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# EDITORIAL

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## Coughing, Sneezing and Mosquitoes in the Transmission of Leprosy

During travels in the Orient two questions, based on recent reported research, are frequently posed to us by both the general public and by leprosy workers. These were most intensely discussed at a time when newspapers throughout the area carried an item often captioned "Coughing and Sneezing Transmit Leprosy." The tone as well as the frequency of the questions suggested a fragility of belief in the commonly reiterated concept that leprosy is one of the least infectious of the contagious diseases.

**The first question** was generally an anxious inquiry as to whether or not it is true that leprosy is transmitted by coughing and sneezing and, if so, should there not be major changes in the currently more relaxed attitude toward the care and treatment of those having the disease. The news reports were apparently derived from presentations at that time related to several published reports (5, 14).

Nasal lesions (Figure) have long been known and their discharges seriously discussed as a possible and probable source of contagion. Danielssen and Boeck in 1847 illustrated the internal nasal ulcers in their ATLAS COLORÍE DE SPEDALSKHED (4) and the nasal discharge of bacilli was discussed at the First International Leprosy Congress (Berlin 1897) where Jeanselme first reported bacilli in the nasal mucus of 61.5% of leprosy cases. The subject seems to have been well

FIG. Nasal leprosy. From lantern slide file of a medical school teacher of the writer. Original source: U.S. Army Medical Museum.

aired in succeeding years so that Klingmuller [9] in his monumental monograph wrote of nasal lesions and their bacilli-rich secretions, and at about the same time Jeanselme [7] noted, "That every author quoted noted the significance of nasal involvement and admitted that inoculation can be effected by the nasal discharge." Rogers and Muir [15] by 1946 (pp 152–154) briefly summarized a long list of studies of nasal secretion in which bacilli were noted in 68% to 100% of lepromatous cases and considerably lesser numbers (43% to 47%) in "neural" cases or patients at or toward the tuberculoid end of the spectrum. They also noted that lesions of the throat are a source of infection and stated that in coughing, sneezing, and even speaking, the bacilli are projected over a meter though they did not relate how this was determined. Presumably it was based on droplet dispersion observations.

This interest in nasal contagion was somewhat offset by several studies such as the one at Culion settlement in the Philippines [15] where of over 300 children living with parents who had leprosy, no child was found to show a primary nasal infection; and of 24 with primary skin lesions, only 13 showed nasal lesions in addition.

It is highly improbable that "coughing and sneezing" dispersal of bacilli is likely to cause dermal lesions to as great a degree as closer contact, so the expectation was that if droplet infection were of importance it would probably be manifest mainly as the occurrence of primary nasal lesions. These types of findings and considerations are still a barrier to be overcome before any current "may be" and "might be" hypothesis can be seriously considered in policy practice.

It, of course, should be recalled [15] that the nose is only one part of the upper respiratory system, which extends to the larynx. In fulminant, untreated lepromatous leprosy the soft palate, uvula and aryepiglottic folds as well as the fauces are often involved. The larynx may be affected by extension and in presulfone days was commonly seen to the point where at one Southeast Asian leprosarium visited in the late 1940's, hoarseness was described as a common complication, and another large leprosarium claimed 10% tracheotomies in its patient population. Thus, the origin of the recently reported [1] finding of *M. leprae* in bronchial washings would seem not to be a significant mystery. Drainage and aspiration of upper respiratory material into bronchi and elsewhere in the lungs are too common an occurrence to require devious speculations, or at least would have to be eliminated as being causal before posing as a mystery.

Recently the extensive nasal and pulmonary involvement reported for experimental leprosy infection in the armadillo would seem to pose a problem of possible contagious risk by massive discharge of bacilli from these areas. Perhaps a greater risk than respiratory droplet transmission from human to human may be that suggested by Rogers and Muir relating to nasal transmission [15]. They (p 195) suggested that "picking" the nose, a very common practice, might well be a common mechanism of infection and noted that it is the parts of the mucosa within reach of the fingers that are most commonly affected (Figure). This could also be a hazard in those caring for infected armadillos.

Perhaps a most serious possibility, against which all precautions should be taken, of the armadillo infection is that of escaping infected animals creating the leprosy zoonosis which has long been sought and never found. Since they live in a system of burrows from 4 to 24 feet in length, having within it a "home" burrow [2], these animals with their reported great susceptibility to *M. leprae* would probably not need to pick their noses in order to achieve transmission. In our experience, these creatures are persistent and strong seekers of freedom, and utmost security must prevail if their attempts at escape are to be frustrated. Alternatively, all leprosy research could be conducted on single sex animals in an area where there are no wild armadillos, preferably an island, e.g., Hawaii?!

