also to be found in the trial of an antileprotic. These difficulties can be largely overcome as exemplified in the careful trial of Macrocydon by WATERS in which a comparison was made between the effectiveness of Macrocydon plus sulphone and sulphone alone (control group). No difference was found so that this one trial has given clear information which obviates the need for future trial of the drug, thus saving time, manpower and expense.

Clinical trials need not be very long today. Assessment can be made on the rate of decrease of Ridley's Bacterial index, and comparison with that of a control group receiving sulphones. Now that WATERS and REES have defined the changes in the morphology of *M. leprae* in patients under treatment it is possible by estimating the rate of fall in the proportion of non-granular (viable) organisms to assess the effectiveness of a drug in a period of a few months only. A further result of their work is that patients formerly considered infective by the Bacterial Index may in fact, if the proportion of viable organisms is low, be considered non-infective and may be treated as such.

It is interesting that more attention is now being taken to the reaction of the body to invasion by *M. leprae*. It is known from the work of WATERS and REES that the dead (granular) organisms are eliminated only slowly from the body. A search is in progress now for

compounds which will accelerate the disposal of dead organisms and it was partly for its surface active properties thought to be useful in this respect that Macrocyclon was tried. Similarly utilisation of biological reactions such as the Epithelioid Cell Reaction (Pseudo-reaction de Souza Lima) is suggested by HIRAKO and SAKURAI. The TECHNICAL COMMITTEE ON PATHOLOGY AND EXPERIMENTAL TRANSMISSION in the recent Congress suggest that an Histological Index (comprising not only the concentration of Acid Fast Bacilli but also the area of cellular infiltration) to be a better assessment of the disease process than the Bacterial Index.

The discovery of the ideal antileprotic agent must await studies on the metabolism and immunology of *M. leprae* made possible by its culture.

Mycobacterium leprae.

This is the first specific micro-organism to have been associated with a human disease.

Culture. Culture on media which support growth of other Mycobacteria has failed repeatedly. Growth of *M. leprae* occurs according to BROWNE (a) on tissue cultures of Schwann Cells. Consistent growth in the footpads of mice is claimed by SHEPARD. Hitherto all such work has been complicated by the growth of contaminant, and largely unknown mycobacteria. The problems posed by *M. leprae* have stimulated interest and research on other mycobacteria and much has been learnt by analogy with *M. leprae murium* and *M. tuberculosis*.

Immunology. In other diseases methods of inducing active passive immunity have been devised soon after the discovery of the causative organism. Little success has attended such attempts in leprosy probably because it is now known that *M. leprae* belongs to a group of mycobacteria which lack surface antigens, circulating antibodies forming only to the antigenic products of the dead organism. Until recently the immunology of leprosy was largely concerned with the use and interpretation of the lepromin reaction. Assuming that the allergic response determines the form of the disease then conversion of lepromin reaction from negative to positive using Baccille Calmette Guerin (BCG) should be advantageous. Trials have cast doubt on the effectiveness of BCG as a prophylactic in leprosy and it may be that it is rather the form of the disease that determines the allergic response, making the lepromin reaction less relevant. Attempts are being made by SHEPARD to make a combined prophylactic containing *M. leprae* and BCG. Finally, it is not entirely surprising that auto-antibodies have been found in leprosy (BONOMO). The fact that they are thyroglobulin antibodies and their relation to thyroid metabolism in leprosy must await further evidence as must the whole question of thyroid metabolism in leprosy.

Epidemiology. The exact mode of transmission of *M. leprae* is unknown. Although many modes including insect vectors have been suggested, prolonged intimate contact has been the official teaching. However, the few patients who have contracted leprosy after apparently casual contact have raised the possibility that individual susceptibility to the organism is important. The incidence of conjugal transmission suggests that less than 10% of the population are susceptible. SPICKETT provides evidence that individual susceptibility and the form of the disease are genetically determined by a single irregularly dominant gene. HSUEN and others find that the incidence of leprosy is high in Blood Group O and low in Blood Group B. A pressing need therefore is for a test which will identify susceptible individuals.

The Future.

The problems caused by leprosy are not unique but rather represent a convergence of the undesirable features of many diseases. There are diseases which are more disfiguring, more disabling, and more debilitating; which are less effectively treated than leprosy and which are associated with a social stigma. Solution of the problems depends on future developments in other fields and the solution will undoubtedly contribute to other fields in medicine. The study of leprosy needs increasing contributions from anatomy, physiology, pharmacology, pathology, radiology, surgery, medicine and psychology. Improvement in the treatment of leprosy awaits easier culturing of *M. leprae* and a clearer understanding of the pathogenesis of leprosy based on histological observations, such as those of WEDDELL, when integrated with known clinical and epidemiological facts.

As the disease is better understood and treated more effectively so there is hope that the stigma of leprosy will disappear. The stigma will be lost in history when public and patient understand that leprosy is a disease like any other but unlike many is eminently curable. Euphemism alone will not eradicate the stigma though measures such as avoidance of the term 'leper' and substituting Hansen's disease instead of 'leprosy' can contribute greatly to the peace of mind of existing patients. In this respect it is worth recalling the name suggested by Dr. Ross Innes for leprosy: Mycobacterial Neuropathic Dermatitis (M.N.D. for short). This has the advantage of being completely free from any emotional connotation while exactly defining the nature of the disease in line with present trends in medical nomenclature.

Correction of the attitude of society towards the leprosy patient does not depend only on education. More fundamentally it depends, with correction of the attitude towards all who cannot, or will not contribute and conform to an established pattern of society, upon 'a

belief in the individual worth and dignity of every human being' (CARSTAIRS). To be counted in a recent census was thus a source of great comfort for a leprosy patient in Nigeria. Christian Missions and organisations have pioneered leprosy work stressing the worth of the patient to his Creator and his fellowman and this must be believed by public and patient.

A special interest in leprosy is necessary until it ceases to be considered an affliction apart from other diseases and until patients are managed under the usual health and social services. This interest is more than charity aimed at relieving present sufferings: it is a vision of a thrilling venture aimed at preventing suffering in future generations of mankind.

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References

- ANONYMOUS. The Contraction of Leprosy—The Humanitarian and Christian Aspect. *Leprosy Rev.* (1951) **22**, 6.
- BONOMO, L.; DAMMACCO, F.; PINTO, L.; BARBIERI, G. Thyroglobulin Antibodies in Leprosy. *Lancet* (1963) **ii**, 807.
- BRADFORD HILL, A. The Clinical Trial. *Practitioner* (1963) **190**, 85.
- BRAND, P. Reconstruction of the Hand in Leprosy. *Leprosy Rev.* (1953) **24** (1), 104.
- Deformity can be Prevented. New Delhi Hind Kusht Nivaran Sangh (1958).
- BROWNE, S. G. (a) Present perspectives in Leprosy. *Scot. med. J.* (1962) **7**, 466.
- (b) Leprosy in Africa Today *Postgrad. med. J.* (1962) **38**, 86.
- CARSTAIRS, G. M. This Island Now (Summary of 1962 B.B.C. Reith Lectures). *Brit. med. J.* (1963) **i**, 141.
- CHAUSSINAND, R. La Lepre (2nd ed.) Expansion Scientifique Française (1955).
- COCHRANE, R. G. Biblical Leprosy—a Suggested Interpretation, London: The Tyndale Press (1961).
- CROMBIE, B. W. The Feet of Clay of the Double-Blind Trial. *Lancet* (1963) **ii**, 994.
- DHARMENDRA. Notes on Leprosy. The Ministry of Health, Government of India (1960).
- FARROW, J. Damien the Leper. London: Sheed and Ward (1955).
- FRAZER, J. E. The Golden Bough, (2). London: Macmillan (1957).
- FREUD, S. Totem and Taboo (1913–1914). London: Hogarth Press (1955).
- GOUDGE, ELIZABETH. Saint Francis of Assisi. London: Hodder and Stoughton (1959).
- HIRAKO, T., SAKURAI, H. Chemotherapy of Leprosy Chiefly with Sulphamethoxypyridazine. *Leprosy Rev.* (1963) **34** (4), 193.
- HSUEN, J.; THOMAS, E.; JESUDIAN, G. A.B.O. Blood Groups and Leprosy. *Leprosy Rev.* (1963) **34** (3), 143.
- INNES, J. ROSS. An Approach to the History of Leprosy. Ciba Symposium (1959) **7**, 117.
- JOPLING, W. H. (a) Leprosy and its Management in Britain. *London Clinic Medical Journal* (1963) **4** (2), 47. (b) The Treatment of Leprosy. *Postgrad. med. J.* (1960), **36**, 634.

- KAMIYA, M. Psychiatric Studies on Leprosy. *Folia Psychiat. Neurol. Jap.* (1959), **13**, 143-73.
- KELLERSBURGER, E. R. The Social Stigma of Leprosy. *Ann. N.Y. Acad. Sci.* (1951), **54** (1), 126.
- LARA, C. B.; TIONG, J. O. The problem of negative inmates in the Culion Sanatorium. *Internat. J. Leprosy* (1955), **23** (4), 361.
- LENDRUM, F. C. The Name 'Leprosy'. *Am. J. trop. Med. and Hyg.* (1952), **1** (6), 999.
- LEPROSY AND THE BIBLE. London: United Bible Societies (1961).
- LIE, H. P. On Leprosy and the Bible. *Leprosy Rev.* (1938). (a) **9** (1), 25. (b), **9** (2), 55.
- LORD, EDITH. Group Rorschach Responses of 35 Leprosarium patients. *J. Project. Techniques* (1954), **18** (2), 202-7.
- LOWE, J. Comments on the History of Leprosy. *Leprosy Rev.* (1947), **18**, 54.
- LOWINGER, P. Leprosy and Psychosis. *Amer. J. Psychiat.* (1959), **116**, 32.
- MACARTHUR, M. Mediaeval Leprosy in the British Isles. *Leprosy Rev.* (1953), **24** (1), 8.
- MARTIN, BETTY. No one must ever know. London: Macdonald (1959).
- MAXWELL, J. L. Leprosy, Shanghai (1937).
- PEDLEY, J. C. Healing of the Mind: An important aspect of Leprosy. *Conquest by Healing* (1961), **37**, 11, reprinted in *J. Christ. med. Ass. Ind.* (1962), **37** (1), 17.
- PEIFFER, E. Rorschach test on African Negroes with Leprosy (Fr.) *Med. trop. Marseille* (1955), **15** (1), 1.
- RICHARDS, P. Leprosy in Scandinavia. *Centaurus (Kbh)* (1960), **7**, 101.
- RYRIE, G. A. The Psychology of Leprosy. *Leprosy Rev.* (1951), **22** (1 and 2), 6.
- SCOTT, H. H. A History of Tropical Medicine (1). London: Edward Arnold (1939).
- SHEPARD, C. C. Leprosy Bacilli in Mouse Foot-Pads. Ciba Foundation Study Group No. 15 (1963).
- SPICKETT, S. G. Genetics and the Epidemiology of Leprosy. *Leprosy Rev.* (1962), **33** (2), 76.
- SURTY, TEHMI. Leprosy—Social Aspects and Rehabilitation. *Leprosy in India*. (1962), **34** (1), 82.
- TAS, J. On Leprosy and the Bible, *Actes de 7e Congres Int. d'Histoire des Sciences*, Jerusalem (1953).
- TECHNICAL COMMITTEE ON PATHOLOGY AND EXPERIMENTAL TRANSMISSION. Report. VIIIth International Congress of Leprology, Rio de Janeiro (1963).
- VERMA, L. P. Leprosy and Mental Disorders. *Ind. J. Psychiat.* (1954) **5**. Abstracts *Leprosy Rev.* (1963), **34** (3), 162.
- WATERS, M. F. R. Chemotherapeutic Trials in Leprosy. *Leprosy Rev.* (1963), **34** (4), 173.
- WATERS, M. F. R.; REES, R. J. W. Changes in the Morphology of *M. leprae* in patients under treatment. *Internat. J. Leprosy*. (1962), **30** (3).
- WEDDELL, G.; PALMER, ELIZABETH; REES, R. J. W. and JAMISON, D. G. Experimental Observations Related to the Histopathology of Leprosy. Ciba Foundation Study Group No. 15 (1963).
- WORLD HEALTH ORGANISATION. *Wld. Hlth. Org. techn. Rep. Ser.* (1960), **189**.

LEPROSY: THE TASKS FACING SCIENTIFIC RESEARCH

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During the past two decades our knowledge of leprosy has made considerable advances. There have been definite achievements in diagnosis, treatment and prevention. Leprosy may now be diagnosed in the very earliest stage of its development and, in certain cases, even before the appearance of visible symptoms. All this has been achieved as a result of a whole complex of clinical, functional and patho-histological research.

In cases of malignant (lepromatous) leprosy present-day forms of treatment are able comparatively quickly to stop the spread of the leprosy bacillary focus into the surrounding area by achieving so-called bacterial negativity. Early diagnosis and effective treatment have made it possible, on a comparatively large scale, to transfer leprosy patients to outpatient treatment. All this has undoubtedly helped to alter the age-old view of leprosy as a highly infectious incurable disease and to overcome vulgar panic-stricken fear of the leprosy sufferer.

