

Effect of Temperature, Grain Size and Organic Content on Persistence of Fecal Indicator Bacteria in Aquatic Sediments

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Pathogenic bacteria from poorly treated sewage present a health threat in recreational waters. Sewage derived bacteria can attach to particles and sink to the bottom, where they may persist longer than in the water column. If sewage derived bacteria persist, contaminated sediments may function as a reservoir for indicator bacteria and pathogens that can be resuspended, recontaminating the water column. We quantified the persistence of the fecal indicator bacteria (FIB), *Escherichia coli* and *Enterococcus* sp., in aquatic sediment microcosms in relation to sediment organic content, grain size and temperature. Surface sediment used for microcosms came from 5 near shore Hudson River estuary sites with different grain size distributions and organic content. Sediments from each location were divided into three separate containers that were then incubated in darkness at 18°, 25° and 30° C for several weeks. Subsamples were collected from each microcosm approximately weekly to track the decay of the FIB as a function of time. Duration required for 90% decay in different microcosms ranged from 6.7 to 63 days for *E. coli* and 5.1 to 60 days for *Enterococcus* sp., longer than has been typically observed in the water column. Our measurements of *E. coli* persistence were also longer than described in previous work. We found that *E. coli* persistence was strongly related to temperature with faster decay at higher temperatures. In contrast, *Enterococcus* sp. persistence was weakly related to temperature but was strongly related to sediment organic content and grain size distribution with decay rate increasing in sediments of low organic content and coarser grain size. Quantification of FIB persistence in sediment reservoirs can be used in water quality and public health predictions. The contrasting responses of *E. coli* and *Enterococcus* sp. persistence to sediment characteristics implies different suitability as indicators depending on environmental conditions.