

## Polyaxonal Myelination in a Human Leprous Nerve

### TO THE EDITOR:

The presence of aberrantly myelinated fibers was reported by us earlier in the sciatic nerves of mice inoculated in the foot pad with *Mycobacterium leprae*<sup>(3)</sup>. Subsequently it was noted that mice treated with high concentrations of dapsone (DDS) or with immunomodulating regimens, such as thymectomy-irradiation or cyclosporin A, when followed by *M. leprae* infection showed a higher incidence of polyaxonal myelination<sup>(4,5)</sup>. Such aberrant myelination also has been reported in the developing sciatic nerves of mice with benign muscular dystrophy<sup>(1,2)</sup>. However, so far we have not come across any documented evidence for the presence of similar polyaxonal myelination in human nerves.

In this communication we wish to record the presence of polyaxonal myelination in a human leprous nerve. This was observed in a sural nerve biopsy obtained from a pure neuritic case of leprosy. This 17-year-old male had involvement of multiple nerves, the left lateral popliteal (common peroneal), left sural and left median nerve were thickened. The left sural nerve funicular biopsy was obtained 1 year after the MDT-MB WHO regimen<sup>(6)</sup>. The nerve biopsy was studied using both light- and electron-microscopy and revealed an active borderline

(BB-BL) lesion. The bacterial index in the nerve was nearly 4+ while multiple skin smears were negative throughout. Most of the bacterial load was seen within the Schwann cells (Fig. 1). There was an extensive loss of myelinated fibers. The endoneurium was well populated with Schwann cells, with and without any axonal sprouts. Occasional, small-size, thinly myelinated fibers were seen scattered all over the funicle. Dense perivascular foci of lymphocytes were present both within the endoneurium and in the epineurium. A few fibroblast-like cells with elongated processes were seen encircling groups of Schwann cells and axons. The aberrantly myelinated fiber seen in this nerve was large in size. Several axons and Schwann cell processes were seen encircled by a comparatively thin ring of myelin with normal periodicity (Fig. 2). Inner and outer mesaxons were clearly seen. The Schwann cell ensheathing this group of fibers appeared normal.

Although rare, this finding shows that polyaxonal myelination similar to that seen in mice also may occur in human leprosy lesions. The exact pathogenetic mechanism involved in such aberrant myelination is not clear. We have speculated that the occurrence of myelination around multiple axons in the mouse leprosy model is a misguided

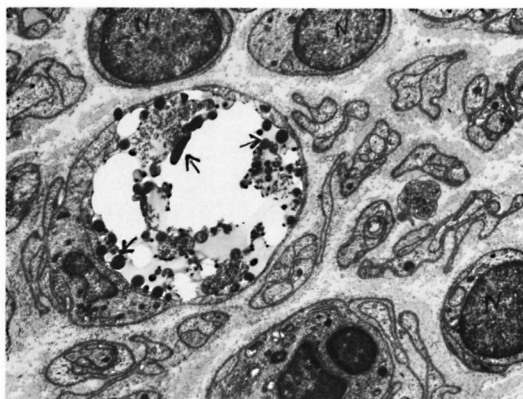


FIG. 1. Transverse section of sural nerve. A low-power electron micrograph showing *M. leprae* (arrows) in a Schwann cell of an unmyelinated fiber. Note increase in number of Schwann nuclei (N) ( $\times 4500$ ).

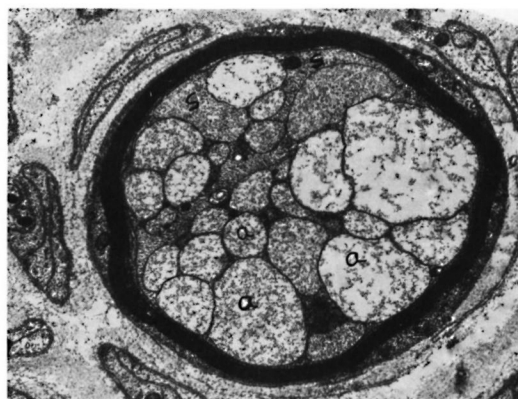


FIG. 2. Another area in Fig. 1 nerve showing groups of axons (a) and Schwann processes (s) surrounded by a thin ring of myelin with normal periodicity. Inner and outer mesaxons are clearly seen ( $\times 12,000$ ).

