

THE WASSERMANN AND LUETIN REACTIONS IN LEPROSY.

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INTRODUCTION.

MANY observers have reported positive results in the application of the Wassermann reaction to cases of leprosy. This investigation was undertaken to determine if the value of the reaction, as employed in this laboratory, for the diagnosis of syphilis, is discounted by the occurrence of positive reactions in lepers.

In 1906 Eitner¹ found that the serum of a leper examined by him deflected complement in the presence of an aqueous extract of lepromata. Subsequently he obtained the same result when he employed an alcoholic extract of guinea-pig's heart in place of the lepromatous extract.

In 1908 Wechselmann and Meier reported a case of leprosy in which the serum deflected complement in the presence of an extract of syphilitic liver, in the presence of an alcoholic extract of normal human liver, and also in the presence of an emulsion of lecithin.

In the same year, Slatineanu and Daniélopolu examined the sera of 21 lepers. They used, as their antigen, an alcoholic extract of syphilitic liver and they found that, of the 21 cases, eleven gave positive reactions.

Jundell, Almquist and Sandmann, who employed an alcoholic extract of guinea-pig's heart, reported in the same year that they had examined the sera of 22 lepers with completely positive results in only four cases.

In 1909 Ehlers and Bouret examined the sera of 44 lepers. They obtained complete inhibition of haemolysis in three cases only; of the 41 remaining, 39 of the sera produced partial inhibition and two were

¹ See References at the end of this paper.

negative. These observers, like Jundell and Almquist, employed an alcoholic extract of guinea-pig's heart as antigen. The sera which they investigated were obtained from lepers in the West Indies and were brought to Europe, packed in ice. Three or four months had elapsed before they could be examined, and nearly all of them had become anti-complementary.

Alberto Recio reported upon the examination of 18 lepers in Senegal by Bauer's modification of Wassermann's method. Fourteen cases with *manifestations cutanées* were investigated, with the result that only one gave a negative reaction; while, of four others with anaesthetic leprosy, two were positive and two were negative.

In 1911 H. D. Bloomberg examined the sera of 21 Filipino lepers by the original procedure of Wassermann, except as regards the antigen, which was prepared from guinea-pig's heart. Eighteen of the 21 cases gave negative reactions, and Bloomberg stated that he considered it doubtful if a positive reaction was to be obtained as a result of infection with the *Bacillus leprae*, and that he thought it was necessary to consider the possibility, not only of syphilitic taint, but also of present or antecedent framboesia.

In contrast to the above, Photinos and Michaélidès, who examined 204 patients in the leper-settlement of Spinalonga, an island off the coast of Crete, obtained a large proportion of positive results. They employed the original method of Wassermann, but used an alcoholic extract of foetal liver. Out of 104 cases of tubercular and mixed leprosy, 75 per cent. gave positive results and, of 100 anaesthetic cases, 38 per cent. were positive. They concluded that, in countries where leprosy is endemic, false conclusions may be drawn from the Wassermann reaction carried out for the diagnosis of syphilis.

Montesanto and Sotiriadès have also carried out investigations in the island of Spinalonga. They employed the modifications of Bauer and Stern in the examination of 48 patients. Their results supported those of Photinos and Michaélidès.

Howard Fox in 1910 obtained similar results. He examined 60 cases by Noguchi's method. The sera of 38 of these patients, who were suffering from tubercular leprosy, gave only seven frankly negative reactions; while in 22 anaesthetic cases the reaction was negative in 19. Fox states that in no instance was a history of syphilis obtainable, nor were luetic lesions found in any of the cases.

Rocamora examined the sera of 19 cases of leprosy with positive results in 14, in none of whom was there evidence of antecedent

syphilis. He is of opinion that the substance which fixes the complement in syphilis and in leprosy is derived from the cellular formations, which he considers bear a strong resemblance to each other, in the two diseases.

It appears that the discrepancies in the results reported by various investigators are due to two things; first to differences in the methods which they have employed, some having adopted one modification of the original Wassermann reaction and some another, and secondly, the discrepancies are due to the interpretation of the final readings, where much depends upon whether instances of partial inhibition are included among the positive results or are considered as negative.

Recently, Noguchi's luetin reaction has been applied to leprosy with results even more discordant than those obtained by the Wassermann reaction. Moses T. Clegg examined 24 lepers, none of whom showed any signs of syphilis. The Wassermann reaction was positive in 11 of them; the luetin reaction was negative in all. Schnitter examined 25 Filipino lepers, 20 of whom gave positive Wassermann reactions; but, in marked contrast to the results of Clegg, 22 of them reacted positively to injections of luetin.

The Author's observations.

Through the courtesy of Dr Glenn, Medical Officer in charge of the Leper Asylum at Kuala Lumpur, an institution containing about 300 patients, I was able to examine one hundred cases taken at random from among them. Eighty-seven of them were Chinese, 11 were Tamils, one a Eurasian and one a Malay. All, with two exceptions, were of the labouring class: 51 of them were mining coolies. Six of them had been born in the Malay States or Straits Settlements, the rest were immigrants. Most of the latter had been living in the Malay States for a considerable number of years before they became lepers. Excluding two, who were lepers when they immigrated, and three, who became lepers within one year of their arrival, the remainder had been in the country, on an average, for 11 years before they developed the disease. In none of the cases was there any room to doubt the diagnosis of leprosy, which was confirmed, in all but the most conspicuous cases, by the demonstration of Hansen's bacillus in the lesions or in the nasal mucus.

The samples of blood, for examination, were collected at this laboratory, which is within a mile of the leper asylum. The sera were

inactivated a few hours after the blood had been obtained and the tests were carried out on the following day, within 24 hours of the time at which the samples were taken.

The method adopted for the examination of the sera was that of Browning, Cruickshank and McKenzie which has been employed in this laboratory for some time and has been found to be most reliable. In place of the anti-oxhaemolytic system used by the authors of the method, an anti-human system was employed.

The results of the examination are shown in Table I. Out of the 100 lepers examined, 22 gave positive Wassermann reactions and in some of them the reactions were exceptionally powerful: for instance, the serum of Pachimuttu (No. 8, Table I) deviated no less than 58 doses of complement; an extraordinary amount for a case in which there were no signs of active syphilis. The examination of 12 of the positive and a number of the negative cases was repeated on several occasions with consistent results.

Some observers hold the opinion that the Wassermann reaction in leprosy varies according as the form of the disease from which the patient is suffering be of the tubercular or of the maculo-anaesthetic type. Other writers consider that the activity of the disease is the determining factor.

While one group of investigators have found that the Wassermann reaction is more frequently positive in tubercular and mixed leprosy than in the anaesthetic variety, others have concluded that the form of the disease is a factor of no influence in this respect.

