

COMPARISON OF *ENTEROCOCCUS* MEASUREMENTS IN MARINE BEACH AND BAY SAMPLES BY QUANTITATIVE (REAL-TIME) POLYMERASE CHAIN REACTION, MEMBRANE FILTRATION AND ENTEROLERT

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ABSTRACT

Cell densities of the fecal pollution indicator genus, *Enterococcus*, were determined by a rapid (4 h or less) quantitative polymerase chain reaction (QPCR) analysis method in water samples collected from recreational and environmental beaches and bays in New Jersey during the summer of 2007. Measurements by this method were compared with counts of *Enterococcus* colony-forming units (CFU) determined by Method 1600, membrane filtration (MF) analysis using mEI agar and a defined substrate technology test (Enterolert). Measurements of *Enterococcus* densities by the qPCR method and by the approved MF and Enterolert methods showed similar levels of between visit variability while within visit variability was generally higher for qPCR results from 20 bay and ocean recreational beaches and environmental sampling areas over a nine week study period.

The geometric means ranged from 6.8 to 188 calibrator cell equivalents (CCE) by QPCR analysis and 5.2 to 64.9 CFU by MF analysis in Monmouth County Beach/Bay Samples (N=204). The geometric means from the samples collected in Ocean County were 6.6 to 1785 cells by QPCR and 6.2 to 150 CFU by Enterolert (N=200). In general, when *Enterococcus* concentrations were low using MF and Enterolert, qPCR results followed the same trend. QPCR concentrations increased exponentially as MF or Enterolert results increased. Up to a 12 fold higher amount of Enterococci was detected by qPCR. However, the qPCR concentrations generally increased or decreased in relation to the corresponding MF or Enterolert analysis. Regression analysis of these results showed a significant positive correlation between qPCR and MF/Enterolert methods with an overall correlation coefficient (r) of 0.79.

qPCR was found to provide accurate and sensitive measurements of *Enterococcus* sp. concentrations and was performed in less than 4 hours per sample. The qPCR protocols are more complicated than the traditional laboratory techniques and a higher level of expertise is needed to perform the analysis. There is a need to collect epidemiological data in conjunction with qPCR data to help formulate appropriate risk values. In addition to epidemiological data, laboratory round robin studies using different qPCR platforms is needed before decisions regarding use of this technology for bathing beach management is implemented.

KEYWORDS

Enterococcus, qPCR, bathing beach, membrane filtration, marine water