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Investigation on virucidal activity of chlorine dioxide. experimental data on feline calicivirus, HAV and Coxsackie B5

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Abstract

Introduction: The aim of this study was to evaluate the efficacy of ClO2 with regard to viruses which show a particular resistance to oxidizing agent such as HAV and Norwalk and Norwalk-like viruses, and which play an important role in the epidemiology of viral foodborne diseases. In the food industry, disinfection of processing systems and equipment is a very important instrument to prevent secondary contamination and to guarantee food safety. Among disinfectants, chlorine dioxide (ClO2) presents a good efficacy at wide range of pH values, its action is rapid and generates few reaction byproducts if compared to hypoclorite. Experimental studies have highlighted that ClO2 shows a good bactericidal activity and it is also active towards viruses. Furthermore, the low concentrations and low contact times required to obtain microbial load reduction are favourable elements for the application of this compound in the industrial sanitizing practices.

Methods: As it is impossible to cultivate the Norwalk virus in vitro, we tested the resistance of Feline calicivirus (F9 strain) vs. ClO2, in comparison with HAV (strain HM-175) and Coxsackie B5. Chlorine dioxide was used at concentrations ranging from 0.2 to 0.8 mg/l in water solution, at pH 7 and at +20 degrees C. Viral suspensions were added to disinfecting solution and, at pre-set times, were sampled to undergo to titration after blocking the disinfectant action with thiosulphate 0.05 M. On the basis of the data obtained, for each virus and in relation to different concentrations, mean reduction times were calculated for 99%, 99.9% and 99.99% using the regression analysis model.

Results: As regards Feline calicivirus, at a concentration of 0.8 mg/l of ClO2, we obtained the complete elimination of the viral titre in 2 min while 30 min were required at concentrations of 0.2 mg/l. Coxsackie B5 showed a similar behaviour, being completely inactivated in 4 min with 0.4 mg/l of ClO2 and after 30 min at a concentration of 0.2 mg/l. Inactivation was quicker for HAV, which was eliminated after only 30 sec at a concentration of 0.8 mg/l and after 5 min at 0.4 mg/l.

Conclusion: Our data show that for complete inactivation of HAV and Feline calicivirus, concentrations > or = 0.6 mg/l are required. This observation is true for Coxsackie B5 too, but this virus has shown a good sensitivity at all concentration tested according to regression analysis results. For Feline calicivirus and HAV, at low concentrations of disinfectant, prolonged contact times were needed to obtain a 99.99% reduction of viral titres (about 16 and 20 minutes respectively).

Related information

PubChem Compound (MeSH Keyword)

LinkOut - more resources

Research Materials

NCI CPTC Antibody Characterization Program

Miscellaneous

NCI CPTAC Assay Portal