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Decay of Coliphages in Sewage-Contaminated Freshwater: Uncertainty and Seasonal Effects

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ABSTRACT

Understanding the fate of enteric viruses in water is vital for protection of water quality. However, the decay of enteric viruses is not well characterized, and its uncertainty has not been examined yet. In this study, the decay of coliphages, an indicator for enteric viruses, was investigated in situ under both sunlit and shaded conditions as well as in summer and winter. The decay rates of coliphages and their uncertainties were analyzed using a Bayesian approach. The results from the summer experiments revealed that the decay rates of somatic coliphages were significantly higher in sunlight (1.29 ± 0.06 day^{-1}) than in shade (0.96 ± 0.04 day^{-1}), but the decay rates of male-specific (F+) coliphages were not significantly different between sunlight (1.09 ± 0.09 day^{-1}) and shaded treatments (1.11 ± 0.08 day^{-1}). The decay rates of both F+ coliphages (0.25 ± 0.02 day^{-1}) and somatic coliphages (0.12 ± 0.01 day^{-1}) in winter were considerably lower than those in summer. Temperature and chlorophyll a (chla) concentration varied significantly ($p < 0.001$) between the two seasons, suggesting that these parameters might be important contributors to the seasonal variation of coliphage decay. Additionally, the Bayesian approach provided full distributions of decay rates and reduced the uncertainty, offering useful information for comparing decay rates under different conditions.