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LEPROSY REVIEW.

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CONTENTS.

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Editorial

In his Malcolm Morris Memorial Lecture " Leprosy in Great Britain ", published in this issue, Dr. J. M. H. Macleod states that when the disease ceased to be endemic in Great Britain the remaining cases, being few in number, came to be regarded as negligible, a policy which has been maintained up to the present time. But even though the cases are few in number, in view of the serious nature of the disease, and the possible danger of unrecognised cases in an active phase infecting children, it is surprising that the present policy is maintained. " At the present time lepers can travel freely in public conveyances, can sit with their neighbours in places of entertainment, and may even live with their families in close association with young children, unless the Medical Officer of Health becomes cognisant of their existence and somehow manages to provide suitable accommodation for them."

Dr. Macleod mentioned that the St. Giles Homes with accommodation for twelve, and the only hospital for lepers in the country, are dependent, like the voluntary hospitals, on a charitable public, and have no grant or subsidy from the State.

In this connection a question was asked in the House of Commons as to whether the Minister of Health " is aware that out of the lepers in Great Britain only 12 can receive treatment in homes suited for that purpose; and if he proposes to take any action to remedy this state of affairs, both in the interests of the lepers themselves, their families, and the general public?" The reply was " I am advised that in the conditions which exist in this country the disease referred to is very unlikely to be conveyed from one person to another, and no action would appear to be called for in the interest of the public health. If, however, my hon. and gallant friend has any particulars of individual cases which he desires to bring to my notice, I shall be glad to know of them and to make the necessary investigations." Whether there is danger or not, and to what extent there may be danger, is at present a matter of surmise. The same question has recently arisen in France, where the condition is very similar to that in England. Both countries have citizens spending many years in the colonies where work implies touring and mixing with primitive races in which leprosy is common. Often they have, for want of better accommodation, to sleep in insanitary native huts. It

is therefore small wonder if a certain proportion of them acquire leprosy. But in France alarm was caused because investigations by Dr. Flandin had revealed patients with leprosy who had never been outside the country. How many cases similar investigations in this country would reveal it is impossible to say.

In France, however, ample accommodation is supplied at the *Leproserie de Valbonne,* and by the leprosy service of Saint Louis Hospital, where in the last thr
the supervision of Dr. Flandin and Dr. Ragu, the number of patients in residence has risen from 4 to 26, and 69 others are under observation either at the hospital or elsewhere. The authorities in Paris, including Dr. Marchoux, the well-known leprosy expert, consider compulsory notification undesirable, and that the best solution of the problem would be the leprosy dispensary and supervision of lepers by visiting nurses. On the suggestion of Dr. Marchoux the Academy of Medicine has appointed a commission on which five of its members will sit.

We would be wise in this country if we followed France in its humane and well-considered plans, instead of our present policy of *laissez-faire.*

* * *

Those who have spent years in the study of leprosy must at times have felt depressed by the slow progress of our knowledge regarding this most difficult disease. Occasionally an oasis appears in the barren desert of negative results, but too often the seeming oasis turns out to be little more than a disappointing mirage. In our present number we report no fewer than three gleams of hope.

Dr. Adler (see page 39) of the Hebrew University, Jerusalem, claims to have successfully inoculated splenectomized Syrian hamsters with human leprosy. If his results are confirmed, and it is found possible to pass M. leprae through a
step will have been taken in our knowledge of leprosy.

We review Dr. McKinley and Dr. de Leon's article appearing in the International Journal of Leprosy, in which he confirms his own previous results with the growth of M. leprae on artificial medium under an atmosphere of oxygen and carbon dioxide. If these results are confirmed by other workers, and if this organism can be grown in sufficient quantity to test its chemical and serological qualities, then we may soon have some of the facilities for dealing with

leprosy that we have with tuberculosis. In Calcutta experiments, following McKinley's methods (page 42), have obtained some results, but these are still doubtful.

The third claim of importance appears in the review of Dr. Lleras Acosta's article (page 43). He claims to have grown an acid-fast organism from the blood of 20 out of 66 cases of leprosy on modified Petragnani's medium. There is nothing surprising in this claim as it has been made repeatedly before, but the results which he shows with complement fixation, using his organism as antigen, are certainly astounding. He obtains positive results in almost all cases of cutaneous leprosy, and in over 92 per cent. of lepers giving negative bacteriological findings; while out of 1,194 healthy non-lepers only one gave a positive result. But the most important assertion he makes is that 18 per cent. of apparently healthy relatives of lepers, and 11 per cent. of children of lepers without signs, showed complement fixation. The prolonged incubation period of leprosy, with the uncertainty whether contacts and especially children have been infected and still harbour organism, is one of the greatest handicaps in dealing with the disease. If these claims are fully confirmed, then a distinct advance has been made.

* * * * *

The article on *The Significance of Positive Wassermann and Kahn Tests in Leprosy* shows the difficulty of interpreting serological results, and emphasises the teaching that serological tests are of value only as a supplement to the clinical picture; taken by themselves they are apt to lead to wrong conclusions.

* * * * *

Reference has been made in a previous number to the International Leprosy Conference to be held in Cairo from the 21st to the 28th of March, 1938, at the generous invitation of the Egyptian Government, which has appointed a committee, with Prof. Khalil Bey as Secretary, to make local arrangements. The Conference is being organised by the International Leprosy Association, and some sixty members hav

Abstracts of over 60 papers have been received dealing with various aspects of leprosy. While papers will be read and general discussions take place at the morning sessions, it is planned to give full time for thrashing out various special problems in committee. Further information can be obtained from the Hon. Secretary-Treasurer of the International Leprosy Association, 131 Baker Street, London, W.1.

*Leprosy in Great Britain at the present time

J. M. H. MACLEOD.

When the Chadwick Trustees conferred on me the honour of inviting me to give the Malcolm Morris Memorial Lecture I was in the unique position of having no difficulty in the choice of a subject for the dis
speak is one in which the late Sir Malcolm Morris was specially interested, and in his work in connection with it I was closely associated during the last decade of his life. It has now fallen to my lot to carry on the work which he inaugurated, helped and stimulated by the inspiration of his memory.

To many people it may come as a surprise to be told that leprosy, a disease which, from the deformities and mutilation associated with it, has been regarded with dread " all down the ages " is still present in our midst.

Fortunately the cases are now comparatively few and are usually imported cases occurring in British subjects who have come from abroad to settle at home, either with the knowledge and obvious signs of their affliction, or in the incubation period before the symptoms have developed sufficiently to be noticeable.

Leprosy may occur at any age but children are far more susceptible to it than adults. Like tuberculosis it is not congenital, though the predisposition to it may be transmitted from parent to child. It always seems to have been more common in males than females and at present in this country the majority of the imported cases are in adult males.

It is a disease which is no respecter of persons and in the past even royal personages such as King Robert the Bruce and Henry IV are believed to have suffered from it. In this country at the present time it may be met with in all grades of the social scale from artisans to professional and s
and forest department, planters and sailors of different races and colour who have come into the docks with it and have found their way to the hospitals for tropical diseases and elsewhere.

The majority of the cases seem to have come from the

* The Malcolm Morris Memorial Lecture (abridged) of the Chadwick Trust, delivered on November 2nd, 1937.

West Indies, British Guiana, South Africa and India.

The women suffering from it, who have come under my observation, have returned home from residence abroad in a district where it was endemic, and may possibly have contracted it from leprous servants. Some years
a case in a woman from a colony who attributed it to infection from a mosquito bite on the face which refused to heal, a theory of the method of transmission which is improbable.

In addition there are occasional contact cases in which the disease is contracted in this country as the result of contact with infected persons. I have reported three such cases in individuals who had never been abroad.

One case was that of a boy who, born in Ireland, had never been out of that country till he reached the age of 12 years, when he was brought to London by his father to seek advice with regard to his disease. His father was a Russian who had emigrated to Ireland suffering from leprosy. When I saw him he was in an advanced stage of the disease and I have little doubt that he was the source of the boy's infection.

A second case was that of a boy aged 15 years who was born in Lancashire and had never been out of England. During his childhood he had been in close contact with an elder brother who suffered from leprosy which he had contracted in, and brought from British Guiana.

Another case was that of a boy aged 14 years who, born in England, had never been abroad but who contracted the disease from a leprous father. (*Vide* Brit. Med. Journ., January 17th, 1925.)

These cases are highly important as they indicate the possibility of infection
advisability of measures being taken by the Health Authorities to prevent such a terrible occurrence.

It is impossible to estimate the exact number of cases now existent in this country, and such numbers as 75 or 100 which are usually given, though possibly not far out, are simply guess-work.

The following reasons are responsible for this lack of precise knowledge of the number of cases.

(1) Because cases of leprosy are liable to be hidden away and their existence carefully concealed both by the patients themselves and their relatives; for example some years ago a male leper was found who had been hidden away in a mortuary for nearly two years where he was imprisoned and never allowed out.

(2) Because they are apt to go unrecognised, as in these days the disease is so comparatively rare in the British Isles that only specialists in tropical medicine, dermatologists, and a few men who have been in practice abroad where the disease was endemic, are capable of recognising it.

(3) Because at the present time the Government has not considered it of sufficient importance as a menace to the public health to have included it in the list of notifiable diseases.

It will not be possible for me to do more than refer briefly to the intriguing subject of the history of leprosy in this country but it will be of interest for me to recall a few of its salient features.

The disease leprosy was known in very ancient times, possibly in Egypt even as early as 3000 B.C. in the reign of Husapti, and described in Egyptian papyri; it is certain that it was known in India and China long before the Christian era. From Egypt and the East it was carried westward by the Roman Soldiers, traders and crusaders and gradually spread over Europe. In Britain it was certainly recognised as early as the tenth century and probably before then.

It is to Aretaeus in the first century of the Christian era that we are indebted for the first description of the disease as we now know it. It is the disease known by the ancient Greeks as Elephantiasis (a name now applied to quite another affection) and by the Arabian translators as lepra.

In these early days and even up to a century ago owing to the imperfect knowledge of the causation of the disease the name leprosy was used in a wide sense to include a variety of disfiguring skin diseases of a totally different nature from true leprosy, and many of the people who were incarcerated in lazarettes both in this country and on the Continent and who were subjected to the stringent and cruel regime and regulations enforced on the leper were suffering from skin affections of a far less serious character.

In this country it gradually increased up to the 15th century when it became a veritable scourge. Leper hospitals were everywhere established, leper slits or windows appeared in most of the churches and sums of money were given to endow leper charities; but in spite of it all the leper population became so great that the available accommodation was quite insufficient to house them.

In Scotland the earliest leper house or "spital" as it

was called was founded in Berwickshire in the 12th century in the reign of William the Lyon, and in Ayrshire at Kingcase a lazar-house was established in the 13th century by King Robert the Bruce. Subsequently numerous hospitals sprang up all over England and Scotland which are described in the classical essays by Sir James Y. Simpson in 1872, and by Sir George Newman in the volume of Essays on Leprosy published by the New Sydenham Society in 1895.

