

ENVIRONMENTAL INFLUENCES ON *VIBRIO VULNIFICUS* ABUNDANCE IN
THE ALA WAI CANAL

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BY

SHAUN GIANCATERINO

THESIS ADVISOR

DR. GRIEG STEWARD

Abstract:

Vibrio vulnificus is a potentially fatal human pathogen indigenous to coastal ecosystems worldwide. This free-living bacterium is ubiquitous in the Ala Wai Canal in Honolulu, Hawaii, and can pose a significant threat to human health when found in elevated concentrations. Two major routes of infection are direct ingestion of contaminated seafood and direct exposure of open wounds to contaminated seawater. Many of Honolulu's recreational waters and beaches (e.g., Waikiki beach, Ala Moana Beach Park) are located close to the Ala Wai Canal, and thus it is critical to understand when and where environmental pathogens such as *Vibrio vulnificus* are most prevalent there. Correlations between environmental variables and the abundance of *V. vulnificus* have been described for temperate and subtropical environments. Unfortunately, these correlations have little predictive power, may not apply in tropical waters, and ignore differences among strains of *V. vulnificus*. In this study, I measured how the growth rates of two strains of *V. vulnificus* are affected by varying organic matter concentrations, and by variations in temperature and salinity, under controlled conditions in the laboratory using basal media derived from natural stream and harbor waters. Preliminary experiments showed that the basal medium, or medium supplemented with 0.2 μ m glucose, contained insufficient organic matter to promote robust growth. I found that the addition of organic carbon in the form of protein digests did result in measurable changes in optical density in the cultures. Data from the subsequent experiments show that both A-type and B-type strains of *V. vulnificus* were strongly affected by temperature in

the range typically observed in coastal waters of Hawaii (24 to 36 °C), with warmer temperatures resulting in higher growth rates. Both strains had a very broad tolerance to salinity. Growth rates increased most significantly when salinity was increased from around 5 to 10, but the growth rates were indistinguishable in the salinity range of 10 to 35. These results will contribute to the development of a coupled biological-physical model describing the dynamics of *V. vulnificus* in coastal waters. Such a model can then serve as the basis for quantitative microbial risk assessments to better understand and manage the risks of infection in coastal recreational waters.