Comparative effects of several intermediate-level and low-level disinfectants on the inactivation of emerging viruses

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Abstract

Modern human activity is profoundly changing our relationship with microorganisms with the startling rise in the rate of emerging infectious diseases. SARS-CoV-2, Ebola virus and Nipah virus are prominent examples. Since COVID-19 and the West African Ebola virus disease outbreak, more efforts have uncovered preventative measures to limit their spread. However, there are currently no published validation studies for the chemical disinfection against Nipah virus.

Virucidal efficacy of three low-level disinfectants and medical ethanol against SARS-CoV-2, Ebola virus and Nipah virus was evaluated in quantitative suspension tests in our study, including Micro-Chem Plus detergent disinfectant cleaner, FWD, W30 and medical ethanol. Among them, Medical EtOH® and Micro-Chem Plus® (MCP, National Chemical Laboratories, Inc., Philadelphia, Pennsylvania) are two commercial, broad-spectrum disinfectants. Similar with MCP but more environmental friendly, FWD is also a dual quaternary ammonium compounds (QAC) product which is still in the stage of research and development. W30 is an amphoteric surfactant with lower toxicity, which could be touched by skin directly. All products with different concentration were tested with application time from 15 seconds to 8 minutes and performed a comparative inactivation analysis for three emerging viruses above.

Our results show that they are highly effective at inactivating SARS-CoV-2, Ebola virus and Nipah virus in 15 seconds, even 19% ethanol was also able to inactivate Nipah virus with more than 8 minutes contact time. Comparative analysis displayed sufficient virucidal efficacy of them against SARS-CoV-2, Ebola virus and Nipah virus despite some differences in working concentration and contact time. We expect that our study can assist in decontamination in healthcare settings and high level biosafety laboratories and can be

beneficial to control for emerging infectious diseases caused be above emerging viruses.

Biography

Dr. Yi HUANG is a Ph.D. at National Biosafety laboratory, Chinese Academy of Sciences carrying out research in emerging virus and biosafety. She went to France in 2008 and 2010 for training and scientific research in Laboratory P4 of Jean Mérieux in Lyon. Here she evaluated the virucidal activity of several low-level disinfectants and medical ethanol against emerging viruses including SARS-CoV-2, Ebola virus and Nipah virus.

Importance of Research and Development

Modern human activity is profoundly and irreversibly changing our natural world and our relationship with microorganisms to far-reaching effect. The impact of this altered relationship can be seen by the startling rise in the rate of emerging infectious diseases. Surveillance or rapid detection, treatment, vaccination and decontamination or improved sanitation all are key components of successful control program of emerging infectious disease, but much remains to be done. What's more, the pathogens, such as Nipah virus, Ebola virus and SARS-CoV-2, are limited to handling at high levels of biosafety containment (BSL4 and BSL-3) in the world, and use of validated methods of inactivation/disinfection is an essential requirement when working with these emerging viruses. One aim of my research is to provide a summary that bridge between interested scientists from different disciplines including chemistry, biochemistry, physics and public health etc., and may assist in disinfectant choice and in developing and improving related operating procedures for decontamination in healthcare settings and high levels of biosafety laboratories.

About Laboratory

After the 2003 SARS epidemic, the government of China initiated a plan to construct a national high-level biosafety laboratory system to prepare for and respond to future infectious disease outbreaks. One of the goals was to build a BSL-4 laboratory that meets the national and international standards for diagnosing, researching, and developing antiviral drugs and vaccines while additionally preserving highly pathogenic BSL-4 agents for future scientific research.

Within the framework of the Sino-French Cooperation Agreement on Emerging Infectious Diseases Prevention and Control signed in October 2004, the infrastructure for the National Biosafety (Level 4) Laboratory in Wuhan, CAS, China's first BSL-4 laboratory, was completed in 2015. During construction, prospective BSL-4 laboratory staff members visited France, the United States, or Australia for BSL-4 training and capacity building. After 2 years of testing and commissioning, Wuhan BSL-4 laboratory passed a series of assessments, and the China National Accreditation Service for Conformity Assessment certified it as meeting the highest biosafety standard in January 2017. In August 2017, research in the Wuhan BSL-4, on Ebola virus, Nipah virus, and Crimean-Congo hemorrhagic fever virus, were approved by the National Health and Family Planning Commission of China.

Recent Publications

Huang Y*, Xiao S, Song D., Yuan Z*. Evaluating the Virucidal Activity of Four Disinfectants Against SARS-CoV-2. Am J Infect Control. 2021 Nov 12:S0196-6553(21)00719-7.

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