It is of interest to note that St. James Palace in London is built on the stite of the leper hospital of St. James the Less which housed " sixteen leprous maidens."

In London one of the largest leper hospitals was the Hospital of St. Giles, situated in the fields to the north west of the city. It was founded through the munificence of Matilda daughter of Malcolm King of Scotland, the queen of Henry, and housed about forty lepers. As the original endowment was only £3 it was necessary to allow the lepers to augment it by begging and receiving alms, a custom which became generally prevalent but one which led to abuse as so-called proctors and self-appointed people began to go round churches and through the streets begging for lepers without the supervision exercised in connection with a flag-day in modern times.

In the north of England the largest lazarette was the Sherburn hospital near Durham which accommodated 65 lepers. It was founded by Hugh Pudsey, Bishop of Durham, and was richly endowed. This hospital still exists, though no longer as a lazarette, but from its endowment-funds a sum of £200 is now allocated annually by the governors to the Homes of St. Giles for British Lepers, of which I have the honour to be chairman.

The leper houses in the middle ages were not hospitals in the modern sense of the word for no attempt was made in them to cure lepers but they were simply housed, clothed and isolated. Many of them were religious establishments with chapels annexed, where religious observances were strictly enforced. It is recorded that in one of them the Lepers had daily to say for morning duty, a paternoster and an Ave Maria thirteen times and to repeat them seven times at vespers. If they failed to do this they were severely punished by having their diet reduced to bread and water, and if the offence was repeated three times they were expelled.

The cost of these **religious** establishments was sometimes considerable, for example, it is recorded that at the St. Giles hospital for lepers at Norwich a large and costly staff

was maintained consisting of a prior, eight regular canons acting as chaplains, two clerks, seven choristers and two sisters to attend to the bodily and spiritual needs of eight poor bed-ridden lepers.

After the 15th century leprosy began to decline not only in Great Britain but throughout Europe. Although it had died out to a large extent in England by the 17th century it still continued in the northern islands of Scotland, especially in the Shetland Islands. There the lepers were segregated on an island to the west of the Shetland group named Papa Stour which is separated from the mainland by a stormy sound effectively isolating it in anything but fine weather. The last case of leprosy in Papa Stour as far as I have been able to ascertain died over a century ago, and the present people, some of whom number lepers among their ancestors area hardy

The chief influences which lead to the decline of leprosy in Europe were the stringent and too often cruel methods of isolation of lepers, enforced alike by church and state, which compelled them to make known t
of wooden clappers or the ringing of bells, banished them as mendicants beyond the city walls, and even performed over them a burial service depriving them of citizenship and condemning them to a living death.

Apart from these influences in this country there was the gradual improvement in the general health and hygienic conditions of the people, and the recognition as belonging to a different category, of diseases wrongly diagnosed and previously treated as leprosy.

When the disease ceased t be endemic in Great Britain the remaining cases, being few in number came to be regarded as negligible, a policy which has been maintained up to the present time; but even though the cases are few in number, in view of the serious nature of the disease and the possible danger of unrecognised cases in an active phase infecting children it is surprising that the present policy is maintained.

There can be no doubt that leprosy is an infective disease but the danger of infection from it in countries like ours where only a few cases exist, though quite possible, is comparatively slight and for it to take place it seems necessary that there should be close contact with an infected person over a prolonged period. The casual contact entailed in nursing and tending lepers with ordinary precautions is free from risk of infection. It is advisable, however, for nurses to wear overalls while on duty, gloves while doing dressings and to cleanse their hands carefully and rinse them in an

antiseptic lotion afterwards, to use a mouthwash and to avoid unnecessary contacts either direct or indirect with the patient. If such common-sense precautions are taken, the risk of infection is no more, and possibly less, than that entailed in nursing cases of tuberculosis.

In the middle ages the contagiosity of leprosy was stressed to exaggeration and the belief that it was contagious has persisted in most countries in Europe to the present day, but for some strange reason in this country about a century ago an erroneous idea took root that not only was leprosy not contagious but that all methods of se
unnecessary and cruel. A committee to enquire into the matter appointed by the Royal College of Physicians of London in 1862 unfortunately corroborated this mistaken view, and the results of their finding may be traced in the attitude held towards leprosy to-day.

In 1909 an international congress on leprosy was held in Bergen at which authorities on leprosy from all over the world assembled and the following resolution was passed :—

"Leprosy is a disease which is contagious from person to person, whatever may be the method by which this contagion is effected. Every country in whatever latitude it may be situated is within the range of possible infection by it and may, therefore, usefully undertake measures to protect itself."

The lapse of more than a quarter of a century has borne out the wisdom of that resolution.

In this country in modern times until 1913 there was no special provision for the housing of lepers and this has been a matter of grave concern to all who have had to deal with them. The result is that lepers generally hide themselves in their own homes tended by their relatives and are apt to be neglected by them when they become helpless. Lodging houses and hotels naturally refuse to take them in if they are aware of their affliction. The general hospitals are averse to admitting them in case their presence should cause panic among the other patients or even among the nurses, and their last r
council hospital of the district in which they reside, but in these institutions they are unwelcome guests and the authorities and guardians are apt to do all in their power to block their admission. When cases become mental the difficulties of finding a home for them are further increased, as every obstacle is put in the way of their being admitted

to a mental asylum owing to the excessive cost of providing special attendance and seg

In this country there is no embargo to the admission of lepers, and they are liable to come in unrecognized at the ports, but there are endless difficulties in getting them shipped out of the country to return to the colony from which they have come where they would be compulsorily segregated in a lazarette. This state of things encourages lepers to come here.

At the present time lepers can travel freely in public conveyances, can sit with their neighbours in places of entertainment, and may even live with their families in close association
of health becomes cognizant of their existence and somehow manages to provide suitable accommodation for them.

So long as the cases are in a quiescent phase especially nerve cases, there is comparatively little risk of infection from them and there is no urgent need for their isolation, but in active cutaneous cases with ulcerating sores, it is quite another matter, and some form of control and supervision is demanded.

Some years ago certain medical men interested in the leprosy problem tried to deal with those difficulties and among their number was the late Sir Patrick Manson. A meeting was arranged by them with the principal medical officer of the then Local Government Board at which he was urged to use his influence with the authorities to induce them to consider the situation and to take measures to remedy it even to the extent of making the disease notifiable; for certain reasons this was met with completely negative results.

In 1913 as no assistance was obtainable from the Government a further meeting of those interested in the matter, both medical men and laymen, was called, when it was decided to try and raise a fund to provide a home where helpless lepers could be voluntarily isolated and housed and where they could be nursed and cared for and could live a community life a
the late Sir Malcolm Morris was closely associated. The fund collected at that time was employed to found the present leper colony in Essex known as the Homes of St. Giles for British Lepers.

The story of how the colony grew from its inception in a little farm near Chelmsford to its present state of efficiency and usefulness is an epic worthy of that great physician.

The colony which plays such an important part in the

protection of the public health is situated in a peaceful upland country, surrounded by old trees and pleasant pastures, and with its bungalow settlement for the patients, its community house for the Anglican sisters who nurs
its chapel a converted old Essex barn, and its cemetery for those who, relieved of their sufferings, have passed on, is one of the most peaceful spots in the countryside.

The work of the colony is done by the Anglican community of the Sacred Passion which has its English home at St. Giles and its chief centre of activity and motherhouse in Africa in Tanganyika.

In the colony the patients have the advantages not only of a pleasant home in healthy surroundings but of skilled medical attention, and as one of the honorary staff is Dr. Ernest Muir, a leprologist of world-wide reputation, they have the further advantage of treatment by the latest methods.

At the homes not only are the physical and medical needs of the patients supplied but every
devoted sisters to render their lives as bearable as possible and to distract their minds from their affliction by getting those of them who are sufficiently fit to be interested in out-of-door occupations such as gardening, keeping hens and the like, and to indulge in indoor recreations such as billiards and other suitable games. They are encouraged to read, and some kind person is provided to read to those of them whose infirmity or blindness prevents them from doing so.

In this way their time passes peacefully, and as an indication of the success of the sisters in their efforts, not long ago a distinguished foreign leprologist on visiting the homes declared that he had never been at a leper colony where the inmates were so well looked after and so happy.

At the present time the homes can only house 12 cases but when funds permit they will be extended. A considerable number of cases have passed through them since their inception and there have been 12 deaths.

They are entirely dependent, like the great voluntary hospitals of this country on a charitable public and h
grant or subsidy whatever from the state. The good they are doing is incalculable and a living tribute, better than any statue or cenotaph however inspired, to the memory of Malcolm Morris.

The Significance of Positive Wassermann and Kahn Reactions in Leprosy

ERNEST MUIR and T. N. ROY.

Much has been written on this subject since 1923. It is generally acknowledged that both Wassermann and Kahn reactions may be strongly positive in cases which never during life show clinical signs indi

It is well known that in cases with positive serological findings during life no pathological signs may appear at autopsy. Murales-Otero examined two such groups, one leprous and the other non-leprous. In the former, 90 per cent. showed positive serological and negative pathological findings, as compared with 17.2 per cent. in the latter.

In an article describing the work of several collaborators (Hazen et al 1936)[1] in the United States it is related that discrepancies in results were obtained when sera from the same supposedly non-syphilitic patients were sent to various serologists for examination. In a series of 50 leprous patients the positives varied in the hands of different serologists from 76 to 42 per cent.; in 36 malarial patients from 19.4 to 8 per cent.; in 53 tuberculosis patients from 7.7 to 0 per cent.; in 25 menstruating women from 12 to 0 per cent.; of 25 women not menstruating all gave negative results except that one of the thirteen serologists found 4 per cent. positive. Malaria and especially leprosy gave the largest numbers of positives and the greatest variations in results.

While in leprosy it is usual for a
accompany a positive Wassermann, in some cases these two tests give contradictory results, the one becoming positive when the other is negative and *vice versa*.

Table I gives the results of repeated simultaneous Wassermann and Kahn tests, taken on the dates mentioned, in nine leprous patients under treatment in Calcutta. (The patients are indicated in the table and in the comments by their initials and the two tests by W and K.)

The question naturally arises as to whether these cross purposes between two standard tests are to any extent caused by drug treatment. We therefore give three further cases in Table II. and detail the form of treatment given immediately before the dates of taking blood for examination.

TABLE I.

