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Diurnal variation in *Enterococcus* species composition in polluted ocean water and a potential role for the enterococcal carotenoid in protection against photoinactivation

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ABSTRACT

Enterococcus species composition was determined each hour for 72 h at a polluted marine beach in Avalon, Santa Catalina Island, CA. Species composition during the day was significantly different from that at night, based on an analysis of similarity. *Enterococcus faecium* and *E. faecalis* were more prevalent at night than during the day, while *E. hirae* and other *Enterococcus* species were more prevalent during the day than the night. *Enterococcus* spp. containing a yellow pigment were more common during the day than the night, suggesting that the pigmented phenotype may offer a competitive advantage under sunlit conditions. A laboratory microcosm experiment established that the pigmented *E. casseliflavus* isolate and a pigmented *E. faecalis* isolate recovered from the field site decay slower than a nonpigmented *E. faecalis* isolate in a solar simulator in simulated, clear seawater. This further supports the idea that the yellow carotenoid pigment in *Enterococcus* provides protection under sunlit conditions. The findings are in accordance with previous work with other carotenoid-containing nonphotosynthetic and photosynthetic bacteria that suggests that the carotenoid is able to quench reactive oxygen species capable of causing photoinactivation and photostress. The results suggest that using enterococcal species composition as a microbial source tracking tool may be hindered by the differential environmental persistence of pigmented and nonpigmented enterococci.

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