

Does Droplet Infection Play a Role in the Transmission of Leprosy?

J. C. PEDLEY AND JOHN G. GEATER

Experiments are described aimed at repeating in the context of modern knowledge the long neglected work of Schaffer on the release of *Mycobacterium leprae* from the upper respiratory passages during sneezing, coughing and normal speech. In two Bhutanese patients large numbers of *M. leprae*, including some of normal morphology, were projected during sneezing up to a distance of 30 cm from the face and smaller numbers to a distance of 50 cm. None could be recovered during 20 min of normal speech. Only patients with untreated or relapsing lepromatous leprosy are implicated, as distinct from borderline cases, the criterion being the presence of a highly bacilliferous nasal discharge.

Does Droplet Infection Play a Role in the Transmission of Leprosy?

At the first International Leprosy Congress at Berlin, Schäffer (1898) described experiments in which sets of microscope slides were placed at distances up to 50 cm in front of 2 patients with severe lepromatous leprosy during the process of talking, coughing and sneezing. Large numbers of acid-fast bacilli were found on the slides. At that time it was impossible to identify these as *Mycobacterium leprae*, and Schäffer's work suffered from the neglect which for so many years surrounded nasal infection in leprosy, on the grounds that authentic *M. leprae* could be confused with contaminating acid-fast bacilli at this site.

The attention drawn by one of us to nose blows (Pedley, 1973) once again stimulated interest in Schäffer's findings. His original paper was written in German. Dr R. J. W. Rees arranged for its translation into English by Dr Bodingius, and the relevant sections are as follows.

"20-30 glass slides, closely adjacent, were placed in front of the patient. The patient talked for 10 min, reading or counting, after which time the slides had on them specks of mucus of different sizes. The slides were left till dry, fixed over a flame, and stained by the Ziehl-Neelsen method. For counting slides were divided into 8 quadrants, numbers of acid-fast bacilli in each quadrant were counted using oil immersion lens, and the total number of bacilli then calculated. Mistakes were avoided by decolourising with acid alcohol, bacilli about which there could be no doubt showing characteristic cigar shaped bundles and the occurrence of conglomerates (globi). No bacillary complexes were counted, only single organisms. It was found that if the patient stood upright, droplets were projected as far as 30-50 cm onto surfaces held in front of the patient.

Results. One patient released 10,000 to 25,000 bacilli. The other patient released 75,000 to 120,000 bacilli and on one occasion 185,000 bacilli. In both patients investigated the secretion from the nose contained very many bacilli. Extremely large numbers of bacilli were released in sneezing (patients were given sneezing powder) . . . in one sneeze a patient released 110,000 bacilli.

Conclusions. Leprosy patients with mucous membrane affection of the respiratory tract . . . release thousands of bacilli during speech, coughing and sneezing. Are the released bacilli viable? Some authors think they are dead. This is still unproved because no culture or animal inoculation has been possible up till now. We should not worry too much because clinical experience has shown that the danger of leprosy transmission is in fact extremely small. Cases of close contact for years do not acquire leprosy. Bacilli in great masses reach healthy persons without leading to disease. We may however not conclude that bacilli released by the respiratory tract do not play a role in the transmission of leprosy.”

Nowadays patients with untreated florid lepromatous leprosy are not easy to find, but it seemed to us worthwhile to repeat Schäffer’s work against the background of modern knowledge. An opportunity arose when a suitable patient attended at Mongar Hospital, Bhutan. The patient, a Bhutanese patient about 35 years of age, had been suffering from lepromatous leprosy for 5 years and was untreated. The disease was well advanced, and smears of the noseblow showed that the mucus was heavily infected with acid-fast bacilli and numerous globi. The B.I. of skin smears was 5.0.

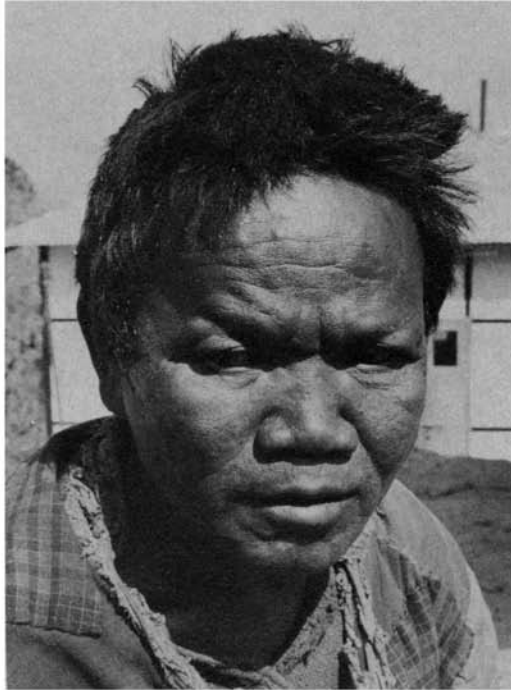


Fig. 1. Name: Sonam. Nationality: Bhutanese. Age: 35. Untreated lepromatous leprosy 5 years.

Method

Sneezing was induced by tickling the nasal mucosa. The patient directed his sneeze towards microscope slides placed at distances of 20, 30 and 50 cm from the face. Slides were fixed, stained by the Ziehl-Neelsen method and examined for acid-fast bacilli.

Findings

SNEEZE AT 20 CM

Two slides with a total area of approximately 39 cm² were examined systematically and revealed the presence of 500 droplets of sizes varying from 0.2 mm to 0.7 mm in diameter. Fifty droplets (i.e. 10% of the total) were examined in detail in succession as they occurred on the slides using the oil immersion lens. In 35 of the 50 droplets (i.e. 75%) bacilli were found, arranged as follows:

Globi	20
Smaller aggregates (cigar shaped bundles, clusters, etc.)	32
Single bacilli	50-100

Figure 2 shows a single field from a slide at this distance.

SNEEZE AT 30 CM

Three slides from which a total area of approximately 35 cm² was systematically searched revealed the presence of about 340 droplets with the same variation in size as recorded above. Fifty droplets were examined under oil immersion. Thirteen showed the presence of acid-fast bacilli, classified as follows:

Globi	8
Smaller aggregates	16
Single bacilli	20

Figure 3 shows a single field from a droplet which was 0.4 mm in diameter at this distance.

SNEEZE AT 50 CM

A second patient, a Bhutanese youth aged 22 years, suffering from untreated and well advanced lepromatous leprosy (B.I. of skin 3.5, B.I. of nasal mucus secretion 4.0) sneezed towards a slide held at 50 cm from the face. A search of the slide revealed the presence of 7 droplets, in 6 of which acid-fast bacilli were found, occurring singly, in groups and in globi.

At all distances individual bacilli were encountered which preserved the stain uniformly.

Figure 4 shows a single field from a slide at 50 cm.

The photomicrographs from both patients are filed at the Leprosy Study Centre, London.

Further experiments were undertaken with the first of these two patients in order to ascertain the release of bacilli in talking, snoring (simulated with the mouth open), and panting after vigorous exercise. Table I summarizes the findings in all these experiments.

References

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