Advanced Fluorescence Microscopy Techniques for Soil Microbial Ecology. (S03-ghiorse105335-Oral)

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Abstract:

A major goal of microbial ecology is to understand the factors that control communities of microorganisms in their native microhabitats, which are the basic units of microbial ecology. Microhabitats of soil are um to mm in size, structurally complex, with chemical gradients dominating community structure and activities. Previous work with conventional epifluorescence microscopy usually examined soil smears using specific fluorochrome staining, fluorescent antibody staining, microautoradiogrphy, and fluorescence in situ hybridization. These techniques have revealed the number and identity of microbial inhabitants and allowed for quatification of some activities. But establishment of in situ spatial relationships at the microscale has been elusive. Recent advances in specimen preparation for confocal fluorescence microscopy combined with advances in molecular probe labeling techniques allow for new insight into soil community structure. Limitations of detection sensitivity, background fluorescence, and fading are overcome with a variety of approaches, mostly borrowed from cell biology. The current generation of confocal laser scannning microsopes and image processing software give hope that routine 3D imaging of soil microbial populations in relationship to other materials in their native microhabitats will soon be possible. This will lead to new understanding of the microscale distribution of microbial

populations and regulation of microbial communnity activities in soil.

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Presentation Information:

Presentation Date: Monday, November 11, 2002
Presentation Time: 2:30 pm

Keywords:

fluorescence microscopy , soil microbal ecology, confocal imaging, fluorescence imaging techniques