Effect of Environmental Parameters on the qPCR Signal of Enterococci in Tropical Waters

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Fecal contamination is the major source of pathogens in recreational waters. The need for quick public notifications has expanded the interest in the use of a rapid, quantitative polymerase chain reaction method (qPCR) to determine enterococci density. However, very little information is available on the fate and transport of the enterococci qPCR signal under a variety of environmental scenarios. In this study, we focused on the relationship among the enterococci qPCR signal, culturable enterococci and environmental parameters in marine tropical waters. Sampling was conducted from June thru October, 2008 at a beach located in Luquillo, Puerto Rico. Samples were collected three times per week at waist deep and processed for enterococci densities using membrane filtration and qPCR. Hydrometeorological and biogeochemical variables were collected on a 24 hour basis using automated equipment installed at the beach. The culturable enterococci information indicated that the highest densities were detected closer to a mangrove channel draining a sanitary sewer pumping station. Culturable and qPCR enterococci densities were not linearly correlated ($r^2 = 0.05$) indicating that outputs from each methodology cannot be explained by the same environmental variables. Using a statistical modeling approach, a preliminary model was developed to identify the variables that can best predict enterococci concentrations. Results indicated that the flow of the closest river was the strongest variable. This result suggests that flow may be a good surrogate for other, more proximate, sources. Data collected during this study identifies the parameters that best describe the variability of the enterococci molecular signal, providing a basis for the development of more accurate predictive models that can be used as alternative tools for fast assessments of recreational water quality.

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