As a result, certain legislation regarding leprosy has been changed in many countries, including the Soviet Union; in particular the regulations relating to the hospitalisation of patients have been reviewed and dispensary methods more and more widely adopted in leprosy treatment.

However, these achievements were based for the most part on empirical data. There still remains a great deal that is unclear and unsure in our knowledge of the disease.

The great problem is to discover ways of obtaining the cultures of the leprosy bacterial focus in human beings. In spite of the great body of research already carried out, no research worker has yet been able to discover a method of obtaining cultures from a leprosy patient. It is true that there have recently been indications of the possibility of cultivating mycobacteria in tissue cultures, but these require verification.

Our knowledge of the biochemistry of the leprosy bacteria in man is very meagre indeed.

In regard to the diffusion of *Mycobacterium leprae* in man in its viable form, it would seem a possibility in the future, using bio-

chemical methods, to obtain more precise data about its chemical composition, and its fermentative and other properties. Of particular interest, especially for diagnosis and prophylaxis, is the study of the antigenic properties of albuminous and other fractions obtained both from the leprosy bacilli and from infected tissues.

Undoubtedly, the greatest hope for progress lies in a study of the morphology of the leprosy bacilli by means of the electron microscope. From our point of view this research should be carried out during the course of treatment using tissue culture and growth in symbiosis.

Research into experimental leprosy is particularly important. Here, quite obviously, an investigation of the forms of leprosy in human beings is fundamental. It is difficult to say beforehand which particular channel of investigation will be found to be most profitable but it goes without saying that those who undertake research in this field should make a very careful study and analysis of the mistakes of their predecessors.

Another promising field of possible development is the comparative study of the immunological, pathological, morphological and biochemical properties of the leprosy bacillus in man and in mice, and of other mycobacterial diseases in animals in order to determine more precisely the connection between the respective forms. There is definite practical and theoretical significance in the study of the mutual connection—clinical, epidemiological and immunological—of leprosy and tuberculosis, and also of certain paratuberculous diseases. The leprosy-like diseases in mammals, birds, fish, reptiles, etc., have not been widely studied.

Of particular interest is the study of leprosy in mice (Stefanov's disease) which, because of its many parallel symptoms, can serve, at least in part, as an accepted model for leprosy in human beings. However, it must be remembered that the bacilli of this disease are nearer to the tuberculous and paratuberculous bacilli than to the leprosy bacilli in man (CHAUSSINAND, N. A. TORSUYEV).

One of the fundamental criteria in judging the resistance of the body to leprosy infection is the lepromin reaction. It has been proved that healthy persons with a positive lepromin reaction very rarely succumb to leprosy, and if the disease does develop it usually takes a benign course. On the other hand, people with a negative lepromin reaction have less resistance to leprosy; with them the disease is usually malignant. From this it follows that the strengthening of the lepromin reaction in healthy people and in leprosy patients is an indicator of the resistance of the body to leprosy infection.

In this connection there is definite theoretical and practical importance in attempts artificially to strengthen the lepromin reaction in healthy people who have been in contact with leprosy patients. In particular, the search for ways and means of strengthen-

ing the lepromin reaction is of some interest. At the same time convincing proof must be forthcoming that this is accompanied by an increase in the resistance of the body to leprosy infection.

Specific vaccines, which might boost the defensive resources of the organism and, in leprosy patients, prevent the spread of the disease, are yet to be found. The solution to this problem of increasing the resistance of the human body to leprosy infection must therefore be approached by indirect methods, using other unspecific substances.

Interest has increased in the study of the defensive effect of BCG vaccination in leprosy contacts and patients. An established effect of this vaccine in leprosy patients is to stimulate a change-over from a negative to a positive lepromin reaction. There is much evidence to show that the morbidity of leprosy among people vaccinated with BCG is less than among those not so vaccinated. However, the defensive role of the vaccine in the prophylaxis of leprosy is not definitely proven. A study should be made of the possible methods of using this vaccine (cutaneous, intracutaneous, peroral, etc.). A study of the BCG vaccine in the prophylaxis of leprosy should most usefully be undertaken, on a mass scale, in those areas where leprosy is most endemic. These measures should be carried out jointly with measures against tuberculosis, given the simultaneous prophylaxis of both leprosy and tuberculosis.

Studies must also be made of other antigens which are capable of increasing resistance to leprosy. Repeated doses of the Mitsuda lepromin itself, though it has only a weak antigenic power, may also strengthen lepromin reaction. However, in this case it has not been established whether any changes are caused in the body which encourage an increase in the resistance to leprosy. In this connection a study should be made of other antigens and stimulants (Stefanskiy's lepromin, Kedrov's antigen, Friend's stimulant, etc.).

The chemoprophylaxis of leprosy has not been widely studied. Several authors have reported that amongst children in contact with the disease, treated with subtherapeutic doses of DDS, the morbidity of leprosy is considerably less than amongst children who were not treated. During breast-feeding a child receives a medicinal preparation in sufficient quantity from the milk of his mother, who is taking sulphones. Some authors recommend that after weaning, or after birth if the mother is not receiving treatment, the child should be put on a course of sulphone treatment consisting of 5 mg. a week for each 1 kg. of weight. However, as regards the problem of whether it is profitable to use similar chemoprophylaxis in the case of leprosy, there is still a great deal that is controversial and unsubstantiated.

At the present time it has become rather difficult to get the antigen of lepromin because of the absence of initial material for its preparation namely the tissues of lepomatous leprosy patients containing

Mycobacterium leprae. Due to earlier diagnosis and adequate treatment active tissue material is less often obtainable. Moreover, the demand for lepromin grows from year to year. Therefore the search for new methods of obtaining it—and the use of other substances in its place—becomes of prime importance. In order to economise on lepromin it can be used in larger dilutions than is normally accepted.

The absence of a tissue-free leprosy antigen is a spur to research into the formation of a specific antigen free from tissue material.

The extraction of the most active fractions of lepromin, or of *Mycobacterium leprae*, would provide an answer to the problem concerning the nature of both the late and the early lepromin reaction.

The use of serological reactions in leprosy runs into difficulty because of the absence of a leprosy antigen. However, experience shows that these reactions may be studied with antigens prepared from other germs as of tuberculosis, syphilis, etc.

On examination of the blood serum of lepromatous leprosy patients with paraspecific antigens, considerably more antibodies may be found than is the case with healthy people. Moreover, the skin reaction to lepromin in these patients is almost always negative, indicating a state of anergia. This contradiction calls for a simultaneous study of serological reactions and skin reactivity in leprosy. Parallel research into the reactivity of mycobacterial antigens of differing origin, and a comparison of these reactions in clinical and experimental situations, might help in the study of many problems connected with the immunology of leprosy.

There is a pressing need for a study in depth of the epidemiology of leprosy in general and, in particular, of each focus (determining the boundaries of each focus, the rate of infection and the dynamics of development, the course and the dying away of the focus, dissemination, the formation of new foci, etc.). This would facilitate the planning of new and better methods of attack in the battle against leprosy.

As with other diseases, one of the factors governing the spread of leprosy is its infectivity. However, other very important factors should be taken into account. One of these is individual human susceptibility. For example, by no means everyone who has had close and prolonged contact with lepromatous leprosy patients acquires the disease. This explains the low incidence of leprosy amongst the husbands or wives of patients and the rare cases of infection amongst leprosaria staff.

Many attempts have been made to infect people artificially with leprosy. But they have all failed. For example over a period of 14 months GUY PRIETO and CONTRERAS transfused into a 26 year old subject the blood of leprosy patients in an exacerbated state. They also administered to their subject nasal mucus from lepromatous

patients containing a large quantity of *M. leprae* and grafted on to him pieces of biopsied tissue from a leprosy patient. During subsequent investigations over an 8-year period no traces of leprosy were to be found in the subject. Although we consider similar experiments on human beings to be inadmissible, we cannot fail, nevertheless, to take their results into account.

Obviously, we cannot countenance the obligatory isolation of all leprosy patients, since it is frequently a hindrance to measures being carried out to combat the disease. According to conclusions reached by the Pan-American Conference (1958) and the African Conference at Brazzaville (1959) the compulsory isolation of patients in leprosaria is a positive obstacle to control of the disease, since many sufferers, fearing isolation, hide themselves away.

On the question of separating healthy children from parents suffering from leprosy there is much controversy. Experience in some countries has indicated that to put such children in special preventive institutions has made their return to society difficult and has sometimes been the cause of psychological trauma with serious consequences.

Because of the absence of experimental models of leprosy in man, the study of the effectiveness of medical preparations is still carried out, without intermediary, on the patient himself. In these circumstances bursts of unjustified enthusiasm, followed by gradual disappointment, are inevitable. One example of this in recent years was the persistent recommendation by certain authoritative leprologists of isoniazides and thiosemicarbasones as effective treatments for leprosy; these have failed to prove themselves during more prolonged investigation.

The discovery of sulphone preparations in 1908 and the subsequent confirmation of their effectiveness (FAGET and colleagues) was a revolutionary development for leprology. For leprosy treatment at present there are basically two sulphone preparations which are used: DDS (diaminodiphenylsulphone) and Sulphetrone (a soluble sulphone). Comparatively recently there were reports of the effectiveness of CIBA 1906 (DPT) which is derived from thiourea. In the Soviet Union clinical tests have been carried out on Etoxid, which is also derived from thiourea. The results have shown that it is effective in the treatment of leprosy. Undoubtedly worthy of close attention are the many reports testifying to the positive effectiveness of Etisol (a derivative of ethylmercaptan). This preparation, which in itself has little influence on the course of the disease, increases to a quite significant extent the therapeutic effectivity of sulphones, particularly of DDS. Of the quite numerous new substances recommended for the treatment of leprosy, mention should be made of Vadrine (oxidiazalone) and Cycloserine. Soviet leprologists have no experience of the use of these last two preparations.

As for the future of leprosy treatment, there are two directions for development. One of these is to improve existing methods of leprosy treatment by determining the optimum doses, confirmed by experiment, for treatments; and by calculating precisely their distribution in the organism and the times at which the preparation is administered. Given the above, it may be possible in the future to use drug combinations and to study the feasibility of using several treatments simultaneously; also to work out the most effective rotations of the above and a combination of anti-leprosy and other unspecific effective methods which prevent the development of toxic manifestations and of other side effects. At the same time the search must go on for new highly-effective anti-leprosy preparations with minimal toxic properties. The appropriate methodology must be used for the evaluation of new preparations for leprosy treatment. Observations should be carried out only on lepromatous-type patients, and as far as possible on those who have not previously been treated. A group of patients being treated with DDS in the usual dosages must be included in these observations.

Also of very great importance is the elimination of cosmetic defects and orthopaedic lesions due to leprosy or secondary to it. At the Scientific Research Institute for the Study of Leprosy, nasal deformity is already being corrected with the aid of a specially prepared prosthesis made from plastic and also free skin plastic surgery of the nose and of the eyebrow with favourable cosmetic and functional results. In the press recently there were reports of muscular atrophy in leprosy being treated successfully by local injections of Vitamin E.

There is still a good deal of obscurity in the theory and practice of leprology. For the thoughtful research worker there is still much to do. The majority of the unanswered questions in leprology are closely bound up with the present-day problems of modern medicine and biology.

"It should never be forgotten", says the famous leprologist R. G. COCHRANE, "that leprosy is not a shameful social disease, but a deeply interesting problem which deserves the attention of the best scientific minds and opens up a wide field for research".

Summary (*added by the Editor*)

The author writes from out of his experience and that of his colleagues at the Institute for the Study of Leprosy at Astrakhan and makes valuable suggestions for research and the modern control of leprosy. He emphasises that the chief priority is to stop the spread of the leprosy bacillus, both in the body and in the geographical area, and that modern drug treatment has achieved a great deal in this regard. It is, however, urgent to continue research for quicker and more effective drugs and he mentions some of them which have

been tested, particularly Etoxid which so far has achieved excellent therapeutic results in Russia. See *Leprosy Review*, **34**, 4. Oct. 1963, pp. 212–218.

The greatest problem is how to culture the leprosy bacillus and though tissue culture has been achieved it has not obtained practical application. Another urgent need is the discovery of an effective vaccine, whether based on human leprosy or on related diseases in man or animals. In the meantime, he thinks that BCG is not to be despised and mentions evidence that the morbidity of leprosy among people vaccinated with BCG is less than among those not vaccinated. He mentions that repeated doses of the Mitsuda lepromin itself may also strengthen the positive reaction to leprosy, and calls for a study of other antigens. He calls for a simultaneous study of serological reactions and skin reactivity in leprosy. He points out that there is a pressing need for study in depth of the epidemiology of leprosy in general and of each focus in particular.

On using modified dosage of anti-leprosy drugs to prevent the disease in children, he thinks the evidence is equivocal.

For deformities in leprosy, plastic and reconstructive surgery have found a very important and satisfactory place.

The author's paper well repays study in the complete form.

