

HEALTHYSOLE CLINICAL STUDIES

Prevalence and Characteristics of Toxigenic Clostridium Difficile, C. Perfringens, and Enterococcus on Shoe-Bottoms from a Hospital System

In: American Society for Microbiology (ASM) Texas Branch Fall Meeting, (poster presentation) Oct 29-31, 2015 (SAM HOUSTON STATE UNIVERSITY, HUNTSVILLE, TX)
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ABSTRACT: Background: Healthcare associated infections (HAI) are common everywhere in the world. Environmental surfaces are cleaned regularly, but can be re-contaminated from shoes. Shoe-bottom surfaces could be highly contaminated with pathogenic bacteria from diverse sources. Our recent studies on community house shoe-bottom surface swab samples were found to be frequently contaminated with toxigenic *C. difficile*. Our objectives of this pilot study were to investigate the prevalence *C. difficile*, *C. perfringens*, and

Enterococcus of shoe-bottom surface swab samples from a large hospital source.

Materials and Method: We collected 20 shoe-bottom swab samples from a hospital system and cultured for the bacteria using standard methods. Isolates were characterized by molecular methods. *C. difficile* and *C. perfringens* were cultured anaerobically by enrichment and selective agar plates (CCFA and *Perfringens* agar). *Enterococcus* counts were determined by an Enterolert kit.

Results: All the samples (20/20; 100%) were positive for *C. perfringens*, and 9 (45%) for toxigenic *C. difficile* (*tcdA* and *tcdB* genes). *Enterococcus* counts were between 25 and >12000 cells/swab for all the samples. Vancomycin resistant *Enterococcus* species were recovered from 90% (18/20) the samples by selective culture using m*Enterococcus* agar.

Conclusion: Overall, hospital shoe-bottom samples were highly contaminated with potential human pathogens.

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Physician as an Infective Vector at a Department of Surgery

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ABSTRACT: This study was designed to assess the degree of risk of bacterial transmission from physician to patient through hands, equipment and enclosing surfaces (shoe soles).

Material and Methods: The study was conducted in the Clinical Department of General and Onco- logical Surgery UM in Łódź. In days 16.10.2013, 17.10.2013, 18.10.2013 there were done swabs from hands, stethoscopes and soles of shoes from the same group of

physicians before and after doctor's rounds. The presence of alert-pathogens in swabs was regarded as positive result.

Results: Isolates included mostly aerobic saprophytic bacilli and *Staphylococcus* species coagulase- negative. There were detected a singly cases of *Acinetobacter Baumani* and *Escherichia coli*. Alert- pathogens were found in 4 (16%) swabs taken from hand before doctor's rounds and in 7 (28%) swabs taken after rounds. Stethoscopes were contaminated

by alert-pathogens in 3 (12%) cases before doctor's rounds and in 3 (12%) cases taken after doctor's rounds. Soles of shoes were contaminated by alert- pathogens in 14 (56%) cases taken before and 16 (65%) cases taken after doctor's rounds.

Conclusions: 1. Physicians are important factor of bacterial transmission in hospital. 2. Hands, ste- toscopes and particularly soles of shoes of medical staff is the source of infection

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Theatre shoes – A Link in the Common Pathway of Postoperative Wound Infection?

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ABSTRACT: Introduction: Operating department staff are usually required to wear dedicated theatre shoes whilst in the theatre area but there is little evidence to support the beneficial use of theatre shoes.

Patients and Methods: We performed a study to assess the level of bacterial contamination of theatre shoes at the beginning and end of a working day, and compared the results with outdoor footwear.

Results: We found the presence of pathogenic bacterial species responsible for postoperative wound infection on all shoe groups, with outdoor shoes being the most heavily contaminated. Samples taken from theatre shoes at the end of duty were less contaminated than those taken at the beginning of the day with the greatest reduction being in the number of coagulase- negative staphylococcal species grown. Studies have demonstrated that floor bacteria may contribute up to 15% of airborne bacterial colony forming units in operating rooms. The pathogenic bacteria

we isolated have also been demonstrated as contaminants in water droplets spilt onto sterile gloves after surgical scrubbing.