**The second question** was directed at whether or not mosquitoes transmit leprosy. A somewhat facetious reply is that a mosquito may be, in respect of the finding of leprosy bacilli in it, essentially a microsyringe; and even macro-syringes have not been able to accomplish human transmission on volunteers. Indeed, the recent workers on this subject well recognize that finding bacilli in mosquitoes does not establish these insects as vectors [8, 12, 13].

The concept of leprosy transmission by mosquitoes is not new. Montestruc and Blache ([11]) in 1951 reported the case of a healthy four month old child, nourished by her lepromatous mother, in whom on two occasions numerous acid-fast bacilli partly grouped in globi, were found in dermal lymph at the sites of mosquito bites of 24 hours' duration. The blood-filled intestine of a Culex mosquito caught in the house of the patient contained numerous acid-fast bacilli. Five days after the initial finding of bacilli in the infant's lymph, no bacilli could be found at the previously investigated sites.

Some years previous to this report, De Oliveira Castro and Mariano ([6]) noted that it was then known that after mosquitoes have bitten a person with leprosy, bacilli can be demonstrated in the alimentary canal of the insect. Yet earlier, a presentation from Lutz ([10]) at the Cairo Congress (1938) seemed to assume mosquito transmission to be established and proposed six rules directed at the control of such transmission, one of which read in part: "No human habitation should be allowed in the neighborhood of leper hospitals or settlements within the distance attainable by the flight of mosquitoes." He predicted that, "Gradually . . . results will appear and finally lead to the suppression of this dread plague wherever anti-mosquito prophylaxis is carefully maintained."

Surely the mosquito control/antimalarial campaigns which have in recent times been vigorously pursued in vast areas having endemic leprosy should by now have given some evidence of the results predicted by Lutz if, indeed, the mosquito is a significant vector for leprosy transmission. No association seems to have been reported.

During the period under discussion it so happened that the leprosarium in Hong Kong was being closed down due to the marked decrease in the number of patients as a result of control and treatment measures in effect for the past 25 years. A few remaining patients were transferred to the infectious disease hospital. The adjacent community, and even some nurses, erupted into severe protest against the move citing the "newer knowledge" of coughing, sneezing and mosquito transmission as evidence of a contagious hazard. This made repeated headlines in the press and required the expenditure of much judicious effort to resolve satisfactorily a move which was essentially for the good of both public and patients. Thus, honest well-meant hypotheses directed at better understanding and announced in a pauci-leprosy area reverberated into a set-back for public health educative efforts in a leprosy endemic region.

Relevant to both questions here posed is a study reported by the ILA's indefatigable president emeritus Robert G. Cochrane in his first textbook on leprosy ([3]) and apparently unknown to many who use his later editions. He studied the prevalence of leprosy in a group of villages in South India, all of which lay within a radius of five miles. Leprosy prevalence varied from nil to 124 per 1,000. Remarkably, for example, one caste village had a prevalence of 43.8 per 1,000 while its outcaste extension lying 20 yards away showed no leprosy. The inhabitants of the outcaste villages served in the caste villages but had no physical contact with the inhabitants of the latter. The converse situation of high prevalence in outcaste villages and low prevalence in caste villages suggested that possible genetic differences between the two types of inhabitants were not responsible for prevalence differences. The malarial index was the same.

These findings, and other epidemiologic observations, suggest that neither airborne droplets from coughing and sneezing nor mosquito bites are significant means of leprosy transmission. Epidemiologic study such as this would seem to warrant further confirmation.

It is important to note that none of the authors in the publications cited made such claims. They were circumspect in their publications but the press, and therefore the public, jumped the gap from implied possibility to probability and even certitude. So fragile is the public's (including many working with leprosy patients) awareness and confidence in the newer concepts of leprosy that the "may be" and "might be" of scientific hypothesis are readily reinterpreted into unease and even fear on the basis of still held opprobrium and fear.

At times one almost gains the impression that underlying the acclaim for advances in leprosy control and understanding there lurks a subconscious desire for the old fears and opprobrium to continue. In this sense the

poem,[1] entitled "The Song of the Lepers," written by Rainer Maria Rilke (1875-1926), an Austrian poet who once lived in Paris as a secretary to Rodin and who may have there seen leprosy, still has meaning.

See, I am one whom all have deserted.
No one knows of me in the city,
leprosy has befallen me.
And I beat upon my rattle,
knock the sorrowful sight of me
into the ears of all
who pass near by.
And those who woodenly hear it, look
not this way at all, and what's happened here
they do not want to learn.

As far as the sound of my clapper reaches
I am at home; but perhaps
you are making my clapper so loud
that none will trust himself far from me
who now shuns coming near.
So that I can go a very long way
without discovering girl or woman
or man or child.

I would not frighten animals.

—Olaf K. Skinsnes

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[1]Kindly brought to our attention by Heinrich Klüver, Ph.D., Sewell L. Avery Distinguished Service Professor Emeritus in the Division of Biological Sciences, University of Chicago.