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LEPROSY REVIEW.

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EDITOR E. MUIR, M.D.

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NOTES ON CONTRIBUTORS.

G. A. RYRIE, M.B., CH.B., is Medical Superintendent of the Leprosy Settlement at Sungei Bolah, Federated Malay States.

H. P. LIE, M.D., of Bergen, is the Chief Doctor for Leprosy in Norway.

JOHN LOWE, M.D., is the Director of the Leprosy Research Department at the School of Tropical Medicine, Calcutta.

DR. DHARMENDRA is an Assistant in the Leprosy Department of the School of Tropical Medicine, Calcutta.

DR. RAMIRO GALVEZ has worked for some years at the Leper Hospital of "La Piedad" in Guatemala.

C. J. AUSTIN, M.B., CH.B., is Medical Superintendent of the Central Leper Hospital, Makogai, Fiji.

H. W. WADE, M.D., is Medical Director of the Leonard Wood Memorial for the Eradication of Leprosy.

Editorial

We print in this issue the second half of Dr. Lie's enlightening article on " Leprosy in the Bible ", the first half having appeared in our January number. Dr. Lie's reasoning makes it clear that the disease described in Leviticus was not the disease caused by Hansen's bacillus. What *Zaraath* was we do not know. It does not fit clearly into the picture of any disease we know nowadays. It is well-known that Hansen's leprosy is not common among nomadic tribes. It is when the nomad settles down and mixes with other races, leaves off his simple but effective tribal sanitary customs, and begins to adopt the externals of a higher civilization without its safeguards, that the conditions for the spread of leprosy are favourable. It is therefore unlikely that the nomadic Israelites would be attacked by Hanse

Naaman the leper gives a clearer picture. In all probability the basis of his disease was scabies. Among the Arabs of Transjordania scabies of man and camel is one of commonest complaints. Thirtyfive years ago, when the writer worked at the Tiberias hospital, Arabs came in crowds for treatment for all manner of diseases, but they seldom came for scabies. Through all that region the well-known remedy for this complaint was to " dip seven times " in the sulphur springs at the famous baths of Rabbi Mayer, some two miles distant from Tiberias. How appropriate too was the retribution of the covetous servant Gehazi, who ran after Naaman and begged from him his rich apparel, doubtless infected with *acarus scabiei.*

With Dr. Lie's comment on King Uzziah we are not so inclined to agree. " Then Uzziah was wroth, and had a censer in his hand to burn incense: and while he was wroth with the priests the leprosy even rose up in his forehead before the priests
typical of the diffuse form of cutaneous leprosy which may be quite inconspicuous under ordinary circumstances, but under emotions such as anger or shame, will suddenly show up facial lesions in marked relief.

As to Job's disease, it would seem to be of less value to argue, if this book was written, as many suppose, not as a history but as an allegory with a view to discussing the problem of human suffering. It would be almost equally profitable to discuss the geography of the *Pilgrim's Progress.*

Regarding the ten lepers mentioned in the New

Testament we have nothing to guide us as to the nature of the disease, except the fact that
from the community—" stood afar off "; and their condition came within the scope of the levitical law—" go show yourselves unto the priests ". Leprosy is not a common disease in Palestine in modern times. Outside the Jerusalem Leper Home of the Moravian Mission there appear to be comparatively few lepers.

With regard to the recognition of Hansen's disease, it is extraordinary what contrasts are found. A European in India served for years in a well-known caterer's shop while suffering from a complaint for which he consulted several leading physicians, who diagnosed lymphangitis and other diseases. Later, expert examination showed that he was an advanced and highly infectious leper. On the other hand, a Chief of the wilds of Sierra Leone was asked to call together all those with skin diseases in his chiefdom. Some thirty six patients appeared and were lined up. The Chief, who was an intelligent man, but had little knowledge of European medicine, was asked to pick out all the cases of leprosy. This he did promptly, choosing only seven out of the group. Examination showed that these seven were the only lepers; he had not made a single mistake.

There may be some who will be disappointed at these arguments that much of leprosy as described in the English Bible is not our modern leprosy. Their interest is perhaps to a certain extent built upon sentimentality. But truth is stronger as well as stranger than fiction, and we are grateful for the research and scholarship which is marshalled in Dr. Lie's paper.

* * *

Dr. Austin's report on the Leper Hospital at Makogai, Fiji, has items of special interest. Of the sixty admissions during 1936, 37 were Indians and only 15 Fijians. Here, as in Malaya and elsewhere, Indians and Chinese have introduced leprosy among more primitive peoples, though in some of the Melanesian Islands leprosy appears to have been present from time immemorial.

Another point of interest is the greater severity of the disease among the Fijians in the hospital, as compared with Indians, 20.3 per cent of the former being advanced cutaneous cases, as compared with 3.1 per cent of the latter. The same contrast is also noticed in the proportion that show improvement, the Indians showing 22 per cent more under this heading. In Malaya also the Indians appear to have

a milder type of leprosy than the Chinese. The question arises as to the cause of this racial difference. Is it physiological, cultural, economic or social? But it is difficult to come to reliable conclusions regarding racial, sex and type incidence from figures culled from a leper hospital. For this purpose a careful survey of the people in their natural surroundings is necessary, such as that which is at present being carried out in the Solomon Islands.

* * *

The *Bruxelles Medical* announces that steps are being taken in Belgium towards forming a National Leprosy Association. This is said to be in response to the views of Great Britain and our desire to see international co-operation in health matters. The north east part of the Belgian Congo is one of the most highly endemic areas in Africa, and the adjoining districts of Uganda and the Sudan likewise show high incidence. The control of leprosy in this and other similar border areas may be promoted by collaboration between national leprosy associations. The Journal mentions that at a meeting presided over by the Minister of the Colonies the matter was considered and the King of the Belgians is to be asked to create a special commission to study the question and bring forth proposals for the foundation of a Leprosy Association.

* * *

Dr. Ryrie raises a number of interesting points in his paper on *tuberculoid leprosy*. We shall be grateful if readers will give us their experience in the treatment of this condition.

* * *

On page 83 we abstract a very useful article by Dr. Wade which seeks to crystallize the various suggestions that have been put forward in recent years for a practical and comprehensive classification of leprosy.

Obituary.

SIR THOMAS STANTON, K.C.M.G.

We report with deep regret the death of Sir Thomas Stanton, Chief Medical Advisor to the Secretary of State for the Colonies. Sir Thomas was for many years an active member of the Executive Committee of B.E.L.R.A., and his sympathetic help and advice were invaluable in the Association's campaign against leprosy in our Colonies and Dependencies.

The Treatment of Tuberculoid Leprosy

G. A. RYRIE.

Until recently the standard treatment for tuberculoid cases in Sungei Buloh has been the subcutaneous injection of esters combined with intradermal injections at the lesion site. It has become growingly apparent, however, that intradermal treatment benefits mainly the subactive cases which are only a very small proportion of the tuberculoids here. Chinese in Malaya do not appear to tolerate intradermal esters nearly so well as Indians.

A series of experiments therefore was conducted to ascertain the best method of treating active tuberculoid leprosy. The experiments were indicated over a period of four months. For each experiment twenty five male adults were chosen. The Sedimentation Rate was taken once a fortnight but was not found to be of similar value to rates taken in similar experiments in cutaneous cases. Periodic smears were not taken during the experiment as the normal variation in bacillary content of tuberculoid lesions makes assessment difficult. Two separate observers made daily notes on the cases.

The question arose to begin with as to whether the same results could be obtained with no treatment as with any specific therapy. For this purpose twenty five cases were given normal saline twice weekly in five cc. doses subcutaneously. The " treatment " proved popular and at the end of one month there was subjective improvement in 100% of cases. By the end of three months many of them were becoming doubtful. By the end of the fourth month the position was as follows:—

Patients own opinion: stationary 7; improved 10; worse 5; (three cases had dropped out with intercurrent ailments).

Observers' Opinion: stationary 7; slightly improved 5; slightly worse 10.

In no case was there any marked deviation from the initial

to its painlessness (Chinese do not have the Western fear of a needle). Quite frequently the psychological improvement was specific, e.g. the injections had improved the appetite, caused increased clearness of vision, banished chronic " numb-pains " and so on. It is however obvious from this experiment that active tuberculoid leprosy needs something more than general hygiene and psychotherapy.

A second group were given injections of phthalic acid dissolved in hydnocarpus oil (3 grains of phthalic acid in

5 cc. of hydnocarpus oil). Five cc. of the mixture were injected subcutaneously twice a week.

All patients developed acute inflammation at the site of injections. Two had to be admitted into hospital with large abscesses. Nine others had multiple abscesses requiring daily outpatient dressings. The experiment was terminated at the sixth week. It should indeed have been stopped before this.

A third group were given five cc. intradermal hydnocarpus esters twice a week. No subcutaneous or intramuscular injections were given, the object being to determine the effect of intradermal treatment alone. This experiment had to be stopped after five weeks owing to the high incidence of inflammation of an undesirable type.

This experiment confirmed my previous observation that intradermal treatment is unsuitable for active tuberculoids. This group after a suitable rest were then given subcutaneous infiltration of esters under the lesions. The same doses and times of injection were employed. Results were equally unfortunate, most cases developing pain and inflammation. The experiment was abandoned after four weeks.

The results in this somewhat unfortunate group confirmed my previous opinion that in acute tuberculoid leprosy in Chinese the local lesions should be left strictly alone. Late results of intradermal treatment in such cases have been equally disappointing.

This should not be considered as a condemnation of intradermal treatment of certain simple leprides or of cutaneous leprosy. There is, however, a tendency to believe that leprosy treatment consists essentially of intradermal injections wherever possible. Such a tendency is bound to detract from the very deserved repute of intradermal treatment in cuteaneous cases.

A fourth experiment consisted of large doses of hydnocarpus oil. One cc. of oil was given for every ten pounds of body weight and injections were given subcutaneously twice a week. In this treatment it is advisable to divide doses of over ten cc. and inject in two different areas. One of this group weighed two hundred pounds and received therefore forty cc. a week. Treatment was continued for four months. *Result*: stationary 2; improved 20 (one intercurrent illness); worse 2. Long before the four months was over most of the other groups were clamouring for this form of treatment. It will be noted that no local treatment was given to the lesions. In one case shewing marked improvement, the lesion had been slowly advancing

for twenty-seven years. Hydnocarpus oil in the doses I have indicated is the most effective treatment of acute tuberculoid leprosy that we have been able to discover here.

Before discussing the next group it may be well to consider what constitutes " improvement " in a tuberculoid case. In the groups considered above, signs of improvement have been taken as (a) the checking of peripheral spread of the lesion and (b) the decrease or disappearance of activity in the lesion. The checking of peripheral spread is undoubtedly a very desirable clinical result; on the other hand a temporary increased activation in a tuberculoid lesion may be beneficial. Artificial activation of cases who have previously suffered from an attack of acute tuberculoid leprosy would obviously be unsuitable, and there is a very real danger in the activation of transitional or intermediate cases who are neither tuberculoid nor cutaneous. I do not think any general rule can be laid down; each case must be considered on its own merits.

A fifth group of active tuberculoids were given injections of 2% phthalic acid intravenously twice a week in doses of three cc. per ten pounds of body weight. After eight injections 21 out of the 25 cases shewed definitely increased activity in the tuberculoid lesions.

This result together with general experience of the two drugs convinced me that phthalic acid and hydnocarpus oil act in opposite ways. Phthalic acid accelerates tuberculoid activity, hydnocarpus oil controls it.

It was decided therefore to alter the phthalic acid group experiment and they now receive alternative courses of six subcutaneous injections of hydnocarpus oil (1cc. to ten pounds of body weight) followed by two intravenous injections of 2% phthalic acid (3 cc. for ten pounds). The injections as before are given at bi-weekly intervals. The experiment has been going on for three months and is marked in almost every case by the reactivation of the lesion after phthalic acid and its gradual retrogression during the following three weeks of intensive hydnocarpus oil treatment.

It is hoped that this alternative treatment will produce better ultimate results than those achieved by administration of hydnocarpus oil alone.

