

Pilot- and bench-scale testing of faecal indicator bacteria survival in marine beach sand near point sources

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ABSTRACT

Aim: Factors affecting faecal indicator bacteria (FIB) and pathogen survival/persistence in sand remain largely unstudied. This work elucidates how biological and physical factors affect die-off in beach sand following sewage spills.

Methods and Results: Solar disinfection with mechanical mixing was pilot-tested as a disinfection procedure after a large sewage spill in Los Angeles. Effects of solar exposure, mechanical mixing, predation and/or competition, season, and moisture were tested at bench scale. First-order decay constants for *Escherichia coli* ranged between -0.23 and -1.02 per day, and for enterococci between -0.5 and -1.0 per day. Desiccation was a dominant factor for *E. coli* but not enterococci inactivation. Effects of season were investigated through a comparison of experimental results from winter, spring, and fall.

Conclusions: Moisture was the dominant factor controlling *E. coli* inactivation kinetics. Initial microbial community and sand temperature were also important factors. Mechanical mixing, common in beach grooming, did not consistently reduce bacterial levels.

Significance and Impact of the Study: Inactivation rates are mainly dependent on moisture and high sand temperature. Chlorination was an effective disinfection treatment in sand microcosms inoculated with raw influent.

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