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Selective Isolation and Characterization of Actinomycetic Strains for Biotechnological Applications

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In this series of experiments, fifteen bacterial strains were isolated from environmental soil samples using methods tailored to selectively recover actinomycetes, a type of filamentous, gram-positive bacteria that has many applications in the biotechnology industry for molecule and drug synthesis. The methods for recovery included heat shock of the soil samples and CaCO3 treatment combined with various agar growth media. The strains were subsequently identified by gene sequencing of their 16S rDNA, and additional efforts were made to document the morphology and growth of these bacteria: both to confirm their standing as actinomycetes and to more closely describe their characteristics. Using the 16S rDNA sequences, phylogenetic trees were constructed from a wide variety of known *Streptomyces* species, and the environmental strains were placed within the trees to illustrate the evolutionary diversity of these isolates. The antimicrobial capabilities of the strains were tested due to the substantial potential of actinomycetes for generating drugs as secondary metabolites, and in preparation for further engineering of these strains to achieve more efficient drug production. Actinomycetes have been previously demonstrated to produce polycyclic tetramate macrolactams (PTMs) and piperazic acid, both of which have critical bioactivity. Degenerate primers were designed to specifically recognize PTM or piperazic acid gene sequences, and these primers were subsequently used to identify possible producers of such bioactive molecules among the environmental strains. Finding novel or higher activity producers of PTMs and piperazic acid could have considerable implications for the pharmaceutical industry in the years to come.