The effect of hydnocarpus oil in these active tuberculoids led me to a consideration of its use in acute tuberculoid leprosy. Acute tuberculoid leprosy in Chinese here may be, and often is, of a very violent character necessitating prolonged hospitalisation. Until recently we have considered hydnocarpus derivatives unsuitable in lepra fever (cutaneous

reaction) and in acute tuberculoid leprosy—the two volcanic belts at either side of the leprotic range.

It was found, however, that treatment wth high doses of hydnocarpus oil has a definite ameliorative effect in acute tuberculoid leprosy. Doses up to one cc. per ten pounds of body weight are well tolerated. In some cases we have given 1 cc. per five pounds of body weight subcutaneously twice a week for a short interval with beneficial results.

Phthalic acid in acute tuberculoid cases is contra-indicated as spurring on a resistance that has already got beyond control.

While considerable research has been done on the pathology, clinical appearance and significance of the tuberculoid process of leprosy, there has been a tendency to belittle the need for medical attention and to regard it as more or less self-healing. While this may be true in certain races, in others the results may be just as devastating as those of any cutaneous case, there is the ever present possibility of acute tuberculoid leprosy, and untreated or badly treated cases may change over to cutaneous leprosy as is not infrequently seen here. The response to the type of treatment I have outlined has moreover a very satisfactory effect on the morale of any settlement in both patients and staff alike. I have ventured therefore to describe a system of treatment for tuberculoid leprosy. It can be summarised as follows:—

(i) For simple subactive leprides or leprides of the indolent type, standard injections of ethyl esters combined with intradermal injections.

(ii) For all leprides with advancing periphery or lepride plaques with granulomatous activity—leave the local lesion strictly alone. Give subcutaneous hydnocarpus oil in doses of 1 cc. per ten pounds of body weight twice a week on courses of five months followed by one month's rest.

(iii) Hydnocarpus oil will control and damp down tuberculoid activity; phthalic acid will increase it. Where it is desired to keep a recurring flicker of tuberculoid activity, I suggest hydnocarpus oil in the dose given above for six injections followed by two injections of 2% phthalic acid, three cc. to ten pounds of body weight. The alternative treatment to be continued for five months followed by a month's rest. In individual cases the amounts of either drug would require to be varied according to the lesion response.

(iv) In acute tuberculoid leprosy as much as 1 cc. of hydnocarpus oil to five pounds of body weight may be given twice a week until the acute phase is over. Phthali should not be given to acute tuberculoid cases.

(v) A series of experiments including controls has been briefly described showing very satisfactory results from the methods summarised above. With a few exceptions the subjects of the experiment were Malayan Chinese.

Dr. Ryrie sends a later note written on January 28th, 1938, in answer to questions regarding further progress of the cases, and the possibly depressing effect of very large doses of hydnocarpus esters:—

The twenty cases on large doses of hydnocarpus oil have continued to do well and it is now nearly a year since treatment was inaugurated. I think, however, it would be well to qualify my results by pointing out that Chinese leprosy in Malaya is not necessarily representative. For example intradermal treatment here does not have the wide range of usefulness that is claimed for it elsewhere; in Chinese Malayans it is usually effective in cases where there is any degree of cellular activity Again leprosy among these Chinese appears to have eruptive propensities that are less common elsewhere. A treatment therefore which ameliorates the cases I have described may not necessarily have general application. Malays, however, appear to respond well in tuberculoid cases.

With regard to apparent improvement being due to deterioration and lessening of reactive power. I would suggest that the lesions may subside either for good or evil, just as a temperature may subside on recovery or on the break-down of resistance. The general condition of my cases on hydnocarpus oil leads me very definitely to the belief that the apparent improvement is real and beneficial. On the other hand we have other cases where paralysis and atrophy of cellular response obviously occur as a result of resistance break-down and are reactivated on general recovery. I myself am convinced, however, that the two processes are different.

The matter seems to me of very great importance. The greater part of the reputation of hydnocarpus derivatives is built on their effect on tuberculoid lesions. If the specific obliteration or recession of these lesions is harmful, then most workers are doing a considerable amount of damage, slowly with low doses and more quickly with high doses. Possibly my point of view is one-sided owing to the exhausting virulence of some of the tuberculoid cases here. I have ceased to regard tuberculoid leprosy as a manifestation of resistance but as a potentially dangerous sensitisation of the area involved—tissue—vindictiveness rather than tissue defence.

*On Leprosy in the Bible

H. P. LIE.

There is also a number of other circumstances which make it practically impossible to assume that the *zaraath* mentioned in the Bible can have been the present day leprosy. Thus in the description of *zaraath* it appears that this can change appearance in a very short space of time, such as one or two weeks. On the contrary, present day leprosy is

*Second part of an article reprinted with permission from *Acta Dermato—Venereologia,* Vol. XVIII, No. 4.

emphatically a chronic disease which changes very slowly. Even minor changes often take years and it may also remain inactive for years. The only exc
acute attacks, but these distinguish themselves by a reddish, at times a highly red colour, at any rate among the white race, and are accompanied by severe leprous infiltrations of the affected skin. These parts are, therefore, more or less elevated above the level of the surrounding skin. This is exactly the opposite of what takes place in *zaraath.*

According to the biblical version of *zaraath,* it must be assumed in many cases to have been an easily curable disease. A typical instance of this is that of *Naaman* (II. Kings, chapter 5, verse 14). Our present day leprosy would certainly not be cured by bathing seven times in the River Jordan, as was the case with *Naaman.* It is unfortunate that this history does not give any description of the disease, since it strikingly calls to mind the affection mentioned in Leviticus, chapter 13, verse 6. In regard to the latter, there is more or less general agreement that it conce
That it really was scabies or a similar epizootic in the case of *Naaman* is not disproved by the statement that the prophet's servant, GEHAZI, who received some garments from *Naaman,* also contracted a disease which, according to the Bible, was hereditary as punishment for disobedience. According to what was stated in this narrative, it could not be our present day leprosy. It must also be assumed that *Miriam's zaraath* was cured since she was received into the camp again (Numbers, chapter 12) after seven days of isolation. This simple cure of *zaraath* is greatly in contrast with the prognosis of our present day leprosy. Leprosy is not altogether incurable, but it takes a very long time and usually many years to cure the disease.

Apart from the references cited above, the occurrence of *zaraath* in individuals is described in three other places, namely in II. Kings, chapter 7, where four lepers lay at the entrance of the gate of Samaria and went to the camp of the Syrians. But no mention is made of any symptoms of the disease and nothing appears in their history to throw light on the actual nature of their disease. The case is somewhat different with regard to the two instances of *zaraath* mentioned in II. Kings, chapter 15, verse 5, and in II. Chronicles, chapter 26, verses 16, 19, 20 and 21. It must be assumed that both kings AZARIAH and UZZIAH were inflicted with a much more serious disease than for instance MIRIAM, since both were obliged to spend their entire life in isolated dwellings. In this instance we might perhaps consider actual

leprosy. It is unfortunate that no detailed descriptions are given of their disease. The fact that the disease suddenly broke out on UZZIAH'S forehead while he " was wroth with the priests and censored their privileges in their presence," is more apt to weaken than to strengthen this opinion.

The fact which throws the greatest doubt on the opinion that *zaraath* was the same as our present day leprosy is the biblical description of *zaraath* on *garments of different cloth, on furs and on stones in the house wall* (Leviticus, chapter 13, verse 47, etc., chapter 14, verse 34, etc.). Here, to be sure the colour is another than that on human beings, namely greenish or reddish, but otherwise it greatly resembles the latter. It is more deeply situated than the surrounding healthy parts and spreads in the same manner as that described in human beings, and the same observation and isolation regulations are in force. This disease on clothes, etc., must have been highly infectious and feared, since very strict measures regarding cleansing processes of the attacked articles, and in particular for the houses concerned, are set forth. It was further decreed that not only such articles should be cleansed, but also individuals who had been in the houses had to cleanse themselves. There can scarcely be any doubt but that this concerns some species of fungi.

If one turns to *Talmud* in the hopes of finding more information regarding *zaraath,* one is disappointed not to find any further clinical information
Bible. Neither is there any agreement between the *zaraath* in the Bible and *zaraath* in the *Talmud* where the question of leprosy is treated in *Mischna.* Here we encounter the unexpected assumption that *zaraath* does not belong to *nega* (nega = contagion) and it is, therefore, not considered to be infectious. According to *Mischna*, however, *bahereth. seeth* and *sappachath* belong to *nega. Bahereth* as well as *seeth* are white, but only the former is glistening like snow or the whitewash on the wall, while *seeth* is more dull white and not glistening. But in both instances there is a scaling variety and that is *sappachath.* This is not in agreement with the assumption that these words are similar to our present day leprosy, a thing we should be inclined to deduct in accordance with Leviticus, chapter 13, verse 2, if we assume that *zaraath* is our present day leprosy. Further, a red *bahereth* is also mentioned, and a great number of colours are set up varying between red and white. Thus one teacher sets up 72 different forms. This fact leads us quite " out of bounds " and beyond the medical apprehension of our present day. For this very reason it is readily under-

stood that it was decreed that such patients must only be examined when the light was favourable and fell favourably upon the body, and that no one-eyed person or priest with poor eye-sight was permitted to examine these individuals and express his opinion on the nature of the disease.

As far as *zaraath* otherwise is concerned, it must have been a dreaded disease as it attacked the surroundings with its *emanations*. *Talmud* mentions an old saying that a bad wife means zaraath for the husband and he shall leave her and be healed. It will be seen that *Talmud's* version of *zaraath* is not so little different from that of the Bible. It does not support the assertion, however, that the *zaraath* spoken of in the Bible is our present day leprosy.

It has already been pointed out above that both the Septuagint and the Vulgate translate *zaraath* with lepra. But the Greek word λέπρα, derived from λέπω = scaling, is the term used for various less severe diseases presenting crusts and scale-formations which are totally different from our present day leprosy. The latter is generally spoken of as *elephantiasis* by Greek authors. This regrettable confusion has been further increased by the fact that HALY ABBAS'S Latin translator STEPHENUS, has translated the Arabian *baras* also as lepra. This *baras* which is described by a number of Arabian writers is said to have two forms, one dark and one white. This latter form is considered as being the actual *baras* and identical with the Greek λεύκη and the *zaraath* of the Hebrews, but not with the Greek *elephantiasis*. But the confusion became complete when the Arab's *judam, juzam, aljuzam* and *dsjuddam* which are the equivalent of the Greek's *elephantiasis,* were also translated as lepra by the Arab's Latin translators with one exception, namely, the translator of HALY ABBAS, who translated *juzam* as *elephanta*. As a result of these erroneous translations we surely have one of the reasons for the confused views taken by many writers prior to DANIELSSEN and BOECK, and also that the Hebrew's *zaraath* has found its way into biblical translations and has been looked upon as our present day leprosy.