	M.F.					M.L.									U.R.								N.L.B.							
	3.12.28	10.12.28	1. 1.29	19.12.29	19.10.30	21. 2.27	2. 6.27	4. 7.27	25. 8.27	18. 2.28	5. 3.28	10. 9.28	23. 9.29		21. 1.27	12. 5.27	9. 8.27	20. 6.27	16. 8.28	27. 8.28	17.12.28	31. 1.29		23. 1.28	20. 2.28	26. 3.28	3. 7.28	17.12.28	9. 1.29	28. 1.29	9. 3.31
Str'gly Pos.	W		W	W	W		W						W		W	W	W	W	W	K	W	W					K	K	K	K
Mod'ly Pos.		W				W	K	K	W			W							K					K	K	K	K			W
Doubtful					K	K				K	K				K	K	K	K			K										
Negative	K	K	K	K				W	K	W	W	K	K							W		K		W	W	W	W	W	W	W	

	E.H.					B.R.																			G.S.						
	5. 8.27	25. 6.28	4. 7.28	23. 7.28	5.11.28	10. 2.27	26. 5.27	31.10.27	20.12.27	6. 2.28	27. 2.28	5.11.28	12.12.28	4. 2.29	23. 3.29	2. 9.29	25. 8.30	12. 1.31	20. 4.31	11. 5.31	29. 6.31			6. 6.27	7.11.27	30. 7.28	30. 8.28	10.12.28	2. 6.30		
Str'gly Pos		K	K	K	K			W	W	W	W	W	W	W		W		K	W	W						K				
Mod'ly Pos.	K				W				K	K	K						W				W			W	K		K		W	
Doubtful						W	W																		W			K	K		
Negative	W	W	W	W		K	K	K				K	K	K	W	K	K	W	K	K	K			K		W	W	W			

	J.M.							J.N.										
	8. 9.27	26. 9.27	17.10.27	6. 2.28	5. 3.28	5.11.28	4. 1.29	7. 4.27	20. 6.27	4. 7.27	28.11.27	13.12.27	11. 6.28	13. 8.28	10. 3.28	26.11.28	17.12.28	7. 1.29
Str'gly Pos.	W	W	W	W	W	W	WK	W	K	K	W	K	K	K	K	W		
Mod'ly Pos.			K	K	K			K					W	W	W	K	K	K
Doubtful		K				K			W	W	K	W					W	W
Negative	K																	

Notes on Table I.

M.F. Over a period of almost two years 5 double tests (W.R. and Kahn) showed a persistently positive Wasserman and a persistently negative Kahn.

M.L. To begin with the W.R. was moderately positive and the Kahn doubtful. On 2.6.27, while reacting to potas. iod. the Kahn became positive and remained positive a month later when the W.R. had become negative. After yet another month the position was again reversed. Later both became negative or doubtful, but seven months later, while the Kahn remained negative, the W.R. had again become positive.

U.R. After six months in which the W.R. was strongly positive and the Kahn doubtful, the position was reversed, and again after another six months the original position was restored.

N.L.B. Here we have the exactly opposite position to that in M.F., the Kahn being positive and the W.R. persistently negative, until after over three years it became moderately positive.

E.H. The record here is almost exactly the same as in N.L.B.

B.R. For two and a half years the W.R. is positive and the Kahn negative; on 23.3.29 the W.R. is negative, but strongly positive again six months later; then the Kahn takes advantage of a second lapse of the W.R. to negative, to become for once positive. After this the original position is restored.

G.S. Here we have another criss-cross similar to M.L., J.N. and B.R.

J.M. Here the Kahn, at first negative, later joins the W.R. in being positive, but becomes doubtful after two courses of bismuth; but two months later it is up at four plus.

J.N. Here for the first eight months the Kahn and W.R. appear to be at cross purposes, the one becoming positive as soon as the other became doubtful. Then for six months they are more or less in agreement, both being positive. Later, after a course of bismuth, finished on 26.11.28, the W.R. became strongly positive and then dropped to negative, leaving the Kahn still positive.

Notes on Table II.

S.6. During the period under re iew this patient was given seven courses of novarsenobillon or neosalvarsan, each consisting of six weekly injections. He also had 9 courses of avenyl (a mercury preparation soluble in oil) each consisting of 6 injections. He also was given massive doses of potassium iodide which however, produced little or no clinically noticeable constitutional disturbance. It is difficult to correlate in any way the administration of these drugs with the respective and relative changes in the W. R. and Kahn findings.

S.7. This patient beginning with a negative W.R. and doubtful Kahn was given a provocative dose of novarsenobillon, which was followed by the W.R. becoming positive and the Kahn negative, which they continued to be for a year in spite of treatment.

S.3. In this case the W.R. appears to follow tardily behind the Kahn, as is shown by taking the blood repeatedly at short intervals. It may be that in some cases changes which cause a positive or negative W.R. may be slower than those which cause corresponding changes in the Kahn. This might account for some but not for all of the differences.

TABLE II.

	Negative	Doubtful	Mod. Pos.	St. Pos.	
S.6.					
Course of 6 injections of N.A.B. and Bismuth cream				W K	23. 7.26
16 injections of .25 grams of avenyl		W			26.10.26
No injection of arsenic or mercury given but massive doses of K.I. given orally			K	W W	8. 2.27
After prov. N.A.B.		K		W W	8.11.27
16 injections of avenyl			K	W W	31. 1.28
Course of K.I. (240 grains per dose)				WK	26. 6.28
ditto				WK	10. 7.28
10 Bismuth injections		W		K	25. 9.28
240 grains K.I. orally and 6 injections N.A.B.			WK		30.10.28
N.A.B. and avenyl course				K	26. 3.29
ditto				K	2. 7.29
ditto				K	25. 2.30
Treatment nil				K	22. 7.30
240 grains K.I. orally	K				26. 8.30
Treatment nil				K	23. 9.30
Neosal and avenyl				K	14.10.30
N.A.B. and avenyl and bismuth ...				WK	24. 2.31
N.A.B. and avenyl			WK		18. 8.31
Avenyl				K	28. 6.32
K.I.				K	18.10.32
ditto	W		W	K	1.11.32
Treatment nil		K	W	K	8.11.32
ditto	W			K	15.11.32
ditto			W	K	22.11.32
ditto			W	K	29.11.32
ditto			K	W	6.12.32
ditto				W	13.12.32
ditto			W	K	20.12.32
S.7.					
	W				12. 2.26
Provocative dose of N.A.B. 0.45g. ...		WK			1.12.31
Treatment nil	K			W	15.12.31
Provocative dose of N.A.B. 0.45g. ...	K			W	29. 3.32
16 injections of N.A.B. (form 0.18 to 0.54g.)	K			W	19. 4.32
Treatment nil	K			W	25.10.32
ditto	K			W	8.11.32
				W	20.12.32

S.3.	Negative	Doubtful	Mod. Pos.	St. Pos.	
2 Courses of N.A.B. and avenyl ...			K		6. 5.32
Provocative dose of N.A.B. 0.45g. 16.9.32		K		W K	13. 9.32
1 Injection Avenyl	W			K	18.10.32
ditto		K	W W		25.10.32
ditto			W	K	15.11.32
ditto			K	W K	22.11.32
ditto			K W KW		29.11.32
					6.12.32

The Wassermann tests were conducted by the Serological Department at the School of Tropical Medicine, Calcutta. The Kahn tests were carried out in the leprosy department by an experienced chemist, the results being read by one of us (E.M.). Great care was taken to avoid any errors of technique, to which the differences between the results of the two tests cannot be attributed.

Discussion.

In early and slight cases of leprosy, in which there is no profound constitutional disturbance, and in which the patient is in reasonably good general health, a persistently strong or moderate Wassermann or Kahn reaction should be taken as indicating spirochetal disease; but in advanced cutaneous or mixed cases, especially in those who are sensitized and subject to attacks of " lepra reaction," a positive serological result alone, in the absence of positive history or clinical signs, should not justify a diagnosis of accompanying syphilis. In such cases serological tests (both Kahn and W.R.) should be repeated frequently so as to ascertain whether they are consistently positive.

Ishibashi (1937)[2] examining 138 lepers, found 22.5 per cent. Wassermann-positive. He considers that this frequency is due to a special antibody in the serum of lepers. Experimenting with animals he found that the serum of rabbits, immunised with ether-soluble substances obtained from acid-fast bacilli (avian tubercle bacilli) was often Wassermann-positive.

A positive serological reaction (Wassermann or Kahn)

is in some cases undoubtedly due to accompanying syphilis. But the great variations in total results as reported by Hazen and others, the great variations from time to time in individual cases, and marked lack of coincidence of Wassermann and Kahn results in these cases, suggest that a fair proportion of positive serological results in leprosy is due not to accompanying syphilis but to some other factor.

Ishibashi's work seems to throw some light on this other factor, which may be connected with the breaking up of acid-fast bacilli inside the body and the setting free in the serum of certain fractions. This would seem to be the more likely, for " lepra reaction," during which there is more active breaking down of leproma, and connected with which bacillaemia is more commonly found, appears according to many writers to produce a higher proportion of serological positives.

References : 1. Hazen et al., Int. Jl. of Leprosy, Vol. IV. No. 3, 1936, p. 315.
2. Ishibashi, Tohoku Jl. of Experimental Medicine, Jan.1937, p. 287/315.

A Note on Anaesthesia in Leprosy

B. MOISER.

Changes in tactile sensation in leprosy (heat and cold are not here considered), are often so slight that they escape detection altogether, and since the diagnosisin many cases depends upon them, it is important that tests be carried out in a most careful manner.

African natives vary much in their general sensibility to touch, so that this general sensibility must be gauged in each patient. Most normal people can feel a fly walking on the skin, especially on those parts which are clothed with short hairs, but there are others who do not respond to quite a heavy touch.

The general mental condition must also be gauged, and it is often necessary to spend considerable time in teaching the patient to respond to the least touch that he feels.

Having first set an estimate on these two conditions, tests for anaesthesia ca be commenced.

A piece of cotton wool appears to be the best means, rolled into a pencil, with one or two single fibres pulled out at the end. In many cases it is necessary to touch the skin

with these single fibres alone, in order to detect the very minute changes in sensation which occur in leprosy.

A feather, light as it is, is much too heavy an object to use. A piece of paper is useless, for it creates a sound besides being too stiff. With cotton wool the slightest changes become apparent. The amount of pressure employed can be varied within wide limits, and can be used to determine the depth of anaesthesia. Tapping the skin with the firmer portion of the wool is often of value.

Thumbs. For some reason or other, the thumbs of natives are curiously insensitive, and the determination of anaesthesia in these parts presents the greatest difficulty, and since the radial nerve is almost as frequently affected as the ulnar, the thumb is a matter of importance.

Dorsum of Foot. This area is very similar to the thumb in this respect, but the thin skin at the base of the toes is generally extremely sensitive, and is much more useful in the determination of anaesthesia than the dorsum.

Changes in sensation often precede changes in pigmentation, and can be readily as certained by the cotton wool method, but they require a great deal of time and patience.

At this hospital it is not possible to get ice-cold water, so that changes to heat and cold cannot be ascertained.

