THE INFECTIVITY OF NEURAL LEPROSY [1]

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It is a strange reversal of fortune that, after the centuries during which leprosy has been looked upon with fear as the most dangerous of diseases, it is now necessary to attempt to convince a scientific audience that the neural form of that disease is contagious. It is necessary to do this because with our advancing knowledge it has become clear that, so far as adults are concerned, leprosy in any form has a low degree of infectivity in a population which has achieved a certain degree of civilization. It is well substantiated that neural leprosy is much less infective than lepromatous leprosy; but that argument has been pushed beyond its logical conclusion, so that most countries now work on the supposition that neural leprosy presents no public health problem at all.

I wish to refute this argument on the following grounds: (1) that neural leprosy is caused by the *Mycobacterium leprae* in the skin as well as in the nerves; (2) that neural cases of leprosy, at some time or other, discharge *M. leprae;* (3) that neural cases have infected others; and (4) that endemic leprosy can become epidemic.

South Africa is the only country, so far as I am aware, which insists on compulsory segregation for all types of leprosy until such time as any given case is found to be cured, after which it is discharged. Most countries in which leprosy legislation has been found necessary have divided their control measures into two sections: (*a*) that concerned with open, or bacillus-discharging cases, and (*b*) that concerned with closed or bacillus-negative cases. All lepromatous cases fall in the first group, and most neural cases fall in the second one. The two most recent general international conferences, i.e., those held in Cairo in 1938 and in Havana this year, both advised segregation in the case of lepromatous or open leprosy but did not consider that patients with neural leprosy should be placed under restraint.

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Why should there be this difference of opinion as to who should or should not be segregated or isolated? I submit that there are two reasons. The first is practical politics. Leprosy occurs mostly in countries of low cultural and hygienic standards. Such states are *ipso facto* composed of individuals who are low tax payers or who do not pay taxes at all. It is therefore impossible to support health measures which are pushed to their logical conclusion. In South Africa the same conditions apply to our tuberculosis problem; we must cut our suit according to our cloth. So far as the leprosy problem of most countries is concerned, therefore, the solution—or attempted solution—has been to recommend the isolation of a part only of the leprosy cases, i.e., the open ones.

The second reason for this variance of opinion hinges on the question of what constitutes infectiousness. I, myself, hold that any case which shows clinical activity does so because of the presence of bacilli, and that such a case is infectious or potentially infectious. We in South Africa, having isolated our neural cases, have evidence of the evolution of neural leprosy. Before submitting that evidence I shall offer some quotations from the literature.

The quotations submitted are in reference to closed or neural leprosy, but this point perhaps requires a little elaboration. A neural case is considered "closed" if a routine examination of nasal smears is negative for *M. leprae;* no other avenue of discharge is considered reasonable or possible.[2] Lepromatous leprosy on the other hand is considered "open" if nasal smears or smears from open wounds or of scrapings of incisions into the skin lesions show the bacilli. We know that of routine nasal smears in lepromatous cases only 20 to 30 per cent may be found positive, whereas smears from skin incisions are 100 per cent positive. In other words, the bacilli will be found with a frequency directly in proportion to the energy expended in looking for them. The following extracts from the literature show the same to be true of neural leprosy.

Rodriguez and Wade (3), in a follow-up of 46 neural cases after five years, found that 10 per cent had become bacteriologically positive in smears from the skin.

In an investigation of 53 neural cases, Wade, de Simon and Fernando (6) found 15 out of 53 i.e., 28%) to be bacteriologically positive in skin

[2] The writer apparently refers here to the practice in the Union of South Africa. In other places as much attention, or more, is given to smears from the margins of active skin lesions as to those from the nasal mucosa.—EDITOR.

smears. They stated: "We cannot say . . . why so many should have had positive macules. The clinical appearance, the subsequent course and the histological findings do not afford any indication that they were undergoing transformation to the cutaneous [i.e., lepromatous] type." Of this group seven were positive in the earlobes, though no evident lesions were present there.

Lowe (2) in a study of macules of "nerve" leprosy found bacilli in only 10 per cent of the biopsies of such lesions until he began to examine six or eight sections of each macule, after which his positive findings rose to 60 per cent.

Lie (2) examined ten biopsy specimens from neural cases in South Africa and reported, "In all of the specimens, including those that were tuberculoid, I have been able to demonstrate bacilli."

These four quotations show a spiral from 10 to 28 to 60 to 100 per cent. It may be argued that these findings concerned only bacilli that were safely locked away in the tissues, and that the patients were not then of public health importance. But Wayson, who for years was the director of the Leprosy Investigation Station at Honolulu, once wrote in a symposium on the infectiousness of neural cases (5) that, "If the *Mycobacterium leprae* (Hansen's bacillus) is accepted as the cause of leprosy, there are no grounds for assuming that patients affected with the neural forms of leprosy may be considered noninfectious. It is conclusively established that a large percentage of such patients harbor the bacterium in the upper layers of the nasal mucous membrane, and that they may therefore readily disseminate it to others."