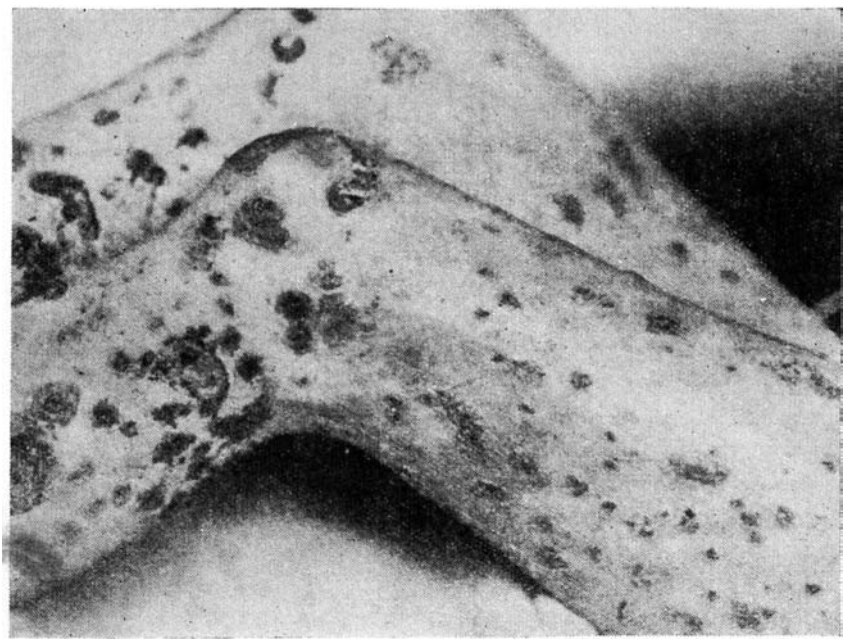
It must be admitted that several of those who have declared that they assume that the biblical *zaraath* is our present day leprosy, have had a private doubt as to the correctness of their assumption. But most individuals who occupied themselves with leprosy mentioned in the Bible have had no doubt that *Job* was a leper. A sufficient proof of this fact is that *Morbus Hjobi* was quite a general name for leprosy. Likewise all the pictures from the Middle Ages

which illustrate him, represent *Job* as a leper. This assumption has flourished up to this very day. Thus BABES, in his great work on leprosy from the beginning of this century, says: *' Hjob ist jedenfalls ein Lepröser "*. Some authors have disagreed with this opinion and in the course of time a great many opinions have been advanced as regards *Job*'s disease. Thus, it has been expressed that *Job*'s disease must have been *syphilis* on account of the nocturnal pains, for *Job* exclaims: " My bones are pierced in me in the night season " (Chapter 30, verse 17). On account of the doubtful existence of syphilis in ancient times, one can, I presume, ignore this theory. BARTHOLIN has been of the opinion that the disease was a boil in the throat, since *Job* says: " It bindeth me about as the collar of my coat " (Chapter 30, verse 18). This seems but little reasonable since this diagnosis does not take into account a number of other symptoms and circumstances connected with the disease. Again, others have advanced the theory that it may have been *varicella,* or even bubonic plague etc. MUNCH is of the opinion that *Job*'s disease must have been eczema on account of the persisting and severe itch. PREUSS shares more or less in MUNCH'S opinion and looks upon it as a *general eczema.* After a thorough analysis, B. EBBELL has arrived at the firm conviction that *Job*'s disease, which in Hebrew is called *schechin,* has been *variola.* EBBELL'S view is very interesting and enticing, but despite this, I cannot share his opinion of the variolous nature of *Job*'s disease, particularly since he disregards the important characteristic feature of *Job*'s disease, namely the itch. Neither can I accept the view that *Job*'s disease was a case of leprosy. In the severe pains in the legs of which *Job* complained, some authors may perhaps have recognized the severe and painful *neuralgiae* which frequently occur in the extremities of lepers. It must be borne in mind, however, that such pains are most often met with in the maculo-anaesthetic patients, and rarely in purely nodular lepers. The extreme formation of sores from the crown of the head to the soles of the feet, which is emphasized in *Job*'s case, is not encountered in the uncomplicated maculo-anaesthetic case of leprosy. One may likewise state that the itch does not belong to any form of uncomplicated leprosy. The itch which these patients occasionally complain of is exceedingly slight and the cause of it can generally be explained by other reasons than leprosy. The formation of sores belong to the later and last stages of nodular leprosy, and many patients escape sores altogether. In the description of *Job*'s disease there

is made no mention of the formation of *nodules*. If, in accordance with BABES' supposition, we assume that *Job* was leprous, then it must be exceedingly hard, if not impossible, to believe that *Job* was cured. For *Job* became eventually cured and happy, and left a healthy and beautiful issue. We cannot take for granted that such a description should refer to a leper who, according to BABES, was so severely attacked by the disease in the throat that he suffered from difficulty in breathing. In lepers such difficulties in breathing arising from throat affection are caused by scarred strictures in the larynx. Ulcerations in lepers may, to be sure, be cured, but not these scarred strictures. BABES himself is quite aware of the fact that it is difficult to assume that *Job* was a leper on account of his cure. He evades this difficulty, however, by assuming that the cure was only *relative*, an assumption which seems to me quite unconvincing. That *Job* suffered from an exceedingly severe and troublesome itch must be accepted as fact, and he has, in order to get relief from his suffering " taken him a potsherd and scraped himself withall " (Chapter 2, verse 8). As far as can be gathered, this symptom has also been decisive for MUNCH and PREUSS, since they have diagnosed the case as *eczema*. This assumption, however, seems to me inadequate to explain the description of the severity of the disease, neither the extensive formation of sores (Chapter 2, verse 7), nor the dark colour of the skin (Chapter 30, verse 30). It is still more difficult to assume that *Job*'s disease has been *eczema* when one considers that *schechin* is enumerated among the plagues of Egypt. We shall return to this later. It is likewise out of the question that *eczema* could have become epidemic and attacked the greater part of the entire people.

The thought has become more firmly fixed in my mind in the course of time that *Job*'s disease has not been any of the aforementioned diseases, but *scabies*, and in particular the malignant form which goes under the name of *scabies crustosa*. Unfortunately, this is also mentioned as *scabies norvegica*, but quite without any reasonable cause since it is reported from most European countries and all parts of the world, except Australia. It was D. C. DANIELSSEN who first verified and described it at ' *naturforskermotet* " (meeting of natural science investigators) at Christiania (Oslo) in 1844, where he demonstrated the curious crust-formations with enormous masses of *sarcoptes scabiei* in the crusts, such as he had encountered them in a leprous patient. The disease is also described in DANIELSSEN and BOECK'S

chief work ' *Om spedalskhed* " in 1847, page 160. It is also pictured in the atlas of this great work. In regards to the description I shall merely cite a few clinical symptoms: " The peculiar thing is the large, horny, grey-brown crusts which, when they are knocked or torn off, leave behind an ulcerated skin surface which secretes a scanty, viscid matter, and shortly forms new crusts. The patient is constantly troubled with an insufferable itch over the entire body; he is never seen sitting still, but is constantly scratching



SCABIES CRUSTOSA

himself, and his night's rest is greatly disturbed ". A more detailed description of the disease was published by BOECK in 1855, owing to a couple of new cases among non-lepers. According to KIESS not more than a total of 57 cases had been recorded up to 1928. It would certainly be quite erroneous to assume that this inconsiderable number presented the actual expression for the frequency of the disease. Neither is the clinical picture in all cases quite limited; the crust-formation can be more or less pronounced even in *scabies crustosa.*

It is known that scabies is most frequently complicated with eczema and occasionally with abscesses, furunculosis, or phlegmons. In such cases there may be greater or lesser crust-formations and the limit between these and the real *scabies crustosa* may become uncertain. The actual cause

of the pronounced crust-formation is as yet unknown. It appears most frequently among young, neglected and poor individuals. The cause of the malignant form must be sought in the host rather than in the parasite, and uncleanliness plays doubtlessly an important part in this respect. We must assume, therefore, that the malignant form of scabies occurred in ancient times as well as in modern times much more commonly than considered and that the ancient Hebrews formed no exception.

As far as the relation between leprosy and scabies is concerned, the latter has certainly been a very frequent companion of the former, and doubtless has at times assumed serious proportions. The first case described by DANIELSSEN is not the sole proof of this. Throughout the literature on leprosy we encounter scabies and at times this disease assumed forms which rightly made it greatly feared. When leprosy was most prevalent in Norway it was rare to find a leper who was not also inflicted with scabies. Among these I have personally come across a typical case of *scabies crustosa*. The treatment of this case lasted an entire year although the crust-formation was less pronounced than in the case described by DANIELSSEN. If we turn further to the Norwegian history on leprosy we find that CHRISTEN HEIBERG described cases of leprosy in 1827 which prove that the malignant forms of scabies cannot have been a rarity. HEIBERG describes three forms of leprosy: the nodular, the smooth (*glabra*) and the scaling (*squama*). The characteristic features of the latter form, according to HEIBERG, are that it begins with a dryness and shrivelling of the skin on feet and hands, which spreads to the limbs and then particularly o the inside parts, and occasionally to the breast and abdomen. After some time there appears a ringworm-like rash on the limbs, and the skin becomes scaly. This rash may disappear to return later and becomes very unpleasant on account of the severe itch. The rash continues to spread and without disappearing it forms into broad grey-white crusts approximating an inch (3 cm) in thickness, with swelling of the lymph nodes in the armpits and groins. It is my opinion that this concerns the veritable *scabies crustosa*. The swelling of lymph nodes so commonly encountered in this form is obviously due to secondary infections. I have described such infections in a fatal case of scabies crustosa in a non-leper.

Writers in the 18th century, such as HENSLER who observed one single case of leprosy and collected a great amount of literature on the subject, mentions one form of

rash as leprosy. This began with spots that shortly itched and produced scales which broke off. But the rash increased in extent and size and the scales became huge crusts which caused a *burning feeling in the skin,* and an insufferable itch. Pursuant to HENSLER, some writers have called this complaint *impetigo,* others *prurigo,* but most of the writers have called it a dry ulcerating scabies (*scabies sicca ulcerosa*), which was very much feared during the Middle Ages on account of its malignant form. HENSLER may have been partly correct in specifying it as a form of lepra, although not pure leprosy, owing to the fact that the affection was partly accompanied by reduced feeling in arms and legs. It is quite evident to me that it is *scabies crustosa* which most nearly answers the description of this disease. The crusts are partly described as pieces of bark (*cortices*), and partly as round and hard formations with the addition of *ostraca, testositas.* The somewhat varied colour is described as dark by the majority of writers. The possibility of *syphilitic rupia* can presumably not be excluded in every case, but the insufferable itch must be looked upon as a proof of the presence of scabies. With regard to the diagnosis *impetigo* it must be mentioned that W. BOECK (1855) states in his description of *scabies crustosa,* as well as in his special work on leprosy (Om den spedalske Sygdom) (1842), that *eczema impetiginodes* is very common among lepers with scabies. Of other 18th century writers I shall only mention PLENCK who goes so far as to specify a special form of leprosy, *lepra scabiosa,* which commences with blisters, extensive itch and burning of the skin. The blisters turn later on into large grey-green crusts which cover the entire body and even the face. Other Middle Age writers have also associated scabies and itch with leprosy, such as BERNHARD GORDON (Montpellier, 1305) and the aforementioned " author innominatus " Even such an early writer as ARETAEUS (ca. 100 A.D.) states in his excellent description of nodular leprosy, that itch may be present in connection with this disease.

Scabies has been so thoroughly discussed in order that it may be compared with *Job*'s disease and the symptoms present great similarity. It has already been stated that *Job* must have suffered from an insufferable itch and in order to convey an impression of the manner in which *scabies crustosa* may present great sores which cover the entire body, a photograph is inserted of a case of *scabies crustosa* in a non-leper which has previously been mentioned by the writer.

The patient in question was actually covered with sores and crusts from the soles of his feet and up to the crown

of his head. In accordance with *Job*, chapter 2, verse 5, it must be assumed that in the case of *Job* crusts have formed on his skin, and the " worms " that he complains about in the skin can very well be explained by the burning and insufferable itch which accompany this form of scabies. When *Job* says in chapter 30, verse 30: " my skin is black upon me and my bones are burnt with heat ", from this may be referred that the crusts in *scabies crustosa* often are dark and that the disease often begins with big, dry crusts on the feet (see W. BOECK's sketches). That *Job*'s nights are a torture and that he is troubled with dreams seems to agree very well with the restless and sleepless nights sustained by scabies patients (chapter 7, verse 14). The fever that often accompanies the malignant forms of scabies will also be able to explain the severe pains that *Job* complains of (chapter 30, verse 27): " my bowels boiled, and rested not ". It appears from chapter 30, verse 10 that they who were around him abhorred and fled from him: " they abhorr me, they flee from me ". This is quite reasonable since *scabies crustosa* is very contagious and the afflicted person is most gruesome in appearance. If *Job*'s disease had been leprosy it is surprising that his friends would sit with him, since leprosy was considered an infectious disease in accordance with ancient statutes. It was for this reason that all lepers had to be isolated. The same must presumably have been the case in *Job*'s disease, had it been *variola*.

