Warming-Driven Selection for Thermotolerant Human-Pathogenic Vibrio in Gulf Oysters: Strain Level Growth Responses and Novel Predator-Based Treatment

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Human-pathogenic Vibrio, particularly Vibrio vulnificus, in Gulf oysters pose increasing public health risks as coastal waters warm. Although temperature–Vibrio relationships are known, strain-level differences between pathogenic and non-pathogenic taxa and their implications for future risk remain poorly understood. This study tested the hypothesis that human-pathogenic Vibrio strains exhibit greater thermotolerance and evaluated a novel biological treatment strategy using predatory bacteria Bdellovibrio and like organisms (BALOs). Gulf oysters were collected from Grand Isle, Louisiana in August. Vibrio abundance was quantified using thiosulfate citrate bile salts sucrose (TCBS) agar plating, and 54 isolates were identified by 16S rRNA gene sequencing. Thirteen representative strains were incubated in triplicate for 16 h across a 15–35 °C gradient to quantify thermal growth responses. Growth was analyzed using linear regression and linear mixed-effects models. Then, a predation experiment tested whether BALOs could reduce oyster-associated pathogenic Vibrio populations. Mean Vibrio abundance was 7.15 × 104 CFU g?¹, with V. vulnificus comprising 39% of isolates. Pathogenic isolates showed a significantly stronger temperature response (Temperature × Pathogenicity interaction $p = 0.002$). At 35 °C, pathogenic strains exhibited approximately 1.9-fold higher mean growth. BALO treatment significantly reduced V. vulnificus levels in seawater by 73% ($p < 0.01$). These findings suggest warming may restructure oyster-associated Vibrio communities by enhancing pathogenic strain performance, providing a potential mechanism linking climate change to seafood-borne disease risk. The results also demonstrate the feasibility of BALO as an emerging predator-based pathogen biocontrol.

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Third Award of $1,200