Jundell, Almquist and Sandmann concluded, from the examination of 22 lepers, that neither the type, nor the progress, nor the duration of the disease has any influence on the reaction. Ehlers and Bouret, as a result of their examination of 44 lepers, supported this view. On the other hand, the majority of workers have found a larger proportion of positive reactions among lepers suffering from the tubercular type of the disease. Photinos and Michaélidès, who examined the sera of 204 lepers, obtained 75 per cent. of positive reactions in tubercular leprosy and 38 per cent. in the anaesthetic form. Howard Fox obtained 31 positive results in the examination of 38 lepers of the tubercular type, but only three in 22 anaesthetic cases. McIntosh and Fildes state that "the reaction is chiefly to be found in the tubercular form."

In Table I the patients examined in this laboratory have been classified as either (a) tubercular or (b) anaesthetic. All those cases with superficial nodules have been classified as tubercular, so that all

mixed cases are included under this heading. The anaesthetic group comprises macular, mutilated and anaesthetic cases free from palpable cutaneous nodules. In the first, or tubercular group, there were 44 patients, 12 (27 %) of whom reacted positively to the Wassermann test. In the second, or anaesthetic group, which comprised 56 cases, there were 10 (18 %) positive reactions. The numbers of positive results in both the groups are so small that the difference between them might be merely a matter of chance, or it might be accounted for by reactions due to syphilis, a factor which it is impossible to exclude. Six of the twelve positive tubercular cases and seven of the ten positive anaesthetic cases admitted former syphilitic infection. If these cases be excluded, there remain six cases in the tubercular group and three cases in the anaesthetic group which gave a positive Wassermann reaction. No conclusions can be drawn from such small figures.

As regards the influence of the duration of the disease on the Wassermann reaction, the onset of leprosy is, in most cases, so insidious that it is no easy matter to ascertain the date of its commencement. Except in the case of one of the patients examined here, the only information which was available on this point was the account of his disease given by the leper himself. Relying upon this information, the average duration of the disease among the 22 lepers who reacted positively to the Wassermann test was four years and eight months, as compared with an average of three years and eight months for the 78 patients who reacted negatively. Excluding those cases which had been admitted less than one month before this examination, the average length of time since their admission to the asylum was, in the positive group, one year and ten months, and, in the negative group, one year and six months. Though the average duration of the disease was longer in the positive group, there were many very old-standing cases among those who reacted negatively; no fewer than 20 of the latter had been lepers for more than five years, while among the positive cases there were only nine who had suffered from the disease for more than three. It does not appear, then, that the mere duration of the disease is a factor which influences the Wassermann reaction.

Some observers have contended that it is only in the more advanced stages of the disease that the Wassermann reaction becomes positive. Montesanto and Sotiriadès consider that the increase of the leprous lesions produces a greater abundance of antibodies which cause deviation of complement, and therefore that advanced cases of the disease are

more likely to give positive reactions. Among the 22 positive cases examined in this laboratory, there were several instances in which the disease was not in an advanced stage; for instance, Ah Wai (No. 35, Table I) showed nothing more than a few inconspicuous, scattered anaesthetic patches; Pachimuttu (No. 8) had similar lesions with the addition of a few minute tubercles on the ears; yet his serum deviated an exceptionally large amount of complement. Seventeen of the 22 positive cases were in an advanced and conspicuous stage of the disease, and it might be argued that the remaining five, which were cases of early or arrested leprosy, reacted positively by reason of syphilitic infection and, indeed, they all five admitted former venereal disease. On the other hand, however, there were many advanced and progressing cases among the lepers who reacted negatively; cases quite as advanced and progressing quite as rapidly as any in the positive group. As instances may be mentioned the Malay (No. 27, Table I), a case of actively progressing tubercular leprosy, and Chiew Tung (No. 34), whose face and body were covered with red, hyperaemic, active-looking tubercles. In short, the Wassermann reaction does not appear to be influenced by the duration or the activity of the disease.

In an investigation undertaken with the object of determining if leprosy *per se* can, in some cases, so modify the serum that the Wassermann reaction becomes positive, the difficulty encountered at the outset is the impossibility of excluding the disturbing factor of syphilitic infection.

As a check upon the results of the Wassermann reaction and in order to determine what proportion of the lepers examined were likely to have been infected with syphilis the following means were available:

- (1) Inspection of patients in order to determine the presence of venereal sores, scars, or the stigmata of congenital syphilis.
- (2) Interrogation of the patients.
- (3) Examination of the patients' families.
- (4) Comparison of the results of the Wassermann reaction, in the group of lepers, with the results of the reaction, as applied to a similar group of persons who were not suffering from leprosy.
- (5) Examination of the lepers for the presence of the *Treponema pallidum*.
- (6) The effect of Salvarsan upon the Wassermann reaction in those cases which reacted positively.
- (7) The luetin reaction.

As a great majority of the lepers were immigrants, the examination of the patients' families was possible in only one case. It was not considered justifiable to employ injections of Salvarsan. While this drug does not cure leprosy, its employment is by no means free from danger.

Inspection of patients. None of the patients was suffering from visibly active syphilis and in only one of them (No. 8, Table I) were definite syphilitic scars to be found. It is not always an easy matter to decide by inspection whether lepers, with their harsh, dry skins, macules and tuberoso swellings, are free from the stigmata of syphilis or are not.

In three of the positive cases (Nos. 54, 59 and 89, Table I) the patients had been lepers since the ages of eleven, five and fifteen respectively. It is unlikely that they had acquired syphilis, and as far as could be determined, in these unfortunate boys terribly disfigured by tubercular leprosy, none of them showed any signs of congenital lues.

Interrogation of the patients. The information to be obtained from patients as to the occurrence of former venereal disease is notoriously unreliable. Chinese distinguish between gonorrhoea and chancres, but, to them, "syphilis" implies the manifestations of the secondary and tertiary stages. It was found that some of the patients who stated that they had suffered from syphilis had never had chancres, and on further enquiry it appears probable that they had mistaken the lesions of leprosy, first appearing, for those of syphilis.

Thirty-three of the lepers admitted former syphilis and 13 of these gave positive Wassermann reactions. Among the remaining 67 who denied former syphilis, there were nine positive reactions.

Examination of patients' families. As noted above, this was possible in only one case (No. 59, Table I). The mother and a young sister, aged nine, of this patient were inspected. Their serum could not be obtained for the application of the Wassermann reaction. No history was obtained from the mother which pointed to syphilitic infection and the sister showed none of the stigmata of the congenital disease.