We have already mentioned that the Hebrew word for *Job*'s disease was *schechin*, with the addition of *ra* = malignant, and this may very well agree with *scabies crustosa*. The general scabies must have been widely known and not particularly feared. The malignant form, however, was altogether a different matter and greatly feared. The Septuagint translates *schechin ra* with ἕλκος πονηρός, but this does not give a hint in any special direction and we cannot find, at any rate in the literature, any such term designating true leprosy. Neither does the Vulgate, which translates *schechin ra* with *ulcus pessimum*, give us any hint as to whether we can assume it to be leprosy. Its Latin translation conveys the meaning of a malignant sore-disease in general and says nothing about the special nature of this disease. The disease *schechin* is mentioned several times in the Bible. Thus, in Exodus, chapter 9, verses 8—11 it is employed for one of the plagues of Egypt. Aforementioned reports from the Middle Ages have made it clear that scabies can spread and be greatly feared, and just as the plague here mentioned appeared on cattle also, scabies

is very prevalent among animals and can be transmitted to man from them. There was a time when it was even believed that *scabies crustosa* was a form of scabies transmitted from wolves to man. Presumably this is not the case. However, it is not unlikely that scabies can be passed on to human beings by the horse. As a plague, scabies can of course be naturally classed with the plagues mentioned in Exodus, chapter 8, namely of frogs, lice, etc. In Deuteronomy, chapter 28, are set forth the punishments that shall befall the disobedient and among these is mentioned *schechin* (verses 35 and 37). It is interesting to note that in verse 27, *schechin* is spoken of in connection with itch, and in verse 35 it is stated that *schechin* shall appear on the knees and legs. It may be interesting to mention in this connection that the knees are one of the most predilected places for *scabies crustosa.*

Schechin is mentioned also in II. Kings, chapter 20, verses 1—7 as being Hezekiah's disease. Judging from the description, treatment and the results thereof, we must presume that we are dealing with an abscess or furuncle. This fact neither disproves nor excludes that *schechin* is synonymous with scabies. It has already been mentioned that in scabies it is no rarity to encounter abscesses and similar affections caused by secondary infection, and these two diseases may, therefore, easily have been confounded at that time, as they surely have continued to be.

Schechin is also mentioned in Leviticus, chapter 13, verses 18, 19, 20 and 23, but in such a manner that there must exist some connection between that and *zaraath,* since *schechin* may develop into or change to *zaraath.* But in accordance with the same chapter, verse 2, the same may be the case with scabies. Their similarity in changing to *zaraath,* makes it very likely that *schechin* and scabies have been one and the same disease, if perhaps in some other form or degree. It will be recalled that malignant scabies is frequently encountered in lepers and that some writers have even drawn up the particular form *lepra scabiosa.* It will easily be understood, therefore, that a patient with *scabies crustosa* but *without* leprosy has been considered as a leper and consequently been classified in literature on leprosy, as was probably the case with Job. In regard to this assumption in connection with *Job*'s disease, it should be remarked that the *entire* Book of *Job* mostly conveys the impression that it constitutes a religious composition rather than an objective description of actual facts. Under such circumstances it is not wholly improbable that the

conclusion in this matter, is scarce, wholly confused and some even completely unintelligible. Besides, much of it points in quite other directions than toward leprosy. Thus, if one attempts to find conclusive proofs in the Bible that leprosy has existed among the ancient Hebrews, one will search in vain.

In conclusion, I will avail myself of this opportunity of thanking the Reverend Pastor HERMAN FRIIS LAADING, Bergen, Norway, for his valuable help and guidance with regard to the original biblical texts.

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*Sternum Puncture in Leprosy—a Study of Fifty Cases

J. LOWE and DHARMENDRA.

Leprosy appears to be largely an infection of the reticuloendothelial elements in the body. In the skin and in the nerves infection appears to be of this nature. In "skin" leprosy the endothelial cells lining the blood vessels are frequently affected. The reticulum of the lymphatic glands is frequently affected. Lesions of the internal organs are not uncommonly seen and it is noticeable that the Küpffer cells

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of the liver are frequently affected and also the reticulum cells of the spleen.

That the cells in leprous tissue are of the nature of histiocytes has been demonstrated by the injection of aniline dye which is taken up by the cells. Similar findings have been made in rat leprosy.

An important part of the reticulo-endothelial system of the body is the bone marrow. Very few references are found in the literature of leprosy to affections of the bone marrow. According to Klingmuller the infection of bone marrow was first observed by Babes and later by other workers but the work on the subject is very meagre. Gass (1936) examined the bone marrow of bones removed from cases of leprosy at operation and found lepra bacilli present almost invariably in cases of cutaneous leprosy.

It appears possible that the bone marrow might be an important focus of leprous infection. In cases of cutaneous leprosy the infection is a widespread one in the various tissues and organs of the body and it is noticeable that in such cases, improvement with disappearance of the bacilli from the skin is frequently followed by relapse. It is possible that there may be in the body foci of persistent latent infection one of which might be the bone marrow and that from these foci bacilli are liberated causing relapse. In cases of nerve leprosy the infection is apparently localized in certain tissues of the body. Clinical observation of such cases of leprosy with alternating periods of quiescence and activity suggests that even in cases of nerve leprosy there may be in the body some focus of infection from which bacilli are liberated from time to time. This focus might possibly be the bone marrow.

It therefore seemed desirable that more information should be collected regarding the infection of bone marrow in leprosy and in the various types and phases of leprosy. Our first attempts at investigation of this matter were made at autopsy but autopsy material is very limited in this centre. Nevertheless by trephining the tiba in a few cases of leprosy at autospy we were able to demonstrate that infection of bone marrow is present and is surprisingly heavy in cases of cutaneous leprosy. We were unable to get cases of nerve leprosy to study by this method, and therefore we sought for means of examining the bone marrow during life.

The only method available seems to be sternal puncture which is being increasingly used for a study of bone marrow in connection with blood diseases. The sternal puncture apparatus consists of a fine trocar and cannula rather like a

lumbar puncture needle with a special adjustable guard which can be fixed, by means of the screw, at the desired distance from the end. The cannula is made to fit on to the end of a record syringe. The method of obtaining sternal puncture material is as follows :—

The site for the puncture is the middle of the sternal opposite the third intercostal space. The patient lies on his back and the skin, subcutaneous tissues and periosteum, at the site of puncture, are anæsthetised with 2 per cent. novacain solution, and about 15 minutes later the puncture is made. The guard is fixed between ½ and 1 cm. from the point of the needle, the distance varying according to the thickness of the tissues covering the sternum. The needle is driven straight down with a rotating motion and one can feel the outer bony plate of the sternum being pierced. When the needle has pierced the sternum its further progress is prevented by the guard and it is found that the needle is firmly fixed in the bone. If this is not so, it is probably because the point of the needle is not deep enough and the guard is then moved slightly further up the needle and the needle is inserted a little farther. At this point the trocar is removed and the syringe is attached to the needle and by steady suction about one cubic centimetre of sternal fluid is withdrawn. The actual piercing of the sternum is not painful with proper anæsthesia but a little pain is felt when the fluid is withdrawn.

Materials examined.

Sternal puncture material was taken by this method from 50 patients. They were classified as follows: 32 cases of cutaneous leprosy and 18 cases of nerve leprosy. Since the finding of a few bacilli in the sternal puncture material might possibly be due to the puncture being made through leprous skin, slit smears were made from the skin at the site of the puncture and examined in the ordinary way.

Examinations made.

The sternal puncture fluids were treated as follows :—

(1) A thick smear was made on a slide, dried, dehæmoglobinised with 3 per cent. acetic acid and stained for acid-fast bacilli.

(2) The remaining fluid was treated as follows: It was placed in a sterile tube containing about 0.5 c.c. of 3 per cent. sodium citrate solution. This was centrifuged. The supernatant fluid was removed from the cells and about 4 c.c. of 3 per cent. acetic

acid was added. After thorough mixing, the tube was again centrifuged, the supernatant fluid being removed and smears made from the deposit.

Findings.

Of 32 cases of cutaneous leprosy, bacilli were found in the sternal fluid in 16. Of the 16 cutaneous cases, bacilli were present in the skin of various parts of the body and in the skin covering the sternum of 15, but in most of the cases the number of bacilli found in the sternal fluid was sufficiently great to make it unlikely that the positive findings were attributable entirely to the needle being infected by passing through leprous skin. We interpret these findings as indicating that the bone marrow of the sternum showed bacilli in approximately 50 per cent. of C cases examined. On the other hand in 18 cases of nerve leprosy, bacilli were found in the bone marrow in only one case. This case, however, is striking, the number of bacilli found in the bone marrow being considerable whereas no bacilli had been found in the skin of the body.

Discussion.

These findings show that when bacilli are present in the skin they are often but perhaps not always present in the bone marrow. The failure to demonstrate bacilli by a single puncture of one bone does not rule out the possibility of infection of the bone marrow in other sites. In our experience bacilli are present in the bone marrow in most cases of severe cutaneous leprosy and it would be interesting to find out whether, in cases in which the infection dies out from the skin, the infection still persists in the bone marrow. If so, this may help to explain many cases of relapse. The same remark applies in a modified degree to cases of nerve leprosy. The finding of bacilli in the bone marrow in one of 18 cases cases of leprosy by a single puncture of one bone suggests that a more thorough investigation might demonstrate the presence of bacilli in the bone marrow of a larger number of cases of nerve leprosy. We publish this note largely with a view to stimulating others, who may have facilities for the work, to make a closer study of the bone marrow in leprosy than we have been able to do. A careful study of material taken from *post-mortem* cases of leprosy of various types might give interesting results.

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*Study of a Benign Form of Leprosy Localised in the Feet

RAMIRO GALVEZ A.

In the Leper Hospital of " La Piedad " in the capital city of Guatemala the author had the opportunity of making a detailed investigation of fourteen cases of a special kind of neural leprosy of a very benign type, whose lesions were very definitely restricted in their localisation in the feet, with no signs of the disease in any other part of the body.

Symptomatology.

The history is given of the beginnings of the disease as related by the patients, who tell of neuralgia and lightning pains in the feet, cramp of the toes, with a later sensation of heaviness of the feet, formication and numbness of the toes. These sensations were attributed by the patients to all kinds of simple natural causes and they attached no importance to them. Later, however, they noted certain changes in the toe nails, which became dry and brittle, and finally dropped off or disappeared. In others the nails remained, becoming deformed and diminished in size, until they disappeared. Sometimes the interdigital spaces disappeared, the toes becoming fused together into a solid mass. Sometimes the toes assumed the deformity of " hammer toe " during the process of absorption. Sometimes blisters formed with open sores and ulcers. No pain was ever felt, the toes appearing to be without sensation. Other patients told of changes in the skin of the feet, which became dry and hard, thickened and furrowed.

Development of the disease is very slow, but it progresses continuously until a very definite point of limitation is reached. The histories recorded periods of 10 to 20 years. The social status and mentality of the patients did not incline them to take much notice of the very slow process of the mutilation of their feet, which was more or less painless, unless abscesses or infected ulcers caused inconvenience.

Apart from the mechanical inconvenience of the loss of the toes and its effect on their equilibrium and walk, the patients remained quite fit for work, and all their vital organs functioned normally. When there were open sores

*Translated and abstracted by Dr. J. W. Lindsay from a paper read at the 4th Central American Medical Congress, October, 1936.

and secondary infections the general health would be somewhat affected as in any other disease. There was never, however, any general reaction such as is observed in other forms of leprosy from the toxaemia produced by the bacillus of Hansen. Neither was there observed any signs of that condition of apathy and asthenia so generally seen in other forms, in which there is a more or less general infection.

All the patients observed were adults or old people, although their calculations showed that the disease may have begun any time in childhood, youth or adult age. Men and women suffer in equal proportions. Matters of habits or hygiene did not appear to be of any consequence. The wearing or not of footgear also did not appear to have any connection with the disease. Occupation had no influence, as field labourers and outside workers suffered the same as inside workers and women. There was nothing to indicate that heredity or cohabitation had any influence. The disease is not endemic in any special area, and the patients came from distinct zones of the country and quote different altitudes and climates.

