Aerial Hyphae of Mycobacterium xenopei

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While many properties of the most recently recognized mycobacterial pathogen, Mycobacterium xenopei, have been established by the predominantly consistent findings of several workers (H. C. Engbaek et al., Acta Pathol. Microbiol. Scand. 69:576, 1967), some important morphological properties have not been described. Twenty-three strains of M. xenopei from patients of five countries and the type strain (from a toad) have been critically examined and compared with many cultures, including type strains of other Mycobacterium and Nocardia species. The American xenopei strains (from sputum, pulmonary node, or resected lung) were from patients residing in New York, New Jersey, North Carolina, or California. This corresponds to the predominantly coastal distribution of European sources.

Isolated and grouped colonies grown at 37 and 41 C on Middlebrook 7H10 agar or on cornmeal-glycerol agar are examined on plates inverted on the stage of a low-power microscope or erect on a stereo microscope, at 7 to 100 X magnification. Colonies 2 weeks old resemble those of 2-day-old M. fortuitum, consisting of filaments with monopodial branching. A number of species of rapidly growing mycobacteria have such microcolonies, but M. xenopei, a very slow grower, now shatters the assumption that these are always associated with rapid growth. As growth proceeds, the centers become compact masses of bacteria surrounded by a fringe of branching filaments on the agar surface. These halos are never visible macroscopically, but are one of the most distinctive characteristics of M. xenopei, as has been previously noted (S. R. Pattyn, Zentr. Bakteriol. Parasitenk. Abt. 1 201:248, 1966). Another distinctive feature in substrate growth. Colonies become adherent to the medium by development of a button-like mass in and attached to the agar. Branching filaments may also appear in the substrate agar.

A variable, usually very small proportion of mature colonies, is partially or completely covered with short tufts or filaments; these appear comparable to the aerial hyphae of Nocardia. The extensions are readily seen by use of reflected light and low-power microscope or stereo-microscope (Fig. 1 and 2). A small proportion of strains exhibit aerial hyphae on all colonies. Only 2 of the 24 strains examined have not been seen to form aerial hyphae. Subcultures from a colony with aerial hyphae exhibit this property consistently on all or nearly all colonies, whereas transfers from smooth-surface colonies...
predominantly lack aerial hyphae. Colonies with aerial hyphae are in the rough category: they have a rough, dry surface, are opaque, do not readily disperse in water. Smooth colonies, in contrast, have a moist surface, rarely if ever exhibit aerial hyphae, are translucent, and are relatively easily dispersed. Stranding of bacilli, characteristic of rough strains of most mycobacterial species, is not seen in M. xenopei. The cohesion of bacilli produces peculiar aggregates, owing, evidently, to the great length and curvature of the bacilli. In general, they may be described as interwoven meshworks. Rarely will a colony of M. xenopei exhibit roughness without aerial hyphae production.

Aerial hyphae on other slowly growing Mycobacterium species are never seen. Mature colonies of some rapid growers, like M. smegmatis, occasionally produce projections which are comparable to aerial hyphae. Similarity to Nocardia indicates the necessity of caution in applying this property, as is currently very common in distinguishing nocardiae from mycobacteria. No confusion should arise with M. xenopei, however, for it is distinct in several other properties: strong and complete acid-fastness, slowness of growth, optimum growth temperature above 40°C, no growth at 23°C, arylsulfatase activity, and pathogenicity for birds. Aerial hyphae of M. xenopei are usually inconspicuous compared with those of the commonly encountered Nocardia species, but it must be pointed out that some nocardiae lack aerial hyphae.

Formation of filamentous microcolonies and aerial hyphae by this mycobacterium adds to its already established multifaceted relationships. Its slow growth, high temperature optimum for growth, and pathogenicity for birds relate it to M. avium; its filamentous microcolonies relate it to rapid growers like M. fortuitum; the aerial hyphae strengthen the already strong bonds uniting mycobacteria and nocardiae.