Comparison with a similar group of non-leprous persons. It is interesting to compare the number of positive Wassermann reactions among the lepers here—22 out of 100—with the results obtained by Baermann and Wetter in the examination of normal coolies in Sumatra. They found that 7 per cent. of their coolies were manifestly syphilitic and that 20 per cent. gave positive Wassermann reactions; in lepers

they obtained 50 per cent. of positive results. In the Federated Malay States venereal diseases are very prevalent, so much so that, in his annual report for 1913, the Principal Medical Officer declared that they were of "universal incidence." It therefore appeared possible that all of the 22 positive Wassermann reactions, which occurred in the lepers examined here, were due to syphilis and that none of them was due to leprosy *per se*.

For purposes of comparison 110 inmates of the District Hospital at Kuala Lumpur were examined for syphilis. Forty of these people were suffering from beri-beri and 70 of them from malaria. Twenty per cent. of them either had scars on the penis or admitted that they had suffered from syphilis. In 11 of the cases, eight of whom gave a history of syphilis, the Wassermann reaction was positive. Four of the positive reactions occurred among the 40 beri-beri patients and seven among the 70 malaria patients. That is to say that the percentage of positive Wassermann reactions in the leper group was more than twice as large as that obtained in the control group of non-leprosy patients. Owing to the comparatively small number of cases investigated it cannot be concluded, on these grounds alone, that the larger number obtained in the former group was due to the action of some factor other than syphilis. In the case of the lepers, where there were 22 positive reactions out of 100 cases, the "probable error" calculated by Poisson's formula is 0.11; so that, in the next hundred lepers, there might be as many as 33 or as few as 11 positive Wassermann reactions. In the control group of 110 patients, with 11 positive reactions, the probable error is 0.08, so that in another similar group of the same size the number of positive reactions might be any figure between three and 19.

Examination for the presence of the Treponema pallidum. It is generally agreed that, in syphilitics, the Wassermann reaction is positive only for so long as the infection continues; that is to say, a positive reaction implies the presence of the *Treponema pallidum* within the tissues. If, then, those lepers who reacted positively, did so, not because they were lepers but because they were suffering, in addition, from syphilis, it appears not unlikely that the *Treponema pallidum* might be found in the leprotic tubercles and macules, where the resistance of the tissues is diminished. Serum expressed from the depths of such lesions was examined by dark-ground illumination in 10 of the cases which reacted positively but no *Treponemata* were found.

The luetin reaction. Noguchi's luetin consists of killed cultures of

the *Treponema pallidum*. The use of this preparation in the diagnosis of syphilis is analogous to that of tuberculin in von Pirquet's test for tuberculosis; that is to say, if it is injected into the skin during certain stages of syphilitic infections—notably in the latent tertiary stage—it produces a cuti-reaction. The sample of luetin used in this investigation was kindly supplied by Dr Noguchi of the Rockefeller Institute, and it was thoroughly tested by its employment on the one hand in many cases of syphilis and, on the other, in cases of malaria and beri-beri.

It was considered that by the employment of luetin some light might be thrown upon the question of the reason for the positive Wassermann reaction in leprosy; whether it is always due to syphilis or whether it may be due to leprosy *per se*. Among the 22 lepers who gave a positive Wassermann reaction there were no cases of active syphilis, and if any of them were suffering from infection with that disease, it was in the latent tertiary stage; that is to say, the stage in which the luetin reaction is most often positive.

It was decided to test the effect of luetin upon (a) a group of lepers in whom the Wassermann reaction was positive, (b) a group of lepers in whom the Wassermann reaction was negative, and (c) a group of non-leprous persons among whom there were likely to be many cases of latent syphilis. As mentioned above, the sample of luetin which was used had already been tested by its employment in cases of syphilis and also in cases free from both syphilis and leprosy:

The lepers selected for the test were 21 in number; they comprised two classes; firstly, 13 in whom the Wassermann reaction was positive, and secondly a group of eight from which the possibility of syphilis was eliminated, as far as possible, by the selection of young lepers who showed no signs of congenital lues and who reacted negatively to Wassermann's test. For comparison with these lepers the next step was to obtain a number of suitable controls. Within half a mile of the leper asylum there is a Home or Infirmary for decrepit Chinese: blind, halt and maimed wrecks of humanity who are precluded from earning a livelihood by reason of their infirmities. It is probable that among these people there are many cases of latent tertiary syphilis and from among them 28 cases were selected who appeared likely to have suffered, in the past, from syphilis.

As far as the Wassermann reaction is concerned there was little difference between the lepers and the decrepits; among the 21 lepers there were 13 positive reactions and among the 28 decrepits there were

12 positive reactions. Supposing that the positive Wassermann reactions among the lepers were due to old syphilitic infections, it appeared that the group of lepers and the group of decrepits should react in the same way to inoculations of luetin. So far however was this from being the case, that, as a reference to Tables II and III will show, there was not a single positive luetin reaction among the lepers, while among the decrepits there were no fewer than 11.

The evidence of the luetin reaction as applied to these cases of leprosy is negative evidence and too much value should not be attached to it; but, as far as it goes, it is opposed to the view that positive Wassermann reactions in leprosy are due to syphilitic infection.

TABLE I.
Lepers examined by the Wassermann and Luetin reaction.

Number	Name	Nation	Age and occupation	Duration of leprosy and of residence in asylum	Type	Principal features	Length of residence in Malay States	History of syphilis	Wassermann reaction	Amount of complement deviated	Luetin reaction
1	Tan Tay	Chinese (Sin Yeu)	30 Mining cooly	A leper for 1 year. In asylum for 1 month	Anaesthetic	Contractures of fingers of left hand. Not conspicuous	Not known	No history of syphilis	Negative	—	—
2	Yeo Choon	Chinese (Hokkien)	25 Mining cooly	A leper for 2 years. In asylum for 2 months	Anaesthetic	Contractures of fingers. Not conspicuous	7 years	Syphilis 3 years before	Negative	—	—
3	Dumb Boy	Chinese (Kheh)	16 nil	A leper for (?). In asylum for 2 years	Tubercular	Tubercles on face and ears. A conspicuous case	Not known	No manifest signs of syphilis	Negative	—	—
4	Ge Tiam	Chinese (Hokkien)	38 Mining cooly	A leper for 3 years. In asylum for 4 months	Tubercular	Enormous keloid-like tubercles on face. Very conspicuous	17 years	No history of syphilis	Negative	—	—
5	Konduchetty	Tamil	35 Estate cooly	A leper for 2 years. In asylum 1½ years	Anaesthetic	White anaesthetic patches on face and arms. Not very conspicuous	20 years	No history of syphilis	Negative	—	—
6	Superian	Tamil	35 Estate cooly	A leper for 4 years. In asylum 3 years	Anaesthetic	On the left arm there is an anaesthetic patch like an artificial wheal. Not conspicuous	30 years	No history of syphilis	Negative	—	—
7	Govindan	Tamil	30 Railway cooly	A leper for 2 years. In asylum 1 year	Anaesthetic	A little wasting of thenar muscles. Not conspicuous	15 years	No history of syphilis	Negative	—	—
8	Pachimuttu	Tamil	25 Railway cooly	A leper for 2½ years. In asylum 8 months	Anaesthetic	A few dried-up tubercles on the ears and some anaesthetic patches. Not conspicuous	8 years	Syphilis 3 years ago. Scar on penis	Positive on 6 occasions	58 doses	Negative
9	Ah Loong	Chinese (Hylam)	24 Estate cooly	A leper for several years. In asylum 1½ years	Anaesthetic	Amputations of toes of right foot. Conspicuous	10 years	Syphilis 2 years ago	Negative	—	—