Clinical picture of patients.

(a) Subjective signs were, as already indicated, neuralgic pains, cramps, contractions, heaviness of toes, formication and numbness of toes, diminution and later disappearance of both superficial and deep sensibility to pain, heat and cold, although sensibility to touch remained.

(b) Objective signs. The patients generally came for examination only after the disease was well advanced. There were noted the changes in the toe nails which were striated, dry, brittle, flattened or curved and deformed: sometimes the nails were found atrophied until only slight traces of them were left adhering to the skin. Such deformities as hammer toe were observed with the parrot-foot-like varus turning in of the feet, changes in the movements of abduction, adduction, extension and flexion, according as the lesions had affected the external or internal plantar nerves.

The interdigital spaces had disappeared and the toes remained fused together in a solid mass. The mutilation of the toes was without any break in the continuity of the skin, and was due to a process of combined retraction and absorption of the integument and rarefaction of the bones, the distal phalanges becoming cone-shaped stumps, gradually disappearing up to the metatarso-phalangeal joints, at which point the absorption process always definitely stopped. The

vestiges of the toes remained in some as simple buttons of skin, while in others the absorption was so complete that the stumps remained as clean cut as after a surgical operation. The patellar and achilles reflexes remained normal or slightly diminished, but ankle clonus could not be elicited. Sensibility to pain both superficial and deep was abolished as well as to heat and cold, although sensibility for touch remained. These signs were found exclusively in the feet and in a few cases up to the lower third of the legs The walk of the patients was peculiar, being slow and mincing, not from any central or spinal lesion, but from the purely mechanical effect of the weight of the feet in the hyperplasia forms; and from the want of support and flexion of the anterior segment of the foot in the cases of multilated toes the patients sometimes looked as if they were walking on stilts or on their heels. Sometimes distinct schlerodermia of the foot was found with dryness of the skin (anhydrosis). There were also hyperplastic changes in the skin with keloid-like scar formation.

Achromia patches were seen, smooth and anaesthetic, sometimes hyperchromia too, and one case of melanotic pigmentation. There were found pemphigoid lesions which became vesiculo-pustular, ending in ulcers of different aspects, which were sluggish and remained localised; sometimes typical neurotrophic lesions were found, as perforating plantar ulcers, infected and suppurating.

All the lesions had a markedly selective tendency, which is their special characteristic; they were definitely and exclusively confined to the feet, with the skin of the lower thirds of the legs in a condition of elephantiasis. The lesions were always symmetrical in position and simultaneous in their occurrence. No analogous lesions were found in any other part of the body, skin, mucosa or nerves, and no mutilations of the hands or facial paralyses were found. The peripheral circulation was not affected in any way except where the fibrous sclerosis of the tissues with the formation of keloid and furrows had impeded the circulation.

Classification of the clinical varieties observed.

(a) The dry variety with no open lesions, but with mutilation of the toes by absorption. (Figs. 4, 6.)

(b) The hyperplastic variety in which the skin and bones of the feet assumed enormous proportions, as in acromegaly, but without the co-existence of deformities in the hands, thorax, craneum, face, etc. In one such case there were some nodules on the enlarged foot, but no nodules in any other part of the body. (Figs. 1, 2, 3.)

(c) The mixed variety with dry mutilation of the toes, sometimes with open sores, atonic discharging ulcers, sometimes even perforating ulcers. (Fig. 5.)

(d) The complex type with dry mutilation of the toes, extensive ulceration of the side of the foot and heel and very pronounced melanotic pigmentation. (Fig. 7.)

Complementary Examinations.

The urine was found normal in all cases; in three cases centrifugal examination revealed the presence of the Hansen bacillus in the sediment fixed by heat and stained with Ziehl-Nielsen.

Nothing special was noted in the blood.

The serum reactions, Bordet, Wasserman and Kahn, were negative; the Menniche test was positive in three cases. Rubino's reaction of sedimentation was positive.

Nasal mucous examined repeatedly with or without iodine of potassiun, were always negative for Hansen's bacillus.

Smears from open lesions showed the bacillus in two cases.

Material from scrapings of skin of affected parts and from patches of achroma and anaesthetic patches, as well as from gland puncture, gave negative results.

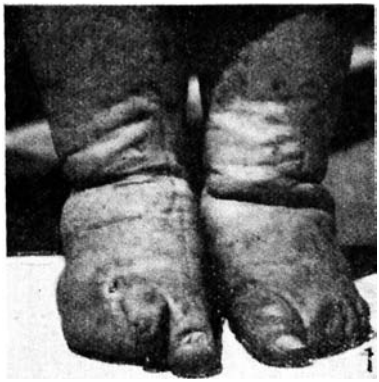
Histopathology.

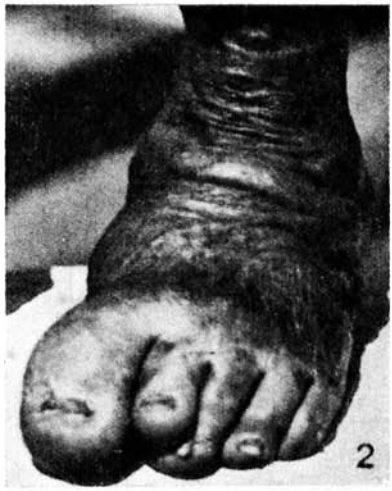
A nodule from a hyperplasia case was excised and examined anatomo-pathologically. It was found to present all the characteristics of classical lepromes. Similar examinations were made of pieces of tissue from the affected feet. This was considered to be the best method of diagnosis of such clinical cases of neural leprosy, as it did not yield positive results in the search for Hansen's bacillus.

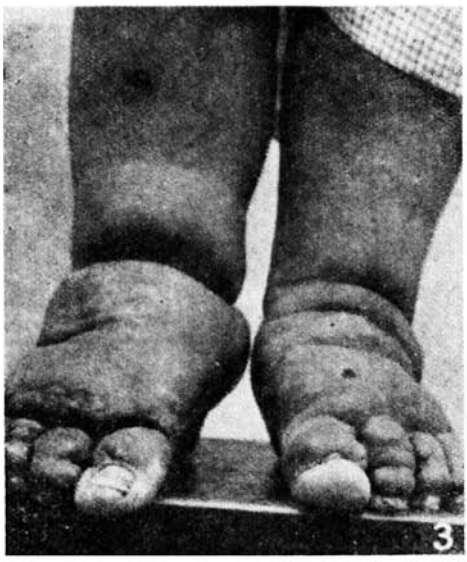
Radiograms demonstrated a series of processes taking place in the skeleton of feet, deformation, rarefaction, proliferation and absorption of bone.

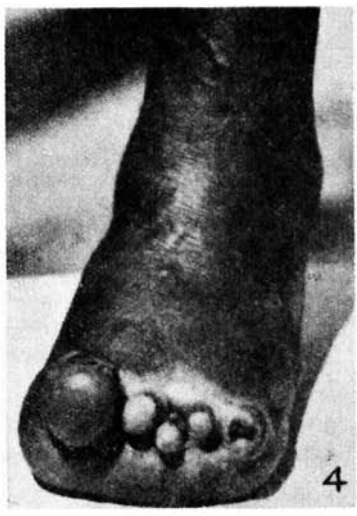
In the dry form with mutilation from absorption of the toes, disturbance of sensation and sclerodermia, and administration of chaulmoogra derivatives produced a certain degree of improvement in the return of sensibility to pain, heat and cold, the disappearance of formication, and the feeling of heaviness of the feet, while the skin of the feet became almost quite normal again.

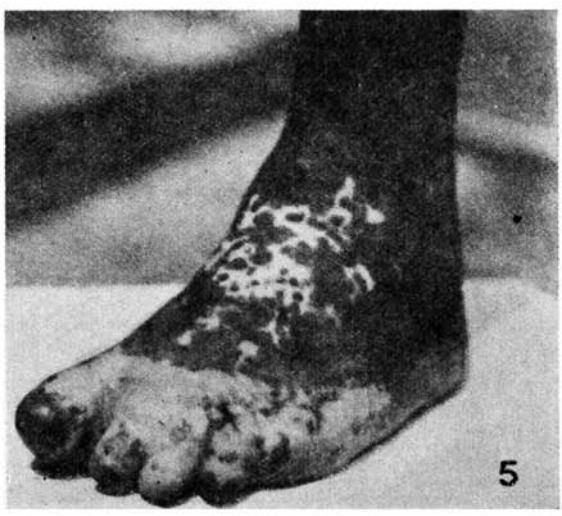
The most marked and most surprising effects, however, were seen in the treatment of mixed cases. In two cases in which the discharge from the local lesion was positive for Hansen's bacillus, the treatment produced complete sterility from bacilli, and complete and firm cicatrisation of the open lesions and even of a perforating ulcer.

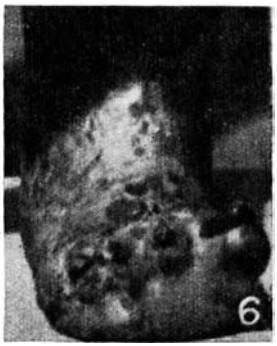


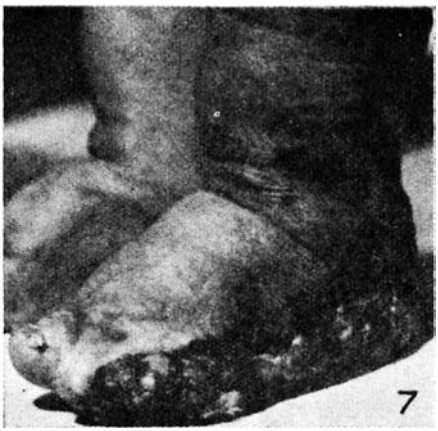


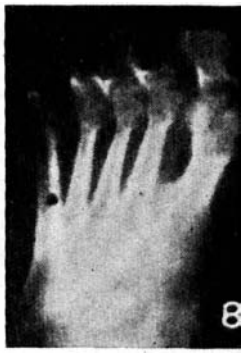












Plates illustrating the cases.

Fig. 1. Complete mutilation of last four toes of both feet; cutaneous hyperplasia of feet and lower third of legs, very distinct elephantiasis.

Fig. 2. Enormous increase in size of both feet; hyperplasis of skin; change of nails.

Fig. 3. Enormous increase in size of feet; hyperplasia of skin; nodules of skin; achromic anaesthetic patches on big toe of right foot; change in nails; four "hammer toes."

Fig. 4. Mutilation of toes of both feet, which remain as mere buttons of skin. Achromic zones correspond to ulcerated lesions healed after treatment; the patches are anaesthetic.

Fig. 5. Deformity and mutilation of toes; changes in nails; achromic anaesthetic zones corresponding to ulcers cicatrised after treatment; parrot-foot deformity.

Fig. 6. Mutilation of all the toes of both feet; traces of nails left; exfoliative cutaneous lesions; both feet reduced to deformed stumps.

Fig. 7. Mutilation of toes of left foot; remain as simple buttons of skin. Extensive ulceration of outer side of foot as far as the heel, with marked melanotic pigmentation.

Fig. 8. Radiogram showing rarefaction and decalcification of bone. alterations in joints and absorption of phalanges : thickening of metatarsals.

*Leper Hospital, Makogai

C. J. AUSTIN.

In view of the fact that the twenty-fifth anniversary of the Hospital occurred during the year, a short review of the history and progress of the institution from its inauguration in 1911 may be appreciated as an introducton to the actual report.

The island of Makogai—about two and a half miles long and one and a half in width—was purchased by the Government of Fiji in 1909 for the specific purpose of segregating cases of leprosy. The latter policy had already been carried out on a small scale on the island of Mbengga, but with the proposed introduction of compulsion, an island not otherwise inhabited became necessary, and Makogai, hitherto a coconut plantation, was selected for the purpose.

Forty patients were transferred from Mbengga to Makogai in November and December of 1911, buildings having been erected, a doctor and two Sisters of the Order of Mary appointed, and a native staff for farm work collected. It is noteworthy that thirty-six of this number had been voluntary admissions to Mbengga, the four others having been transferred from the gaol or lunatic asylum. Of these original admissions, three survived to 1934, and the final survivor—who had been a patient at Mbengga for some years before his transfer —died in 1936.