J. R. INNES, *Editor*.

References

- TORSUYEV, N. A. *BME. M.*, vol. 26, 1962, p. 867.
CHAUSSINAND, R., *Bull. Acad. Nat. Med. (Paris)*, 1948, vol. 182, p. 486.
COCHRANE, R. G. *Leprosy in Theory and Practice*. Bristol, 1959.
FAGET, G. H. *et al.*, *Publ. Hlth. Rep. (Wash.)*, 1943, vol. 58, p. 1729.
PRIETO, J. G., CONTRERAS, F. B. *Memoria del 6 Congreso Internat. de Leprologia*, Madrid, 1953, p. 475.

LEPROSY IN SOCIETY

I. "LEPROSY HAS APPEARED ON THE FACE"

by OLAF K. SKINSNES, M.D., PH.D.*

Objectives and Sources

Prevalent Western social misconceptions concerning leprosy have been well publicised. In recent years it has been widely stated that such misconceptions existent through the world, and in the West in particular, are attributable to the Bible; *vide*, "One major and world wide problem in public health results from an erroneous translation of the Old Testament" (LENDRUM, 1945). It is contended that the term "leprosy" is a mistranslation of the Hebrew term "tsara'ath" (zaraath) (COCHRANE, 1956; GRAMBERG, 1959; LENDRUM, 1952; LOWE, 1942; MACARTHUR, 1953; NIDA, 1960; SWELLENGREBEL, 1960; TAS, 1955; WALLINGTON, 1961) and that "tsara'ath" was, in fact, some other, presently unknown and perhaps extinct disease (MOISER, 1961).

While there is no denying the influence of Western interpretation of the Bible on Western society's reaction to leprosy, it seems that there has been no adequate attempt to study and understand the underlying basis for society's response apart from this vigorous pursuit of attribution of responsibility to Biblical influence.

Many of the contentions advanced to uphold this position appear unrealistic and superficial in view of the prevalence of similar social reactions to leprosy which are widespread among people only recently, or not at all, under Biblical influence. It seems, therefore, that an inquiry into the folklore of leprosy in such a society might yield a clearer and less parochial understanding of the problem and that this, in turn, might serve as a commentary on the above-mentioned assumptions. In the search for understanding, well-meaning half-views and resulting obfuscations are no more helpful than tenacious adherence to misapplications of ancient concepts and misconception no matter what their origin.

On this basis, the following presentation has three major objectives. The first is to present a better understanding of the social milieu with which patients having leprosy must contend; secondly, to bring into the open misconceptions that will otherwise be less likely to

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be confronted by rebutting facts; and thirdly, to provide a background for the better understanding of the relationship between the social and medical pathology of leprosy.

The material presented has been derived from multiple sources, mainly as follows:

1. Translations from Chinese records, ancient and modern.
2. Conversations with a considerable number of Chinese during a decade of leprosy oriented work in Hong Kong, with supplemental trips in South China and Formosa. Individuals contacted came from all walks of life, including patients at the Hay Ling Chau Leprosarium.
3. An organised inquiry in several agricultural villages, fishing communities, temples, and locally practicing herbalists in Hong Kong. This was accomplished through the assistance of two young, intelligent Chinese men. Though not medically trained, they were well educated, had been given a considerable knowledge of leprosy, and were thoroughly briefed in techniques of questioning through informal conversation. Findings were reported in detail almost daily, from well-kept notes.
4. Term papers written by medical students at the University of Hong Kong who used as their sources of information grandparents, other relatives, and acquaintances.
5. A review of all reports concerning leprosy which appeared in the *China Medical Missionary Journal*, the *National Medical Journal of China*, and the *Chinese Medical Journal* from 1887 through 1950.

Geographically and ethnologically, Hong Kong is a part of South China, lying contiguous to the province of Kwangtung which apparently has as great an incidence of leprosy as any area in China. A large portion of the people living in Hong Kong give as their home some village in China in which their families have resided for generations and with which they retain close contact. During the decade of inquiry here concerned, numerous immigrants from many other areas of China also took up residence in Hong Kong.

Against this background, it is suggested that the information to be presented on the social reaction to leprosy is reasonably representative of concepts held in South China and that they also have validity for other areas of China. This conclusion is further substantiated by references to this subject found in the Chinese medical journals noted above.

The Reaction of Society to Leprosy

The Reaction in Concepts of Source and Transmission

The legend current concerning the origin of leprosy refers to the period of the Tang Dynasty (A.D. 618–906), though there is in ancient Chinese literature evidence that the disease was known and recog-

nised at the time of the Han Dynasty (206 B.C.–A.D. 220), if not considerably earlier. According to this folk story, during the middle of the Tang Dynasty the reigning emperor was engaged in a war with a powerful war-lord named An Liu-Shan who laid siege to the capital and forced the emperor to flee in the company of his favourite courtesan, Yang Kwei Fei. She was a lady of legendary beauty and was responsible for the emperor's misfortune, having caused him to neglect affairs of state to the extent that discontent was rife among his people and his lords. While the emperor and his retinue, accompanied by the remnants of his army, were in flight, his immediate guards suddenly refused to proceed farther unless he first permitted execution of Yang Kwei Fei. To spare his own life, the emperor issued the order and her body was left lying by the roadside as a witness to the accompanying army that she had finally been deposed. As the convoy passed, some soldiers, charmed by the beauty of the body, had improper relations with it. The legend states that all the soldiers who committed this misdemeanour subsequently developed leprosy as a punishment from Heaven and that thus the disease originated. One of the many names current for this disease is *Tien Ying*, meaning "Reward from Heaven". This story was repeated as often as any other concept during the interviews conducted during the survey.

This account sets the tone for much of the folklore and many of the concepts concerning leprosy. There are two predominant opinions regarding the transmission of leprosy. The first holds that the disease is venereal, contracted almost exclusively through contact with prostitutes. There is a common saying which declares, "If one likes gambling one will always be poor, if one likes to play with harlots one will get leprosy." The belief is so firmly held that it is usually one of the first opinions ventured when questions are asked about leprosy. Anyone contracting leprosy is almost automatically assumed to have lived improperly. Patients, early in the course of giving their histories, protest vehemently that they do not know how they could have contracted leprosy since they have not been guilty of running in the company of prostitutes.

An equally widespread corollary concept holds that leprosy can be "sold" by the sufferer to individuals of the opposite sex through cohabitation with a healthy partner. If a man thus gives of his disease to a woman, it is reasoned, he will have less of the illness himself. It is said that women are forced into prostitution in order to have the opportunity of "selling" their leprosy, thus lessening its severity and possibly even obtaining a final cure. Some informants give the number of necessary acts for effecting a cure as eight, but most consider it indefinite.

Stories in this respect are numerous, one common one being as follows. Once a woman, after contracting leprosy, succeeded in

seducing a young and only son in a quiet lane. They were observed from a distance by his sister. Seeking to save the boy's life and the family name she quickly enquired of him if he had passed urine since his act. When he answered in the negative, she admonished him not to, the idea being that if he had not yet urinated the germs would not yet have passed up into his body. She then immediately had intercourse with him. According to some accounts she thus received the leprosy agent into her own body, but according to other versions she caught the emerging germs in some fresh, warm ox turd which twenty-four hours later showed a growth of worms thought to represent the leprosy inducing agent. The sister, to conclude the account, subsequently committed suicide out of shame for her incestuous act, but her brother did not contract leprosy.

The second, firmly held concept regarding the transmission of leprosy is that the disease is congenital. Children of infected parents are believed certain to acquire the disease. Though there are some variations, such hereditary transmission is generally conceived to extend through three generations. By the fourth generation the disease will have died out, or at least have become so mild as no longer to make itself apparent. A common derivative custom has entailed enquiring back three generations into the family history of parties about to be married and of slave girls before purchase. A proverb states, "If the slave-girl is very cheap she probably has the leprosy".

In addition to these two main concepts of the transmission of leprosy, there are numerous subsidiary ideas regarding its contagiousness, with respect to which one does well to govern one's actions in any contact with persons having the malady. The urine and faeces of patients with leprosy are considered to be among the most dangerous of poisons and it is believed that contacts with such excreta, or objects contaminated therewith, will give rise to the illness. The excrement is regarded as being most dangerous when still warm. In South China public toilets have often been constructed overhanging ponds so that the excrement drops into the water. If a person having leprosy uses such a toilet, the fish in the pond may become contaminated through eating the refuse and it is thought that those who subsequently eat such fish will get leprosy.

The notion of bodily heat transference of noxious influences carries into several other beliefs. Thus it is alleged that if a person with leprosy urinates on hard, dry, sun-baked ground, the urine heat will tend to rise. If then a healthy person urinates on the same spot, the heat will pass directly up his urinary stream and he will get leprosy. Likewise, it is declared that if one sits on a chair which still retains bodily warmth from recent occupancy by a person with leprosy, then such a sitter may expect to get leprosy. If the chair, on the other hand, has had opportunity to cool off, the danger will have passed.

There is a story current concerning a group of more public-minded individuals with leprosy living in a certain Kwangtung village who had special chairs hung up under the rafters to be brought down only for the use of healthy visitors. Another account tells of an actor who contracted leprosy before World War II. Following a common belief, he ate the flesh of a dead infant, believing that this treatment would drive leprosy from his face into his buttocks. He then reserved a special chair for himself which no one else was permitted to use.

There is a saying that it is not dangerous to sleep in the same bed with one having leprosy. This is, however, conditioned on taking proper precautions. Thus, if the healthy sleeper retires first and the one with leprosy second, the bodily heat of the latter will remain with himself and there is no danger. If, on the other hand, the individual with leprosy retires first and warms the bed, the healthy bedfellow may expect to get leprosy. In sleeping with such a bedfellow one must also take care not to lie foot to foot so that the soles of the feet touch.

It is not considered dangerous to talk to or eat with a person having leprosy, though other informants said that it is possible to spread the disease by inhaling droplets of spittle thrown into the air and though sputum is considered by some to be a possible contaminant source of leprosy. In eating with such individuals, however, one should avoid eating the gravy or the soup, presumably because the prevailing use of chopsticks and common centre dishes may give opportunity for transferring the leprosy agent to the fluid in which all the vegetables bathe.

"Feng-shui", the somewhat mystical and indefinite combination of lucky and unlucky influences in a district which determine its fortunes, is not generally considered to be a factor in the occurrence of leprosy. Those who do attribute a definite influence to it cite, for example, the report that the villagers some time ago dug a pond in front of the village of Lo Woo. Thereupon three persons in the village were found to have leprosy and were chased away. Subsequently, three more instances were found and "Feng-shui" influences, presumably disturbed by the digging of the pond, were blamed for this outbreak of the disease.

Related to this supposition, though not actually of it, is the account of an individual with leprosy who after his death was buried by the villagers on a hill-slope not facing their own village. The slope did, unfortunately, overlook another village from a distance of three miles and the inhabitants of this second village protested the burial vehemently on the ground that leprosy would be transmitted to them from the facing grave. As a result the body was exhumed and re-buried farther away near the sea-shore where its influence presumably would be dissipated over the waters.

During the Ching Ming Festival, in the fourth lunar month, it is

customary to visit the graves of ancestors, clear them of overgrowth and make propitious offerings. Accordingly, in the terms of another account concerning the malign influence of leprosy even after death, a ten year old son presented himself at the grave of his formerly leprotic father to pay his respects at Ch'ing Ming. Returning home he remembered that he had left one of the ritual cups at the grave and went back for it. On the second trip he cut his foot on some grass at the grave and not long afterwards developed leprosy. The villagers concluded that the buried bones had contaminated the growing grass, which had its roots in the same soil, and so the disease was transmitted to the son.

Various tests are employed to detect the presence of leprosy and these have been applied to potential slave girls before purchase, to persons suspected of having leprosy and in some districts, at least, they are customarily applied to amahs (woman servants) and wet-nurses before employment. One of the commonest consists of viewing the face of the suspect through a charcoal flame, on which there may or may not have been thrown mercury. If leprosy is present, the face is said to appear red and nodular, while, if healthy, it will appear greenish. Variations consist, for example, of viewing the face through the light of a kerosene pressure lamp, an electric bulb, or through a mosquito net in the light of a candle. Another commonly quoted test consists of burning a hair from the suspect. If the hair curls up, the person is regarded as healthy while if its ashes drop to the ground, he is regarded as having leprosy.

The Reaction in Concepts of Curability and Treatment

Public opinion regarding the possibilities of curing leprosy are unfavourable to the patient, the predominant attitude being that no cure is possible. When queried on this matter one merchant exclaimed, "If leprosy can be cured, then salted fish can live again!" A common proverb declares, "If a gambler can reform, then there too is medicine for leprosy."

In visiting temples to determine the priests' interpretations of whether or not the gods could provide a cure, the spurious case of a friend, who had disfigurement of his face from leprosy and who had tried Western trained physicians as well as local herbalists, was posed and the advice of the priests asked. In each case the answer was that even the gods could not cure this disease. Oracle sticks were shaken and the answers were uniformly unfavourable, except in one instance. Here the answer, though somewhat ambiguous, appeared favourable and the interpreting priest was momentarily puzzled. He, however, soon saw his way out and his reasoning was: (a) Leprosy can not be cured, (b) in this instance the god gives a favourable answer, (c) ergo, the diagnosis of leprosy given by the Western physicians and the local herbalists must be at fault and the friend probably does not have leprosy.

