Microbial diversity, comparative analysis, and the use of molecular methods in natural environments

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Recent molecular microbial surveys carried out in natural environments are demonstrating the existence of a huge microbial diversity which is practically undeterminable. While molecular techniques allow the detection of microorganisms without a need for culturing, the diversity of microorganisms is so large that it is still far from being precisely measured. Microbial communities are generally composed by a low number of abundant microorganisms and a huge number of poorly represented microbial types. A number of methods are being used to obtain a quick representation, profile, or fingerprint of a microbial community, generally accounting for the most abundant microorganisms. Fingerprinting methods are highly valuable for distinguishing communities and looking for spatial and temporal differences. Although fingerprinting methods do not provide with an absolute or complete view of the diversity of a microbial community, they are very useful in many microbial ecology applications. This study describes some of the current methods and their pitfalls in assessing microbial community dynamics, introduces several ecological and methodological perspectives in relation to the problem of estimating microbial composition and structure in nature, and comments on the consequences of the existing huge microbial diversity in our planet.

Keywords microbial diversity; comparative analysis; diversity index; microbial communities