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## **Correlation between quantitative polymerase chain reaction and culture-based methods for measuring *Enterococcus* over various temporal scales and three California marine beaches**

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### **ABSTRACT**

Several studies have examined how fecal indicator bacteria (FIB) measurements compare between quantitative polymerase chain reaction (QPCR) and the culture methods it is intended to replace. Here we extend those studies by examining the stability of that relationship within a beach, as affected by time of day and seasonal variations in source. *Enterococcus* spp. were quantified at three southern California beaches in the morning and afternoon using two QPCR assays, membrane filtration, and defined-substrate testing. While QPCR and culture-based measurements were consistently and significantly correlated, strength of the correlation varied both among and within beaches. Correlations were higher in the morning ( $0.45 < \rho < 0.74$ ) than in the afternoon ( $0.18 < \rho < 0.45$ ), and higher when the fecal contamination was concentrated ( $0.38 < \rho < 0.83$ ) than when it was diffuse ( $0.19 < \rho < 0.34$ ). The ratios between culture-based and QPCR results (colony forming units (CFU) or most probable number (MPN) per calibrator cell equivalents (CCE)) also varied spatially and temporally. Ratios ranged between 0.04 and 0.85 CFU or MPN per CCE, and were lowest at the beach affected by diffuse pollution. Patterns in the ratios over the course of the day were dissimilar across beaches, increasing with time at one beach and decreasing at another. The spatial and temporal variability we observed indicate that the empirical relationship between culture-based and QPCR results is not universal, even within a beach.

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