10	Munusemy	Tamil	30 Estate coolly	A leper for 4 years. In asylum for 3 years	Anaesthetic	Right foot much swollen and anaesthetic. Not conspicuous	3 years	No history of syphilis	Negative	—
11	Punusamy	Tamil	25 Road coolly	A leper for 2 years. In asylum 1 year	Anaesthetic	Amputation of toes. Paralysis and con- tractures of fingers. A conspicuous case	10 years	No history of syphilis	Negative	—
12	Lye Poh	Chinese (Cantonese)	24 Mining coolly	A leper for 1 year. In asylum 2 months	Tubercular	Tubercles on both ears. Not a conspicuous case	6 years	No history of syphilis	Negative	—
13	Yap Shin	Chinese (Kheh)	40 Mining coolly	A leper for 10 months. In asylum 1½ months	Tubercular	Tubercles over the lower part of the face and papules on arms and trunk. Conspicuous	15 years	No history of syphilis	Negative	—
14	Phang Tuck	Chinese (Cantonese)	28 Mining coolly	A leper for several years. In asylum 2 years	Tubercular	Prominent tubercles on face and ears. Con- spicuous	10 years	Syphilis 4 years ago	Negative	—
15	Leong Sang	Chinese (Cantonese)	43 Mining coolly	A leper for 2 years. In asylum for 1½ months	Anaesthetic	Tips of ears swollen. An inconspicuous patch on right cheek	21 years	Syphilis 7 years ago	Negative	—
16	Mok Khuan	Chinese (Cantonese)	44 Mining coolly	A leper for 10 months. In asylum for 6 months	Anaesthetic	Circinate patch on right forearm and pink patches on face. Not conspicuous	4 years	No history of syphilis	Negative	—
17	Ah Fook	Chinese (Kheh)	38 Mining coolly	A leper for 2 years. In asylum 2½ months	Anaesthetic	Contracture of hands. Pink raised patches on face. Not conspicuous	16 years	No history of syphilis	Negative	—
18	Ah Yeong	Chinese (Cantonese)	40 Carpenter	A leper for 3 years. In asylum 1 month	Tubercular	Tubercles on face. A conspicuous case	20 years	No history of syphilis	Negative	—
19	Lung Yeong	Chinese (Sin Yeu)	35 Hospital servant	A leper for 2 years. In asylum 1 year	Anaesthetic	Superficial sores and peripheral neuritis. Conspicuous	25 years	Syphilis 3 years before	Negative	—
20	Ah Fook	Chinese (Cantonese)	56 Samsu maker	A leper for 2 years. In asylum 1 month	Anaesthetic	Paralysis of right hand. A circinate patch in- volving whole of right shoulder. A patch on face. Fairly conspicu- ous	13 years	A chancre 30 years ago	Negative	—

TABLE I—(continued).

Number	Name	Nation	Age and occupation	Duration of leprosy and of residence in asylum	Type	Principal features	Length of residence in Malay States	History of syphilis	Wassermann reaction	Amount of complement deviated	Luetin reaction
21	Ah Teck	Chinese (Hylam)	36 Gardener	A leper for 5 years. In asylum 1 year.	Tubercular	Tubercles on face and ears. Sores on feet and hands. Conspicuous	6 years	No history of syphilis	Negative	—	—
22	Yap Yoon	Chinese (Kheh)	44 Mining coolie	A leper for 2 years. In asylum 3 days	Anaesthetic	Perforating ulcer of great toe. Not conspicuous	24 years	A chancre 13 years ago	Negative	—	—
23	Vong Fah	Chinese (Kheh)	40 Mining coolie	A leper for 8 years. In asylum for 2 days	Anaesthetic	Amputations of several fingers and toes. Conspicuous	12 years	Syphilis 8 years ago	Negative	—	—
24	Hon Tiam	Chinese (Kheh)	45 Woodcuttler	A leper for 2 years. In asylum for 5 months	Tubercular	Old tubercles on face. Not very conspicuous	15 years	No history of syphilis	Negative	—	—
25	Kok Yew	Chinese (Hokkien)	33 Rickshaw puller	A leper for 3 years. In asylum for 2 years	Tubercular	An old ulcerated tubercular case. Conspicuous	7 years	Had syphilis 5 years ago	Positive on 3 occasions	34 doses	Negative
26	Ah Seong	Chinese (Kheh)	42 Mining coolie	A leper for 7 years. In asylum for 1½ months	Anaesthetic	Wasting of hands. Superficial sores on legs. Not conspicuous	15 years	No history of syphilis	Negative	—	—
27	Mat	Malay	20 Gardener	A leper for 1 year. In asylum 1 month	Tubercular	Generalised tubercles. Conspicuous	Born in the State of Pahang	No history of syphilis	Negative	—	—
28	Valayan	Tamil	22 Estate coolie	A leper for 3 years. In asylum for 4 months	Anaesthetic	Some superficial ulcers on the extremities. Shrunken tubercles on the ears. Not conspicuous	13 years	No history of syphilis	Negative	—	—
29	Phan Siew	Chinese (Kheh)	66 Mining coolie	A leper for 3 years. In asylum for 1 year	Anaesthetic	One side of face paralysed. Lobes of ears slightly swollen. Not a conspicuous case	15 years	No history of syphilis	Negative	—	—
30	Cheong Yoon	Chinese (Cantonese)	35 Mining coolie	A leper for 2 years. In asylum 3 weeks	Tubercular	Old faded tubercles. Fairly conspicuous	15 years	No history of syphilis	Negative	—	—

