Harnessing Coral Bacteria as Probiotics to Combat Vibrio cholerae Water Contamination

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The World Health Organization reports Vibrio cholerae serogroup O139 as a high-priority pathogen that has the potential to precipitate the 8th cholera pandemic. This project explores the use of coral bacteria to prevent/halt pandemics in cholera-contaminated reservoirs. Additionally, this research compares a range of assays to address a lack of research in probiotic screening for marine microbes. Coral isolates McH1-7, OfavHM2-11, OfavHM2-17, and McHM3-18 were tested upon Vibrio cholerae N16961 and MZO-2 and Vibrio coralliilyticus OCNOO8 in solid (disc-diffusion, liquid spot, well, and cross-streak on Mueller Hinton 0-3% NaCl) and liquid (384-well plate) media assays. Results demonstrated high efficacy of McH1-7 across assay and media types for all pathogens, outperforming chloramphenicol (CHL, positive control) in cross-streak, well, and disc-diffusion assays with zones of inhibition ranging from 0.1 to 0.6 cm greater ($p < 0.005$). Liquid media assays measured the absorbance of each isolate supernatant against the pathogens over 72 hours. McH1-7, OfavHM2-11, and McHM3-18 demonstrated high efficacy against all pathogens ($p < 0.005$) in comparison to CHL. Additional testing on Saccharomyces cerevisiae ($p < 0.005$), identified that the supernatants prove non-toxic to the predictive model and suggests they would be non-toxic to eukaryotic cells. Comparisons between assays and salt content provide insight into developing effective methodologies for environmental disease testing and treatment, especially for probiotic discovery. McH1-7, OfavHM2-11, and McHM3-18 demonstrate immense potential to prevent the 1.3-4 million annual cholera cases. Chemical analysis is underway to identify antimicrobial compounds and discover novel antibiotics for human health applications.

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