A number of local herbalists were visited and the same spurious case posed. Many of the practitioners were cautious, indicating that they could cure the disease but always reserving at least one type of leprosy as being incurable. The type declared as incurable by some of the practitioners was "chicken-foot" leprosy which was characterised as showing clawed hands and fluid escaping from the feet. (Cure here was obviously equated with loss of paralysis and return to normal function.) Most of these healers declared that there were 36 kinds of leprosy in all—a classification which in complexity is reminiscent of some modern clinical attempts along this line. Some pointed out that 5 of the 36 varieties each affected one of the "five vital organs" (heart, liver, lungs, kidneys, spleen) and therefore were incurable. One herbalist maintained that he could cure 30% of all cases of leprosy but his medicine was so strong that those who took it and were not cured would die from it. In general, the impression was that these healers were almost all willing to try to cure the disease but that actually they had no real confidence that this could be accomplished. The prospect of a fee seemed to be a motivating influence in the willingness to attempt treatment.

This pessimism regarding the possibility of curing leprosy is interesting in view of the fact that *hydnocarpus* has been used in indigenous medical practice for the treatment of leprosy for centuries. There are accounts of this drug in writings as remote as the Sung Dynasty (A.D. 960–1279), though it appears that, particularly in earlier times, it was used as a balm for the treatment of all kinds of sores. By the Ming Dynasty (A.D. 1368–1644), however, it was clearly in use for leprosy and Li Shih Chen says, "It is called *Ta Fung Tzu* (leprosy seed) because it is used for treating *Ta Fung* (leprosy)."

Current indigenous methods of therapy and hopes for favourable results are concerned more with concealing the disease or making it less apparent than with actual cure. To have "leprosy appear on the face" is a major calamity, because it then becomes impossible to hide it. If the disease can be driven to the feet, to the buttocks, or to the bones, for example, it will be less apparent and easier to hide and the sufferer can more readily retain his position in society. According to some herbalists even the incurable form of leprosy can be treated with a certain medicine (of undivulged nature) so that it will no longer show. Mercury often has this attribute given to it. One herbalist who was consulted declared that he could give a medicine which would have such an effect. He refused to divulge its nature and declared himself too ethical to use his knowledge because patients so treated would be able to continue life in the community and be a source of danger to others.

A "special" laxative is said by some to be able to produce a diarrhoea with which the leprosy germs pass out of the body in the faeces. It is said also that some similar drugs can be used by female

sufferers to drive the germs to the womb and thus create a more favourable opportunity for "selling" the disease.

One distasteful method said to be occasionally practiced in the attempt to hide the disease is the eating of the flesh of dead infants. Some believe that a cure can be effected in this manner but others merely declare that leprosy can be made to recede to the part of the body corresponding to the part from which the infant's flesh is taken.

The Reaction in Concepts of Diagnosis and Detection

The community's wish to make the disease apparent stands in opposition to the desire of the sufferer to keep the disease hidden. A common belief is that the presence of banyan trees makes a district liable to have leprosy. A corollary notion holds that the banyan tree, particularly its roots, has a baneful effect on persons having the disease. If the suspect drinks water in which banyan roots or streamers have been boiled or soaked, his ears will become larger and nodules will appear on his face if the disease is present (an apparent reference to lepra reactions). In addition he will feel ill. This is used as a test in the case of leprosy suspects, but it is also used to drive away known cases. Wishing to get rid of such a person, the villagers will place the root of a banyan tree in the village well and, on drinking the water, the undesirable one is expected to feel so ill that he will leave the community.

Fisher folk have an adaptation of this idea in their practice of burning shells of king crabs. It is maintained that even if such a shell is burned in a room separate from that occupied by a person with leprosy, the latter will, on smelling the burning odour, feel ill immediately.

Mixed in with all the inaccuracies in concept there is a core of true knowledge about the disease, particularly as regarding the manifestations whereby it may be recognised. The thickened ears and nodular facies are well-known though the loss of eye-brows and eye-lashes are not much referred to by the general populace. The latter is, however, well recognised in traditional medical writing and is known to the indigenous practitioners. Thus the *Nei Ching*, or Canon of Internal Medicine (attributed by some to the tenth century before Christ but certainly written much later than that) states, "Thus suffering from 'ta feng' (leprosy) have stiff joints, the eyebrows and beard fall off." The deformities and sores encountered in leprosy are likewise well-known to the public and it is recognised that the ulcers, particularly of the feet, are slow in healing. The atrophy or "no flesh" of the muscles of the hand, particularly in the region of the fifth abductor and the first dorsal interosseous muscles, are frequently mentioned, especially by the practitioners. The herbalists also refer to anaesthesia of the lesions, but the general public apparently takes little heed of the anaesthesia and more commonly refer to the lesions of leprosy as being itchy. Though not

much mentioned by the general public in the interviews recognition of anaesthesia of the leprosy lesions has been known from ancient times. Thus in Ko Hung's, "Prescriptions for Emergencies" (A.D. 281-361) there is a statement to the effect that, "The first symptom of 'lai ping' (leprosy) is numbness of the skin or a sensation of worms creeping."

In the year A.D. 610 there was published a famous medical treatise known as *Ch'ao Shih Pin Yuan* (Ch'ao's Pathology) which noted in detail many of the diagnostic signs of leprosy such as loss of sensation, absence of sweating, loss of hair and eyebrows, perforating ulcers, distorted ears and fingers, disfigured face, bleared eyes, hoarse and raucous voice, nasal deformity, etc. The descriptions are so comprehensive that they include a variety of other skin diseases, which cause confusion to later writers. The confusion continues down to the present day, affecting not only the public but also the traditional practitioners. Thus leprosy may be confused with secondary lues, scabies and various dermatomycoses. It is also commonly believed that various other diseases may be transformed into leprosy. One patient described how his first lesion appeared near one eye. A friend told him that it was ringworm and that he had better have it treated because if it spread and reached the eye it would turn into leprosy. Not infrequently one hears the report that syphilis can turn into leprosy and one informant cautioned against feeding an infant who has smallpox the flesh of cocks or geese, saying that if this was done the child would be liable to develop leprosy.

In summary, it appears that from periods as remote as the Han Dynasty or earlier, leprosy has been dreaded as a calamity sent to punish moral evil. This attitude probably arises in large part from the lingering and deforming nature of the disease which has its major manifestations on the surface of the body where they are clearly evident to all observers. From this concept it is easy to understand the growing supposition that sexual misdemeanour as a moral lapse may be associated with contracting this disease. It is likely that confusion over the identities of secondary lues and the manifestations of leprosy in the past three centuries has greatly enhanced such judgement. This idea is the major social reaction in concept to leprosy and has greatly influenced society's reaction to persons contracting the infection. It has given rise to many of the subsidiary notions and practices.

The Reaction in Action

Almost invariably when the subject of leprosy is raised, horror, fear and disgust with this illness will be expressed. Usually when queried as to how they would treat a person found to have leprosy, the answer of the villagers was, "Drive them away".

When the Hong Kong leprosarium was first projected, the Hong Kong area was thoroughly surveyed for possible sites. As likely

locations were found inquiries were made as to the possibility of obtaining land and the purpose for which it was desired could, of course, not be hid. The immediate reaction of neighbouring villagers was that of facing a major calamity that must be averted at all costs. Numerous were the arguments heard and no amount of talking could persuade them that their fears were groundless. They were convinced that if a leprosarium were built in their neighbourhood they would soon have no grandchildren because no one would then venture to marry their daughters. They were certain that some leprous influence would move over the hills and leprosy would become common in their villages. And so the arguments went, *ad infinitum*, till when pressed too far, the ultimate argument, as tersely expressed by one village elder, was, "If you bring 'lepers' into this area we will kill them!"

Remarkably enough, in the area where the first temporary quarters were located, there was no difficulty with the neighbours. They were not influential or organized and the patients were moved *en masse* to the prepared quarters one morning. The Chinese neighbours calmly accepted the presence of the patients as a matter of fate, already accomplished and beyond their control. Nearby European residents wrote letters to the press concerning the dangers of having leprosy so near, but the Chinese vegetable gardeners and others, promptly proceeded to make a small profit by selling vegetables to the patients and buying in return rabbits and ducklings.

Likewise, when land was finally secured for the institution and compensation was paid to the few villagers on the island, the majority left but a few requested employment as gardeners or other helpers. The contractors who subsequently erected the major buildings claimed that they would have difficulty in recruiting workmen, but as a matter of fact the institution never suffered on this account. When the first female patients went to the island, there were rumours that the workmen would surely leave, but again sufficient workers were available for the work to proceed as scheduled.

In Kwangtung it is not an uncommon practice for villages to employ persons with leprosy as guards for their fields. The fact that they have this disease is considered as increasing their effectiveness in scaring away marauders.

One gains the impression that though there is a deep-rooted feeling of revulsion toward leprosy and those suffering from it, the Chinese sense of fate and of tolerance enables his society to accept the occurrence of the disease without a preliminary violent reaction. The community approaches the problem of the individual with leprosy with caution. Increasing suspicion is directed at the suspect and gradually his reputation and social position may be completely ruined. This is easily accomplished because society is steeped in accounts and stories having to do with the evilness of persons with

leprosy and children are early inculcated with the notion that all such individuals are monsters or creatures of evil. Thus there appeared at the laboratory one day a young man and his wife of three years, accompanied by interested male relatives and friends. The problem was, did the girl have leprosy? She had no evidence of this disease but the villagers had been whispering that she had leprosy, and, as a result, her husband had been suspicious of her and had refused to live with her as husband. It requires no great stretch of imagination to understand the mental and emotional disturbance that this girl must have gone through.

Occasionally an outburst does occur and when it does, it is often violent and extreme even though the immediate provocation may be slight. The provocations may be economic or may result from particularly obnoxious action of some person with leprosy, or personal animosity may result in some individual using the fact of leprosy to remove another individual with whom there is a difference.

One week-end in June, 1951, rumours of unknown source rapidly spread through several fishing communities in Hong Kong. These were to the effect that there were "lepers" swimming about in the water of these areas seeking to kill people in order to obtain human hearts for the preparation of medicine with which to treat their disease. These communities were kept in an uproar for much of one night, everyone combining in a hunt to trap the supposed invaders. None were found, and it is thought that the rumours were started by interested individuals for undisclosed personal reasons. Some even thought that the attempts at that time to find a site for the leprosarium might have had an influence on the origin of this episode.

Occasionally the community takes violent action to rid itself of such "undesirable" individuals. Thus stories are heard of villagers (not in Hong Kong) taking persons with leprosy out and shooting them. On other occasions such sufferers have been locked in houses and burned. In some places it is told, any person having leprosy and found roaming the streets is caught in a net (so as to avoid touching him with bare hands) and then tied to a stake and burned.

These are dramatic episodes, but fortunately they have been relatively uncommon and unnecessary. Society is competitive. When economic conditions in general are poor and the necessities of life are available in only limited quantities, the protection and assistance of the family and group assumes an increasing importance to the well-being and survival of the individual. This is well-demonstrated in China where family connection and the influence of friends has traditionally entered into many of life's reactions. When the individual was saddled with the handicap of leprosy and the onus that it carries, and when, in addition, as a result of these concepts, his family and friends abandoned him, the ultimate in misfortune had indeed touched him. In the full sense of the saying: "Leprosy

has appeared on the face" of both the individual and the social group which so treats him.

The Reactions of the Person Contracting Leprosy

The Human Reaction

Sharing his community's concepts of leprosy, having heard since childhood the stories current about this disease, lacking any real conviction of the possibility of a cure, knowing the ostracism and family disgrace that awaits the public recognition of his disease, and finding no comfort in his religion (for the priests declare his illness a punishment from Heaven and incurable by the gods), the predominant reaction of the person contracting leprosy is one of disgrace and fear. He vehemently protests his innocence of moral delinquency and seeks by all possible means to hide the evidence of his malady. The sufferer will probably spend most of his substance on drugs and medical fees in the forlorn hope of obtaining a cure or at least of driving the disease to some unexposed portion of his body where it can be concealed. He is preyed on by quacks advertising secret formulas capable of producing the longed for cure. Great was the glee of some of the Hong Kong patients when one day there was admitted to the leprosarium an herbalist whom they recognized as one to whom they had in the past paid good money for a promised cure that never materialised.

Suicide is contemplated by many and accepted as the final solution by not a few. Thus one villager related that ten years previously there lived in a village known to him a married woman having four sons. When she found that she had contracted leprosy she wished to die and requested that her family bury her alive. They dug a hole in the ground, she jumped in, and so she was interred as she requested. In Formosa, of a group of about two hundred young men with early leprosy, fifteen committed suicide within a period of a few months.

In most individuals who contract the disease, the urge to lie is strong. Besides attempting to hide the disease, many try to "sell" leprosy as described above. Just how widespread this practice is cannot be known, but the general public believes that it is widespread, and it is this belief which is largely responsible for the ill repute of those with leprosy. Thus one villager stated that, "Lepers always think of lessening their disease, so they are selfish and they always try to sell the disease to others."