regenerative response following partial denervation of unmyelinated fiber groups—a result of defective Schwann cell axon interaction<sup>(4)</sup>. As in the mouse studies, the rarity of this finding in human leprosy also could be attributed to two possible factors. Firstly, such abnormal regeneration occurred only during the early stages of infection, i.e., between the fourth and eighth postinoculation months. Secondly, a detailed study of both longitudinal and transverse sections of these nerves in mice revealed that such myelination occurred along a small segment of otherwise unmyelinated fibers, and the axons within the myelin ring system subsequently fused to give an appearance of a single axon. According to Brown and Radich<sup>(1)</sup> such fibers undergo degeneration, thus suggesting that it is a transient phenomenon. It is not surprising therefore that such fibers are only rarely seen in human leprosy lesions.

—Dr. Vanaja Shetty

Senior Research Officer  
The Foundation for Medical Research

84-A R.G. Thadani Marg, Worli  
Bombay 400018, India

#### REFERENCES

1. BROWN, M.J. and RADICH, S.J. Polyaxonal myelination in developing dystrophic and normal mouse nerves. *Muscle Nerve* 2 (1979) 217–220.
2. OKADA, E., MIZUHARA, V. and NAKAMURA, H. Abnormally combined myelinated and unmyelinated nerves in dystrophic mice. *J. Neurol. Sci.* 33 (1977) 243–249.
3. SHETTY, V.F. and ANTIA, N.H. Myelination around multiple axons in peripheral nerves; an unusual ultrastructural observation. *Acta Neuropathol.* 50 (1980) 147–151.
4. SHETTY, V.P. and ANTIA, N.H. Multiple axonal myelination in the experimental mouse leprosy model. *Int. J. Lepr.* 52 (1984) 249–251.
5. SHETTY, V.P., BIRDI, T.J., MISTRY, N.F. and ANTIA, N.H. Effect of T cell depletion on bacterial multiplication and pattern of nerve damage in *M. leprae* infected mice. *Int. J. Lepr.* (submitted for publication).
6. WHO STUDY GROUP. Chemotherapy of leprosy for control programmes. Geneva: World Health Organization, 1982, pp. 1–33. Tech. Rep. Ser. 675.

## Enhanced Response of Serum IgG Class of Anti-PGL-I Antibodies in Leprosy Patients During Onset and Following Clinical Remission of Type 1 and Type 2 Reactions

TO THE EDITOR:

Phenolic glycolipid-I (PGL-I) contains a trisaccharide, unique to *Mycobacterium leprae* <sup>(2)</sup>. Reports are available on the response of serum anti-PGL-I antibodies in untreated and successfully treated leprosy patients <sup>(11)</sup> as well as in contacts <sup>(15)</sup>. However, little information is available on the response of serum anti-PGL-I antibodies during lepra reaction and after its remission following steroid therapy. There is no study on the binding of anti-PGL-I antibodies for its ligand.

The micro-ELISA technique is often used to estimate the serum levels of anti-PGL-I antibodies <sup>(6)</sup>. The affinity dependence of these assays is marked when antigen of low epitope density is employed <sup>(13)</sup>. The number of epitopes in the PGL-I molecule is perhaps limited. Monoclonal IgG to PGL-I

reacts exclusively with the distal 3,6-di-*O*-methyl- $\beta$ -D-glucopyranose <sup>(5)</sup>.

Keeping this in mind, we have designed this study aiming at quantifying serum levels of IgG and IgM classes of anti-PGL-I antibodies employing the micro-ELISA technique <sup>(6)</sup> in 9 patients (5 males and 4 females between 21 and 45 years of age) at the onset of type 1 and type 2 reactions as well as following clinical remission after steroid therapy and compared their sera antibody levels with those in 10 lepromatous leprosy (LL) patients without reaction (6 males and 4 females between 25 and 45 years of age).

To estimate the binding constants (K) of anti-PGL-I antibodies in the sera of these patients we compared their serum titers with that of a mouse monoclonal (MC-1433-S) (WHO) containing a known amount of the