A Novel Biological Treatment for Antibiotic-Resistant Vibrio Infections in Aquaculture

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Vibrio infections are an increasing global concern. These pathogenic bacteria not only affect humans but are also a leading cause of mortality in aquaculture, often linked to major oyster hatchery crashes. Moreover, conventional treatment with antibiotics has contributed to the rise of antibiotic-resistant bacteria in the environment. Therefore, it is urgent to find new ways to combat vibriosis. In this project, I tested whether Bdellovibrio and Like Organisms (BALOs), naturally occurring predatory bacteria in coastal water, could prey on antibiotic-resistant Vibrio and reduce oyster larvae mortality rates. First, 24 Vibrio strains resistant to ciprofloxacin, previously isolated from seawater, were identified using the 16S rDNA sequencing technique. These strains were taxonomically classified into 7 Vibrio species, including V. campbellii, V. nigripulchritudo, V. hyugaensis, V. antiquaries, V. tubiashii, V. coralliilyticus, and V. mediterranei. Then, 7 strains were selected to validate their predatory relationship with BALO strain VP4, also previously isolated from seawater, through a 2-day incubation experiment. These isolates were then screened for their pathogenicity in oyster larvae (Crassostrea virginica), and the 4 most pathogenic ones were chosen to challenge oyster larvae, with or without BALO treatment. Results showed VP4 effectively killed all 7 Vibrio isolates tested for predation. The pathogenicity tests revealed significantly higher larvae mortality in 5 out of 7 Vibrio treatments compared to the control. However, applying BALO reduced mortality by up to 73% in the larvae challenged by pathogenic Vibrio. This project provides a novel solution to vibriosis and antibiotic resistance in aquaculture, reducing economic loss and protecting coastal resources.

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