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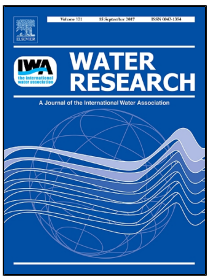

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Efficient inactivation of MS-2 virus in water by hydrodynamic cavitation

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Abstract

The aim of this study was to accurately quantify the impact of hydrodynamic cavitation on the infectivity of bacteriophage MS2, a norovirus surrogate, and to develop a small scale reactor for testing the effect of hydrodynamic cavitation on human enteric viruses, which cannot be easily prepared in large quantities. For this purpose, 3 mL scale and 1 L scale reactors were constructed and tested. Both devices were efficient in generating hydrodynamic cavitation and in reducing the infectivity of MS2 virus. Furthermore, they reached more than 4 logs reductions of viral infectivity, thus confirming the scalability of hydrodynamic cavitation for this particular application. As for the mechanism of page inactivation, we suspect that cavitation generated OH^- radicals formed an advanced oxidation process, which could have damaged the host's recognition receptors located on the surface of the bacteriophage. Additional damage could arise from the high shear forces inside the cavity. Moreover, the effectiveness of the cavitation was higher for suspensions containing low initial viral titers that are in similar concentration to the ones found in real water samples. According to this,