Numbers increased rapidly in 1912 to 154, and then more gradually to 300 in 1917, remaining around that figure for the next ten years. From 1927 onwards the Hospital began to merit its present title of " Central Leper Hospital," for a scheme was started by which patients were sent to Makogai from New Zealand and its dependencies—the Cook and Niue Islands, and Western Samoa—as well as from Tonga. A " peak year " was reached in 1935, when the Gilbert and Ellice Islands Colony entered the scheme, and the total of patients at the end of the year numbered 575.

Over two thousand patients have been admitted during the quarter century, but a number of Indians, particularly during the early years, were admitted only for short periods of treatment prior to repatriation. Voluntary repatriation is still permitted by an arrangement with the Government of India, provided the latter can trace relatives willing to assist, but the number of applicants is now very small.

It was not until the year 1918 that an amendment to the

*Abstracted with permission from the Annual Medical and Health Report. Fiji, for 1936.

Leper Ordinance was passed allowing the conditional discharge of patients certified by a Medical Board as having been free from activity for a minimum period of two years. Such patients were to report themselves every three months to the Medical Officer of their district, without whose permission they were not allowed to change their domicile. Three hundred and sixty-three patients benefited by this clause, of whom sixty-two have later returned to Makogai. The majority of the latter, however, have been re-admitted for trophic lesions due to previous nerve damage, and cannot, therefore, be regarded as relapses.

The island is arbitrarily divided into a patients' area and a "clean" area tambu to patients. No irritant boundary fence is required and the recognised boundary line is loyally observed by the patients. The clean area includes the houses for the staff and farm labour, and the dairy, bakery, and soap factory; the patients' area includes the Hospital itself, and five outlying villages for able-bodied men, distributed according to race. Ample space is set aside for gardens, &c. Coconuts, breadfruit and citrus fruits abound, and the patients cultivate bananas, cassava, yams and taro, and to a less extent, European vegetables.

The main water supply depends on a dam constructed in a gorge well above the Hospital level, which is said to hold about 900,000 gallons. Sufficient pressure is thus obtained for the supply of the villages as well as the higher buildings in Hospital.

A three-mile motorable road connects the two ends of the island and in addition to its use by the staff, allows the daily transport of milk, bread, &c., from the clean area to the Hospital. Communication with Levuka—about 17 miles, or Suva—about 60 miles, is by an auxiliary cutter, which brings weekly mails, stores, etc.

TABLE I.—STATISTICS FOR THE YEAR 1936, CENTRAL LEPER HOSPITAL, MAKONGAI.

	European.		Half-Caste.		Fijian.		Melanesian.		Indian.		Rotuman.		Chinese.		Samoan.		Maori.		Niue Is.		Cook Is.		Tongan.		Gilbert Is.		Total
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	
1/1/36	3		7	2	91	38	43	4	145	45	29	22	9		12	6	1		1	3	27	26	7	9	30	15	575
Admissions	...	1	...		10	5	3	3	30	7	...	...	1		...	...	...		...	...	...	...	...	...	...	...	60
Deaths	...	1	...		13	4	5	...	12	5	2	...	1		2	1	...		...	...	2	1	...	...	5	...	54
Conditional Discharges	...		4	...	2	...			13	...	...	...	...		...	...	...		...	...	...	...	1	...	...	...	20
Repatriations	...		...	...	...	...			6	...	...	...	...		...	...	...		...	...	...	...	...	...	...	...	6
31.12.36	3		7	2	84	39	39	7	144	47	27	22	9		10	5	1		1	3	25	25	6	9	25	15	555
Total	3		9		123		46		191		49		9		15		1		4		50		15		40		555

The above and the following tables indicate that Indians continue to present the main problem in Fiji. Of the sixty admissions, thirty-seven were Indians and only fifteen Fijians.

Table II, showing the new patients classified according to nativity and type of leprosy, is fairly satisfactory as showing twenty-five of the sixty admissions in the comparatively non-infective neural stages, and the complete absence of advanced cutaneous cases. Little difference is to be noted between the Fijians and Indians as regards type and stage of the disease, proportions being 40.0 per cent. and 43.2 per cent. neural respectively. This question of the stage of disease is, of course, of vital importance with reference to prognosis, neural cases being on the whole much more amenable to treatment than cutaneous cases.

TABLE II.—ADMISSIONS, 1936.

	N-1	N-2	N-3	C-1	C-2	C-3	Total
Half-Caste	.	...	...	...	1	...	1
Fijian ...	1	4	1	.	9	...	15
Indian ...	2	14	...	1	20	...	37
Solomon Is.	2	1	...	2	1	...	6
Chinese ...	.	...	.	.	1	...	1
	5	19	1	3	32	...	60

For the purpose of survey, the records of 616 patients who had been six months or more during the year at Makogai have been investigated. These 616 patients are classified in Table III to show the relation of patients according to nativity and type of disease, the sexes being distinguished throughout. It may be noted as between Fijians and Indians that 44.2 per cent. of the 138 Fijians are neural, and only 32.2 per cent. of the 220 Indians. On the other hand, 20.3 per cent. of the Fijians are advanced cutaneous cases but only 3.1 per cent. of the Indians have reached that stage. This anomaly has been pointed out in previous reports, namely, that although the Indian appears to reach the moderately advanced stage of leprosy more readily than the Fijian, he comparatively rarely passes into the fully advanced stage. The typical " leontiasis " of advanced cutaneous leprosy is much less common in the Indian than in the Fijian sufferer.

TABLE III.—RACE IN RELATION TO TYPE OF LEPROSY.

	N-1		N-2		N-3		C-1		C-2		C-3		Total		
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	
European	...	...	...	...	1	...	...	...	2	...	...	...	3	...	3
Half-Caste	...	...	...	...	...	...	...	...	6	1	...	...	6	1	7
Fijian	10	6	22	18	4	1	12	2	28	7	22	6	98	40	138
Indian	16	5	29	16	3	2	28	3	87	24	6	1	169	51	220
Solomon Islanders	9	2	8	3	2	...	5	1	16	1	5	...	45	7	52
Rotuman	4	11	13	9	...	...	...	...	10	2	2	...	29	22	51
Cook Islanders ...	4	7	7	4	1	1	4	2	9	10	2	1	27	25	52
Gilbert Islanders	5	3	3	3	1	...	3	1	13	4	5	4	30	15	45
Samoan	...	...	2	1	...	...	2	...	6	4	2	1	12	6	18
Chinese	...	...	1	...	...	...	...	...	6	...	3	...	10	...	10
Tongan	...	...	1	...	1	1	1	3	4	3	...	1	7	8	15
Niue Islanders ...	...	1	...	...	...	...	...	2	1	...	...	...	1	3	4
Maori	...	...	...	...	1	...	...	...	...	...	...	...	1	...	1
	48	35	86	54	14	5	55	14	188	56	47	14	438	178	
Total ...	83		140		19		69		244		61		616		616

Treatment.

There is no question that general hygienic measures are of at least equal value with specific drugs in the treatment of leprosy. Nourishing food, fresh air, exercise and freedom from worry and boredom are vitally important factors. Patients at Makogai are encouraged to undertake open air work in their gardens, which are in themselves valuable sources of additional food for them, their surplus being bought for Hospital needs. Public work on buildings and roads is open to the able-bodied, while prizes are offered from time to time for cricket, tennis, canoe racing and other sports. For the further prevention of ennui and brooding, there are evening cinema shows, concerts by their own band, as well as the provision of picture papers, &c.

From the point of view of specific therapy, iodised chaulmoogra oil as described in previous reports, retains its popularity over other drugs. According to patients' accounts the injection is less painful than the previously used iodised ethyl esters of the oil, and although it is a much thicker product, abscess production is comparatively rare in view of the large number of injections given. The majority of patients further continue to take plain chaulmoogra by mouth, so that the specific effect of the injection is difficult to assess. Details of treatment are shown in Table IV.

For the nerve pain accompanying acute reaction in neural cases, injection of the ethyl esters of ndilo (*calophyllum inophyllum*) is still popular, as witness the nearly 300 injections voluntarily called for during the year. The oil has also been much in demand as an embrocation for painful parts.

The local injection of individual nodules by methylene blue has been continued and is of undoubted benefit in most cases. Very little general effect is observed however, and ordinary infiltrations and patches apparently fail to react.

Results of Treatment.

Having compared the relative proportions of the various stages of leprosy among Fijians and Indians—the only classes with sufficient numbers to justify comparison—it will be of interest to inquire if they fulfil the general rule as to prognosis given above. Reference to Table V will show that the Fijian figures give 5.0 per cent., 18.1 per cent., and 22.4 per cent of arrested (=freedom from activity for two years or more), quiescent (=freedom from activity for six months or more), and improved cases, respectively, as against Indian percentages of 7.2, 21.3, and 39.0. If the total of improved cases in each class be taken, the Indian figures show 67.7 per cent. as contrasted with only 45.8 per cent. for the Fijian. This discrepancy can be readily explained by the relatively large proportion of advanced cutaneous cases among the Fijians, the progress of whose disease can at the best be only retarded by any method of treatment so far in use.

TABLE V.—RACE RELATED TO PROGRESS.

	Arrested		Quiescent		Improved		Stationary		Worse		Died		Repatriated		Totals		
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	
European	...	...	...	...	2	...	1	...	...	...	...	...	...	...	3	...	3
Half-Caste	...	...	1	...	1	1	3	...	...	...	1	...	...	...	6	1	7
Fiiian ...	6	1	15	10	22	9	32	14	10	2	13	4	..	...	98	40	138
Indian ...	14	2	33	14	64	22	34	7	6	1	12	5	6	...	169	51	220
Solomon ...	2	...	15	2	13	5	7	...	3	...	5	...	...	...	45	7	52
Rotuman	...	...	11	16	5	3	8	1	3	2	2	...	...	...	29	22	51
Cook Islanders	...	1	7	10	11	6	6	6	1	1	2	1	...	...	27	25	52
Gilbert Islanders	...	...	1	3	8	8	16	4	...	...	5	...	...	...	30	15	45
Samoan ...	...	...	...	...	5	...	4	3	1	2	2	1	...	...	12	6	18
Chinese ...	...	...	...	...	1	...	7	...	1	...	1	...	...	...	10	...	10
Tongan ...	1	1	...	1	3	4	3	1	...	1	...	...	...	...	7	8	15
Niue Islanders	...	...	...	1	...	...	1	2	...	...	...	...	...	...	1	3	4
Maori ...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	1	...	1
	23	5	83	57	135	58	123	38	25	9	43	11	6	...	438	178	616
Total ...	28		140		193		161		34		54		6		616		

Table VI, showing progress in relation to stage of the disease confirms the statement that neural cases are likely

to show better results than cutaneous cases. Thus, of twenty-eight arrested cases, twenty-one or 75 per cent. are neural in type, and of one hundred and forty quiescent cases, one hundred and three, (73.5 per cent.) are neural. The Improvement column shows, however, a large proportion of cutaneous cases, so that it is evident that while cutaneous cases can be improved by modern treatment, comparatively few improve to the extent of " cure."

TABLE VI.—TYPE OF LEPROSY RELATED TO PROGRESS.

	Arrested	Quiescent	Improved	Stationary	Worse	Died	Repatriated	Total
Neural 1 ...	6	45	15	11	3	3	...	83
Neural 2 ...	12	54	38	20	4	10	2	140
Neural 3 ...	3	4	3	3	...	6	...	19
Cutaneous 1 ...	2	22	19	17	7	2	...	69
Cutaneous 2 ...	5	15	111	73	15	21	4	244
Cutaneous 3 ...	...	...	7	37	5	12	...	61
Total ...	28	140	193	161	34	54	6	616

The possibility of sex influencing the incidence and prognosis of leprosy has often been debated. As regards incidence our figures show once again a preponderance of males in the ratio of 438 to 178 females, or 71.1 per cent. Of the males 33.8 per cent., and of the females 52.8 per cent. are neural in type, so that, other things being equal, somewhat better results might be expected among women. We find, however (Table V) that 82.1 per cent. of the arrested, 59.2 per cent. of the quiescent, and 69.9 per cent. of the improved cases are male, while only 33.2 per cent. of the total of Improved cases are female. This must be in part at least the result of the more sedentary occupations and generally restricted life of the female patients, for the smaller incidence among women negatives the possibility of a lesser resistance to leprosy in their sex, without the further assumption that they are less exposed to infection.