When finally "Leprosy appears on the face," and the individual is driven from society, he reacts by attempting to hide himself in larger cities where he may make his living by begging or by petty criminal efforts. Occasionally in rural areas incidents have been noted where such persons have banded together and lived in deserted temples or in less inhabited areas in the hills near villages. From such

vantage points they would keep an eye on village events. If, for example, they heard of an impending wedding, the leader of the group might suggest to the chief parties to the event, e.g. the groom's father, that a cash contribution be made to their organization. If the contribution was refused, the group leader selected the most disfigured case of leprosy in his group and sent him to the house of the principals to "squeeze" them and frighten them into reversing their decision.

In some instances tales are heard of persons with leprosy who actually react so violently against societies' treatment that they set out to deliberately wreak vengeance by giving leprosy to others with no hope of thus mitigating their own disease. Thus villagers told of one man who mixed some of his urine with the tea for others to drink. Another man is said to have scraped the skin scales from his lesions and mixed them with the food in a restaurant. He was caught and killed.

With a background such as this, it is not surprising that some of the patients who show up for institutional care are far from being tractable, cooperative individuals. The surprising thing is that the majority react with reason and cooperation when they are met with an understanding of their problems and their cultural background, and with a genuine expression of concern.

Discussion

No survey of old general Chinese literature is available devoted to a study of the possible mention of leprosy and its connotations in everyday life. Surveys of remote Chinese medical writings have, however, been made (K. C. Wong 1930; S. H. Lae 1954). Though there is some ambiguity the further back one goes with respect to what disease entity was meant by terms now used for leprosy, it is fairly clear that leprosy was known at least back to the Han Dynasty (206 B.C.–A.D. 219) and that descriptions of that period include characteristics recognized as typical for leprosy as it is known today. This literature is not concerned with the social reaction to disease, but occasionally one finds coupled with the mention of leprosy indications that the disease was looked on with horror and fear and that even in ancient times it was thought of as a punishment for moral lapse. Epidemics of other diseases were likewise considered as evidence of heavenly displeasure, but the suggestion is that leprosy was peculiarly so in an individual way rather than as a punishment of society as a whole.

There is no doubt but that the ancients of the East, as well as of the West, confused and grouped together disease entities which modern medicine differentiates. It is thought that psoriasis, eczema, impetigo, scabies, etc. were perhaps so confused with leprosy. Syphilis may likewise, at least since Ming Dynasty times, have been

grouped with leprosy. There is considerable question as to whether or not syphilis existed in China prior to this period, though gonorrhoea and chancres (soft?) were earlier described.

It might be expected that even at present times a relatively medically illiterate populace, such as that which was for the most part the subject of this survey, might likewise show much confusion over these disease entities. Yet, this populace readily separates out the fully developed case of leprosy and shows a high degree of astute suspicion with respect to earlier cases. Though not unheard of, relatively few cases with disease other than leprosy presented themselves at the leprosy outpatient clinic as new cases. One is led to believe that in an endemic area of leprosy the populace is quite knowledgeable in recognising and delineating this disease entity without at the same time necessarily understanding it. One wonders, without available evidence, if the ancients were less knowledgeable.

The origins of the folk tales and conceptions of leprosy are obscured by time and diffusion. Nevertheless, there is no question but what the populace knows the object of these tales. There also is no question but that the Bible had no part in the development of this folklore in South China for it has not been there long enough nor had a significant effect on the general populace so as to influence their thinking and beliefs. In fact, most of them have never heard of it.

The conclusion seems inevitable that leprosy *per se* called forth this social reaction; that where subsidiary disease entities enter the picture they merely provide additions to the theme of belief and reaction for which leprosy provides the core.

The question arises as to whether this may not also have been the case in the Middle East and gives impetus to further search for the reasons responsible for the unique response of society to the presence of leprosy. A possible answer will be suggested in a subsequent paper.

Summary

An inquiry has been made into the beliefs and practices of sample segments of society in South China, including farmers, fishermen, temple priests, practicing herbalists, patients with leprosy and assorted persons from other occupational groups. These have been supplemented by reports in the Chinese medical journals.

From this inquiry the following major concepts held by the general populace regarding leprosy become apparent:

1. Leprosy has been regarded as a punishment from heaven for moral misdemeanor. It is therefore often spoken of as "T'ien Ying" meaning "Retribution from Heaven."
2. Persons who contract leprosy were thought to be transgressors of moral law and likely to be morally suspect.
3. Leprosy has been regarded as a venereal disease.

4. Bodily discharges, body heat, skin scrapings, etc. from persons with leprosy have been regarded as noxious elements, and since persons having the disease are believed to be evil, they have often been suspected of using these elements to harm society•
5. Inquiry at temples confirms the belief of the common people that the gods can cure all diseases except leprosy, and there is therefore no hope for those with this infection.
6. Leprosy is thought to be hereditary for three generations and the children of parents with leprosy are considered certain to acquire the disease.
7. Frequently mentioned is the belief that persons with leprosy may "sell" the disease to others and cure themselves through sexual contacts with varying numbers of healthy persons.

These concepts, with wide ramifications and elaborations, are embedded in the folklore of the common people. Current methods of treatment and hope for favourable results are therefore more concerned with concealing the disease or making it less evident than with achieving a cure.

This folklore is indigenous and unaffected by Biblical statements or other Western writings concerning leprosy. The parallel reaction noted in this society with that prevalent in the West casts doubt on the contention that the reaction to leprosy in Western society is the result of Biblical teachings regarding leprosy, or mistranslations of the Bible into tongues other than the original.

References

- COCHRANE, R. G., "Biblical Leprosy—A Suggested Interpretation." (1956) *The Life of Faith*, 80, No. 3474, January 19.
- GRAMBERG, K. P. C. A., "Leprosy and the Bible." (1959), *Trop. and Geograph. Med.* 11: 127-139.
- LAI, SAN-HO, "The Disease Leprosy." (ca-1954). Formosa: privately mimeographed in Chinese.
- LENDRUM, F. C., "That Tragic Name of 'Leprosy'." *Modern Hospital*, January, 1945.
- LENDRUM, F. C., "The Name 'Leprosy'." (1952), *Am. J. Trop. Med. and Hyg.*, Vol. 1, No. 6.
- LOWE, J., "Comments on the History of Leprosy." (1942), *Indian Medical Gazette*, 77: 680-685. Reprinted, *Lep. Review*, 18, 54-64.
- MACARTHUR, SIR WILLIAM, "Medieval Leprosy in the British Isles." (1953), *Lep. Review*, 24: 8-19.
- MOISER, B., "'Leprosy': Ancient and Modern." (1961), *The Star*, 20 (5): 5-6.
- NIDA, E. A., "The Translation of 'Leprosy'." (1960), *The Bible Translator*, Vol. 11, No. 2.
- SWELLENGREBEL, J. L., "The Translation of 'Tsara'ath' and 'Lepra'." (1960), *The Bible Translator*, Vol. 11, No. 2.
- TAS, J., "On the Leprosy of the Bible." (1953), *Actes du 7e Congres Intern. d'Histoire des Sciences, à Jeruzalem*, p. 583 ff. Reprinted in *The Star*, June 1955.
- WALLINGTON, D. H., "Conclusion." (1961), *The Bible Translator*, Vol. 12, No. 2.
- WONG, K. C., "The Early History of Leprosy in China." (1930), *China Medical Jour.*, 44: 737 ff.

NEURO-HISTOLOGICAL CHANGES

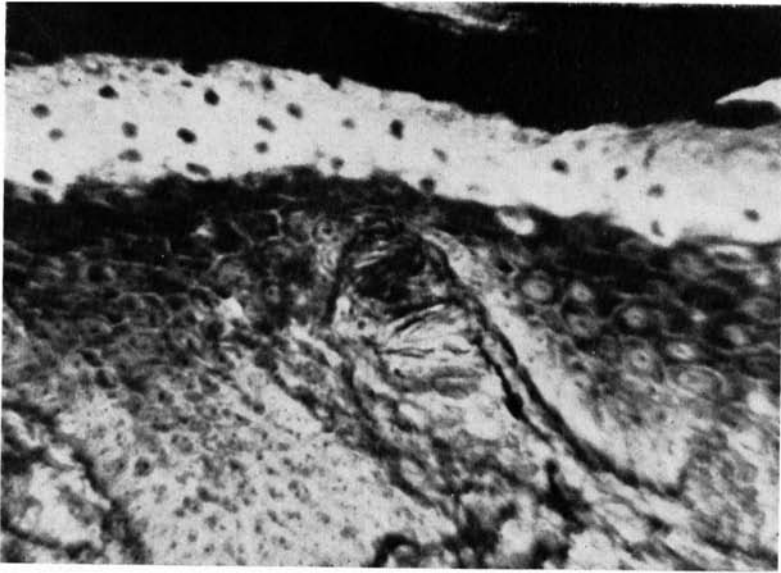


Fig. 1: Meissner's Corpuscle in dermal papillae showing a single nerve fibre ascending into the corpuscle and ramifying with fragmented fine filaments. Distal pad of ring finger, Male, 32 years, Lepromatous x 400

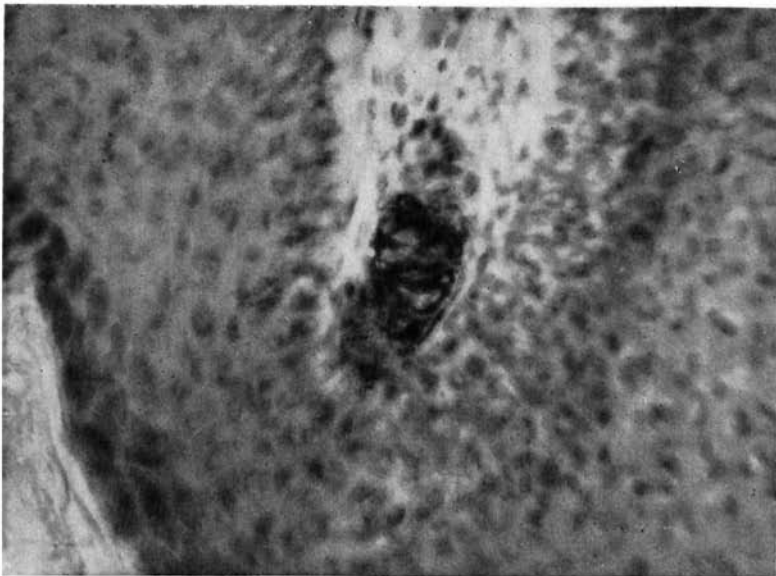


Fig. 2: Corresponding section to Fig.1 showing positive Cholinesterase reaction in Meissner's Corpuscle Cholinesterase x 400

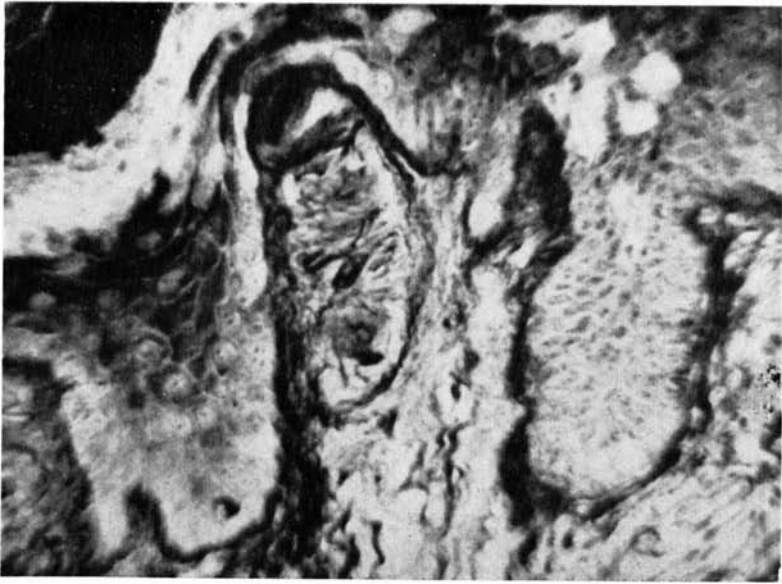


Fig. 3. Meissner's Corpuscle showing fine filament ramifying the Corpuscle and a nerve fibre is seen ending in papillary ridge. Distal pad of middle finger, male 25 years. Early lepromatous leprosy x 400

