



Efficacy of Different Cleaning and Disinfection Methods against *Clostridium difficile* Spores: Importance of Physical Removal versus Sporocidal Inactivation (ICHE 2012;33:1255-1258)

Abstract

Clostridium difficile (*C. diff*) certainly remains one of the most important causes of healthcare-associated diarrhea. Statistics published by the CDC indicate the number of deaths from *Clostridium difficile* Infection (CDI) have raised from 3000 during 1999-2000 to 14,000 during 2006-2007. Prevention of transmission can then be divided into two categories: preventing horizontal transmission, to minimize exposure; and by decreasing the risk factors for patients to develop *C. difficile* infection (CDI), if exposure has occurred. The primary mode of transmission resulting in disease is person-to-person spread through the fecal-oral route whether through contact with contaminated hands, contaminated environment or contact with *C. diff* positive patients. The hands of healthcare workers (HCW), transiently contaminated with *C. difficile* spores are probably the main means by which the organism is spread during non-outbreak periods, but certainly it is believed that environmental contamination also has an important role in transmission within healthcare settings. Additionally, patient care equipment such as electronic rectal thermometers or inadequately cleaned commodes or bedpans that have been shared between patients has been found to contribute to transmission. However, we must also consider other underlying risk factors for disease such as; age, duration of hospitalization, exposure to antimicrobial agents, cancer chemotherapy, immunosuppression, gastrointestinal surgery or manipulation of the gastrointestinal tract such as a feeding tube, and while controversial, breaches in the protective effect of stomach acid resulting from the use of acid suppressing medications also seems to increase risk.

Background

Current [SHEA](#)ⁱ and [APIC guidelines for managing *Clostridium difficile*](#)ⁱⁱ in healthcare facilities agree that the efficacy of cleaning is critical to the success of decontamination in general and that cleaning and disinfection activities using the physical motions of cleaning and use of a routine germicide removes and dilutes spore concentration and is acceptable in the absence of an outbreak. Further, user acceptability and material compatibility (corrosion and pitting of equipment and other surfaces over time) of the disinfectant being used is key issue.

While there is an understanding that a contaminated environment certainly plays some role in transmission and acquisition, the true contribution remains controversial. The level of environmental spore contamination has been quantitated by several studies to be at levels below 1 Log₁₀ (i.e. <10 colony-forming units), yet we have not studied or qualified the best method with which to clean surfaces

contaminated with *C. diff* spores. Dr. Rutala and his research team in this study assessed the relative importance of physical removal of *C. diff* spores using both sporocidal and non-sporocidal cleaning and disinfecting agents.

Study

The study compared two non-sporocidal agents and four sporocidal agents to determine the effectiveness of different cleaning methods and agents in reducing spore load on a Formica surface. The end result was that any method (regardless of sporocidal status of the agent used) resulted in approximately a 3 Log₁₀ reduction of *C. difficile* spores and therefore, would be sufficient to remove the expected level of contamination. Wiping surfaces twice as compared to wiping the surface once lead to improved removal of *C. difficile* spores. Sporocidal agents provided a greater than 3 Log₁₀ reduction depending on formulation and/or application with the most commonly used sporocidal bleach wipe showing just under a 4 Log₁₀ reduction.

Conclusion

Management of *Clostridium difficile* requires a multifaceted approach. Current infection prevention and control guidelines agree that thorough cleaning of environmental surfaces is a necessary step in the removal of a substantial number of spores from the surface. While this study concluded that the use of a sporocidal agent to wipe the surface provides the highest level of removal and inactivation of spores, the non-sporocidal agents were shown to reduce the spore count by 3 Log₁₀ which is considerably more than the expected 1 Log₁₀ level of *C. diff* contamination reported to be found in the environment.

While a product's ability to kill is important, we must be realistic in assessing the resources, both time and human, as well as how products are utilized by the environmental services department. A chemistry that has proven cleaning efficacy and the ability to physically remove spores will enhance facilities' success in eradicating spores.

Implications for AHP

AHP Disinfectants are One-Step Disinfectant Cleaners

- AHP has proven cleaning efficacy resulting in lower costs and faster results as well as added confidence that disinfection can occur
- The Oxivir TB formulation has also been proven to kill *C. diff* spores by > 2 Log after 1 minute exposure and has been found to reduce hospital associated infections (HAIs) by 20%^{iii iv}



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AHP Disinfectants provide the perfect balance between safety and efficacy

- AHP provides a HMIS rating of "0", meaning it has been proven to be non-toxic, non-irritating to eyes and skin and non-skin sensitizing and does not require the use of personal protective equipment to handle
- The ingredients found in AHP are all listed on the EPA and Health Canada Inerts lists and the FDA Generally Regarded as Safe List

AHP Disinfectants are environmentally sustainable

- AHP's active ingredient, hydrogen peroxide, breaks down into water and oxygen leaving no active residues
- AHP does not contain Volatile Organic Compounds (VOCs) or other chemicals that will negatively impact indoor air quality

AHP Disinfectants have realistic contact times

- Short contact times ensure surfaces remain wet for the required contact time, providing comfort and confidence that disinfection has occurred
- AHP's shelf life both as a ready to use and concentrate once diluted ensures less product is used making it more economical

AHP Disinfectants are compatible

- AHP formulations are tested to ensure compatibility that preserve your investments in equipment, furniture, and building surfaces

ⁱ Cohen SH et al. Clinical Practice Guidelines for *Clostridium difficile* Infection in Adults: 2010 Update by the Society for Healthcare Epidemiology of America (SHEA) and the Infectious Diseases Society of America (IDSA). *Infect Control Hosp Epidemiol* 2010; 31(5): 431-455

ⁱⁱ Guide to the Elimination of *Clostridium difficile* in Healthcare Settings. 2008;32.

ⁱⁱⁱ The Oxivir TB Formulation of Accelerated Hydrogen Peroxide (AHP) is Effective for Killing *Clostridium Difficile* Spores on Toilet Seat Surfaces. CJIC Vol 22, No. 1, Spring 2007, pg 49

^{iv} Use of a daily disinfectant cleaner instead of a daily cleaner reduced hospital-acquired infection rate. AJIC 43 (2015) 141-6