

Effectiveness of Ultraviolet-C Light Treatment of Shoes in Reducing Pathogen Transfer

I. Introduction

- Hospital floors are known as reservoirs for healthcare-associated pathogens
- Pathogens can spread from floors to patients, all surfaces, and approximate areas
- Healthcare personnel's shoes may act as indicators for the transmission of pathogens.
- Genetic linkage found between *Clostridioides difficile* strains on shoes and infected patients
- Floor contamination rapidly reoccurs despite disinfection mechanisms
- Preventatives strategies targeting contaminated shoes may reduce the spread environmentally

II. Purpose

- Determine the frequency of pathogen transfer from healthcare personnel shoes to patient room floors
- Evaluate whether an 8-second ultraviolet-C (UV-C) shoe treatment reduces pathogen transfer or not
- Assess the effectiveness of repeated UV-C cycles on infectious diseases such as MRSA and *C. difficile*, and contamination

III. Methods

- Descriptive experimental study conducted in disinfected, empty patient rooms
- 32 healthcare personnel participated
- **Procedure:**
 - Participants walked into and out of the room (pre-UV-C condition)
 - Participants received one 8-second UV-C shoe treatment
 - Participants walked into and out of the room again (post-UV-C condition)
- **Pathogens Evaluated:**
 - Methicillin-susceptible *Staphylococcus aureus* (MSSA)
 - Methicillin-resistant *Staphylococcus aureus* (MRSA)
 - Vancomycin-susceptible enterococci (VSE)
 - Vancomycin-resistant enterococci (VRE)
 - *Clostridioides difficile*
- **Data Collection & Analysis:**
 - RODAC plates used to measure colony-forming units (CFUs)
 - Gauze sampling used for *C. difficile* detection
 - McNemar χ^2 test and Wilcoxon signed-rank test used
 - Significance level set at $P < .05$

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IV. Results

- 32 participants completed testing
- **Vegetative Pathogen Transfer:**
 - 84% (27/32) transferred ≥ 1 vegetative pathogen before UV-C
 - 28% (9/32) transferred ≥ 1 vegetative pathogen after UV-C
 - Statistically significant reduction ($P < .001$)
- **Mean Bacterial Burden:**
 - Significant reduction in CFUs after UV-C treatment ($P < .001$)
- **Clostridioides difficile Transfer:**
 - 38% (12/32) before UV-C
 - 22% (7/32) after UV-C
 - Not statistically significant ($P = .58$)
- **Repeated UV-C Cycles:**
 - MRSA reduced $>3 \log_{10}$ after one cycle
 - *C. difficile* reduced $0.57 \log_{10}$ after one cycle
 - $2.0 \log_{10}$ reduction in *C. difficile* after six cycles

V. Conclusion

- Healthcare personnel shoes frequently transfer vegetative pathogens to patient room floors
- An 8-second UV-C treatment significantly reduces vegetative bacterial transfer
- Single-cycle UV-C treatment does not significantly reduce *C. difficile* transfer
- Repeated cycles may improve the reduction of spores
- UV-C shoe decontamination may serve as an additional infection control strategy
- Further research is needed to evaluate the impact on the rate of healthcare-associated infections in hospitals

Reference:

Torres-Teran, M. M., Bennett, C. T. P., Osborne, A. O., Cadnum, J. L., Wilson, B. M., & Donskey, C. J. (2023). Effectiveness of ultraviolet-C light treatment of shoes in reducing the transfer of pathogens into patient rooms by shoes of healthcare personnel. *Infection control and hospital epidemiology*, 44(8), 1361–1364. <https://doi.org/10.1017/ice.2022.242>