Identification and antibiotic resistance profiling of marine bacteria with relevance to wastewater contamination from deep-sea samples

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Marine environments, particularly in areas impacted by human activity, act as reservoirs for diverse microbial communities, including bacteria that may harbor antibiotic resistance genes. The potential contamination of marine ecosystems by wastewater effluents raises concerns about the dissemination of antibiotic-resistant bacteria. This study investigates the isolation, identification, and antibiotic resistance profiling of bacteria from deep-sea samples collected near Sesimbra, Portugal, emphasizing the implications for wastewater contamination and public health risks.

Fifteen samples were collected from two deep-sea dives off the coast of Sesimbra, including samples from algae, water, sediment, sea cucumber aspirate, sea cucumber feces, sea cucumber tentacles, and sea urchin swabs. The bacteria were isolated using general, selective, and differential media, identified through MALDI-TOF mass spectrometry, and tested for antibiotic resistance, focusing on potentially pathogenic strains, particularly those listed as priority pathogens by the WHO.

A total of 28 bacterial strains were isolated, including Bacillus spp., Enterobacter cloacae, Enterococcus faecalis, Vibrio alginolyticus, Escherichia coli, Vibrio mytili, Rothia mucilaginosa, and Proteus mirabilis. Antibiotic susceptibility testing revealed the presence of resistant strains, including Enterococcus faecalis showing resistance to quinupristin-dalfopristin and Enterobacter cloacae resistant to cefoxitin and amoxicillin-clavulanic acid. Three Escherichia coli strains from sea cucumber samples exhibited multidrug resistance, including resistance to ampicillin, ciprofloxacin, tetracycline, and chloramphenicol.

The presence of antibiotic-resistant bacteria in deep-sea environments, potentially influenced by wastewater contamination, highlights the critical need for surveillance of microbial diversity and resistance patterns in marine ecosystems. These findings emphasize the importance of monitoring marine environments for the spread of clinically significant antibiotic resistance, particularly in areas affected by wastewater discharge.

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