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Exploring Marine Bacteria in the Arabian Gulf Region for Antimicrobial Metabolites

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Abstract : The overuse of antibiotics worldwide has contributed to the development of multi-drug resistant (MDR) pathogenic bacterial strains. There is an increasing urgency to discover antibiotics to combat MDR pathogens. The microbiome of the Arabian Gulf is a largely unexplored and potentially rich source of novel bioactive compounds. Microbes that inhabit the Abu Dhabi coastal regions adapt to extreme environments with high salinity, hot temperatures, large temperature fluctuations, and acute exposure to solar energy. The microbes native to this region may produce unique metabolites with therapeutic potential as antibiotics and antifungals. We have isolated 200 pure bacterial strains from mangrove sediments, cyanobacterial mats, and coral reefs of the Abu Dhabi region. In this project, we aim to screen the marine bacterial strains to identify antibiotics, in particular undocumented compounds that show activity against existing antibiotic-resistant strains. We have acquired the ESKAPE pathogen panel, which consists of six antibiotic-resistant gram-positive and gram-negative bacterial pathogens that collectively cause most clinical infections. Our initial efforts of the primary screen using colony-picking co-culture assay have identified several candidate marine strains producing potential antibiotic compounds. We will next apply different assays, including disk-diffusion and broth turbidity growth assay, to confirm the results. This will be followed by bioactivity-guided purification and characterization of target compounds from the scaled-up volume of candidate strains, including SPE fraction, HPLC fraction, LC-MS, and NMR. For antimicrobial compounds with unknown structures, our final goal is to investigate their mode of action by identifying the molecular target.

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