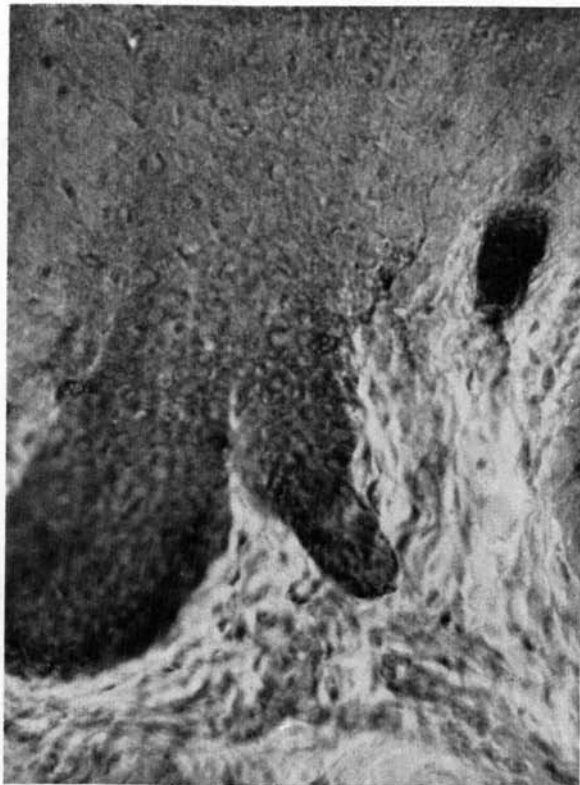


Fig. 4. Corresponding section to Fig. 3, showing positive cho-

NEURO-HISTOLOGICAL CHANGES

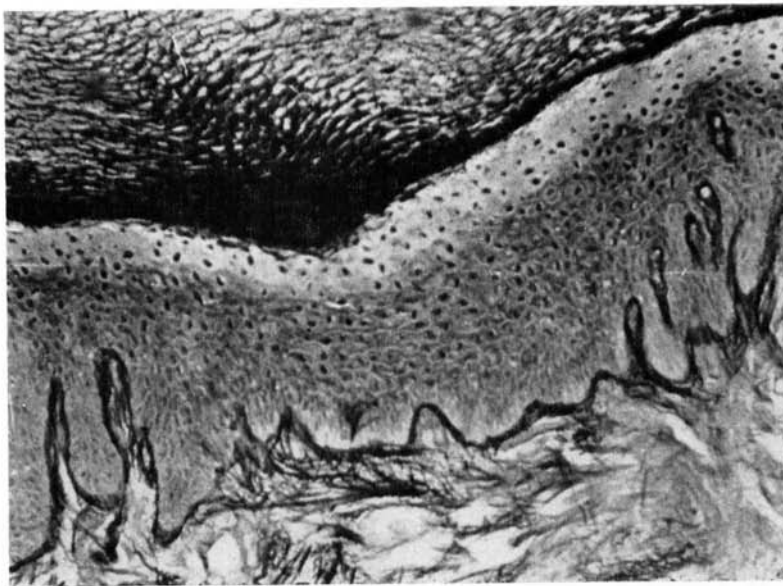


Fig. 5. Section of digital skin showing the epithelium with flattened papillary ridges. Distal pad of middle finger, male, 27 years. Tuberculoid x 100

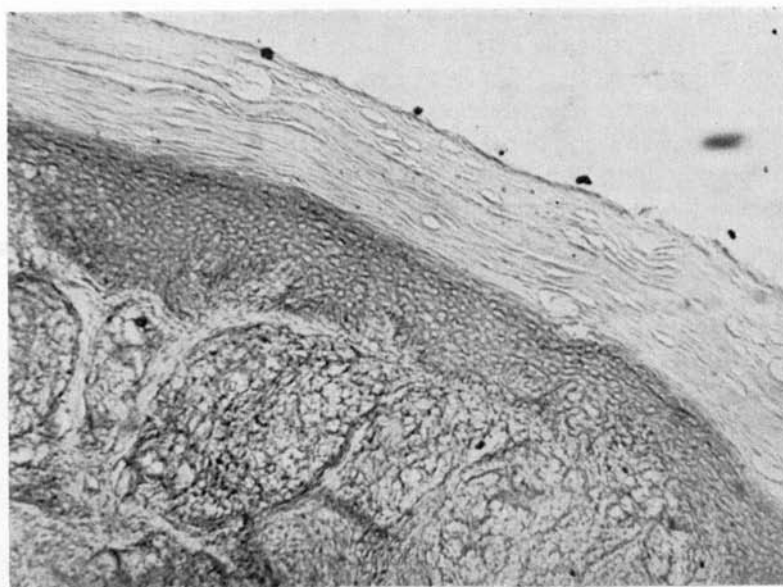


Fig. 6. Corresponding section to Fig. 5, of another tuberculoid patient showing no cholinesterase activity in any part of the epithelium, Cholinesterase x 100

STUDIES ON THE DISTRIBUTION OF CHOLINESTERASES IN RELATION TO NEURO-HISTOLOGICAL CHANGES IN SPECIALIZED SENSORY NERVE ENDINGS IN LEPROSY SKIN

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It is generally accepted that the nervous transmission is a chemical process and depends upon the action of cholinesterases during stimulation. The cholinesterase system which involves the enzymatic hydrolysis of acetyl choline plays an important role in the mechanism of transmitting impulses at nerve junction and nerve endings. The precise significance of this enzyme in nervous activity is not fully understood. NACHMANSON (1959) suggests that this enzyme is essential not only in synaptic activities but also in nervous conduction. In general it is believed that cholinesterase has an active function in nervous transmission to restore the mechanism for repeated activity. CAUNA (1960) worked out on the cytological localisation of the enzyme in relation to the structure of the cutaneous receptors compared to neurohistological studies and he suggests the enzyme cholinesterases may constitute an active agent in synaptic transmission of nervous impulse in Meissner's corpuscles.

The present work is an investigation on the distribution of cholinesterase compared to neuro-histological changes in Meissner's corpuscles and some of the specialised sensory nerve endings in leprosy skin. The presence of high concentration of cholinesterases in specialised sensory nerve endings prompted us to examine the distribution of cholinesterase in the skin of leprosy patients. Meissner's corpuscles are concerned with selective touch receptors and are designed for tactile discrimination.

Material and Methods

Twenty piece of skin were taken from the distal pad of the fingers from 20 patient showing typical lesions of leprosy; 15 from lepromatous and 5 from tuberculoid cases. There were no visible lesions anywhere on the finger pads. Biopsies were also taken from lesions of each patient to confirm histologically the type of lesion. Tissues were fixed in 10% neutral formalin. Half of the specimen was immediately transferred to ice for histochemical studies. Out of the remaining tissue, frozen sections were taken at 20 micron thickness and stained for nerve fibres by the method described by BALASUBRAMANYAN, JAYARAJ and GASS (1954). Twenty sections were taken from each specimen for this study. Remaining tissues were processed for paraffin sections. Sections were stained for hematoxylin and eosin

and for acid fast bacilli by the method described by JAYARAJ (1955). Three pieces of normal skin were taken from digital pad of the fingers as control.

Pieces of skin intended for histochemical studies were fixed in 10% cold formalin at 4 degree centigrade for four hours. Frozen section at 20 microns were taken and incubated for 30 minutes to 1 hour using histochemical technique of KOELLE (1951).

Results

In lepromatous leprosy the area occupied by Meissner's corpuscle shows mild to moderate intensity of cholinesterase activity. Superficial endings also show scattered activity of the enzyme. Mild intensity of the enzymatic reaction is seen in the papillary nerve endings. The nerve bundles did not show cholinesterase activity. The enzymatic activity differed in intensity from one to another in Meissner's corpuscles. In early lepromatous leprosy the intensity of enzymatic activity seems to be more concentrated in Meissner's corpuscles. The reaction on the papillary nerve endings also shows heavier concentration. In tuberculoid leprosy, the cholinesterase activity is not seen. The enzymatic reaction on the epidermal region shows no activity. The papillae that occupy the Meissner's corpuscle are completely collapsed and compressed. Practically there are no papillary ridges seen and the enzymatic activity is absent.

The neuro-histological changes in Meissner's corpuscles in lepromatous leprosy show a certain complexity and fragmentation of axons. The corpuscles receive one to two myelinated nerve fibres which branch as fine filaments in corpuscles. An occasional single myelinated nerve fibre is seen ramifying in the Meissner's corpuscles. The whole process looks myelinated. In few cases Meissner's corpuscles show the free fading filaments. In early lepromatous leprosy the Meissner's corpuscles look almost normal. The ramification of the nerve filaments is well seen. Paraffin sections stained for acid fast bacilli show abundant bacilli alongside the neuro-fibrillary ramification. In lepromatous leprosy, the epithelium is flattened leaving the surfaces of the papillary ridges in limited length in the corium. The ridges are prominently seen even though the epithelium is flattened. The nerve fibres ascending from the corium are seen ending in the papillary ridges. The ridges are found to vary in length between advanced lepromatous to early lepromatous leprosy. The paraffin sections stained for acid fast bacilli show higher concentration of bacilli in the papillary ridges. In tuberculoid leprosy, the thickness of the epithelium is reduced. In many areas, there are no papillary ridges seen. The dermal papillae that occupies the Meissner's corpuscle is compressed. In no part of the epithelium the nerve endings are seen.

Discussion

It is well known that there is high concentration of cholinesterases in the specialized sensory nerve endings, even though the function of this particular enzyme in these locations is still unknown. FLOREY (1961) introduced a theoretical consideration concerning the widely accepted chemical transmission of the nerve impulse in the nerve endings. He states that axons and nerve endings contain the enzyme system capable of synthesizing the chemical transmitter which is stored in physiologically inactive bound form and the transmitter is released by the nerve endings upon the arrival of the nerve impulse. CAUNA (1960) suggests that in Meissner's corpuscles the mechanical stimulus is converted into a nerve impulse within the cytoplasm of the lamellar cell, and microvesicles, produced by the perinuclear cytoplasm, are carriers of an excitatory agent, probably acetyl choline. It is of considerable interest to observe that in leprosy the enzymatic reaction of cholinesterases is distributed wherever nerve endings are distinctly seen. In lepromatous leprosy the intensity of the reaction differed from one Meissner's corpuscle to another. It is felt that the intensity of the reaction depends upon the severity of damages caused to the fine nerve filaments by the disease process. When the dermal papillae is compressed and the corpuscle is destroyed, the enzymatic reaction is completely absent. This clearly shows that the nerve endings are not capable of synthesizing the enzyme system when they are damaged. GOMORI (1956) stated most nerve fibres will not be demonstrated by any enzymatic technique now available and even in case of cholinergic nerves, it appears that only a part of them, usually the endings, are positive. In leprosy it was found that only the endings in Meissner's corpuscles and Merkel tactile discs show the enzymatic activity. The intensity of the reaction also depends upon the damage caused to the nerve endings. The nerve bundles deep in the corium have not shown enzymatic reaction. JAYARAJ and CHAUDHURY (1961, 1962) studied the neuro-histological changes in Meissner's corpuscles in leprosy and the structure and function of the papillary ridges in leprosy skin. They found that the terminal fibres in Meissner's corpuscles undergo characteristic changes in advanced lepromatous leprosy and in early lepromatous leprosy the neuro-fibrillary ramification looks almost normal. They also found extensive nerve fibres embedded in the papillary ridges of the lepromatous skin and in tuberculoid leprosy the ascending nerve fibres are mostly destroyed resulting in severe sensory impairment. Compared to the above neuro-histological changes, in the present investigation of the distribution of cholinesterases in nerve endings, it is found that the intensity of the reaction is reduced wherever the nerve terminals are damaged or the dermal papillae are compressed destroying the Meissner's corpuscles. The flattened epithelium without ridges, which is commonly found in the tuberculoid type of

leprosy and where the nerve endings are not found, the enzymatic reaction of cholinesterases is completely absent. Whether the enzyme has any role to play in the conduction of nerve impulse or not, it is of considerable interest to note that the enzyme cholinesterases are present wherever the fine nerve is ending in the epithelium of leprosy skin.

Summary

1. Biopsies from the distal pad of the fingers from 20 leprosy patients comprising 15 lepromatous and 5 tuberculoid were studied by cytological, nerve staining and histochemical methods.

2. It was found that the cholinesterase reaction is reduced in Meissner's corpuscles and in papillary ridges in advanced lepromatous leprosy where the terminal nerve fibres undergo characteristic changes. In early lepromatous leprosy the Meissner's corpuscles looked almost normal and intensity of the cholinesterase reaction was comparatively increased.

3. In tuberculoid leprosy the dermal papillae that occupy the Meissner's corpuscle seemed to be compressed resulting in the destruction of Meissner's corpuscles and the papillary ridges are found to be flattened. The cholinesterase activity is completely absent in all parts of the epithelium.

4. Even though the final agreement is lacking in details on the role of cholinesterases in nervous activity, there is evidence to indicate that it may serve to maintain the structure of the specialised sensory nerve endings for repeated nerve impulse in leprosy skin.

Acknowledgement

The author is highly grateful to Dr. V. Subrahmanyam, D.Sc., F.R.I.C., F.N.I., Director, Central Food Technological Research Institute, Mysore, for kindly offering facilities and encouragement to this investigation and to Dr. T. S. Sambasivan, Associate Professor of Dermatology, Venerology and Leprosy, Mysore Medical College, for kindly providing the clinical material for this investigation. The author is also indebted to Dr. M. Swaminathan, D.Sc., F.N.I., Assistant Director, Central Food Technological Research Institute for kind and valued encouragement. The author is highly grateful to the late Dr. George Gomori for kindly sending the gift sample of substrate which was used for histochemical investigation.