31	Karrupan	Tamil	30 Estate coolie	A leper for 3 years. In asylum for 7 months	Tubercular	Large keloid-like tubercles on the face. Very conspicuous	9 years	No history of syphilis	Negative	—
32	Wan Ng	Chinese (Cantonese)	30 Cook	A leper for 2½ years. In asylum for 4½ months	Anaesthetic	Wasting of face and twitching of cheek muscles. Not conspicuous	11 years	Chancre 3½ years ago	Negative	—
33	Chong Geok	Chinese (Hokkien)	35 Detective	A leper for 11 months. In asylum for 10 months	Anaesthetic	Paralysis of left ulnar nerve. Not conspicuous	12 years	Syphilis 4 years ago	Positive on 2 occasions Negative	13 doses Negative
34	Chew Tung	Chinese (Kheh)	45 Bullock-cart driver	A leper for 3 years. In asylum 2 months	Tubercular	Red and apparently active, generalised tubercles. Conspicuous	10 years	No history of syphilis	—	—
35	Ah Wai	Chinese (Cantonese)	30 Mining coolie	A leper for 3 years. In asylum for 6 months	Anaesthetic	A few scattered anaesthetic patches. Not conspicuous	4 years	Has had chancre and bubo	Positive on 2 occasions	8 doses Negative
36	Chean Fook	Chinese (Kheh)	28 Mining coolie	A leper for 2 months. In asylum for 2 days	Anaesthetic	A few anaesthetic patches. Not conspicuous	14 years	Chancre 7 months ago	Negative	—
37	Ah Lim	Chinese (Kheh)	28 Mining coolie	A leper for 2½ years. In asylum for 7 months	Anaesthetic	Anaesthesia on one side of face. Thumb like syringo-myelia. Not conspicuous	5 years	No history of syphilis	Negative	—
38	Thong Khong	Chinese (Kheh)	48 Mining coolie	A leper for 2½ years. In asylum for 1½ years	Anaesthetic	Contractures of left hand. Paralysis of right side of face and amputations of toes of right foot. Conspicuous	20 years	No history of syphilis but had gonorrhoea 4 years ago	Positive on 3 occasions	46 doses Negative
39	Tham Sam	Chinese (Kheh)	34 Mining coolie	A leper for 1 year. In asylum for 5 months	Anaesthetic	Sores and contractures of hands	8 years	No history of syphilis	Negative	—
40	Nasathan	Tamil	P.W.D. 50 coolie	A leper for 10 months. In asylum for 3 weeks	Tubercular	A few small tubercles on ears and patches on face. Not conspicuous	3 years	No history of syphilis	Negative	—
41	Lam Vun	Chinese (Cantonese)	50 Gardener	A leper for 9 years. In asylum for 7 months	Tubercular	An old mixed case with tubercles on ears, loss of nasal cartilage and amputations of toes	11 years	No history of syphilis	Negative	—

TABLE I—(continued).

Number	Name	Nation	Age and occupation	Duration of leprosy and of residence in asylum	Type	Principal features	Length of residence in Malay States	History of syphilis	Wassermann reaction	Amount of complement deviated	Luetic reaction
42	Teo Hin	Chinese (Sin Yeu)	66 Mining cooly	A leper for 4 years. In asylum for 2 years	Anaesthetic	Cicatrised tubercles of eyebrows. Slight contracture of one little finger. Not conspicuous	22 years	No history of syphilis	Negative	—	—
43	Low Cheong Ping	Chinese (Teo Chew)	50 Mining cooly	A leper for 10 years. In asylum for 7 years	Tubercular	A very advanced case with prominent generalised tubercles	20 years	No history of syphilis	Negative	—	—
44	Leow Chong	Chinese (Kheh)	54 Mining cooly	A leper for 6 years. In asylum for 3 years	Tubercular	Conspicuous tubercles on ears and on nose	28 years	No history of syphilis	Negative	—	—
45	Teh Huat	Chinese (Hokkien)	32 Mining cooly	A leper for 3 years. In asylum for 1½ years	Tubercular	Advanced conspicuous tubercular leprosy of face with great anaemia	18 years	No history of syphilis	Negative	—	—
46	Tan On	Chinese (Hokkien)	61 Gardener	A leper for 3 years. In asylum for 7 months	Tubercular	Typical leonine deformity of face. Sores on extremities	25 years	No history of syphilis	Positive on 2 occasions	18 doses	Negative
47	Yap Hin	Chinese (Kheh)	40 Mining cooly	A leper for 7 months. In asylum for 4 months	Tubercular	Conspicuous tubercles all over face and chest	16 years	No history of syphilis	Negative	—	—
48	Chu Ng	Chinese (Kheh)	41 Wood-cutter	A leper for 1½ years. In asylum for 1 year	Tubercular	Typical conspicuous leontiasis	Unknown	Syphilis 1½ years ago	Negative	—	—
49	Loo Wan	Chinese (Cantonese)	42 Mining cooly	A leper for 3 years. In asylum 2½ years	Tubercular	Typical conspicuous leontiasis	10 years	No history of syphilis	Negative	—	—
50	Wong Cheok	Chinese (Cantonese)	34 Mining cooly	A leper for 1½ years. In asylum 1½ years	Tubercular	Conspicuous tubercles on face. Enormous ears	Unknown	No history of syphilis	Positive on 2 occasions	28 doses	Negative
51	Yap Yean	Chinese (Kheh)	40 Estate cooly	A leper for 3 years. In asylum for 2 years	Tubercular	Conspicuous tubercles on face and ulcerated tubercles on the extremities	20 years	Syphilis 3 years ago	Positive on 2 occasions	8 doses	Negative