A Note on Intradermal Injections

B. MOISER.

The use of short needles has been given a good trial here over several years, but has now been discarded on account of leakage, and also on account of the objections raised by the patients to the multiple punctures.

Instead, an ordinary No. 23 needle is used, the skin is pinched up into a mound, and the needle introduced once only, the point being pushed into various parts of the corium from the interior. The point of the needle can be felt by the pinching thumb and finger, and can be adjusted to a nicety. Leakage is reduced to a minimum, the preparation is distributed into the skin over quite a large area, and the patients do not object.

Care is necessary not to push the needle through the skin, and so puncture the operator's own finger or thumb. It is advisable to point the needle towards the space between finger and thumb.

The Classification of Leprosy

G. A. RYRIE.

Several attempts have been made recently to formulate modifications in or changes of the present classification of leprosy adopted by the Manila Conference in 1931. It is I think generally admitted that the present classification leaves something to be desired. The present article is an effort to discuss (a) What is fundamentally wrong with the present classification? and (b) What the essentials of a new classification should be.

What is wrong with the present classification? To begin with no progress can be made in this matter unless it is frankly admitted that at the Manila Conference the significance and extent of the tuberculoid phases of leprosy were not fully appreciated. There is a good deal of internal evidence of this in the Report of the Leonard Wood Memorial Conference on Leprosy. For instance on page 457 it states that " in many cases that would ordinarily be described as cutaneous leprosy a history of primary nerve disturbance can be obtained and very often careful examination may reveal some degree of sensory disturbance and of nerve thickening ". Here there is obvious confusion between cutaneous and tuberculoid leprosy. Further on, the Report states " it is deemed desirable to class all cases with leprotic lesions of the skin as cutaneous ", whereas it is now clearly realised that skin tuberculoid lesions are associated with the neural form. The report discusses lepra reaction but has no recognition of acute tuberculoid leprosy: it seems a fair assumption that these two completely opposite phases of the disease were lumped together as a single entity. Whether this is unfair to the Conference or not the ordinary person reading the Report felt that all leprotic activity affecting the skin was cutaneous and that neural leprosy consisted of leprotic infiltration of the peripheral nerves and its direct atrophic consequences.

Possibly Japanese workers were clearer in the matter in dividing leprosy into maculo-anaesthetic and nodular forms. This however does not seem a very good classification. Only a minority of tuberculoid lesions are macules in the dermatological sense of the word, and anaesthesia is by no means the sole preserve of tuberculoid leprosy. Glove or stocking anaesthesia for instance is extremely common in advanced cutaneous (or nodular) cases.

Again " nodular " is a poor description of cutaneous

leprosy. Only a small percentage of cutaneous cases are actually nodular and nodules of a tuberculoid character may occur in maculo-anaesthetic cases.

Returning to the Manila classification we find that as tuberculoid skin lesions are associated with neural leprosy they have been rather awkwardly tucked in under the inadequate N blanket. It is obvious, however, from the literature that some workers are still calling these lesions cutaneous because they are skin granulomata—which leads to considerable confusion.

What happens, however, if the tuberculoid lesion is considered as neural? A patient has atrophy of the hands and feet from extensive nerve involvement. He has no skin lesions. He is an N3 case.

Another patient has most of his body surface covered with tuberculoid lesions. He has only slight clinical nerve involvement. He is equally an N3 case. The symbol N therefore loses all its value in giving a mental picture of the patient's condition.

An attempt to solve the difficulty may be made by introducing the symbol N.M. (neuro-macular) as a sub-division of N. This means the automatic addition of a third class. Again the word neuromacular is obviously much more suitable for describing areas of disturbed sensation and pigmentation associated with and secondary to pure nerve leprosy.

Again the symbol T (tuberculoid) has been suggested. To avoid confusion, however, the symbol C for cutaneous leprosy would have to be altered and the whole classification thereby disrupted.

The descriptions neural and cutaneous therefore are misleading and inadequate as applied to the two main divisions of leprosy.

The second fault in the present classification is that it gives no indication of the severity of the conditions. It is an area classification, quantitative not qualitative. N2 if applied to a tuberculoid case may indicate flaring major leprides or a few flat insipid macules which arouse no clinical enthusiasm. Similarly C2 may mean rapidly spreading leprosy with erythema and general debility or just an inert area of bacillary deposit.

A third objection which is partly inherent in the first is that the classification is on a fundamentally wrong basis. To graduate into one of the two main leprosy groups the classification imposes a tissue qualification, cutaneous or neural. In actual fact, however, it does not matter a scrap

which tissue is affected; what does matter is the fundamentally different character, course, and outlook of these two processes. Atrophic lesions are frequently found in advanced cutaneous cases. Tuberculoid lesions of the skin may not be cutaneous in the classification sense, but cutaneous they are nevertheless. The important point is not the location of the lesion but the recognition of two very different processes.

These defects are cited in the hope of clarifying one's consideration of what a classification should be. A good classification should have four features:—

(i) It should indicate on a more general basis that leprosy is divided into two main groups.

(ii) It should retain as much as possible of the Manila Conference classification with which we are familiar whose symbols N and C are useful and easy tissue indicators.

(iii) It should retain a leprosy area classification. The existing 1, 2 and 3 describing slight, medium and extensive involvement seems quite suitable.

(iv) It should indicate in some way the degree of activity or the severity of the lesion.

1. We have seen that the tissue criterion is unsatisfactory in demarcating the two main leprosy groups and that it is further no indication of the essential difference between them. We have leprosy of bacillary attack (cutaneous) and we have leprosy of bodily defence (neural). The statement like any other generali ation is I admit open to detailed criticism.

But in general the essential difference is that in " cutaneous " leprosy the patient is a Minus-variant as regards resistance; in " neural " leprosy the patient is a Plus-variant as regards resistance. That and not the tissue involved is the point of practical importance.

Let us take these types as M and P. M represents minus-variants as regards resistance (cutaneous, nodular, malignant, etc. etc.); P represents plus-variants as regards resistance (neurals, neuro-maculars, maculo-anaesthetics, leprides, etc. etc.).

2. To these can be attached the tissue indicators of the Manila classification. The tuberculoid-cutaneous confusion now disappears. PC2 would indicate tuberculoid lesions

over a moderate area. MC2 would indicate a similar area of " cutaneous " leprosy. The symbol C thus returns to its legitimate use as describing a skin lesion. The other permutations are obvious. It is a fair criticism that some of the possible combinations of this system are highly improbable. MN1 for instance would indicate early nerve leprosy of a malignant type—which does sound a trifle hypothetical. Against this, however, we must put the gain of using cutaneous for all skin leprosy.

3. The area indicators of the Manila Classification are retained.

4. A wide variety of terms are used at present to indicate degrees of lesion activity, especially in tuberculoid cases. For clinical purposes it would be considerably better if we could employ the same terms in both the main groups when describing severity. The activity of both types could be described as acute, subacute and chronic.

Thus PC1 chronic would indicate a strictly localised area of simple and minor tuberculoid character. PC3 acute would indicate a generalised attack of acute tuberculoid leprosy. Similarly MC3 acute would represent cutaneous lepra fever or " reaction ". MC2 subacute would indicate cutaneous leprosy over a moderate area but active and spreading.

This not only has the advantage of describing lepra reaction and acute tuberculoid leprosy but also localised forms of both these conditions.

Two difficult types occur under my classification. The first is the early lesion before one knows whether the lesion will become (a) abortive, (b) tuberculoid, (c) malignant cutaneous. The second is the transitional type where the patient is changing over from tuberculoid to cutaneous—from being a resistance plus-variant to a resistance minus-variant. There are cases in which it appears that a focus or reservoir of malignant cutaneous leprosy in one part of the body is responsible for the appearance of tuberculoid lesions in other parts. In a case seen recently there were cutaneous lesions (lepromas) on the face and tuberculoid lesions on the trunk (both confirmed by section). Patient gave a history of both lesions being of equal duration. In such cases the P or M indicating type would simply be left out, the omission indicating the inability of the examiner to place the patient in either group.

Some such system as I have described is not merely

necessary for efficient classification of cases. Certain forms of tuberculoid lesion will shew temporary retrogression as a result of almost every form of metabolic disturbance. For instance by vaccinating certain selected tuberculoid cases one might be able to shew that vaccination appears to be an excellent treatment for leprosy. By vaccinating another group of cutaneous cases on the reaction threshold it might equally well be shewn that vaccination is a very dangerous procedure in leprosy.

Take the lepratherapy literature of the last five years—its discordancy is amazing. It is as if three different observers described the same man as (a) two and a half feet high and thin, (b) ten feet high and fat, (c) non-existent. Methylene blue is an excellent drug, and it is also worse than useless. Solganol is a helpful auxiliary, also it just damages the patient. Treatment is good in early cases, treatment is bad in early cases. Hydnocarpus oil and esters are of no value at all, they do a slight amount of good, they produce excellent results. While there are a number of causes for this, the most important element is the lack of clear means of describing the type of case experimented on.

To give a personal example. A number of years ago I experimented with the use of trypan blue in leprosy. I naturally selected cases with well defined isolated lesions which would be photographed and observed daily (i.e. tuberculoids) and quite honestly regarded them as cutaneous. The experiment coincided with a wave of disappointment over esters treatment and the psychological effect of something new was enormously enhanced by the selective staining of the lesions. This combined with the metabolic disturbance engendered by the treatment produced excellent results—for a time. In my report I described the lesions as cutaneous. Had I described them as a group of somewhat unstable subacute tuberculoids or had there been a classification which could have conveyed this, it would have saved a great deal of time and trouble for other workers.

Some such classification as I have outlined is therefore not only necessary for clarity but is an essential for co-ordinated progress in therapy.

*On Leprosy in the Bible

H. P. LIE.

Of all human afflictions leprosy has inspired much terror, dread and constant fear through the thousands of years recorded by man and in all probability even in pre-historic days. A proof of this lies in the fact that the term "leprous" not only has been confined to the constitutional disease itself, but has also been applied in moral ethics to express the most loathsome of all human misery. Consequently a great number of names and terms have been adapted for this disease and these have in turn passed from land to land, and race to race, and from language to language. These names and terms have not only been altered in form, but also in meaning, partly on account of pure misunderstanding and partly on account of the difficulty of finding adequate and correct equivalents in translation.

These difficulties have in course of time been greatly augmented by the fact that many chronic, incurable and terrible diseases have been confused with leprosy, although they have had nothing in common with it. It will readily be understood, therefore, how the task has been made exceedingly difficult—in many instances impossible—to discern if these numerous names and descriptions, which have come down to us from antiquity, appertain to our modern concept of leprosy or not.

It is a general opinion that some of the most ancient records of leprosy are to be found in the Bible in the description of diseases embraced by the Hebrew word *zaraath*. Several authors have lately expressed certain doubts about the accuracy of this opinion. Other authors have gone so far as to deny that the diseases embraced by *zaraath* have anything whatsoever to do with leprosy.

