

Evaluation of the Efficacy of Disinfectants Against Foot-and-Mouth Disease Virus in Laboratory Conditions

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Abstract

Background: Foot-and-Mouth Disease (FMD) is a highly contagious viral disease affecting cloven-hoofed animals, causing substantial economic losses to the livestock industry and significant disruptions to international trade. Effective disinfection is a fundamental component of biosecurity measures for the prevention and control of outbreaks caused by the Foot-and-Mouth Disease Virus (FMDV). However, the virucidal efficacy of disinfectants against FMDV varies considerably depending on their chemical composition and environmental conditions.

Objective: This study aimed to evaluate the efficacy of selected commercially available disinfectants and laboratory-developed formulations for the inactivation of FMDV under controlled laboratory conditions.

Methods: Disinfectants evaluated included quaternary ammonium compounds (QACs), chlorine-based disinfectants, and other candidate formulations. Viral inactivation was assessed against FMDV serotypes O, A, and Asia1 using standard virological methods, including plaque reduction assays and median tissue culture infectious dose (TCID₅₀) assays. Key parameters including disinfectant concentration, contact time, temperature, and the presence of organic matter were systematically investigated.

Results: Comparative analysis was conducted to determine the relative efficacy of each disinfectant against highly transmissible FMDV strains. The results provide quantitative evidence on the conditions required to achieve effective viral inactivation and identify disinfectant formulations exhibiting strong virucidal activity under specific conditions. Chlorine-based disinfectants demonstrated the highest virucidal efficacy, achieving a reduction of $>4 \log_{10}$ in viral titer within 5 minutes at a concentration of 0.5%. In contrast, QACs showed moderate efficacy, requiring higher concentrations ($\geq 1.0\%$) and longer contact times (≥ 10 minutes) to achieve comparable viral reduction. The presence of organic matter significantly reduced the efficacy of QACs, whereas chlorine-based disinfectants retained relatively strong activity under the same conditions.

Conclusion: These findings contribute to the optimization of disinfection protocols and the strengthening of biosecurity measures for the effective prevention and control of FMD outbreaks.

Keywords: Foot-and-mouth disease, Efficacy, Disinfectants

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