Deaths during 1936 numbered fifty-four, a larger number than for many years. It is however, inevitable in an institution such as Makogai that the death-rate should be fairly high, for the healthier type of patient is being steadily discharged and there must remain an accumulation of advanced and maimed cases. Forty-one of the deaths occurred in cutaneous or advanced neural patients.

Thirty-four of these deaths may be fairly attributed to leprosy; eight to tuberculosis; nine to disease of the circulatory system; two to disease of the nervous system; one to disease of the respiratory system. This shows a much higher proportion than usual of deaths due to leprosy itself to those due to tuberculosis.

*A Proposed Revision of the Memorial Conference Classfication of Leprosy

H. W. WADE.

After discussing the various amendments to the Leonard Wood Memorial Conference classification of leprosy put forward by different writers, Dr. Wade suggests the following definition of terms and classification:—

DEFINITIONS.

In the present connection it is necessary to modify or extend certain of the definitions of the Memorial Conference classification in the light of present knowledge, and seems desirable to add certain others for the sake of completeness. The most important of the proposed modifications are the precision of "leproma" and the reduction of "leprotic" to its general sense. "Macule" is retained in its special sense, which leprosy workers will undoubtedly continue to give it in spite of the protests of dermatologists. The most important added definition is "lepride," which was unfortunately overlooked by the conference.

Leproma. This term applies exclusively to the lesions of various organs that are characteristic of the cutaneous type of leprosy. The condition is a granulomatous one in which reaction on the part of the invaded tissues is minimal. The essential histological feature is an accumulation of "lepra cells," which may show little differentiation from their original form (the macrophage), or may contain globi, or may have undergone multiple vacuolation to produce the so-called Virchow cells, often multinucleate. These cells contain leprosy bacilli in considerable and often great numbers, though they also occur in other cells. Lepromatous lesions in the skin may be so slight as to be imperceptible, ranging up to marked, extensive infiltrations or conspicuous nodular masses. As a rule they are more ill-defined and diffusely outlined than the leprides, and they do not exhibit the same tendency to radial extension or the same changes of color or sensation.

Lepride. This term is applied to the discrete macular lesions of the skin that are characteristic of neural leprosy. The leprides vary greatly in appearance, size, and as regards elevation; they may be flat, or even depressed (through atrophy), or markedly thickened; they may be smooth-surfaced or very irregular ("granular," "pebbled" or micropapulate); they tend to enlarge radially and to merge with adjacent ones, and to undergo central resolution. Diminution of sensory perception, partial or complete, is a typical feature, though its development may be delayed. The definitely infiltrated leprides, at least, are granulomatous, the essential feature being the nonspecific "tuberculoid" change, with which there usually is banal chronic inflammatory infiltration of variable degree. Associated cutaneous nerves may be

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similarly affected and may undergo necrosis or even cold-abscess formation. These lesions result from the reaction of the tissue to the presence of the leprosy bacillus, but ordinarily bacilli are not found in smears, and only in very small numbers in sections. In occasional cases, however, especially during or after a reaction condition, bacilli can be found in smears and they may be numerous.

Lepromatous. This term signifies of the nature or possessing the qualities of the leproma.

Leprotic and leprous. These terms should be used only in their general sense, signifying pertaining to or affected with leprosy.

Macule. This term is usually applied only to the leprides (neural-type leprosy), signifying a circumscribed area of skin of abnormal color—varying widely in this character in different races but usually hypopigmented, occasionally hyperpigmented, and often erythematous —and commonly with other surface abnormalities, the changes being evident in the whole or only a part of the area. In the terminology of leprosy it is used without regard to the presence or absence of infiltration or elevation. "Macular" is often used more generally, in describing lepromatous lesions.

Infiltration. This term is frequently applied in a special sense to a thickening of lepromatous nature which does not have the characters of a papule or nodule, but it is also commonly used in its customary general sense.

Plaque. Ordinarily this term is applied only to a large leprides in which central resolution is delayed or absent, though it is also used to designate, in a general sense, any large infiltrated area.

Papule. A papule is a small, more or less solid, circumscribed, superficial elevation of the skin, usually but not necessarily circular, conventionally described as varying in size from a pin-head or less to five milimeters in diameter (split-pea size). Papules occur in both forms of leprosy and differ correspondingly in structure and often in appearance.

Nodule. A nodule (synonymous with but preferable to "tubercle") is a solid elevation of the skin, often similar to a papule except that it is larger; in practice the application of this term is not limited as regards maximum size. Ordinarily it is applied only to lepromata. Nodules are usually more deep-seated than papules, and often consist of localized subcutaneous masses.

Polyneuritis. This term has been employed to designate involvement of the main peripheral nerves which results in sensory changes of the extremities that tend to spread centripetally ("acroteric" anesthesia), and in trophic changes of various kinds, and paralyses and atrophies, which may also involve the face. Polyneuritic manifestations do not include the sensory changes in the leprides, or lesions of superficial cutaneous nerves that develop by extension from leprides.

Trophic changes. Under this head are included those changes that are ordinarily ascribed to disturbances of the vasomotor system and of nutrition: anidrosis, glossly skin, ichthyosis, pigmentary changes, loss of hair, perforating ulcers, atrophy and necrosis of bones with consequent mutilations and neuropathic joint lesions. Strictly speaking atrophy and paralysis of muscles. and contractures consequent on them, are not included, but in practice the distinction is seldom made.

PROPOSED REVISION OF THE MEMORIAL CONFERENCE CLASSIFICATION.

The following proposed revision of the formula adopted by the Memorial Conference, based on the foregoing considerations, does not depart essentially from that formula except in so far as is necessary to bring it into line with present knowledge, and in some respects to make it more precise. The primary division into types and the (general) subclassification are retained, but the specifications are elaborated. In addition, however, suggestions—some of them already proposed by other writers—are offered for extending subclassification along other lines, and for indicating certain special features symbolically, but it should be understood that those are secondary matters.

A. Primary classification.

Neural (N) type. All cases of the "benign" form of leprosy, with disturbances of polyneuritic nature (i.e., peripheral alterations of sensation, trophic disturbances, atrophies and paralyses, and their sequelae), or macular skin lesions (i.e., leprides, usually with localized sensory disturbances), or both, without lepromatous changes in the skin. These cases evidence relative resistance to the infection, are of good prognosis as regards life, and usually react positively to leprolin. The skin lesions are typically though not invariably negative for bacilli, though the nasal mucosa is sometimes positive, and many of them are of tuberculoid nature histologically.

Cutaneous (C) type. All cases of the "malignant" form of leprosy, relatively nonresistant and of poor prognosis, usually negative to leprolin, exhibiting lepromatous lesions of the skin and other organs, especially the nerve trunks. Disturbances of polyneuritic nature may or may not be present; they are usually absent in the earlier stages of primarily cutaneous cases, usually present in the later stages, and often present in cases arising secondarily from the neural form.

B. Subclassification.

The following specifications relate to the unavoidably somewhat crude general subclassification of cases according to the degree of severity or advancement of the disease. They indicate roughly the basis of the division, but in practice it is necessary to consider the entire range of manifestations of a type and endeavour to grade them along the lines indicated into three degrees of advancement.

1. General subclassification, by degree of advancement.

Neural 1 (N1). Slight neural: (*a*) Cases with from one to several small macules, or a proportionately smaller number of larger ones, whether flat or infiltrated, without indications of polyneuritic changes; or (*b*) cases presenting only polyneuritic changes of fairly slight degree: peripheral disturbances of sensation affecting one or two extremities, not of marked extent, with only minor trophic disturbances, muscular atrophy or paresis, if any; or (*c*) cases showing combinations of macular and polyneuritic manifestations in corresponding degree of total affection.

Neural 2 (N2). Moderately advanced neural: (*a*) Cases with fairly numerous or large macules of wide distribution, without evidence of polyneuritic changes or with such manifestations of fairly slight degree; or (*b*) cases presenting only polyneuritic changes of moderate degree: peripheral anesthesia of considerable extent if affecting only one extremity, of less extent if multiple; and moderate trophic changes, atrophy and paralyses, including beginning contractures if of limited extent; or (*c*) cases showing combinations of corresponding total degree.

Neural 3 (N3). Advanced neural: (*a*) Cases with very numerous or very extensive macular lesions of the most marked kind, with or without polyneuritic changes; or (*b*) cases presenting only advanced polyneuritic changes: extensive peripheral anesthesia and more or less marked motor and trophic disturbances: paralyses, atrophies, contractures, trophic ulcers and mutilations; or (*c*) cases showing combinations of corresponding total degree.

Cutaneous 1 (C1). Slight cutaneous: Cases with lepromatous skin lesions consisting of one or a few macular areas, or a few small infiltrated patches or nodules; lesions of mucous membranes are usually absent.

Cutaneous 2 (C2). Moderately advanced cutaneous: Cases with numerous macular areas, or fairly numerous or marked areas of infiltration, or nodules, of lepromatous nature; lesions of mucous membranes are frequently present.

Cutaneous 3 (C3). Advanced cutaneous: Numerous and extensive or very marked lepromatous lesions that may vary as regards stage of development or retrogression, usually with lesions of mucous membranes.

"Mixed" cases. Cases of the cutaneous type usually exhibit, sooner or later, varying degrees of polyneuritic involvement. For precision such "mixed" or "complete" cases may be designated CN. The symbol C should be given precedence, regardless of the original nature of the case or the relative severity of the two elements, because of the predominant importance of the cutaneous element. In grading the degree of advancement of these cases the appropriate figure is placed after each symbol: e.g., C2-N1, or C1-N3.

Secondary neural cases. Cases that have previously been cutaneous (mixed cases) but in which the lepromatous lesions have resolved leaving symptoms or sequelae of polyneuritic involvement are called "secondary neural."

To effect a balance in grading neural leprosy in the mass, cases in which leprides are a predominant feature should be placed in a given subclass with less advanced polyneuritic manifestations than those cases which present only the latter changes. It is suggested that cases with only macules should not be graded higher than N2 except when those lesions are extensive and of the severe major tuberculoid kind. When macular cases with polyneuritic changes undergo conversion to the cutaneous type, the grading of the N element will correspond to the degree of the polyneuritic element alone; the skin lesions, having undergone lepromatous transformation, will naturally determine the degree of the C element.

The division of the cutaneous type indicated refers only to the lepromatous element. If polyneuritic manifestations are present and

it is desired to indicate their extent, that should be done separately as indicated in the subdivisions of neural leprosy (see "mixed" leprosy).

There is so great a range between the least and the greatest degrees of advancement in leprosy that each of the three gross subdivisions of this classification includes a considerable range within itself. In practice the writer has found it useful to designate by the subgroup symbol, for example N2, those cases that are in about the middle of that range; and, to continue with the same example, indicate by N2— and N2+ those that are less and more advanced—i.e., those that are not much beyond N1 and those that are approaching N3. This corresponds to the charting on the Wade-le Roux form (39) when the space for each subtype is divided into three.

2. Special subclassification, by other features.

The following pertains to subclassification according to special features of the disease, especially with regard to the principal varieties. Suggestions for the symbolic representation of other features are offered.

Varieties of cutaneous leprosy. No varieties of cutaneous leprosy have been established that are sufficiently distinct, frequent and general in occurrence to require recognition in formal classification. In places (e.g., India) where many cases show extensive "diffuse" involvement of the skin, not localized in macular areas or infiltrations, there might be an advantage in indicating such cases (as by Cd), but it is not certain that this division would be generally useful.