Even the protagonists of the noninfectiousness of neural leprosy do not completely blind themselves to the facts, and Rogers and Muir (4) are compelled to say that among the 700 cases collected by Rogers in which the probable source of infection was traced, 5.3 per cent arose through contact with neural cases. The first two editions of their book also contained the statement that, "Veendam, in British Guinea, pointed out that anaesthetic cases may be dangerous through being more liable to be overlooked; and those from whom lepra bacilli are being discharged from the nose . . . cannot be looked on as completely harmless. . . ."

I cannot concede that 5.3 per cent as a rate of infection by neural cases is negligible as a health problem. As an individual problem it means that, in this institution, there are 60 persons who are here because of contact with such cases. But I believe that this figure is a great under-statement with respect to the conditions in this country.

As has been stated, the finding of bacilli in neural leprosy

is a chance affair. They may be found in the nose, in the macules and even in normal-appearing skin. Rogers and Muir speak of the finding of bacilli in stools, milk, semen, sweat and sputum, and though most such reports probably pertain to lepromatous cases—details are not given—the possibility exists that it can occur in neural leprosy; and they do say that Theroux found bacilli in the vaginal secretions of 3.8 per cent of neural cases.

I have seen evidence in two cases that superinfection can occur in the absence of demonstrable bacilli. In one native woman who had a macule on one buttock another macule developed on the opposite buttock just where the skin surfaces touched. In one native male a macule on the index finger gave rise to a macule on the surface of the thumb that opposed it. We could find no bacilli in any of the four lesions. Though we are not able to give supporting evidence, I believe it possible that native mothers may infect their children while carrying them on their backs. In such cases there is direct skin to skin contact.

While discussing neural leprosy we must not lose sight of the fact that it not infrequently changes to the lepromatous form. I have investigated all of the native neural cases which have accumulated in this institution and have been under observation for more than two years. These are obviously not a true cross section of neural leprosy, since they are cases which have not responded to treatment. Nevertheless it is distressing to find 45.7 per cent of native females and 37.7 per cent of native males have become lepromatous, and that 28.0 per cent of the females and 24.6 per cent of the males have shown bacilli in their nasal smears even though they have remained neural. The totals of those who have either become lepromatous or have shown bacilli are 75.7 per cent females and 62.3 per cent males.

These are cases which have been kept under observation. Others have been discharged, and a disquieting feature of those which have been discharged as arrested is that more than one-quarter of them have returned to the institution as clinically reactive even if not bacteriologically reactive (i.e., 8,000 discharges and 2,000 recrudescences). And we know that the supervision of our discharged cases is inadequate.

An analysis of all the neural cases admitted in 1940 is of interest, since this group is a cross section and gives a reasonable indication of the prognosis of treated neural leprosy.

Number of neural cases admitted, 1940	157
Number died	31
Number discharged probationally	120
Number recrudesced clinically	29

Number recrudesced bacteriologically	2
Number turned lepromatous	22
Number still neural, with positive smears	14

If out of 157 neural cases treated in the institutions no less than 38 (the last three lines above) have shown positive smears, it appears evident that a great many more would have become dangerous to the public health if they had not been segregated and treated.

I regret I am not able to show actual evidence of cases of neural leprosy infecting others. We have instances of neural parents and leprous children, but it cannot be asserted positively that there were no lepromatous cases in the family tree.

It was a great shock to me in Brazil to investigate unsegregated neural patients. There were no restrictions on their occupations or habits. All of the married patients to whom I spoke occupied double beds. One woman, a tuberculoid case, occupied the same bed as her baby daughter. I do not know how closely they follow-up the contacts of neural patients in Brazil, but if it is in any way efficient I think Brazil will have a lot to tell us in another ten years about the infectivity of neural leprosy.

Endemic leprosy in a country can assume epidemic proportions. In tropical French West Africa, in Bangong, it was found that one-fourth of the workers were suffering from leprosy (Rogers & Muir). It is reported from Nigeria that in some villages as many as 20 per cent of the population have been found to have leprosy. The history of the island of Nauru is well known but is worth repeating: In 1920 there were three known cases in a population of about 2,600; in that year there was an influenza epidemic; four years later 30 per cent of the population showed signs of the disease. There is nothing in the standard of sanitation, civilization or of the dietetic habits of our natives which is much above the customs of tropical French West Africa or Nigeria. Climate is the only factor in our favor. South Africa may have a similar influenza epidemic to that which occurred in Nauru. I feel that no precautions whatsoever should be relaxed in our leprosy campaign.

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[The discussion of this paper and that of Dr. Winter follows the latter, p. 260.]