Zaraath is mentioned in the Old Testament in several places, but especially in Leviticus, chapters 13 and 14. The characteristic feature of *zaraath* is white spots situated slightly below the level of the surrounding skin, and where the hair has turned white. These spots increase in size and spread often within one or two weeks. The question arises whether or not there exist symptoms corresponding to this characteristic form in our modern cases of leprosy. We are familiar with such symptoms in certain varieties of

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leprosy. In the maculo-anaesthetic variety, white or light spots may occur, but the hair on these spots does not become abnormally white. These white spots are of a somewhat different nature since they appear in more or less pigmented skin among different races. In the white race they are the residuum or the result of healed leprous processes in the skin. For this reason they do not spread, but, on the contrary, remain unchanged for long periods, perhaps in most instances throughout life. Even if the skin atrophies in these cases, it is in such a slight degree that these white spots do not lie noticeably below the level of the surrounding skin. It is evident, therefore, that these spots cannot be identical with *zaraath* since the latter spreads and is situated slightly below the level of the surrounding skin. Likewise the white hair which characterizes white spots in *zaraath* is by no means a striking feature in the leprosy which is known to us. The spots, which occur in lepers of the white race, certainly spread during the active leprous processes, but spreading takes place very slowly, and at the onset the colour is not white at all, but more or less of a vivid reddish hue. The red colour fades somewhat with time and becomes a hue of more or less pronounced brownish colour. This reddish-brown colour remains in the peripheral parts for a long time, and often throughout life, while the central parts become white and free from pigment.

If this discolouration extends to the peripheral parts, then the whole spot becomes more or less white and the result is the permanent white spots described above, which are the residuum of active leprous processes in the skin. As long as the process is active we may say that this corresponds most often to the presence of pigment in the spots and the affected skin is more or less thickened, so that the level of these parts lie *above* and not *below* the level of the surrounding skin, in the manner characteristic of *zaraath*. Among coloured individuals the leprous spots differ somewhat in appearance from those described above, since it is known that the red colour which appears in the inflammatory process in the white race, very often gives the appearance of being more or less white in the coloured races. The leprous spots in the coloured race can, therefore, contrary to what happens in the white race, also appear as being white during the active leprous process. The leprous process in the skin is, however, very often of a most severe character and the infiltration of the skin may even result in considerable scale formation with desquamation of the skin's surface. Under such circumstances the spots will always rise so much above

the level of the surrounding skin that it would be out of question to designate them as lying below the level of the surrounding skin, in the manner of the descriptions in the Bible of *zaraath*. In modern leprosy there occurs one type of white spots which are situated below the level of the surrounding skin. This type is represented by the slightly scarred spots resulting from *pemphigus leprosus*. This is very rare, but white scars caused by burns are frequently encountered in old cases of maculo-anaesthetic leprosy, on account of greatly reduced sensation. As a rule these spots are hairless and only in rare cases are they covered with a sparse crop of thin and fine hair, faintly coloured or white. These spots are stable, however, and do not spread at all. They are the most likely to correspond to the spots mentioned in Leviticus, chapter 13, verse 23. It is unlikely that these spots were considered leprous in origin since the individuals afflicted with them were pronounced to be "clean". In Leviticus, chapter 13, verses 24 and 25, we find description of spots which the priest pronounced as "unclean". These spots were generally of a reddish colour, but might also be of a white variety. In this instance one might perhaps consider the possibility of these spots being identical with our present day leprous spots. But the affliction described in these two verses must rather be looked upon, however, as granulations produced in burned parts rather than authentic leprous spots.

There is one condition which is of great importance for determining the true nature of *zaraath* in our attempt to decide if this disease is related to modern leprosy or not. In Leviticus, chapter 13, verse 30, etc., it is stated that *zaraath* appeared in the hairy part of the head, as well as in the beard. It should be borne in mind that the original Hebrew text employs two words for these diseases. The first affliction *naethaeq* is derived from *nathaq*, to shake off, or to tear loose. It is apparent that this derivation refers to diseases with crusts, dried exudate on the skin or desquamations. In the Norwegian translation of the Bible this word is interpreted by *"skurv"* (Norwegian translation of the English scurf). Then the original text continues: " It is *zaraath* on the head or in the beard. . . ." (verse 30). In chapter 14, verse 54, on the other hand, the words *naethaeq* and *zaraath* are apparently employed to describe two different diseases. " This is the law for all manner of plague of leprosy (*naega zaraath*) and scale (*naethaeq*). . . . ." In modern leprosy it is a fact that neither the hair of the head. nor of the beard is affected in the maculo-anaesthetic variety

of the disease. It is only this variety which might be considered in the elucidation of *zaraath*. On the other hand, the nodular variety of our modern leprosy (*lepra tuberosa*) very often attacks the scalp and almost invariably the roots of the beard when the disease has lasted a long time. This affection is characterized by a considerable leprous infiltration about the hair follicles which deprives the hair of nourishment and results in the falling out of the hair. The shedding of the eyebrows is known to constitute one of the first symptoms of nodular leprosy. This form of leprosy only rarely and protractedly leads to ulceration in the affected parts and as above mentioned most rarely in the scalp. On the other hand, no desquamation or crust formation occurs if there are no concurrent non-leprous affections such as seborrhea, pityriasis, psoriasis, or on rare occasions trichophytia of various kinds, or possibly favus. It is quite probable, therefore, that the description in Leviticus, chapter 14, verse 54, refers to these or similar affections rather than to leprosy.

The oldest and best descriptions of leprosy fail to make mention of affections in the hair and beard, or at any rate refer to it but casually. ARETAEUS (ca. A.D. 100), merely states the following: " The hair dies off completely: it becomes scarce on the hands, thighs, legs, the groins and the chin. The hair on the head becomes thin and gray hair appears prematurely and there is much baldness. The groins and the chin become completely devoid of hair within a short time and if some few hair do remain, they merely cause disfiguration.".

BERNHARD GORDON (Montpellier, A.D. 1305) makes no mention whatsoever of affections of the hair and beard. In the statutes regarding the examination of suspected cases of leprosy, which were decreed during the Middle Ages, it is only mentioned in the section referring to the face. It reads: " one must examine if bran-like (pityroid) scales appear when the head is scraped." When leprosy had disappeared from Europe, HENSLER, at the end of the 18th century, collected with extreme diligence most of the extant literature on leprosy. Likewise, he drew up a list of many skin affections with crusts and scale-formation which he considered as precursors or the primary stages of " fully developed " leprosy. Among these figured *naethaeq* in the Bible, and baldness, *alopecia*, *mentagra* and *sycosis*. It must be borne in mind, however, that HENSLER had only seen one single leper, namely a German who had become affected in

the Danish West Indies, which represented a typical case of lepra tuberosa. One could scarcely expect, therefore, that HENSLER could render expert judgment of the value of what he had read or collected. We are fully justified, therefore, in believing that the leprologists in the Middle Ages, on account of their considerable practical knowledge of leprosy, did not confound so great a number of skin affection with leprosy as HENSLER has done.

It has already been stated that the word *zaraath* unquestionably could deal only with the maculo-anaesthetic variety of leprosy. This contention necessitates still further proof since several words in connection with *zaraath* characterize the disease, such as *seeth, sappachath* and *bahereth* in Leviticus, chapter 13, verse 2. What do these words mean? It is my opinion that we must revert to the oldest translations of the Hebrew Bible in order to discover their meaning. There are chiefly two of these translations which carry great significance, namely the Greek translation of the Septuagint from about the middle of the 3rd century B.C., which reads as follow:

'Ανθρώπω ἐάν τινι γένηται ἐν δέρματι χροτός αὐτοῦ οὐλή σημασίας ἢ τηλανγής καί γένηται ἐν δέρματι αὐτοῦ ἀφή λέπρας.

The other is the Vulgate Latin version of the Bible from the 4th century A.D. which reads as follow: ' *Homo in cujus cute et carne ortus fuerit diversus color sive pustula, aut quasi lucens quispiam id est plaga lepra. . . .*"

A third old Latin translation reads: ' *Homo cum fuerit in cute carnis ejus tumor (seeth) vel inhaerentia (sappachath) vel candor (bahereth) et fuerit in cute carnis ejus tactum leprae (nega zaraath). . . .*"

From this it is apparent that there is no particular agreement between these translations and hence it is not an easy matter to obtain a clear picture of the condition. It appears that the general interpretation of *seeth* is that it means a swelling, or an elevated part of the skin. One Latin translator has interpreted it thus, and such is the case in the Norwegian translation of the Bible. It is noted that the Vulgate translates the word with *diversus color*, and another translator makes use of *color albus*. Verse 10 mentions *seeth* also, but in connection with *lebana* = white. Whether this is added to explain that *seeth* always means white, or whether this is a special form of *seeth* is not an easy matter to determine. But in verse 2, as well as in verse 10 in the Norwegian translation of the Bible, *seeth* is rendered as

similar to leprosy. It seems more reasonable to assume, therefore, that *seeth* mentioned in verse 2 also is white *seeth*, inasmuch as we cannot have two sorts of *seeth* to characterize leprosy. A Latin translation of verse 2 seems likewise to point in the same direction and it reads: "*Cumque color albus in cute fuerite.*" But we know that nodules in leprosy are not white, but always more or less reddish or brownish in colour and occasionally even very darkly pigmented. White hair is not characteristic of leprous nodules and yet such are especially mentioned in verse 10. As far as *sappachath* is concerned, it will be seen that it is partly translated with *pustula* and again with *inhaerentia*. The latter is considered to be formation of scales (JEANSELME) and neither of these belongs to the picture of leprosy. What οὐλή σημασίας (the scar in the sign) is intended to mean, I dare not say, but it seems out of the question that it should prove the existence of leprosy among the ancient Jews. The Norwegian translation of the Bible renders this as "scabies" and I am inclined to believe that this assumption is a fairly correct one. We shall return to this later. Finally, with regard to *bahereth* there exists a general agreement that it must mean bright, or a shiny affection of the skin. It is my opinion, however, that this cannot be associated with the clinical picture of our present day leprosy. Rather it suggests psoriasis, which in the course of time quite frequently has been confused with leprosy.

There remains still another Hebrew word, viz. *mispachath*, in chapter 13, which needs must be discussed further in this connection. Judging from verse 6, *mispachath* must have been a comparatively innocent complaint, at any rate at the onset, since the sufferer merely needed to "wash his clothes" and he was made "clean." The assumption for this was that the affection had not spread, and if it had spread the patient concerned should be placed under new observation (verse 7). Should *mispachath* spread over the skin, then the patient shall be declared "unclean," the disease is *zaraath*. The Greek translation of the word is σημασία and the Latin is *scabies*. The old Norwegian translation has adopted the Latin one and gives '*skabb*," (scabies). The new Norwegian translation, on the other hand, renders it as '*meinlaust utbrot*" (harmless rash). GESENIUS and LUTHER translate it with "*Schorf-gutartig*," and "*Grind*" respectively, and this means approximately the same as *scurf*. One gets according to this the impression that *zaraath* means the latter, or the more severely developed stage of a disease which in itself is not malignant, at least not at an early stage.