52	Leong Kim	Chinese (Cantonese)	45	Rickshaw puller	A leper for 11 years. In asylum for 4 years	Tubercular	Lion-like facies. An old advanced anaemic case with foul ulcers	18 years	Chancre and bubo 12 years ago	Positive on 2 occasions	13 doses	Negative
53	Piang Chye	Chinese (Cantonese)	15	Parents were hawkers	A leper for 2 years. In asylum for 1½ years	Tubercular	Conspicuous tubercles on the face. No open sores	Born in the State of Selangor	No signs of genital syphilis	Negative	—	Negative
54	Chow Chye	Chinese (Kheh)	14	No occupation	A leper for 3 years. In asylum for 1½ years	Tubercular	Advanced generalised conspicuous tubercles	4 years	No signs of genital syphilis	Positive	6 doses at least	Negative
55	Ah Mok Chye	Chinese (Kheh)	14	No occupation	A leper for 4 years. In asylum for 2 years	Tubercular	Advanced generalised conspicuous tubercles	8 years	No signs of genital syphilis	Negative	—	Negative
56	Ah Cheong	Chinese (Cantonese)	15	No occupation	A leper for 5 years. In asylum for 4 years	Tubercular	Advanced conspicuous anaemic tubercular case with open sores on legs	Born in the State of Selangor	No signs of genital syphilis	Negative	—	Negative
57	Kio	Chinese (Cantonese)	15	No occupation	How long a leper unknown. In asylum for 3 years	Tubercular	Conspicuous tubercles on the face, sores on the hands and feet	7 years	No signs of genital syphilis	Negative	—	—
58	Yam Bee	Chinese (Hokkien)	17	Schoolboy	A leper for 3½ years. In asylum for 3 years	Anaesthetic	A large cicatrised patch on left cheek which is rather conspicuous	Born in Singapore	No signs of genital syphilis	Negative	—	Negative
59	H. Heppon-stall	Eurasian	15	No occupation	A leper for 10 years. In asylum for 4 years	Tubercular	A very advanced tubercular case with open sores	Born in the State of Selangor	No signs of genital syphilis	Positive	8 doses at least	Negative
60	Ah Kiet	Chinese (Hylam)	22	Cakeseller	A leper for 6 years. In asylum for 4 years	Tubercular	A typical conspicuous advanced tubercular case	8 years	No signs or history of syphilis	Negative	—	Negative
61	Liew Kuee	Chinese (Kheh)	31	Mining cooly	A leper for 17 years. In asylum for 7 years	Tubercular	A very advanced old anaemic tubercular case. Conspicuous	8 years	No history of syphilis	Negative	—	Negative
62	Ah Leong	Chinese (Hokkien)	25	Nil	A leper for 5 years. In asylum for 9 months	Tubercular	Advanced generalised tubercular case with sores on feet	Born in the State of Selangor	No history of syphilis	Negative	—	Negative
63	Siaw Kim	Chinese (Kheh)	30	Mining cooly	A leper for 6 years. In asylum for 3 years	Tubercular	Advanced generalised tubercular case with abrasions on hand. Conspicuous	14 years	No history of syphilis	Negative	—	Negative

TABLE I—(continued).

Number	Name	Nation	Age and occupation	Duration of leprosy and of residence in asylum	Type	Principal features	Length of residence in Malay States	History of syphilis	Wassermann reaction	Amount of complement deviated	Luetic reaction
64	Lee Pin	Chinese (Kheh)	26 Wood engraver	A leper for 4 years. In asylum for 1 year	Anaesthetic	Sores on feet. Not conspicuous	8 years	No history of syphilis	Positive on 2 occasions	8 doses	Negative
65	Ving Hoy	Chinese (Kheh)	40 Mining cooly	A leper for 3 years. In asylum for 3 years	Tubercular	Large conspicuous tubercles on the ears	16 years	Had syphilis 10 years ago	Positive	8 doses	Negative
66	Liaw Choy	Chinese (Kheh)	40 Mining cooly	A leper for more than 1 year. In asylum for 5 months	Anaesthetic	Amputations of toes. Conspicuous	10 years	No history of syphilis	Positive	3 doses	—
67	Lim Hin	Chinese (Hokkien)	26 Mining cooly	A leper for 3 years. In asylum for 2 years	Tubercular	Large conspicuous tubercles on face. Ulcers on feet	17 years	No history of syphilis	Negative	—	—
68	Cheaw Fook	Chinese (Kheh)	39 Mining cooly	A leper for 4 months. In asylum for 2 months	Anaesthetic	Red circinate erythematous patches. Not conspicuous	14 years	No history of syphilis	Negative	—	—
69	Ng Chia	Chinese (Kheh)	47 Mining cooly	A leper for 2 months. In asylum for 1 week	Anaesthetic	Amputations of ends of fingers of left hand. Not conspicuous	16 years	Had a chancre 14 years ago	Negative	—	—
70	Nadasan	Tamil	15 Estate cooly	A leper for 7 years. In asylum for 3 days	Anaesthetic	Small raised patches on arms and small ulcerated tubercles on ears. Not conspicuous	5 years	No history or sign of syphilis	Negative	—	—
71	Lye Yew	Chinese (Kheh)	34 Mining cooly	A leper for 1½ years. In asylum for 7 months	Anaesthetic	Inconspicuous reddish patches on face	8 years	No history of syphilis	Negative	—	—
72	Loong Paw	Chinese (Kheh)	27 Bootmaker	A leper for 1 year. In asylum for 1 year	Anaesthetic	A small nodule on one ear and a pale swelling on one cheek. Inconspicuous	13 months	No history of syphilis	Negative	—	—
73	Leong Yit	Chinese (Cantonese)	53 Barber	A leper for 5 years. In asylum for 3 days	Tubercular	Large pale tubercle on right ear. Inconspicuous	9 years	Syphilis about 20 years ago	Positive on 2 occasions	8 doses	—

74	Vong Fook	Chinese (Kheh)	40 Not known	Not known. In asylum for 1 year	Anaesthetic	Paralysis left face. Inconspicuous	Unknown. Patient is very deaf	No signs of syphilis	Negative	—
75	Chung Maa	Chinese (Kheh)	49 Mining cooly	A leper for 6 years. In asylum for 4 years	Anaesthetic	Necrosis of right foot	28 years	Chancere 18 years ago	Negative	—
76	Kan Man	Chinese (Cantonese)	38 Mining cooly	A leper for 3 years. In asylum for 3 months	Anaesthetic	Small perforating ulcer. Very anaemic. Atrophied tubercles of ears. Not conspicuous	26 years	No history of syphilis	Negative	—
77	Choo Piang	Chinese (Kheh)	45 Mining cooly	A leper for 12 years. In asylum for 6 years	Anaesthetic	Extensive amputations of fingers and toes. No tubercles	16 years	No history of syphilis	Negative	—
78	Vong Fah	Chinese (Kheh)	45 Mining cooly	A leper for 6 months. In asylum for 1 month	Tubercular	Conspicuous tubercles on the face and a few small urticarial-like patches on the trunk	20 years	No history of syphilis	Negative	—
79	Vong Chin	Chinese (Kheh)	55 Mining cooly	A leper for 6 years. In asylum for 4 years	Anaesthetic	Slight contractures of the little fingers. Formerly had superficial sores on toes. Very inconspicuous	35 years	Syphilis 8 years ago	Negative	—
80	Sin Yong	Chinese (Kheh)	45 Mining cooly	A leper for 6 years. In asylum for 8 months	Anaesthetic	Contractures of fingers and a perforating ulcer of the foot	8 years	Syphilis 6 months ago	Positive	3 doses
81	Lie Tong	Chinese (Sin Yen)	46 Mining cooly	A leper for 2 years. In asylum for 1½ years	Anaesthetic	An inconspicuous pinkish patch on the face	20 years	Chancere and bubo 7 years ago	Positive	6 doses
82	Liew Hin	Chinese (Kheh)	49 Mining cooly	A leper for 2½ years. In asylum for 1 year	Tubercular	Old generalised conspicuous tubercles	25 years	Syphilis 4 years ago	Positive on 2 occasions	8 doses
83	Liew On	Chinese (Kheh)	50 Mining cooly	A leper for 11 years. In asylum for 7 years	Anaesthetic	Conspicuous contractures and amputations. Perforating ulcers	32 years	A chancere 14 years ago	Positive	8 doses
84	Ong Piang	Chinese (Hokkien)	34 Gardener	A leper for 8 years. In asylum for 4 years	Tubercular	Face covered with tubercles. Sores on hands and feet. Conspicuous	13 years	No history of syphilis or other venereal disease	Positive	8 doses

