



Clostridium Difficile Removal Efficacy of a Novel Non-Antimicrobial Hand Wash

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ABSTRACT

BACKGROUND / OBJECTIVES

Clostridium difficile has been the most frequent cause of infectious diarrhea in Canadian healthcare facilities. It can cause life-threatening complications, and is particularly serious in long-term care facilities where residents are of advanced age. It is known that hand hygiene is important for reducing transmission of *C. difficile* spores, and the Public Health Agency of Canada recommends frequent handwashing with soap and water. The objective of this study was to determine the efficacy of a novel non-antimicrobial hand wash for removal of *C. difficile* spores from hands.

METHODS

A novel hand wash with improved interfacial tension properties, a measure of the interaction of the soap with skin, was tested with 12 participants using a modification of ASTM E 1174. Hands were contaminated with 150 ul ($\sim 1 \times 10^9$ CFU/ml) non-toxicogenic *C. difficile* spores (ATCC #700057) applied to the palmar surface of each hand and rubbed together. Five ml of the test product was applied to dry hands, lathered for 30 seconds and rinsed for 30 seconds. \log_{10} reductions from baseline were calculated.

RESULTS

The baseline \log_{10} recovery was 7.40, and the \log_{10} reduction from baseline was 1.43 ± 0.25 .

CONCLUSION

This study indicates that a novel hand wash has efficacy for removal of *C. difficile* spores on hands (96.3% reduction). This data supports current recommendations for use of soap and water for reduction of *C. difficile* spores on hands.

BACKGROUND

Clostridium difficile is a spore-forming bacteria that is notoriously difficult to remove with hand hygiene¹. Alcohol-based hand rubs are ineffective against *C. difficile* and antibacterial hand washes are no more effective than non-antimicrobial hand washes for removing *C. difficile* on hands^{1,2}. Current recommendations are to wash hands with soap and water after contacting *C. difficile* infected patients³.

Soap has typically been an underdeveloped hand hygiene format with relatively little formulation work being devoted to soap product development. In this study we present data on a novel soap formulation that exhibits low interfacial tension which enables the soap to more effectively spread on skin.

The objective of this study was to demonstrate the efficacy of a novel hand soap for removal of *C. difficile* spores from hands.

METHODS

The test product in this study was a non-antimicrobial foam soap manufactured by GOJO Industries, Akron, Ohio. This study used a modification of the ASTM E1174 Health-Care Personnel Hand Wash method⁴ where the contamination method and organism were modified. The test organism was *Clostridium difficile* ATCC # 700057. Spores were prepared using EPA MLB SOP MB-28 September 2017 "Procedure for the Purification of Spores of *Clostridium difficile* for Use in the Efficacy Evaluation of Antimicrobial Agents" to get a spore inoculum of approximately 1×10^9 CFU / ml. Hands were contaminated with 150 ul spores applied to palmar surface of each hand and rubbed together, including palmar surface of fingers. Subjects underwent a cleansing pre-wash with non-antimicrobial soap then hands were contaminated for baseline. A second cleansing wash was performed then hands were contaminated prior to product application. Five mL of the test product was applied to dry hands, lathered for 30s and rinsed for 30s, then hands were sampled wet. The glove juice procedure was used for hand sampling. Appropriate dilutions were plated on Brain-Heart Infusion Agar modified for *Clostridium* species and incubated anaerobically at 35°C for approximately

72 hours. *C. difficile* produces white colonies and only those colonies were counted. Log₁₀ reductions from baseline were calculated. To ensure effective product neutralization a neutralizer effectiveness assay as conducted according to ASTM E1054.⁵

SUMMARY & CONCLUSIONS

- The test product demonstrated removal of 96.3% of *C. difficile* spores from hands.
- This study supports recommendations for hand washing as measure to help remove *C. difficile* spores from hands.
- Antimicrobial soap active ingredients are not required for *C. difficile* removal efficacy in hand soaps.
- There remains a need for more efficacious hand products to eliminate *C. difficile* spores from hands.

RESULTS

Figure 1
Reduction of *Clostridium difficile* spores

TEST ARTICLE	BASELINE	LOG ₁₀ REDUCTION	STANDARD DEVIATION	95% CONFIDENCE INTERVAL
Non-Antimicrobial Hand Soap	7.40	1.43	0.25	1.27 – 1.59

REFERENCE

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