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Examination of Diurnal Variation at a Non-Sewage Impacted Beach via qPCR and Culture Based Methods

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ABSTRACT

Fecal indicator bacteria concentrations, a measure of water pollution, do not remain static in the environment and can fluctuate both temporally and spatially. Diurnal variation, partially resulting from the effects of UV light, may decrease the density of E. coli, resulting in lower concentrations in the afternoon. Previous studies conducted at 63rd Street Beach in Chicago, IL [1] and North Beach in Racine, WI [2] demonstrated significant diurnal variation using an E. coli standard and culture-based assays. Subsequent studies conducted at sewage-impacted Great Lakes beaches employing molecular assays (qPCR) found that the signal remained stable; it is unknown whether a similar scenario exists at non-sewage impacted beaches. During the summer of 2011, surface water samples were collected in the morning and afternoon (0700 and 1200) and analyzed by both IDEXX/Colilert and qPCR/BioGx SmartBeads/OmniMix HS to determine if temporal variation in E. coli was occurring (n = 29/23, culture/qPCR). Analysis of log-converted data (independent t-test/one-way ANOVA) indicated no significant difference in mean E. coli concentration as determined by morning and afternoon sampling via either method (Colilert/qPCR, p = 0.49/0.09, α = 0.05). Although not statistically significant (p = 0.09) there were 5 of 23 (22%) instances where afternoon qPCR values exceeded morning counterparts; two (10%) when culture-based assays did not show a similar response. The utility of rapid assays lies in their ability to generate results prior to beach opening; temporal or event-based fluctuations should be considered when using molecular assays at non-sewage impacted beaches for regulatory purposes.

KEYWORDS

Diurnal Variation; Beaches; qPCR; Fecal Indicator Bacteria

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