TABLE I—(continued).

Number	Name	Nation	Age and occupation	Duration of leprosy and of residence in asylum	Type	Principal features	Length of residence in Malay States	History of syphilis	Wassermann reaction	Amount of complement deviated	Luethin reaction
85	Liew See	Chinese (K'heh)	31 Mining cooly	A leper for 2 years. In asylum for 2 years	Tubercular	Conspicuous old tubercles on face. Small sores on feet	4 years	Syphilis 2½ years ago	Negative	—	—
86	Ah Loong	Chinese (Hokkien)	30 Gardener	A leper for 7 years. In asylum for 3 years	Anaesthetic	Some faded patches on face. Chilblain-like swelling of fingers. Not conspicuous	11 years	No history of syphilis	Negative	—	—
87	Yong Fat	Chinese (Kao Chow)	39 Mining cooly	A leper for 11 years. In asylum for 1 year	Anaesthetic	White anaesthetic inconspicuous patches	20 years	No history of syphilis	Negative	—	—
88	Chin Kong	Chinese (Teo Chew)	25 Grainshop cooly	A leper for 3 years. In asylum for 1 year	Anaesthetic	Wasting of right hand	8 years	No history of syphilis	Negative	—	—
89	Siauw Seong	Chinese (K'heh)	22 Mining cooly	A leper for 7 years. In asylum for 4 months	Tubercular	Old small tubercles of ears and face. Contracture of left little finger. Conspicuous	7 years	No history of syphilis	Positive	6 doses at least	—
90	Chong Piang	Chinese (K'heh)	31 Attap house builder	A leper for 1½ years. In asylum for 1 month	Anaesthetic	Early perforating ulcer. An inconspicuous case	9 years	Syphilis 2½ years ago	Negative	—	—
91	Vong Yewn	Chinese (K'heh)	62 Goldsmith	A leper for 13 years. In asylum for 1 year	Anaesthetic	One hand has the same appearance as in syringomyelia. Not conspicuous	40 years	No history of syphilis	Negative	—	—
92	Sim Yoong	Chinese (K'heh)	45 Mining cooly	A leper for 10 years. In asylum for 1 year	Anaesthetic	Contractures of finger of left hand. Paralysis upper left face. Sores on feet. Conspicuous	25 years	Syphilis 7 years ago	Positive	6 doses at least	—

93	Vong Ngit	Chinese (Kheh)	46 Mining cooly	A leper for 4 years. In asylum for 1 day	Anaesthetic	A few red papules on face. Red wheals on right hip. Not conspicuous	10 years	Had syphilis 5 months ago. On being questioned further the patient said that the disease consisted of an eruption on the face. It was possibly leprotic	Negative
94	Lee Chung	Chinese (Cantonese)	50 Mining cooly	A leper for 10 years. In asylum for 1 month	Anaesthetic	Old contractures and amputations of both hands and one foot. No sores or tubercles	23 years	Had syphilis 10 years ago	Negative
95	Lee Loong	Chinese (Hylam)	26 Estate cooly	A leper for 2½ years. In asylum for 1 year	Tubercular	Old tubercles on face, flattened bridge of nose and amputation of one toe. Conspicuous	10 years	Had syphilis 5 years ago	Negative
96	Rengasamy	Tamil	28 Railway cooly	A leper for 2½ years. In asylum for 1½ years	Anaesthetic	Wasting and contractures of left hand. Circinate patches on forehead and left arm. Conspicuous	13 years	No history of syphilis	Negative
97	Chong Nghee	Chinese (Kheh)	48 Mining cooly	A leper for 5 years. In asylum for 10 days	Anaesthetic	Wasting and contractures of left hand. Not conspicuous	12 years	Chancere and bubo 5 years ago	Negative
98	Lye Yoon	Chinese (Kheh)	58 Bullock- cart driver	A leper for 2 years. In asylum for 10 months	Anaesthetic	Slight contractures of fingers. Scars of healed ulcers. Not conspicuous	21 years	No history of syphilis	Negative
99	Chong Swi	Chinese (Kheh)	31 Mining cooly	A leper for 1 year. In asylum for 6 months	Anaesthetic	Perforating ulcer right foot and contractures of left hand. Conspicuous	7 years	No history of syphilis	Negative
100	Lanatic	Chinese (Kheh)	30 (?) Nil	Leper for an unknown period. In asylum for 3 years	Anaesthetic	Wasting and contractures of right hand and left foot. Flattening of bridge of nose. Conspicuous	Unknown	Unknown	Negative

TABLE II.

Group of Lepers inoculated with Luetin.

Number in Table I	Name and age	Type of Leprosy	Wassermann reaction	Luetin reaction
8	Pachimuttu 25	Anaesthetic	Positive	Negative
25	Kok Yew 33	Tubercular	Positive	Negative
33	Chong Geok 35	Anaesthetic	Positive	Negative
35	Ah Wai 30	Anaesthetic	Positive	Negative
38	Thong Kong 48	Anaesthetic	Positive	Negative
46	Tan Oo 61	Tubercular	Positive	Negative
50	Wong Cheok 34	Tubercular	Positive	Negative
51	Yap Yean 40	Tubercular	Positive	Negative
52	Leong Kim 45	Tubercular	Positive	Negative
54	Chow Chye 14	Tubercular	Positive	Negative
59	H. H. 15	Tubercular	Positive	Negative
64	Lee Pin 26	Anaesthetic	Positive	Negative
65	Ving Hoy 40	Tubercular	Positive	Negative
53	Piang Chye 15	Tubercular	Negative	Negative
55	Ah Mok Chye 14	Tubercular	Negative	Negative
56	Ah Cheong 15	Tubercular	Negative	Negative
58	Yam Bee 17	Anaesthetic	Negative	Negative
60	Ah Kiet 22	Tubercular	Negative	Negative
61	Liew Kwee 31	Tubercular	Negative	Negative
62	Ah Leong 25	Tubercular	Negative	Negative
63	Siaw Kim 30	Tubercular	Negative	Negative

TABLE III.

