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From bugs to drugs: Combating antimicrobial resistance by discovering novel antibiotics

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Abstract

Introduction: Antimicrobial resistance (AMR) is emerging at an alarming rate as mortality due to resistant pathogens could rise to 10 million per year by 2050. Since AMR is against all clinically utilized antibiotics, finding novel antimicrobials with unexploited targets remains the main goal worldwide. Soil microorganisms produce natural products as a significant number of drugs in clinical use are derived from these metabolites. Actinomycetes and Myxobacteria are soil dwelling microorganisms that produce secondary metabolites to be screened for antibacterial activity. More than 80% of clinically utilized antibiotics are either natural products or natural product-derived molecules such as vancomycin, teicoplanin, daptomycin, and tetracycline. This study aims to isolate and identify novel antimicrobials from Actinomycetes and Myxobacteria.

Methodology: Soil samples were collected from several areas in Lebanon. Samples were serially diluted for Actinomycetes isolation and boiled for Myxobacteria extraction, then plated on suitable media. Colonies obtained were purified and subjected to genomic DNA extraction then 16s rRNA analysis. Novel isolates were tested for their antimicrobial activity against Gram-positive *Bacillus subtilis* (ATCC 6051), *Staphylococcus aureus* (ATCC 29213, Newman, N315), *Enterococcus faecalis* (ATCC 19433), and *Enterococcus faecium* (DSMZ 17050), and Gram-negative *Escherichia coli* (ATCC 9637), *Klebsiella pneumoniae* (DSMZ), *Pseudomonas aeruginosa* (ATCC 27853, MEXAB), and *Acinetobacter baumannii* (ATCC 15308).

Results: Strain isolation and cultivation yielded a number of novel isolates whose extracts demonstrated strong antibacterial activity against pathogens including MRSA, VRE, and *Escherichia coli* (ATCC 9637).

Conclusion: Our efforts now focus on purifying these compounds, elucidate their structures and study their mode of action.

Key words: Actinomycetes; Myxobacteria; antimicrobial.

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