We have endeavoured to prove that the biblical description of *zaraath* has nothing whatsoever in common with the nodular form of leprosy, lepra tuberosa. This is all the more striking since this form of the disease has at all times and among all races left behind the most gruesome and most indelible impression on all who came into contact with it. That only the maculo-anaesthetic variety of leprosy should have occurred among the Hebrews is obviously an erroneous notion since the various forms of the disease are met with among all races affected by the disease. This has been the case since the most ancient records presented us with positive knowledge of the disease.

HENSLER who assumes that *zaraath* is leprosy, namely the so-called white leprosy, has also been aware of the fact that the nodular form is not described by Moses. He states that this is naturally explained by the fact that Moses wrote a book of statutes and not a " medical system." All other forms of leprosy, and in particular the nodular form, betrayed themselves sufficiently by their appearance. The white leprosy could, however, be mistaken for other diseases. These patients were consquently kept under observation. HENSLER's arguments strike me as being quite weak. The intention in the Mosaic Law must have been to separate all the " unclean " from the " clean." If the less severe and gruesome maculo-anaesthetic form was looked upon as " unclean," then the nodular form must have been even more so. It seems rather strange, therefore, that this form is not mentioned at all, nor even surmised, provided that it existed at that time. If we assume, however, that *zaraath* is maculo-anaesthetic leprosy, or *lepra nervorum* in the more modern nomenclature, then we are left completely in the dark about the cardinal symptoms of unsensitiveness and paralysis which appear quite early in the disease and which are so characteristic during the later stages. Neither are the great trophic changes causing mutilations on hands and feet, which are no rare occurrence in this form of the disease, so much as mentioned.

(*To be continued.*)

*Tests of the Suitability of Hydnocarpus Oil for Injection

J. LOWE and N. K. DE.

In this department we have during the last few years received many requests for information regarding how to tell whether a sample of oil is good or not. We have also received many reports of trouble, pain and local reaction after the injection of hydnocarpus oil. We have therefore studied the matter closely, examining various specimens of oil physically and chemically, and correlating the findings with the results of therapeutic tests carried out in patients. This brief paper incorporates the results of this investigation and gives information which may be of use to people who prepare and distribute the oil and to doctors who wish to know how to tell good oil from bad.

Most, if not all, of the trouble with injections of hydnocarpus oil is due to the oil being badly prepared or badly stored or both.

The preparation of the oil.

Hydnocarpus oil, if it is to be good, should be expressed from fresh ripe seeds. Bad fruits and seeds should be rejected. It is preferable that the outside of the seed should be removed before the oil is expressed. Most manufacturers, however, express the oil from the whole seeds. This introduces into the oil many particles of dust and vegetable matter which are adherent to the outside of the seeds. As will be explained later it is important that these particles should be removed as soon as possible by filtration.

Adulteration of oil.

Adulteration of oil is not infrequently seen and may be the cause of trouble with injections. Oil sold by dealers of repute is usually unadulterated.

Tests for adulteration: The only real test for adulteration is to test specific rotation with the polarimeter. The exact method of doing this need not be described here. Anyone desiring to get samples of oil tested should send about 5 c.c. of oil to the Leprosy Department of the School of Tropical Medicine, Calcutta. The specific rotation of good hydnocarpus oil is usually

*Reprinted from *Leprosy in India*, Vol. IX, No. 2, April, 1937.

about +57°. Oils giving a value less than +53° are adulterated or decomposed oils which will probably give trouble on injection.

Prevention of oxidation of oil.

We have found that the irritant properties of oil are greatly increased by oxidation due to bad storage. The products of oxidation are irritant and consist chiefly of acids and other substances such as peroxides. All oil if kept for a long time undergoes a certain amount of oxidation and good oil stored even under good conditions for a year or two may become unsatisfactory for use. This indicates the necessity for using fresh oil but since the trees bear fruits only once a year, storage is necessary. There are certain factors connected with storage which greatly accelerate the process of oxidation. These are the presence in the oil of dirt, dust and water, and the exposure of the oil to air, heat and sunlight. Therefore oil should be perfectly free from water, should be filtered to remove all foreign particles, should be stored in air-tight containers which are absolutely full so that all air is excluded, and should be kept in a cool dark place. If these precautions are not taken oil may very rapidly deteriorate and cause serious trouble. Unfortunately manufacturers of oil not infrequently neglect all these precautions. For this reason it is advisable that all doctors who treat any number of leprosy patients should be able to carry out simple tests of oils supplied by dealers so that if the oil is bad it can be rejected at once. At the same time doctors should realize that the oil may be good on receipt from the dealer and may, because of improper storage, become bad later. Another important point which a doctor should know is that repeated sterilization of oil greatly aids oxidation and renders oil unsatisfactory for use. Oil should be sterilized once only and kept sterile.

Tests for oxidation products in oil.

The two chief products, the presence of which may be tested for, are acids and peroxides. Even good oil contains a certain amount of these but bad oil contains them in excess. The test for acidity is simple but does not give quite such a reliable indication of the irritating properties of oil as does the test for peroxides which is however more difficult.

(*a*) *Acidity.*—The acidity of oil is calculated in percentages of oleic acid. The percentage of acidity of really good oil is less than 1% but with an acidity of less than 3% oil

is usually suitable for injection. Between 3 and 5% it is very doubtful and over 5% it is usually bad.

A rough method of estimating the percentage of acidity of oil is here described :—

> Take a 50 c.c. conical flask, pour in between 5 and 8 c.c. of pure ether and add 1 c.c. of oil carefully measured in a pipette, making sure that there is no oil adherent to the outside of the pipette. The oil remaining inside should be thoroughly washed out of the pipette by repeatedly sucking up and blowing out the ether. Shake the flask to dissolve the oil, add 15 c.c. of pure absolute alcohol, shake and then add a few drops of alcoholic solution of phenolphthalein indicator. Titrate the contents of the flask against $\frac{N}{10}$ caustic soda[1] shaking the flask thoroughly and adding drop by drop from a burette until the pink colour appears and stays after shaking. Read the number of c.c. of $\frac{N}{10}$ NaOH used and multiply by 3. This gives roughly the percentage of acidity if the above amounts are used.

(*b*) *Peroxides.*—Good oil contains only a small amount of peroxides but oxidized oil contains large amounts. The presence of peroxides can be detected chemically. The basis of the test is that peroxides have the power of liberating iodine from potassium iodide, and iodine in the presence of starch gives a marked colour reaction. The test is, however, applicable only to untreated oils as supplied by good dealers. Oils which have been extracted with a solvent or neutralized by caustic soda cannot be tested in this way. (See final paragraph).

The test may be pe ormed either as a qualitative test or preferably as a quantitative test.

Qualitative test. The materials required are :—

> (1) A solvent mixture consisting of chemically pure glacial acetic acid 2 volumes, and chemically pure chloroform 1 volume, (2) pure solid dry potassium iodide, (3) approximately 5% solution of potassium iodide prepared by dissolving potassium iodide in freshly boiled and cooled distilled water, (4) 1% solution of pure starch in distilled water, the solution to be boiled and cooled, (5) a strong thick walled test tube about 17 mm. in diameter and 20 cm. long fitted with a rubber cork.

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[1] (To be prepared by dilution of normal solution purchased from a reliable firm of chemists.)

The method is as follows:—

Take about 1 c.c. of oil in the test tube. Add about 1 gram of solid potassium iodide and about 5 c.c. of solvent mixture. Shake to dissolve the oil. The potassium iodide remains undissolved at the bottom of the tube. Boil vigorously on a flame for about 30 seconds. If marked excess of peroxide is present a brown colour at once develops. If there is no appreciable colour change, put the cork in the tube, cool under a tap and add 10 c.c. of 5% potassium iodide solution and shake. The contents of the tube are now a whitish emulsion. Add about 1 c.c. of the starch solution and observe any immediate colour change. The colour varies from a very light brown, almost pink, to a very dark indigo brown, according to the amount of peroxide present in the oil, the lighter shades of brown indicating small amounts and the darker shades large amounts. If the oil is suitable for injection only a light brown colour should be shown in the test.

Quantitative test. Materials required:—

In addition to the requirements for the qualitative test the following are needed:—

(1) $\frac{N}{500}$ Sodium thiosulphate solution prepared by dissolving 1 gram of crystals of chemically pure sodium thiosulphate and .05 gram of anhydrous sodium carbonate in 2 litres of distilled water freshly boiled and cooled. This solution does not keep well and should be freshly prepared from time to time with perfectly pure salts. For really accurate work it should be standardized by chemical methods, but for rough work this is not necessary.

(2) A 250 c.c. conical flask with a glass stopper.

Method.—Weigh the test tube carefully. Weigh carefully 1 gram of oil in the tube then add approximately 1 gram of solid powdered potassium iodide. Run in about 19 c.c. of the solvent mixture washing down any potassium iodide which is adherent to the walls of the tube. Shake the tube to dissolve the oil. Heat the tube over a flame until it boils gently and then hold the tube into a vessel containing boiling water. The liquid rapidly boils and boiling is continued until the froth rises well up the tube, (about 20 to 30 seconds is usually necessary). At this point insert a rubber cork, shake vigorously for a few seconds and cool under a running water

tap. Measure about 20 c.c. of 5% potassium iodide solution and pour about 5 c.c. of it into the flask. Remove the cork from the tube and pour the liquid from the tube into the flask. Wash out the potassium iodide from the tube into the flask with the remainder of the 20 c.c. of potassium iodide solution.

Keep the stopper in the flask as much as possible. Pour into the flask about $\frac{1}{2}$ c.c. of 1% starch solution; in the presence of peroxides a brown colour results. Titrate the contents of the flask against $\frac{N}{500}$ sodium thiosulphate solution shaking thoroughly the whole time. The end point is reached when the brown colour goes and is replaced by the pale straw colour of the oil in emulsion. Read the number of c.c. of $\frac{N}{500}$ sodium thiosulphate used. With a really good oil the reading should be less than 1 c.c. With readings less than 2 c.c. the oil is usually satisfactory. Higher readings indicate the presence or excess of peroxides.

Purification of oxidized oil.

If oil contains too much acid and peroxide it can be purified by washing one or more times with $\frac{1}{2}$% caustic soda and by passing steam through it, but this is a troublesome process. After neutralization the oil can be tested for acid as described above but the test for peroxide is no longer applicable.

