

Foam—the Result of an Interaction Between Unactivated Macrophages and Dead *Mycobacterium leprae*?*

TO THE EDITOR:

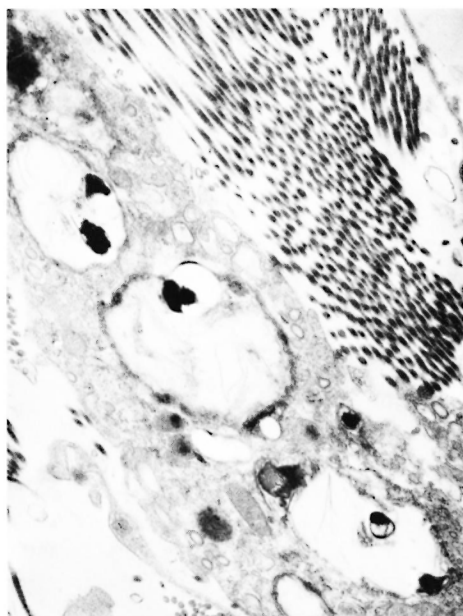
The foam in lepromatous leprosy has been the object of study for many years, and it has been said that it consists of phospholipids and fatty acids (^{2, 4, 7, 9, 10}). Recently, in an important communication by Hunter and Brennan, it was shown that armadillo-derived *Mycobacterium leprae* contain a

phenolic glycolipid that “may be responsible for the electron transparent foam which surrounds the leprosy organism in infected tissue” (⁶).

Light- and electron-microscopic studies of the structure of lepra cells have shown that the opaque droplets seen around *M. leprae* in the early stages of the infection coalesce in the later stages to produce foam containing degenerating bacilli (^{1, 8, 12}).

Several suggestions have been made with

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THE FIGURE. Electron micrograph of a macrophage showing several cross sections of *M. leprae* surrounded by electron-transparent material which causes the foamy appearance of the cytoplasm ($\times 30,000$).

regard to the origin of foam. It was thought that foam may arise from the effect of the intracellular invasion and proliferation of *M. leprae* on the cytoplasm of the cell (^{5, 9}). It was also suggested that it was the breakdown product of the degenerating *M. leprae* (¹¹) or the result of abnormal lipid metabolism of the cells (⁷). Recently in an ultrastructural study of the growth of *M. leprae* and *M. lepraemurium* in nude mouse macrophages, it was found that *M. leprae* produced foamy structures and *M. lepraemurium* produced crystalline material. It was suggested that the foamy structures were made up of a substance produced by the multiplication of *M. leprae* in suitable host cells (³).

We have injected 10^7 autoclaved armadillo-derived *M. leprae* intradermally into nude mice. The sites were biopsied at the end of four weeks. Each biopsy was divided into two parts. One was fixed in 10% formalin for light-microscopic study and the other was further divided into 1 mm cubes and fixed in 2% glutaraldehyde at 4°C for electron-microscopic study.

In the light-microscopic examination, a

few small collections of mononuclear cells were seen around capillaries in the dermis. The cells were mostly macrophages, although a few lymphocytes were seen. The cytoplasm of the macrophages on careful examination revealed a foamy appearance. Acid-fast stain showed bacilli inside the macrophages. An electron-microscopic study of the biopsy showed that the macrophages contained large phagosomes containing fragmented bacilli surrounded by a large amount of electron-transparent material characteristic of foam (The Figure).

There are two possibilities to explain the presence of foam in the macrophages in this study. It may be produced by the dead (autoclaved) *M. leprae* as a reaction of the macrophages to the constituents of the bacilli, or it may be from the inoculum itself because most of the purification methods are not successful in completely removing foam from the bacilli. Further studies are being planned to rule out this latter possibility.

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