

Antibiotic production by soil bacteria: diversity, activity and natural functions

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The living components of soils, the micro- and macrobiota, play an essential role in several life support functions as they enable soils to recycle nutrients, inactivate contaminants, suppress plant pathogens and serve as a suitable substrate for plant growth. Beneficial bacteria occur naturally in soil and are highly abundant on plant surfaces. They utilize nutrients released from plant tissues and in return stimulate root development, promote growth and protect plants from infection by pathogens. To proliferate and survive in soil and plant-associated environments, bacteria produce diverse antimicrobial compounds with specific or broad-spectrum activities. Bioinformatic analyses of bacterial genomes have revealed a large number of orphan gene clusters, i.e. biosynthetic loci for which the corresponding metabolites are yet unknown. Interestingly, analysis of the genomes of well-studied bacterial species have indicated that the number of orphan pathways outnumbers the number of antimicrobial compounds currently known for these bacteria. In this presentation, we provide an overview of the diversity and activity of antimicrobial compounds produced by beneficial soil bacteria. Specific attention is given to lipopeptides, a group of structurally diverse compounds with versatile natural functions, including a role in antimicrobial activity, defense against protozoan predators, cell differentiation and communication, biofilm formation and swarming motility.