REPORTS

Dr. M. J. Oberdoerffer sends a preliminary report on *Jantol,* manufactured by Messrs. Bayer-Leverkusen. He tried out this drug on 16 patients. His conclusions were that *Jantol* is a difficult drug to use. It can only be injected in small doses, as otherwise it produces severe local and general reaction. The high iodine content (2.5%) is a dangerous attribute. The special effects of chaulmoogra preparations depend on the possibility of giving large doses, which are not possible with *Jantol.* He considers that this drug can only be used in small doses and in carefully selected cases. What its final effect will be he cannot judge yet, as he has only used it for six weeks.

Biederwolf Leper Colony, Soonchun, Korea.

Dr. Wilson writes in his report:—" One real problem is the cured leper. If your neighbour had been under treatment in a leper colony and returned saying he was cured, would you care to have him to stay in your home? Or would there be for him any opportunity of marriage? Doubtless, no! One young man was discharged from our colony cured. After a few months he came back in great distress, with this story: ' My own friends would not allow me to drink from our well nor walk in the village path. My family said that my presence would prevent my sister and brother from getting married. I am not allowed to beg; my situation is hopeless. So I have come back to you.'

" We have a solution for such a problem too. It is to

The first group of married cases with their adopted children.

locate cured cases on small rice plots, in families where possible, so that they may be self-supporting and gradually may give assurance to the public that the cure has been permanent and that the former leper is a safe citizen of his community. Then he may go to his village or elsewhere and be an exponent of the eradication of leprosy from Korea.

" A marriage experiment has proved a most happy one. A year ago we selected eleven men with good records of response to treatment and helpfulness in the community life, and arranged for the selection of a wife for each, by the oriental plan, from among women of like progress. Each pair selected a leper child, boy or girl, to adopt and make their home complete. The men, with their consent, were first sterilized. Then there was a union marriage ceremony, and the adopted children acted as attendants at the wedding.

" Each pair was given material with which to build a home in the colony, land for a garden, and a rice field.

Together each pair and their son, or daughter, built the home, planted the vegetables, the flowers and the rice; and they are now carrying on their happy family life. We can go further with this when our friends supply us with additional land. Remarkable progress has been made by the lepers in making the very poor barren soil into fine farm land. The entire colony has gotten the spirit of farming as they have the spirit of treatment. Our friends believe in treatment because they see results. They believe in farming because they see results too; and the full larder means a good table. At our annual fair are displayed a great variety of farm produce and other things made in the colony; and this is a great stimulus to all. At the last fair were exhibited farm products, rabbits, pigs, needle-work, trunks, tinners ware, peg legs, and even a house cat, which was brought in a cage to show the best cat in the place. One rule is that every patient must save seed for next year, and that everyone must plant annually 100 trees. The place has taken on real beauty and has become a haven of rest for an outcast people."

Annual Report for 1936 of Leprosy Research Department, School of Tropical Medicine, Calcutta.

As many as 1762 new patients appeared for diagnosis during the year, of which 1568 were definitely diagnosed as leprosy. Under *Bacteriology* the following abstract is of special interest:—

"Attempts have been made to prove or disprove the claims of successful culture which have recently been made by various workers. Exhaustive experiments have been carried out in the cultivation of lepra bacilli specially, by the methods of McKinley, Soule and Verder. About 1,000 tubes of different media were inoculated in 24 experiments. About one-half of these were put under the gaseous tension recommended by Soule and McKinley and the other half were incubated under ordinary atmospheric conditions. These were periodically examined over a period of several months. Until October no definite evidence of multiplication of the bacillus was obtained. In October, however, the tubes seeded in August were examined and it was found that of the 70 tubes kept in a gaseous environment of 40 per cent. oxygen and 10 per cent. carbon dioxide according to the method of Soule and McKinley, 35 showed slight macroscopic and considerable microscopic evidence of colony formation, many masses of acid-fast bacilli being found in smears. Of the other 70 tubes kept under ordinary atmospheric conditions, 14 showed similar but less marked evidence of growth. Subculture is being attempted. The details of the experiments with the gaseous tension method are at present as follows:—

Experiments under 10 *per cent.* CO_2 *and* 40 *per cent* O_2 *gaseous atmosphere.*

Number of experiments	8
Number of tubes inoculated	313
Number of tubes examined so far	159

Results of the 159 *tubes examined.*

Contaminated	23
No. A.F. bacilli	11
Smears showed scanty to fair amount of A.F. bacilli	89
Large number of A.F. bacilli (Suggestive of multiplication)	36

(All from two experiments.)

Multiplication of bacilli has not been proved, nor has the organism found been shown to be the leprosy organism.

In the minced-chick-tissue medium persistence of bacilli for a long time and carrying over of bacilli from one tube to another is observed, but no definite multiplication has been obtained. It is believed that the findings of Salle, who reported that in tissue cultures and in minced-chick-tissue media the bacilli multiply in alternating acid-fast and non-acid-fast forms at the various stages of sub-culture, has been disproved. The bacilli remain acid-fast, but no non-acid-fast forms have been seen except for the contaminants. These contaminating organisms, when put on to fresh media, do not become acid-fast.

REVIEWS

Inoculation of Human Leprosy into Syrian Hamsters.

Dr. Adler writing to *The Lancet* of 18th September, 1937, describes his method of inoculating Syrian hamsters. On July 23rd, 1937 three young animals were splenectomised and a fragment of human lepra nodule placed in the space between the skin and fascia as far as possible from the splenectomy incision. The results were as follows:—" On August 31st one animal was found dead and unfortunately putrefaction was too far advanced to allow examination. A second animal (the one from which the tumour had been removed) was found to be aborting and in a weak condition. It was immediately sacrificed. The following facts were noticed. The tissue round the second operation wound was necrotic and covered with white curdy material. The abrasions of the skin, particularly round the neck, were still noticeable. A nodule about 1cm. in diameter was found

implanted into the abdominal muscle, and smears from this nodule contained swarms of lepra bacilli typical in arrangement. They were much more numerous than in the human nodule used for the experiment. The site of the second operation was swarming with lepra bacilli. The same bacilli were found in skin abrasions far removed from the site of the original inoculation. *Lepra bacilli were also found in liver smears,* thus proving that a systemic as well as local infection had been established. It is interesting to note that between August 24th and 31st leprosy bacilli had multiplied extensively at the site of the second operation.

" On September 1st the third animal was killed. A fibrous nodule again about 1 cm. in diameter was found adherent to the abdominal wall, and again smears contained innumerable lepra bacilli. The connective tissue in the immediate neighbourhood of the nodule was also infected.

" On September 1st a fourth animal was also examined. This animal had been splenectomised on July 24th but the fragment of human material had been embedded in the muscles of the left thigh. On biopsy not a trace of the original material was found on the site of implantation, but there was a large lymphatic gland in the left groin. This gland was caseating in the centre, and smears showed innumerable leprosy bacilli.

" The fact that a heavy infection was established in three animals and that in one of them there was a systematic infection, all within six weeks, prove that the above findings are not accidental and that in the Syrian hamster, at least under the conditions of experiment described above, we have an animal susceptible t human leprosy. This will, no doubt, both stimulate and facilitate further research.

" It should be pointed out that the Syrian hamster is in many ways a very valuable laboratory animal. Unlike the Chinese hamster it breeds readily in captivity."

Leprosy in India, Vol. IX., No. 3. July, 1937.

R. G. Cochrane and M. P. Raj write on *Solganal-B Oleosum in the Treatment of Leprosy.*

" Eight cases were treated with Solganal-B. Oleosum in order to see whether the claim that it was beneficial in leprosy could be substantiated. The results were not striking but in five cases there was a tendency to subsidence of lepra-reaction. In one case there was not only definite subsidence of signs of reaction, particularly in the eye, but the patient was able, subsequently, to tolerate larger doses of the hydnocarpus preparations. The larger doses of Solganal-B. Oleosum were not only found to be beneficial, but tended to produce reaction.

Therefore it is advised that the dose should be kept low and never exceed 0.1 gm. The course which is likely to produce most benefit appears to be as follows :—3 injections of Solganal-B. I (0.01 gm), 3 injections of Solganal-B. II (0.05 gm) and 1 injection of Solganal-B. III (0.1 gm). All injections should be given at weekly intervals and deeply into the gluteal muscles. It will be found that many patients may not be able to tolerate Solganal-B. III (0.1 gm). Therefore caution must be exercised before proceeding to this dosage. Before and during the course the urine should be examined for traces of albumin.

It was our endeavour to try and discover if there were any indications as to when gold salts should be used. In this we largely failed. The following points may be of interest. Solganal does not seem to have any effect on the febrile stages of lepra-reactions, for this we rely more on Potassium-Antimony-Tartrate and Fluorescein. Nor do we claim, as others have, that it has any effect on the leprous process, except indirectly through controlling the mildly reactive stage. In cases where eye reactions are produced by the small doses of the hydnocarpus remedies, we consider a course of Solganal-B. Oleosum may be helpful, but in such cases one ought to be careful not to increase the dose till it is found that the larger doses are tolerated well. Similarly in breaking down leprotic ulcers where there is no definite fever, a course of Solganal-B. Oleosum is worthy of a trial. We believe, we have in this remedy one more drug added to our list of those used for treating conditions associated with lepra-reaction and we feel that in the milder, but sometimes distressing forms of lepra-reaction it may prove, in some instances, to be the remedy which will be found to succeed when others have failed. We do not recommend a course of gold to be repeated at an interval of less than three months."

We reprinted in full J. Lowe's paper on *Epidemology of Leprosy* in the last number of *Leprosy Review*.

International Journal of Leprosy, Vol. V, No. 3, July-September, 1937.

K. Mitsuda and K. Nagai write on *Alopecia Leprosa*. This condition is much more common in Japan than in other countries, being found in 66 and 80 per cent of males and 66 and 72 per cent. of females in two leprosaria. Its occurrence is most noticed in the 5th to 8th years of the disease. It begins principally in front of the ear, then affects most commonly the pariental and frontal areas.

"When well advanced, leprous alopecia is remarkable for its occurrence chiefly over the course of the larger veins, the hair persisting for a long time over the arteries. Veins, because of the low pressure and slow velocity of the blood in them, and the abundance of perivascular lymph spaces, are more suitable than arteries for the multiplication of the leprosy bacillus and the development of leprous infiltration. Loss of hair follows atrophy of the hair roots, caused by pressure of the leprous infiltration in and around the hair papillae and consequent malnutrition of the hair structure."

A. J. Salle and J. R. Moser give a fifth paper on *Bacteriology of Leprosy,* relating the effect of culture on chick embryo and other media on acid-fastness.

