Evaluation of Hospital Floors as a Potential Source of Pathogen Dissemination Using a Nonpathogenic Virus as a Surrogate Marker

Sreelatha Koganti, Heba Alhmidi, Myreen E. Tomas, Jennifer L. Cadnum, Annette Jenson and Curtis J. Donskey Journal of Infection Control and Hospital Epidemiology

Hospital floors are frequently contaminated with pathogens, but it is not known whether floors are a potential source of transmission. We demonstrated that a nonpathogenic virus inoculated onto floors in hospital rooms disseminated rapidly to the hands of patients and to high-touch surfaces inside and outside the room.

Shoe Soles as a Potential Vector for Pathogen Transmission

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Shoe soles are possible vectors for infectious diseases. Although studies have been performed to assess the prevalence of infectious pathogens on shoe soles and decontamination techniques, no systematic review has ever occurred. The aim of this study was to perform a systematic review of the literature to determine the prevalence of infectious agents on shoe bottoms and possible decontamination strategies. Thirteen studies were identified that supported the hypothesis that shoe soles are a vector for infectious pathogens. In conclusion, a high prevalence of microbiologic pathogens was identified from shoe soles studied in the healthcare, community, and animal worker setting. An effective decontamination strategy for shoe soles was not identified.

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) M. Jahangir Alam , Jacob K McPherson, Julie Miranda, Sangeetha S. Fernando, Lynn Le, Jonathan Amadio, Kevin W. Garey University of Houston College of Pharmacy

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 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 Enterococcus agar.

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

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 Oncological 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 Baumannii 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, stethoscopes and particularly soles of shoes of medical staff is the source of infection.
Reaerosolization of Spores from Flooring Surfaces To Assess the Risk of Dissemination and Transmission of Infections


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 10^3 to 10^4 CFU · cm^2.

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 m).

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.

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

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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

The ORGANISMS TESTED were tested for their antibacterial activity and sanitizing efficacy using HealthySole’s Shoe UV Device. The results show that the device is effective against a wide range of bacteria, including MRSA, VRE, and CRE, with a kill rate of 99.75% or higher. The device is activated in 8 seconds, making it a practical solution for disinfecting shoes in healthcare settings.

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.