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Reduction of Norwalk Virus, Poliovirus 1, and Bacteriophage MS2 by Ozone Disinfection of Water

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Norwalk virus and other human caliciviruses (noroviruses) are major agents of gastroenteritis, and water is a major route of their transmission. In an effort to control Norwalk virus in drinking water, Norwalk virus reduction by bench-scale ozone disinfection was determined using quantitative reverse transcription (RT)-PCR for virus assays. Two other enteric viruses, poliovirus 1 and coliphage MS2, were included for comparison, and their reductions were assayed by infectivity assays as well as by RT-PCR. Virus reductions by ozone were determined using a dose of 0.37 mg of ozone/liter at pH 7 and 5°C for up to 5 min. Based on two RT-PCR assays, the reductions of Norwalk virus were $>3 \log_{10}$ within a contact time of 10 s, and these were similar to the reductions of the other two viruses determined by the same assay methods. Also, the virus reductions detected by RT-PCR assays were similar to those detected by infectivity assays, indicating that the RT-PCR assay is a reliable surrogate assay for both culturable and nonculturable viruses disinfected with ozone. Overall, the results of this study indicate that Norwalk virus as well as other enteric viruses can be reduced rapidly and extensively by ozone disinfection and that RT-PCR is a useful surrogate assay for both culturable and nonculturable viruses disinfected with ozone.

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