E. B. McKinley and W. de Leon contribute an important paper on *Mass Cultivation of Mycobacterium Leprae.* They confirm former reports of culture from nodules and describe the technique in detail. An air-tight incubator 52 x 27 x 27 inches in size is used. Out of this the air is evacuated to 20—25 inches of negative pressure, after which a mixture of 10 per cent. carbon dioxide, 40 per cent. oxygen and 50 per cent. nitrogen is sucked in. The medium used in the culture tubes is prepared as follows:—

"Use fresh lean ground beef. Add 1 litre distilled water plus 10 grams of peptone and 5 grams of sodium choride per pound of beef. Make an infusion and leave in the icebox for 24 hours. Remove meat issue by straining through washed cheesecloth into large glass beakers. Add to filtration 15 cc. N/1 NaOH per litre. Mix thoroughly. Place in boiling water bath for 20 minutes, or until the protein is coagulated. Cool. Decant clear supernatant broth into large beakers or glass dishes. Add 50 cc. clycerol per litre of decanted solution. Adjust pH to 7.4. Add 15 grams of agar per litre of decanter fluid. Dissolve by heat. While melted, distribute to plugged sterile test tubes. Autoclave at 110 degrees C. for 20 minutes. Slant."

While the above is suitable for preparing large quantities, Novy jars or similar anaerobic jars may be used in an ordinary incubator for small quantities.

"Cultivation work with leprosy according to these methods yields small colonies averaging about 1 mm. in diameter, and heaped up, with a distinct mucoid appearance and a loose flamentous border. The colonies are made up of characteristic bacilli which stain solidly with carbolfuchsin, and are not decolourised with 10 per cent. sulphuric acid."

H. J. Henderson makes *A Serological Comparison of the Proteins of Various Strains of Supposed Leprosy Bacilli and Other Acid-Fast Bacteria.* Thirteen out of sixteen strains gave strong precipitin reactions with one another, while those of Duval (nonchromogenic) and Walker (chromogenic) failed to cross react with the large group.

H. I. Cole and H. Cardoso describe *Relation of Irritation to Method of Manufacture of Ethyl Esters of Chaulmoogra Oils.* Their report is summarised as follows:—

"Various methods of preparing *H. wightiana* ethyl esters have been investigated with regard to their irritant effect. There is not much variation in irritant effect of esters prepared by the Culion 48-hour method of esterification, our 8-hour method, and the cold sunlight method. In the purification of these esters, neutralisation is

shown to have the greatest effect in reducing irritation; distillation comes next, and blowing out with steam has the least effect. Even the combination of these three processs yields a product that is too irritating to use without the addition of iodine, creosote, or some other similarly acting substance. This irritation is shown to be due, not to the esters of hydnocarpic and chaulmoogric acids themselves, but, at least in great part, to their decomposition products."

(This is curious as it is quite contrary to the findings in Calcutta and Madras, where undistilled esters show a minimum of irritant qualities.)

H. W. Wade and N. D. Fraser write on *The Skin Lesions of Neural Leprosy Observations in China.*

"The results of a study of leprides in 35 cases of leprosy, from which 39 biopsy specimens were taken, are reported. All but one of the lesions from 31 cases (excluding 4 cases classed as atypical) were clinically simple, tuberculoid, or more or less retrogressed, falling into the classification of leprides developed in the course of the present series of studies. Histologically all of them, with the exception mentioned, showed tuberculoid changes in some degree, thus agreeing with the findings of the preceding study of this series."

This article, which is well illustrated with photographs, should be read in full.

J. Lowe reviews the literature of *Rat Leprosy.*

There are two reprinted articles, one being on *Neural Affections in Leprosy* (well illustrated), by S. N. Chatterji, and the other on *Classification* by Rabello, Jr. The latter compares his classification with that of Lie, as follows:—

Lie's Classification.	*Our Classification.*
Principal forms—	*Principal forms—*
T (Tuberous)	L (Lepromatous)
M (Macular)	M (Macular)
N (Nervous)	A (Tropho-anesthetic)
	T (Tuberculoid)

Complex forms—Combinations of the above forms (the most frequent being LA and MA).

Other Symbols—+, bacteriologically positive; −, bacteriologically negative; 1, primary; 2, secondary.

In the editorial the same subject is dealt with in review.

Culture of Baccillus from Lepers' Blood and Complement Fixation Test.

F. Lleras Acosta, of the National University of the Republic of Columbia (*Revista de la Faculdad de Medecine.* Vol. V, Nos. 1 & 2), claims to have cultured a bacillus from the blood of lepers which, when used as an antigen, gives positive complement fixation results in 96% of 665 lepers, only 1.52% positive in 264 patients suffering from other

diseases, and 0.09% positive in 1,194 healthy people. He calls this the " Lleras test." He claims to have grown this organism from 20 out of 66 cases. The following table gives his complement fixation results in brief :—

	Groups.	*No. of tests.*	*No. positive.*	*Per-cent. positive.*
1.	Bacteriologically positive lepers	638	635	99.38
2.	Bacteriologically negative lepers	360	333	92.50
3.	Children of lepers	211	24	11.38
4.	Lepers' relatives	211	39	18.48
5.	Quiescent and arrested ...	160	61	38.12
6.	Non-lepers with other diseases	264	4	1.52
7.	Non-lepers—healthy	1194	1	0.09

The Kahn and Wassermann tests were done at the same time, but there was no correlation between these and the Lleras test.

The technique for making the culture is as follows :—

1. Withdraw by venous puncture 10 cc. of blood, place it in a centrifugal tube, in which there has been first put 2.3 cc. of citrate of soda solution, 2% or 3%.

2. Shake and centrifuge for 20 minutes.

3. Decant and add to the corpuscles a solution of acetic acid at 3%. Shake and centrifuge for 20 minutes, decant and add to the coagulum some 10 cc. of 5% sulphuric acid solution : shake and allow the acid to work for 5 to 10 minutes.

4. Centrifuge for 20 minutes, add sterilized distilled water, shake and centrifuge for 20 minutes; repeat the same operation; decant. The coagulum remains in the form of dark " mastic."

Spread with a broad platinum spatula in as many tubes as possible. The medium that gives the best results is that of Petragnani, but in its preparation substituting " asparagin " for the peptone. It is best also to diminish the concentration of the " Malachite Green," employing a solution of 1%.

The medium ought to be sufficiently moist to cover the tubes to prevent desiccation. The best temperature for the culture is between 37° and 38° C. The first colonies may appear in 15 days and up till 4 months. After the first culture has been obtained the later " stabs " proliferate in shorter time, and after several passages abundant cultures are obtained in 8 to 10 days. The culture is positive in only 20 to 30% of the cases.

The Antigen is prepared as follows :—

" Plant in Petragnani Medium, using large tubes or flasks so as to obtain abundant growths. As soon as they are ready, sterilize at 110° for 15 minutes. With a platinum spatula scrape off the culture, taking care not to bring away any particles of the medium. Place the moss in a watch-glass, and put it in the oven at 37° for a period of 36 to 38 hours.

" Weigh the culture and place in a flask; for each centigram of bacilllary bodies add 1 c.c. of acetone. Shake and allow the acetone to operate for 24 hours : filter : then dry the bacilli collected on the filter at 37° or in a desiccator. As soon as they are dry weigh again, and place in a flask of pure methylic alcohol of 98 or 99% grade.

To every centigram of bacillary bodies add 1 c.c. of methylic alcohol. Tightly cork the flask and place it in the incubator at 37° for 10-12 days, shaking it at frequent intervals: then filter. The filtrate constitutes the antigen, which ought now to be kept in coloured flasks, well corked, and at laboratory temperature. When the antigen is to be used it must be diluted with saline solution—9 per mille—in the proportion of 1 part antigen to 19 parts saline solution. The dose to be employed for each tube of the reaction is 0.5 c.c."

The complement fixation test is carried out by following the technique used by Kolmer for the Wassermann Reaction. The tubes are set up as follows:—

	Reaction.	*Control.*	*Control.*	*Control.*
Serum of patient inactivated at 56°	0.1	0.1	0	0
Saline solution, 9 to 1,000 ...	0.5	1	0.5	1.5
Antigen, 1 in 20	0.5	0	0.5	0.5
Complement, according to grade of day (1 in 30 to 1 in 50)	1	1	1	0

Ice chest at 8° or 10° C. for 15 to 18 hours, and then add:—

	Reaction.	*Control.*	*Control.*	*Control.*
Haemolysin, according to grade	0.5	0.5	0.5	0.5
Red cells of lamb blood, 2% ...	0.5	0.5	0.5	0.5

Water bath at 37° or 38° 1 hour.

The writer also claims to have made successful inoculations with the organism in guinea pigs and other animals.

J. W. LINDSAY.

The Treatment of Leprosy with Tellurium. Bull. de l'Acad. de Med. 20th July, 1937.

Drs. E. Marchoux and Y. Chorine have employed in the treatment of leprosy tellurium metal and salts in suspension in oil or glucose, which they first administered subcutaneously in animals. Tellurium in the form of its tellurate and tellurite of sodium is said to suspend the evolution of rat leprosy. The germs do not multiply, or do so only slightly, in the treated animal, whereas they increase rapidly in untreated controls. In the treatment of human leprosy colouration of the skin and decolouration of the hair is observed. The cutaneous lesions show up dark or slightly grey skin. An injection of 25 centigrammes is tolerated for five days. Under the influence of tellurium the pains disappear, the lepromas flatten out, and the general condition improves. All this amelioration is shown within a month of beginning treatment.

Prof. Stanziale, of Naples, (Jl. of Trop. Med. & Hyg. Feb. 1, 1929, p. 33) used a 10% suspension of metallic tellurium in 5% glucose, bi-iodide of tellurium in oily suspension at 10% and iodine telluriate of quinine in 5% oily suspension. He treated five patients, four being mixed cases and one macular. Injections were given intragluteally (1-2 c.c.) every 5 to 8 days. There was marked local reaction especially with the metallic form. The nodules became flattened but the bacteriological examination showed no change.

Tellurium was also used by Dr. Frazer of Edinburgh, (Lancet 1930, 2, p. 133) in the treatment of syphillis. He abandoned its use, however, because of the garlic smell which remained in the breath for as much as 8 months after the injections were stopped.

It is significant that Prof. Stanziale, although the clinical lesions were flattened out, found no diminution in the number of bacilli. Marchoux and Chorine also mention the flattening out of lesions, but say nothing about diminution of the number of bacilli. It should be kept in mind that there are innumerable factors which will cause flattening out of lesions and apparent clinical improvement. Among these are various weakening diseases such as malaria, dysentery, etc., also strong doses of irritating drugs will have the same effect. It should always be remembered that leprous lesions are caused not simply by the presence of bacilli, but by the degree of reaction of the tissues to the bacilli in their neighbourhood. If therefore the general health is lowered by disease, or by large doses of irritating drugs, temporary clinical improvement may be produced, but the ultimate recovery of the patient is not favoured thereby.

Marchoux and Chorine's results with rats are more striking. In this experiment the rats were inoculated with tellurium from the very day on which they were infected. This apparently prevented the rat leprosy bacilli from taking root in the tissues of the body. In human leprosy, on the other hand, the disease has, as a rule, taken root before treatment begins.