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Inactivation of Feline Calicivirus, a Norovirus Surrogate, by Chlorine Dioxide Gas

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Abstract

The efficacy of gaseous chlorine dioxide (ClO₂) against feline calicivirus (FCV), a norovirus surrogate, in the dry and the wet states on a hard surface was evaluated. We demonstrated that low-concentration ClO₂ gas (mean 0.08 ppm, 0.22 μg/l) could inactivate FCV in the wet state with 0.5% fetal bovine serum (FBS) within 6 h in 45 to 55% relative humidity (RH) (>3 log₁₀ reductions) and FCV in the dry state with 2% FBS (percentage of FBS in the viral suspension) within 10 h in 75 to 85% RH (>3 log₁₀ reductions) at 20°C, respectively. Furthermore, a <0.3 ppm concentration of ClO₂ gas (mean 0.26 ppm, 0.73 μg/l) could inactivate (below the detection limit) FCV in the dry state with 5% FBS within 24 h in 75 to 85% RH at 20°C. In contrast, in 45 to 55% RH at 20°C, ClO₂ gas had little effect even when the FCV in the dry state was exposed to high-concentration ClO₂ (mean 8 ppm, 22.4 μg/l) for 24 h. These results suggest that humidity plays an important role in the inactivation by ClO₂ gas of FCV in the dry state. According to the International Chemical Safety Card, threshold limit values for ClO gas are 0.1 ppm as an 8-h time-weighted

average and 0.3 ppm as a 15 min short-term exposure limit. From these data, we propose that the treatment of wet areas of human activity such as kitchens, toilets, etc., with low-concentration ClO₂ gas would be useful for reducing the risk of infection by noroviruses (NV) without adverse effects. In addition, we believe that the application of a combination of a <0.3 ppm concentration of ClO₂ gas and a humidifier in places without human activity may make it possible to inactivate NV in the dry state on any surface within a contaminated room without serious adverse effects.

Keywords: [Chlorine dioxide/ Gas/ Feline Calicivirus/ Norovirus/ Disinfectant](#)

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