Effect of several factors on pseudo-kinetics in chlorine disinfection of phage MS2

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Received 12 March 2014; Accepted 21 December 2014

ABSTRACT

The effect of pH, temperature, particulate matter, organic matter, and NH₃ on phage MS2 inactivation using chlorine in pure water, synthetic water and filtered water samples was studied. And four possible models, including the Chick, Chick–Watson, Hom, and delayed Chick–Watson models were attempted to fit the experimental data. The virus inactivation achieved 4 logs at a CT value of 2.8 mg min/L, which met the United States Environmental Protection Agency standards. However, over 2 mg/L chlorine was needed to achieve the same goal in filtered water originated from two local water treatment plants. Furthermore, organic matter, pH, and temperature as well as the presence of NH₃ and particulate matter strongly affected the chlorine inactivation of MS2. Among four possible models, delayed Chick–Watson model was found to provide the most suitable description of MS2 inactivation by chlorine. Furthermore, the equation of the inactivation rate was obtained. And the MS2 inactivation rate predicted by this equation well correlated with the measured results in both simulated and filtered water samples.

Keywords: Chlorine inactivation; MS2; Influence factors; Kinetics; Delayed Chick–Watson model