References

- NACHMANSONS, D. (1959) Chemical and Molecular basis of nerve activity, London, (Academic Press).
CAUNA, N. (1960) The Distribution of Cholinesterases in the cutaneous receptor organs, especially touch corpuscles of the human fingers. *J. Histochemistry Cytochemistry*, **8**, 367-375.

- BALASUBRAMANYAN, M., JAYARAJ, A. P. and GASS, H. H. (1954) An Improved Histological Method for the Examination of Cutaneous Nerves in Leprosy. *Leprosy Rev.*, **15**, 83-86.
- JAYARAJ, A. P. (1955) Periodic acid in the staining of Acid fast bacilli in Tissue Section, *J. Anat. Soc. India*, **4**, 41-42.
- KOELLE, G. B. (1951) The elementation of enzymatic diffusion artifacts in the Histochemical localization of cholinesterases and a survey of their cellular distribution. *J. Pharmacol.*, **103**, 153-171.
- FLOREY, E. (1961) Comparative Physiology: Transmitter Substances, *Annual Review of Physiology*, **23**, 501-528.
- GOMORI, G. (1956) personal communication.
- JAYARAJ, A. P. and CHAUDHURY, D. S. (1961) Studies on the Neuro-Histological changes in Meissner's Corpuscles in leprosy. *Leprosy Rev.*, **32**, 153-157.
- JAYARAJ, A. P. and CHAUDHURY, D. S. (1962) Studies on the structure and function of the papillary ridges of digital skin in leprosy. *Leprosy Rev.*, **33**, 41-44.

FOOT DROP IN LEPROSY

by JOHS. G. ANDERSEN, CAND. MED. ET. CHIR. (HAFN.)

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Foot drop is a fairly common disability in leprosy. Its correction is of the greatest importance to the patient's chances of a successful revalidation.

The cause is a paralysis of the lateral popliteal nerve at the popliteal fossa. Two distinct patterns of paralysis are recognised: Complete Lateral Popliteal Paralysis with involvement of all the muscles of the anterior and lateral compartments, and Incomplete Lateral Popliteal Paralysis with involvement only of the anterior compartment. Cases presenting Irregular Patterns of Paralysis with some muscles outside the anterior and the lateral compartment paralysed as well, and Partial Patterns of Paralysis with only some of the muscles of the anterior and/or the lateral compartments paralysed should be very carefully examined to determine whether a concomitant paralysing disease as poliomyelitis is responsible or whether it is a biological variant of the leprosy itself. A large number of the partial patterns of paralysis represent developing paralyses, either progressing or regressing.

We do not at present have any exact data concerning the possible recovery of paralyses due to leprosy. It can however, be stated that a stable paralysis of not less than 6 months duration has no chances of recovery.

Correction of foot drop with spring attachments to the foot wear should be considered a temporary relief. Corrections by surgery on the skeleton of the foot may be possible, but it is much more daring and difficult surgery than tendon transfers and has no place where tendon transfer is possible (HODGES, 1956).

Since the tibialis posterior muscle for practical purposes always is intact in leprosy, this is the motor tendon of choice. Several techniques have been described. (FRITSCHI and BRAND 1957, GUNN and MOLESWORTH 1957, SELVAPANDIAN and BRAND 1959, ANDERSEN, under printing.)

The various methods can be summarised as follows:

- (1) Interosseous transfer to the middle cuneiform bone;
- (2) Subcutaneous, circumtibial transfer to the middle cuneiform bone;
- (3) Interosseous transfer to the anterior compartment muscles high in the leg;
- (4) Subcutaneous, circumtibial transfer of tib. post. to the insertion of tib. ant., and retrograde transfer of peroneus longus to tib. post;

(5) Subcutaneous, circumtibial transfer of tib. post. to the insertion of tib. ant., and retrograde transfer of ext. dig. long. to tib. post.

A comparison between the various methods bring the following points out:

Route: the circumtibial route seems to be slightly better than the interosseous route. This may be due to the occasional, very crippling adhesions in the narrow interosseous space. No troublesome bow stringing has been seen in the circumtibial route.

Tension: Due to the strong action of the triceps surae a certain drop in dorsiflexion can be expected. This indicates the necessity of suturing the transposed tendons under high tension with the foot in dorsiflexion.

Insertion: A certain amount of evidence will be found to indicate that the dreaded disorganisation of the skeleton of the foot (neuropathic foot) begins in the tarsal region. It will be wise to avoid surgical interference with the skeleton in this region.

Postoperative stability of the foot: Transfer in a single tunnel is easier, but requires careful balancing of the foot to avoid post-operative inversion deformities. This does not appear to be unduly difficult. It has been postulated that a two guy rope transfer would tend to stabilise the midtarsal joints. This is a point which only a careful, long time follow up study can clarify.

Presently suggested technique

The tibialis posterior tendon is identified and detached at its insertion. It is withdrawn into an incision on the medial side of the leg, and the distal short fibres are detached from the tendon, which is tunnelled in the strictly subcutaneous layer round the tibial border of the tibia in the direction of the base of the V metatarsal bone. This is easily done with a curved blunt tendon tunneller as described by the author. The transposed tendon is looped round the ext. hall. longus tendon and is secured to the tendon of the ext. dig. long. The tendon suture is done under high tension with the foot in dorsiflexion. After skin suture the foot is secured in a below-the-knee plaster of Paris boot with incorporated toe guard. After a few days the patient can be ambulated in a walking cast. After 4 weeks the plaster boot is removed and the foot is maintained in a dorsal slab while active physiotherapy is instituted. The majority of patients will achieve a normal gait in 2 to 3 weeks and they can then be discharged with suitable shoes as prevention against ulceration of the foot. The operation lends itself to simultaneous correction of drop or claw toes. No overaction on the dorsiflexion of toes has been noticed.

Material: All the patients in this series were inmates of Santipara Leprosy Colony, Assam. Patients in need of bone surgery for the correction of gross instability of fixed deformities were excluded. Otherwise the patients were accepted for surgery as and when they were ready. No attempts at selection according to age, sex, classifica-

tion of leprosy, etc. were made. Practical difficulties irrelevant to this paper prevented any women from being selected. In all cases the duration of the disease and of the paralysis extended over several years. It is the impression of the author that the average age in this series is higher than in the series published from Vellore and Karigiri by the authorities. It could be expected that this would tend to give less satisfactory results. The patients were selected at the leprosy colony by the resident physiotherapist and the author. The pre- and postoperative physiotherapy took place at the colony, while the actual surgery in most cases was performed at Sevapur Hospital. The necessary travel to and from the hospital (in the dry season 50 miles, in the wet season 100 miles) was both a hazard and a difficulty. Type of paralysis: 10 cases showed complete lateral popliteal paralysis, 2 cases showed incomplete lateral popliteal paralysis.

Five patients had only one foot paralysed, while four patients had both feet paralysed. (In one case a different technique was employed on one foot.) No difference can be demonstrated in the final postoperative assessment. In case of bilateral paralysis the patients seem to find it a little harder to overcome the initial insecurity of the operated foot.

Where preoperative passive dorsiflexion of the foot with straight knee did not reach 70° , contracture of the heel cord was diagnosed. This was treated with a frontal Z plasty of the tendo tricipis surae at the time of operation. If the foot was found unstable either on stance or on passive handling it was excluded, since this was considered an indication for triple arthrodesis. Only in one case (No. IIX) where the patient pleading high age requested tendon transfer without bone surgery, was this done. Much to my surprise no postoperative instability was found.

The postoperative assessment was done not later than 2 months after the actual surgery. The majority of the cases had a follow up period of not less than 12 months.

The pre- and postoperative assessments will be found in Table 1. The figures speak for themselves, but a few comments will be necessary: Case Nos. VII and IIX: in both cases a mild high stepping gait is recorded. Both of these were fairly old. They did achieve a normal gait, but found it too much of an effort to break the long standing habit of high stepping unless they gave their minds to it. Case No. V shows a mild highstepping gait with a comparatively poor active dorsiflexion. He had postoperative fever with swelling of the leg, which necessitated splitting of the cast. He did, however, recognise a substantial improvement.

Relative value of recorded angles

With the knee kept flexed the release angle drops about 10° . This will be the expected active dorsiflexion angle. This would indicate that the foot must be kept at 70° at tendon suture in order to achieve

TABLE NO. 1

	Stability of foot	Passive dorsiflexion with flexed knee	Passive dorsiflexion with str't knee	Tendon suture angle	Release angle	Immobalisation angle	Tendon Achillis lengthening	Angle gained	Active postoperative range with flexed knee	Active postoperative range with straight knee	Postoperative gait	Post-operative stability	Assessment of result	Patient's statement
I	good	—	70	70.	80.	80	—		76/110	80/110	normal	good	exc.	good
II	good	56	56	75	80	75			85/95	85/110	normal	good	exc.	good
III	good	65	70	70	80	65			70/105	85/105	normal	good	exc.	good
IV	good	65	75	70	70	65	10mm	10°	70/105	85/105	normal	good	exc.	good
V	good	65	70	65	70	65			80/90	80/90	high st. mild	good	good	good
VI	good	65	70	65	80	65			75/105	80/105	normal	good	exc.	good
VII	good	60	70	70	85	70			85/95	90/95	high st. mild	good	good	impr.
VIII	defic.	75	80	70	80	65	10mm	15°	80/95	85/95	high st. mild	good	good	good
IX	good	65	70	65	75	65			80/105	85/105	normal	good	exc.	good
X	good	65	70	70	80	70			80/105	80/105	normal	good	exc.	good
XI	good	65	75	65	75	70			80/105	85/105	normal	good	exc.	good
XII	good	60	70	75	75	70			85/95	90/105	normal	good	exc.	good
Average				69°	78	68			78/	84/				

TABLE NO. 2

Circumtibial, subcutaneous transfer of tib. post. to insertion of tib. ant. and retrograde transfer of ext. dig. to tib. post. (Method No. 1.) Postoperative active dorsiflexion with straight knee:

	<i>Mild highstepping gait</i>	<i>Normal gait</i>
71-80	nil	5
81-90	2	3
91-100	1	3

Circumtibial, subcutaneous transfer of tib. post to insertion of tib. ant. and retrograde transfer of per. long. to tib. post. (Method No. 2.) Postoperative active dorsiflexion with straight knee:

	<i>Mild highstepping gait</i>	<i>Normal gait</i>
61-70	nil	1
71-80	nil	6
81-90	1	1
91-100	1	nil

(These figures as quoted from paper by the author which is under print by the Acta Orthopaedica Scandinavica.)

Circumtibial, subcutaneous transfer of the tib. post. to the ext. dig. long. on the dorsum of the foot. (Method No. 3.) Postoperative active dorsiflexion with straight knee:

	<i>Mild highstepping gait</i>	<i>Normal gait</i>
71-80	1	3
81-90	2	6

TABLE NO. 3

	<i>Method No. 1</i>	<i>Method No. 2</i>	<i>Method No. 3</i>
Excellent result:	4	2	9
Good result:	7	6	3
Fair result:	3	2	0
Poor result:	0	0	0

Explanation of terminology:

Excellent result: stable foot, in all respects normal function.

Good result: stable foot, in all essential respects satisfactory function.

Fair result: some improvement in function, but not satisfactory.

Poor results: insignificant or no improvement. Distinctly unsatisfactory.

80° active dorsiflexion. Even though the active dorsiflexion with straight knee will be less than with flexed knee (in this series 6°) this will still allow the foot to be carried forward with no highstepping in the gait.

Comparison with other tendon to tendon methods of tib. post. transfer: Although figures for a full comparison between the various techniques of tendon to tendon tibi. post. transfer are not available, it is considered of some interest to compare the results of the 3 mentioned techniques. In Table No. 2 will be found the angle of active dorsiflexion achieved postoperatively with straight knee at the various methods. The figures tend to indicate slightly better results from the methods introduced here. In Table No. 3 will be found a comparison between the final overall result in the three methods. The assessments have not been done by the same person in all the cases, and some discrepancy may be expected. Still the figures do indicate some superiority of the method introduced here.

Conclusion

A simple and quick technique of transfer of the tibialis posterior tendon for the correction foot drop is presented. It is offered as a valuable alternative to other, already described methods.

Acknowledgements

The author wishes to express his gratitude to the staff members of Santipara Leprosy Colony, notably Dr. P. Murmu, resident medical officer, and Miss Lucille Frickson, physiotherapist, to the staff members of Sevapur Hospital, and to all the patients whose cheerful cooperation has been of immense value in this study.

References

- ANDERSEN, JOHS G. Neurological Patterns in Leprosy, *Journal of the Christian Medical Association of India*, May, 1961.
- ANDERSEN, JOHS G. Foot Drop in Leprosy and its Surgical Correction, *Acta Scand. Orth.*, XXXIII, 2, 151-171.
- FRITSCHI, E. P. and BRAND, P. W. The Place of Reconstructive Surgery in the Prevention of Foot Ulceration in Leprosy, *Int. J. of Lepr.*, 25, 1, 1-8.
- GUNN, D. R., and MOLESWORTH, D. B. The Use of the Tibialis Posterior as a Desiflexor, *J. Bone and Joint Surg.*, 39B, 674-678.
- HODGES, W. A. The Treatment of Deformities of the Foot in Leprosy, *East African Med. J.*, 33, 302-303.
- SELVAPANDIAN and BRAND, P. W., Transfer of the Tibialis Posterior in Foot Drop Deformities, *Ind. J. of Surg.*, XXI, 2, 151-160.
- THANGARAJ, R. H., Personal Communication, 1959.