Conclusion: Theatre shoes and floors present a potential source for postoperative infection. A combination of dedicated theatre shoe use and a good floor washing protocol controls the level of shoe contamination by coagulase-negative staphylococci in particular. This finding is significant given the importance of staphylococcal species in postoperative wound infection.

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HEALTHYSOLE CLINICAL STUDIES

Reaerosolization of Spores from Flooring Surfaces To Assess the Risk of Dissemination and Transmission of Infections

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The aim of this study was to quantify reaerosolization of microorganisms caused by walking on contaminated flooring to assess the risk to individuals accessing areas contaminated with pathogenic organisms, for example, spores of *Bacillus anthracis*. Industrial carpet and polyvinyl chloride (PVC) floor coverings were contaminated with aerosolized spores of *Bacillus atrophaeus* by using an artist airbrush to produce deposition of 103 to 104 CFU · cm².

Microbiological air samplers were used to quantify the particle size distribution of the aerosol generated when a person walked over the floorings in an environmental chamber.

Results were expressed as reaerosolization factors (percent per square centimeter per liter), to represent the ratio of air concentration to surface concentration generated. Walking on carpet generated a statistically significantly higher reaerosolization factor value than did walking on PVC ($t = 20.42$; $P < 0.001$). Heavier walking produced a statistically significantly higher reaerosolization factor value than did lighter walking ($t = 12.421$; $P < 0.001$).

Height also had a statistically significant effect on the reaerosolization factor, with higher rates of recovery of *B. atrophaeus* at lower levels, demonstrating a height-dependent gradient

of particle reaerosolization. Particles in the respirable size range were recovered in all sampling scenarios (mass mean diameters ranged from 2.6 to 4.1 μm).

The results of this study can be used to produce a risk assessment of the potential aerosol exposure of a person accessing areas with contaminated flooring in order to inform the choice of appropriate respiratory protective equipment and may aid in the selection of the most suitable flooring types for use in health care environments, to reduce aerosol transmission in the event of contamination.

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Antibacterial Activity and Sanitizing Efficacy of HealthySole's Shoe UV Device (Kill Rate). Eight Second Activation Time

Microchem Laboratory B. Richard, B.S.

ORGANISMS TESTED:

- Clostridium difficile*** (85.3%) ATCC 43598 (Endospores)
- Staphylococcus aureus*** (99.98%) ATCC 33592 (MRSA)
- Streptococcus pyogenes A*** (99.994%) ATCC 19615
- Enterococcus faecalis*** (99.75%) ATCC 51575 (VRE)
- Escherichia coli*** (99.87%) ATCC BAA-2469 (CRE)
- Pseudomonas aeruginosa*** (99.2%) ATCC 15442

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The Missing Step: Natural Behavior of Pathogenic Organisms Via Shoe Sole Contamination That Can Lead to Infection in a Health Care Facility: Systematic Review

Christopher P. Griffith - 2016

ABSTRACT: Health Care Associated Infections (HAIs) are a cause for preventable death in the US and globally, thus have sounded the alarm for change! Health care executives and Infection Control (IC) specialists throughout the medical industry have been forced to implement new IC programs and strategies to combat the organisms that are causing the problem. Between acute care hospitals and elderly care facilities there are between 5-6 million infections that lead to nearly 500,000 deaths annually.

Although new technologies and stringent interventions have been developed and implemented to combat many known reservoirs of pathogenic presence, there is still an enormous gap that has been left virtually untouched and literally stepped around. Shoe soles are proven to have an overwhelmingly dense pathogenic load, often the highest levels anywhere in the particular environment. There is still very little, if any, protocols, tools, or technology in place to directly prevent shoe sole pathogens from spreading and causing infection in health care.

This review examines how pathogens on shoe soles through natural environmental behavior can pose a threat to human infection in health care. It also asks why in other industries such as pharmaceuticals, biotech, veterinarian and food processing/packaging there are interventions in place to stop the spread of dangerous organisms via shoe soles, however in human health care where people are most vulnerable, there is still a major missing piece of the IC puzzle?

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