Control group of decrepits inoculated with Luetin.

Number	Name and age	Disability	History of syphilis	Wassermann reaction	Luetin reaction
1	Chua Leong 56	Blind from old ophthalmia	No history of syphilis	Positive	Positive Papular
2	Chong Yew 53	Optic atrophy	No history of syphilis	Positive	Positive Pustular
3	Chay Yeong 39	Leg amputated for necrosis of bone 8 years ago. Old scars which look syphilitic	Syphilis many years ago	Positive	Positive Pustular
4	Chin Ghan 36	Tabes and optic atrophy. Old scars which look syphilitic	No history of syphilis	Positive	Positive Pustular
7	Kuan Lin 44	Leg amputated 11 years ago for ulcers	Had a chancre a year before ulceration of leg commenced	Positive	Positive Papular
8	Koh Chan 35	Myelitis for 6 years	Had syphilis about 6 years ago	Positive	Negative

TABLE III—(continued).

Control group of decrepits inoculated with Luetin.

Number	Name and age	Disability	History of syphilis	Wassermann reaction	Luetin reaction
9	Chin Siew	60 Optic neuritis	? (Stone deaf)	Positive	Negative
10	Chea Thean	60 Blind for about 14 years from plastic iritis	Had syphilis about 14 years ago	Positive	Negative
11	Foo Lian	56 Blind for about 10 years from plastic iritis	No history of syphilis	Positive	Negative
12	Liew Yai	49 Tabes and optic atrophy	Had syphilis 20 years ago	Positive	Negative
13	Chong Fat	43 Optic atrophy	No history of syphilis	Positive	Negative
14	Lin Sang	50 Contractures and scars 8 years	No history of syphilis	Positive	Negative
15	Chin Sang	38 Blind from old ophthalmia for 10 years	27 years ago	Negative	Positive Papular
16	Foong Wey	38 Blind from old ophthalmia	No history of syphilis	Negative	Positive Pustular
17	Phung Nghee	58 Blind from old ophthalmia	No history of syphilis	Negative	Positive Torpid
18	Sia Tiap	43 Leg amputated for bone necrosis	25 years ago	Negative	Positive Pustular
19	Chin Yoon	35 Leg amputated for ulcers 10 years ago. Many scars apparently syphilitic	Denies syphilis but admits bubo years ago	Negative	Positive Pustular
20	Liew Fook	48 Optic atrophy. Many scars which look syphilitic	No history of syphilis	Negative	Positive Pustular
21	Ngai Siew	32 Optic atrophy	No history of syphilis	Negative	Negative
22	Lye Song	63 Myelitis 15 years	24 years ago	Negative	Negative
23	Lin Choon	35 Myelitis 3 years	No history of syphilis	Negative	Negative
24	Kum Seong	35 Leg amputated 3 years ago for ulceration	No history of syphilis	Negative	Negative
25	Chong Kiew	36 Leg amputated for ulceration 1 year ago	No history of syphilis	Negative	Negative
26	Tai Chon	33 Leg amputated 2½ years ago after an accident	No history of syphilis	Negative	Negative
27	Lee Yoon	56 Blind for 20 years from old ophthalmia	No history of syphilis	Negative	Negative
28	Liew Kwee	58 Optic atrophy. Blind for 5 years	No history of syphilis	Negative	Negative
29	Cheng Swee	37 Myelitis of 3 years' standing	No history of syphilis	Negative	Negative
30	Goh Lian	50 Leg amputated 3 years ago for ulcers	No history of syphilis	Negative	Negative

SUMMARY.

1. One hundred lepers were examined by Browning, Cruickshank and McKenzie's modification of the Wassermann reaction with positive results in 22 cases. The amount of complement deviated was in some cases exceptionally large.

2. In a control group of 110 non-leprous persons there were 11 positive reactions.

3. In only one of the lepers was there visible evidence of former venereal disease but 33 of the lepers admitted that they had suffered from syphilis or from chancres, and of these 33, 13 reacted positively, while only nine of the remaining 66 gave positive reactions.

4. In the control group, 21 admitted former syphilitic infection and, of these, eight reacted positively; among the remaining 89, who denied syphilis, there were three positive reactions.

5. There were 12 positive reactions among 44 cases of tubercular leprosy and 10 positive reactions among 56 cases of the anaesthetic type.

6. The average duration of the disease, among the 22 lepers who reacted positively, was four years and eight months, as compared with an average of three years and eight months for the 78 patients who reacted negatively; but among the latter there were many old-standing cases.

7. Seventeen of the 22 positive cases were in an advanced stage of leprosy and in some of them the disease was progressing; but among those lepers who reacted negatively there were also many advanced and progressing cases.

8. Serum from the lesions in 10 of the lepers who reacted positively was examined by dark-ground illumination, but in no case was the *Treponema pallidum* found.

9. The luetin test was applied to 21 lepers, with negative results in every instance; 13 of these cases gave positive and eight gave negative Wassermann reactions. The test was also applied to a control group of non-leprous persons selected because they were likely to be latent syphilitics. In this group there were 11 positive luetin reactions.

The conclusions to be drawn from the results.

There were no clinical criteria by which one could foretell the results of the application of the Wassermann test to the lepers who were examined, and, if it be admitted that the positive reactions were due to leprosy and not to syphilis, it is difficult to understand why some tubercular and some anaesthetic cases reacted positively while others, clinically similar, did not; or why some actively, progressing cases reacted positively while others as active and as progressive gave negative reactions; but because the determining factor in these reactions has not been demonstrated it must not be concluded that this is necessarily latent syphilis.

The number of positive reactions in the group of lepers was double that which occurred in the control group; but in the former a larger number of individuals admitted antecedent syphilitic disease.

A striking feature, in some instances, was the strength of the positive reactions given by the leper sera tested, not once only, but on several occasions. The deviation of complement in such amounts as 50 or 30 doses is, at least, a rare occurrence in latent syphilis.

The negative results of the luetin test and of the search for *Treponemata* are in favour of the view that the positive Wassermann reactions were due to some other cause than syphilis.

On the whole it appears probable from the results of this investigation that leprosy, apart from syphilis, may cause a positive deviation of complement when the serum is examined by the method of Browning, Cruickshank and McKenzie.

Leprosy does not cause the luetin reaction to become positive.

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