NEW METHOD OF NOSE RECONSTRUCTION

by T. WYSS, M.D.

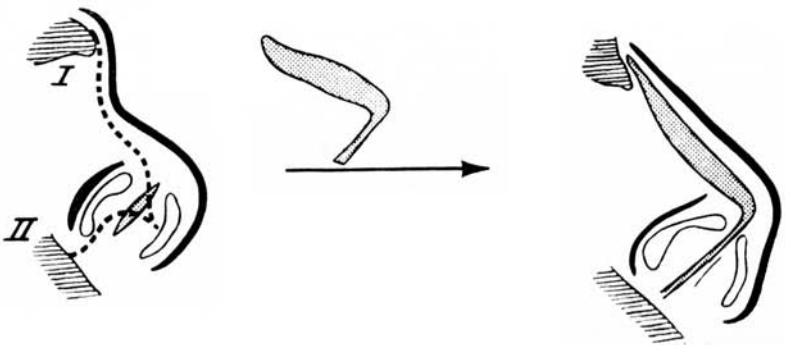
S. Heart H.D. Hospital, Kumbakonam, India.

Collapsed nose is a major obstacle of rehabilitation of H.D. patients. At the Sacred Heart H.D. Hospital, Kumbakonam, India, between 1959 and 1963 research was conducted for detection of easier methods of nose reconstruction.

A good number of attempts have been made to introduce L-shaped nylon or polymethacrylate inserts, in order to substitute the destroyed cartilage of the septum. But the long-term results of this kind of alloplasty were usually bad, as the insert was extruded or attracted infection sooner or later.

There is good evidence, that this bad long-term tolerance of the insert is *not* due to the plastic material itself but only to its hard consistence, which will damage the skin and tissue by mechanical stress. The new idea was to use for the alloplasty some *very soft* material, which would imitate the consistence of the genuine cartilage. Ordinary commercial soft polyethylene has proved to be the well tolerated and adequate material. It gives excellent tolerance for years and allows easy shape giving. Only disadvantage is low melting point, prohibiting autoclaving. Boiling in desogen-solution was used for sterilising.

Operation technique was done in the following way: 1.5 cc. Procain 2% infiltrated in the dorsum nasi, 0.5 cc. in columna nasi. Quarter inch incision in columna nasi. Mosquito forceps, starting from the incision digging two subcutaneous tunnels, one reaching os nasale, the other os maxillare. Paraseptal tissue mobilised by opening of the mosquito forceps only, thus avoiding all sharp cutting inside nose substance (which would create bleeding or danger of perforation into nose cavity). Horizontal beam of the alloplastic insert, handled by sterile forceps, is pushed into horizontal tunnel and deposited on os nasale. Vertical beam taken through columna and placed on os maxillare. The flexibility of the soft polyethylene



is very helpful for the placing. Lateral deviations of the nose can be corrected by asymmetrical placing of vertical beam of the insert. Two U-stitches close the incision. No further fixation.



The alloplastic insert made from soft Polyethylene.

One first batch of 12 patients in Sacred Heart H.D. Hospital, Kumbakonam, carry at present this type of alloplasty by soft polyethylene for more than three years.

From a second batch of 61 patients, 55 have the insert for more than one and a half years.

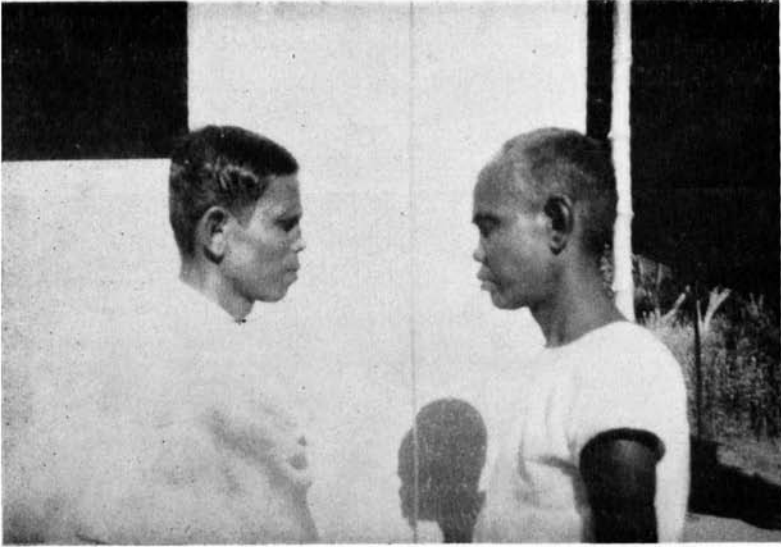
Six inserts had to be removed: 3 due to scar contraction, giving excessive stress on the insert, 2 due to inadequate shape of insert, one due to infection.

(1) Tolerance of the remaining inserts was excellent, no atrophy of skin, no tilting or absorption as frequently observed with bone grafts.

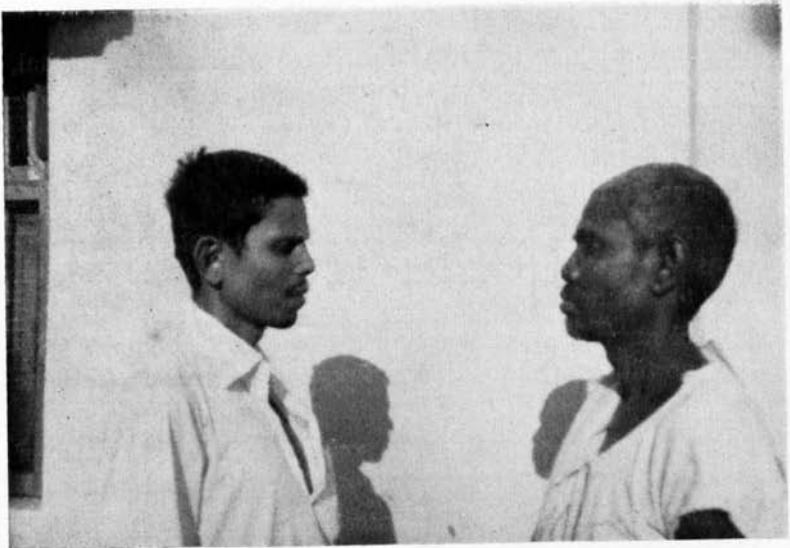
(2) Fifteen noses showed bacilli positive infiltration. In spite of that the inserts remained *in situ* for more than one and a half years.

(3) Due to the softness of the insert the nose remains flexible.

(4) In case of incompatibility or infection the insert can be removed easily by cutting in two pieces at the neck of the column.



Two patients with typical H.D. nose deformities.



Same patients 4 weeks after reconstruction.

(5) In case of extrusion due to inadequate shape or infection a second attempt can be made, as there will be very little scar-tissue from the polyethylene insert.

Summary

An easy, grateful and riskless alloplastic procedure is described for reconstruction of *loose* H.D. nose deformities with collapse of septum. This kind of nose deformity will exert only slight mechanical stress on the insert and thus, *soft* alloplastic material (polyethylene) will be tolerated for years. One major advantage is the fact, that even nose deformities with active infiltrations (Bacilli ++) can be reconstructed without risk of extrusion or infection. For heavily contracted noses with "short skin" this procedure is not adequate; those cases should be operated by complete plasty, that is by the method of N. H. Antia.

A further report will be given in a few years about the long-term tolerance of this type of alloplasty.

LETTERS TO THE EDITOR

Wembley, Middx.,
14th November 1963.

DEAR SIR,

Work on the construction of a leprosarium in Agra, 124 miles south of New Delhi, will start on 14th December with funds raised by public donations in Japan. Negotiations between the Indian Government and the Asia Society for Combating Leprosy have already been concluded for the implementation of this project.

A nationwide movement is now under way in Japan to gather the necessary funds for the erection of the leprosarium.

The site, in the suburbs of Agra—famous as the location of the Taj Mahal—is ideal, surrounded by forests. The best of Japanese architects will design and build the leprosarium, part of which is scheduled to be completed next spring. Mr. Nehru is expected to attend the ground breaking ceremony on 14th December.

When the leprosarium is totally complete, Japan will send doctors and nurses to staff it. Japanese Prime Minister Hayato Ikeda stated that, when he visited India in 1961, Mr. Nehru told him he would like to have a leprosarium built in India by Japan.

M. CORPER.

Weston-super-Mare, Somerset,
16th August 1963.

DEAR SIR,

In the final paragraph of your Editorial in the April 1963 number of *Leprosy Review*, you invite comments and letters on the paper by WEDDELL and PALMER (1963).

I would particularly like to comment on the findings by these workers (pp. 58 and 59) of acid-fast dust in a degenerating nerve fasciculus, together with the presence of two viable (*sic*) organisms lying in healthy Schwann cells related to healthy nerve fibres.

These findings seem to me to be fully in keeping with an idea concerning the biology of *M. leprae* conceived several years ago. This is that the negative results of *in vivo* and *in vitro* culture experiments should be accepted, and that the cause of failure of bacillary growth should be sought not outside bacillary populations but inside each individual bacillus.

One starts with the assumption that each individual *Mycobacterium leprae* is non-viable due to a cause within itself. It is next argued that the relationship of the bacilli to the lepra cells seems to be such that the latter are overcoming this "non-viability" factor since massive multiplication of bacilli is occurring within them, and

regression of lepra cells appears to determine bacillary degeneration. (P. R. DE SOUZA and M. DE SOUZA LIMA 1952).

The next question is the teleological one—asking why lepra cells behave in this way—and the answer is to seek a positive association between bacillary non-viability and pathogenicity, instead of assuming that these two factors are necessarily in inverse relationship, as they are in the case of most other pathogens.

The observations of WEDDELL and PALMER are to my mind suggestive of such a positive association; in other words the morphologically intact bacillus is *not* damaging the nerve fibre, whereas the cloud of acid-fast dust *is* doing so.

Could it be that the Schwann cell is taking on a similar role to the lepra cell in rendering a neuropathogenic endoparasite of *M. leprae* harmless to the nerve fibre of the human host, *but* at the same time symbiotic to the bacillary host, so that the latter is able to reproduce only while under the influence of the cell, reverting to its non-viable form and being destroyed by the endoparasite growing at its expense and damaging the nerve fibre, when the influence of the cell is withdrawn?

These speculations would in no way interfere with pathological concepts assuming a direct action of tuberculoid tissue against the somatic part of *M. leprae*, but, if we think of the target organ of the latter as being the skin, might well account for very circumscribed depths at which lepra bacilli, tuberculoid tissue and lepra cells are found in man.

I have neither the specialised knowledge nor the resources to try to test the validity of this idea, but merely put it forward in the hopes that expert leprologists might be sufficiently interested to do so, and because it seems to me to fit in rather well with the observations already mentioned.

M. G. CORCOS.

References

- P. R. DE SOUZA and M. DE SOUZA, Lima. The Mechanism of Action on the Sulfone Derivatives in Lepromatous Leprosy. *International Journal of Leprosy*, Vol. 20, No. 3, July-Sept. 1952.
G. WEDDELL and E. PALMER. The Pathogenesis of Leprosy. *Leprosy Rev.*, Vol. XXXIV, No. 2, April 1963.

University of Cincinnati, U.S.A.,
4th September 1963.

DEAR DR. INNES,

Through the kind efforts of Joe Stein and the Star, I have read your note in regard to the new name that you propose for leprosy. I certainly do sympathise with the desire for change. In all our teaching, we have included the unwieldy term of "Hansenosis".

As a dermatologist, I should like to protest more than feebly against the term of Mycobacterial Neurodermatosis for several

prejudicial reasons. In dermatology, we are accustomed to using neurodermatitis as a type of morphologic response to any sort of itching. Although this term means much to many people, we do believe here, that it indicates that the individual is disturbed and there is a functional element to the nervous difficulty with the skin rather than a disturbance of the nerve endings in the skin or even perhaps in the enzymes associated with itching in the skin. The term has a certain amount of disfavour among the dermatologists who do not believe in psychosomatic disturbances. As I indicated, we find this term a very useful term for describing the results of scratching and rubbing of any type of skin lesion. It is not a diagnosis of a specific skin disorder, but simply an indication of the discomfort of any type of primary lesion. To complicate the picture even further, we have swimming-pool granulomas which are caused by *Mycobacterium balneii*. When the individual scratches these things, we call these lesions Mycobacterial Neurodermatitis. In this phase, the granulomatous appearance is obscured by lichenified pruritic nodules.

My philology friend from the University of Cincinnati is out of town for vacation or I would try to enlist his help in attempting to offer a substitute for the second phase of your term, as perhaps *Mycobacterial neuropathic dermatosis*. This would indicate nerve involvement of this granulomatous process and would also get away from the objectional psychosomatic oriented term of neurodermatitis.

Thank you again for your interest and troubles.

LEON GOLDMAN.