Principal varieties of neural leprosy. Neural leprosy may be subclassified primarily according to the occurrence of (*a*) polyneuritic changes and (*b*) macules, or (*c*) both. To arrive at a method of indicating these classes it is to be considered that, because N is the general symbol of the type, it must always be used (M alone would appear to indicate a third type); and that because of its general significance it would be improper, and also confusing, to use it alone to indicate cases with only polyneuritic manifestations. Two methods seem feasible.

(1) One method presented first because it has been used (Monrad-Krohn), is to indicate cases with both kinds of changes by NM, those with only polyneuritic manifestations by N(M), and those with only macular lesions—with or without involvement of cutaneous nerves in relation to them—by (N)M. The degree of severity of advancement of each element could be indicated, when desired, by adding to each symbol a figure corresponding to the degree of the condition as specified in the general subclassification.

For reasons indicated both N and M should be used, but with a sign of negation (the parentheses) when one or the other form of change is absent. To use 0 (zero) as proposed by Lie (N0M or NM0) would perhaps invite confusion between it and the letter O. Positive and negative signs are used for other purposes. With regard to grading, because M alone would be used simply to indicate the presence of macules, Lie's suggestion that it might indicate the least degree of macular changes would evidently be impracticable.

(2) The above system is open to the serious objection that the use of N to signify only one element of the neural type would tend

to fix and perpetuate the existing confusion regarding its proper significance. To avoid that difficulty the following suggestion is offered: N to be used only to indicate the type, representing its whole concept; NP to indicate neural cases with polyneuritic manifestations but not skin lesions; NM to indicate those with macular changes but not polyneuritic ones; NPM (or NMP) cases with both kinds of changes. Each of the special features could be graded as before.

These symbols, it is suggested, are clear-cut and unmistakable, avoiding any confusion, and are no less simple on the whole than those of the other method.

Varieties of macules. Classification of cases of the neural type that have macules according to the kinds of those lesions is often desirable in special work, and several writers, including the present one, have offered suggestions for the purpose. There is, however, so much divergence in this matter that, if present knowledge is sufficiently precise to permit making a generally acceptable subdivision of this kind at all, it will probably require action of an international body to do so.

For the symbolic representation of such varieties, it would seem logical to use small letters. Wade and Lie have proposed using "t" to indicate tuberculoid macules. That would be but a beginning in this direction. That symbol seems satisfactory for imprecise use, but it will not suffice if different varieties of that class of lesions are to be indicated. For example, in the writer's classification of macules simple ones could be designated "s," the papulate tuberculoid ones "*p*" and the minor and major ones perhaps "t" and "*t*" (the last, italic in printing, to be indicated in writing by an underline).

Indication of the original phase. If it is desired to indicate symbolically in a mixed case the form that occurred first, this can be done readily by placing the prime accent mark (′ = primary) after the appropriate letter, as C′N or CN′. This would not interfere with the use of the customary figures to indicate the degree of advancement.

It has been suggested that the distinction in question be made by placing the symbol of the primary form before that of the secondary one (i.e., CN or NC), but that would often subordinate the more important cutaneous phase. Furthermore, Germond's proposal that the symbols be reversed for another purpose complicates the matter. The accent marks are simpler and more obvious of meaning than the "p" which Lie suggests, which might often have to follow another small letter, such as "t."

Indication of secondary neural cases. If it should be desired to indicate a secondary neural case, that can be done as N″ (″ = secondary).

Indication of bacteriological status. If for epidemiological or other considerations it is desired to indicate in a case symbol the bacteriological status of a case, that can be done in the way suggested by Lie, by adding B+ or B− to the case symbol. The B+ would be superfluous in most cutaneous-type cases, and B− in most neural cases, but B− in a C. case would indicate one which has improved to the point indicated, but not enough to be listed as completely arrested or cured, and B+ in a neural case would have obvious significance.

Indication of progression of the disease. If, to obtain a maximum of information in the symbolic representation of a case, it should

be desired to indicate symbolically whether the disease or any element of it that is indicated in the case-symbol is progressing, retrogressing or stationary, this could be done by placing the acute, grave or circumflex accent, respectively, above the appropriate letter or letters.

Atypical and special cases. There are certain kinds of cases that are not distinguished in the systematic classification. These are: (*a*) *Incipient* cases, too little advanced to permit positive identification of its type. For some purposes it is useful to put them in a subclass of their own, but in mass work they are ordinarily put into one or the other types according to the bacteriological findings. (*b*) *Abortive* cases, interrupted at an early stage of the disease, usually, if not always, of neural type, and their distinction as a separate group has seldom been made, though it is important from the epidemiological viewpoint and that of the treating physician. (*c*) *Transitional or intermediate* cases, which sometimes give difficulty; this refers chiefly to those which give evidence of changing from the neural type to the cutaneous one. In tuberculoid cases during or after reaction the lesions may look as if they had become lepromatous and may be strongly positive bacteriologically, yet their subsequent course may prove that that change had not taken place. Lowe in Calcutta designates such borderline cases "N?C", until the outcome of the condition is determined. *Special forms* of the disease, such as "lazarine," "bullous," etc., are sometimes dealt with by name but have not found a place in formal classification.

REVIEWS

Leprosy in India. Vol. IX, No. 4, Oct., 1937.

J. Low and S. N. Chatterji give a well illustrated article on their *Experiments in the Treatment of the Trophic Lesions of Leprosy by Injections of Hydnocarpus Preparations.* The trophic ulcers and subcutaneous tissue round the posterior tibial nerve is infiltrated and the tissues round the ulcer are infiltrated with about 2 c.c. of hydnocarpus preparations. The patients remained ambulant during the treatment. There was slight swelling and pain, but some of the ulcers, which had failed to yield to previous treatment, healed up and others improved. Similar injections were given with good effects round the eyelids in chronic cases of lagophthalmia.

J. Lowe and Dharmendra write on *Sternum Puncture in Leprosy.* We reprint this article on page 67.

N. Das writes on *Treatment of Maggots in the Nose* by syringing first with a 10% suspension of turpentine in distilled water, and then with a 1% solution of sodium bicarbonate.

International Journal of Leprosy. Vol. V. No. 4. Oct.-Dec. 1937.

The Dynamic Classification of the Forms of Leprosy by V. N. Kusnetzow.

Leprosy is envisaged as a progressive disease with a losing or gaining fight going on between the reticulo-endothelial system and the invading organism. Therefore special stress is placed upon the functional condition of this system and its 'absorptive capacity', this being tested by Nicolav's method which the author finds more accurate and simple than that of Adler and Reimon. He mentions that the reaction of this system "in infants at the beginning of infection tends much less to the establishment of immunity than in the direction of anaphylaxis". The author divides leprosy into four periods or stages:—I. Latent, in which bacilli may be found and there may be dry rhinitis, swelling or lymph glands, sensations along certain nerves, swelling of the face or limbs, febrile symptoms, pemphigus, disturbance of sweat and fat functions. II. Florescent, which takes the form of a parabola, first increasing and then diminishing. At this stage the disease may take on either a benign form (neural leprosy), or a malignant form, depending on the functional activity of the reticulo-endothelial system. III. Period of relative stability, corresponding to the "closed" forms of nodular or mixed leprosy. IV. "Some patients, having passed the first three periods emerge into the fourth one—the healed period, beyond danger of relapse". These are deformed invalids though they have got rid of the infection. Having described this ground work, the author divides cases into two groups—A and B. A comprises the milder forms of the disease and B the bulk of patients in Stage II.

GROUP A.

Subgroup 1. Patients with lepra incipiens showing unique lesions as regards morphological classification (lepra macan).

Subgroup 2. Patients with lepra II benigna (lepra nervosa), no account being taken of the extent or degree of the process.

Subgroup 3. Patients with lepra II maligna (lepra cutanea, C2-C3) in a stage of prolonged remission.

Subgroup 4. Patients with lepra II maligna (lepra cutanea C2-C3) with a tendency to benign lepra reaction.

Subgroup 5. Patients with lepra III (lepra cutanea, C2-C3), without disturbances of the functional condition of the reticul-endothelial system.

GROUP B.

Subgroup 1. Patients with lepra II maligna of moderate degree (face and peripheral parts of extremities involved), with increased absorptive and proliferative functions of the reticulo-endothelial system and normal oxidation processes.

Subgroup 2. Patients with lepra maligna at the acme of its development (the face, extremities and often the body being involved, with affection of the eyes and the upper respiratory tract); they are subject to frequent lepra reactions. The absorptive function of the reticulo-endothelial system is lowered and the proliferative function is still elevated; there is decrease of neutrophiles and marked shift to the left; the oxidation processes are lowered and there is a tendency to acidosis.

Subgroup 3. Patients in which the process is still more marked. The number of monocytes reaches the upper limit of normal; the shift to the left is more pronounced. Lepra reaction takes place less frequently and is generally mild.

The author's chief justification for his classification is that those in Group A may be subjected to energetic chaulmoogra and other treatment; while with those in Group B treatment has to be applied much more carefully and selectively. [This classification is apparently built upon an experience of leprosy in Russia which is more limited in character and different in proportion of types from that of leprologists in endemic tropical and sub-tropical countries. The insistance on the importance of the functional activity of the reticulo-endothelial system is the most valuable contribution, and we consider that one defect of the classification adopted at the Leonard Wood Memorial Conference is that due stress is not laid on this all-important factor. But the great virtue of the latter was its simplicity, and we fear that Kusnetzow's classification would be found far too complicated and abstruse for the ordinary busy physician. Whatever grouping is finally adopted, we consider that it should combine the simplicity of the present formula with the clearest possible indication of the resistance of the patient to the invading organism.]

The Erythrocyte Sedimentatio Test in Leprosy, by E. Muir.

The technique recommended for performing the erythrocyte sedimentation test is given in detail. It may be used in the detection of the various factors which predispose to leprosy and prevent recovery. Its application in regulating the treatment of leprosy is fully described. Its prognostic value is discussed. The iodide test may be safely used with the aid of the sedimentation test in former C2 and C3 cases which have reached the stage of giving negative bacteriological findings.

Erythema Nodosum Leproticum by F. Reiss.

Two cases of typical lepra reaction are described which the author considers " give further evidence that erythema nodosum does not have a uniform etiology, but that we are dealing with a clinical syndrome in most of the cases.

Erythema nodosum idiopathicum may be different, as it is clinically well defined, but in such cases the etiology is still uncertain."

Two papers on the *Besnier-Boeck Syndrome* and its relationship to leprosy by P. Rabello Junior and by J. Reenstierna, appear in this issue; also answers to a questionnaire from six authorities and an editorial by H. W. Wade on this same subject. The resemblance of this syndrome to tuberculoid leprosy, both clinically and histologically, is a striking one, especially the massive accumulation of epithelioid cells. The suggestion is put forward by one writer that this syndrome may be due to Hansen's infection as a kind of residual disease remaining over in countries from which other forms of endemic leprosy have disappeared. But it is pointed out in the editorial and in answers to the questionnaire that although those unfamiliar with leprosy may mistake tuberculoid leprosy for Besnier-Boeck disease, yet in the latter there are never the characteristic invasion of nerves or sensory changes found in the former.

The Skin Lesions of Neural Leprosy. IV. Observations in Madras by H. W. Wade, R. G. Cochrane and M. Paul Raj.

This beautifully illustrated article is in continuation of those previously published on this subject by Dr. Wade, in conjunction with other authors. A smaller proportion of tuberculoid cases was found at the Lady Willingdon Leper Settlement near Madras than in Calcutta, though the authors are not sure to what extent this is due to weighting of admissions to the settlement in favour of more serious types of cases. A larger proportion of micropapulate and simple lesions was found than in the Philippines and China. The findings support the conclusion previously arrived at that tuberculoid change, of correspondingly slight degree, is an essential element of the clinically simple leprides as well as of the frankly tuberculoid varieties.

Rat Leprosy—A Critical Review of the Literature by J. Lowe.

This concluding section of Dr. Lowe's review deals with filtrability, culture, immunity, treatment, relation of the infection to human leprosy, and leprosy-like diseases of animals. This comprehensive review cannot be abstracted, it will form a most valuable work of reference for all interested in this subject.