505. Quantitative Analysis of Microbial Burden on Hospital Room Environmental Surfaces Contributing to Healthcare-Associated Infections

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Background. Contaminated environmental surfaces are involved in the transmission of epidemiologically important pathogens. It remains unknown which level of microbial load can contribute to healthcare-associated infections (HAI). We used microbiological data obtained from the Benefits of Enhanced Terminal Room (BETR) Disinfection Study to investigate the quantitative relationship between microbial burden and risk of HAI.

Methods. Microbiological samples were collected from high-frequency-touch hospital room surfaces using Rodac plates (25 cm²/plate) in rooms after terminal room disinfection. All rooms were randomly assigned to standard disinfection (Quaternary ammonium [Quat]) or an enhanced disinfection (Quat/ultraviolet light [UV-C], Bleach, Bleach/UV-C). The Quat/UV-C arm was excluded from further analysis since ammonium [Quat] or an enhanced disinfection (Quat/ultraviolet light [UV-C], Bleach, Bleach/UV-C), Bleach, Quat/UV-C). The Quat/UV-C arm was excluded from further analysis since ammonium [Quat]) or an enhanced disinfection (Quat/ultraviolet light [UV-C], Bleach, Bleach/UV-C) was not observed in this arm. All new patients in study rooms were monitored for HAI following terminal disinfection through the BETR study standard protocols. We analyzed the relationship between the total colony forming units (CFU) of bacterial loads from 2,395 environmental samples in 60 rooms and HAI among new patients in the rooms (6 patients with HAI and 54 patients without HAI). Each arm had 2 patients with HAI. Statistical significance was determined by the Wilcoxon test, and P < 0.05 was considered significant.

Results. Overall, contamination in patients with HAI had a mean 39.3 CFU, while samples from rooms of patients without HAI had a mean 35.6 CFU (Table 1). In the standard disinfection, the sampled rooms from the HAI patients had a significantly higher number of total CFU (mean 65.1 CFU) than non-HAI group (mean 35.5 CFU) (P = 0.0019). In the enhanced disinfection rooms, there was no statistical significance between HAI and non-HAI groups.

Conclusion. Although our sample size may have been too small to detect contaminated microbial load in a room though a large clinical trial was conducted, our data based on the Quat arm as standard disinfection demonstrated the significant relationship between microbial load and risk of HAI. Further studies with larger sample sizes and numbers of rooms are needed to confirm these findings and investigate the relationship between microbial load and HAI risk.

Table 1. Microbial load on hospital room environmental surfaces between HAI and non-HAI groups.

| Room disinfection | HAI group (Mean CFU ± SD [No. of samples]) | Non-HAI group (Mean CFU ± SD [No. of samples]) |
|-------------------|-------------------------------------------|-----------------------------------------------|
| Standard Disinfection | 85.1 ± 1.10 [9=80] | 35.5 ± 0.05 [11=719] |
| Enhanced Disinfection | 26.5 ± 0.75 [11=469] | 35.6 ± 0.05 [11=469] |

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506. Eyewash Stations in Teaching and Research Laboratories Host Potential Pathogenic Microbiota

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Background. According to current safety regulations, teaching and research laboratories require one or more eyewash stations installed in case of eye exposure to harmful substances. The presence of potential pathogens on these devices may increase risk of infection when used. Thus, we conducted a research project to evaluate the microbiota of the eye washers present in several buildings across Michigan State University’s campus. Our data showed that 90% of the surveyed eyewash stations on campus are heavily contaminated with bacteria and fungi. Thus, their use in cases of eye injury could be a matter of public health concern.

Methods. 40 labs from different departments equipped with eye washers were visited and samples were taken from each of them. Sterile swabs and contact mycology plates were used to collect samples. The right side of the eyewash was designated for bacterial sampling and the left for fungal sampling. Two Blood agar plates were used for each bacterial sample collection. Both plates were incubated for 5 days at 25°C and 37°C respectively. Mycology plates were used for fungal collection, and these were incubated at 25°C. Following incubation, cultures were observed using microscopy and the number of colonies were counted. Plates were determined to have heavy contamination if the number of colonies were too many to count, and low contamination if few or no colonies were grown. Gram staining was performed for bacterial cultures, and additional biochemical tests were done to identify taxonomy of bacteria. Classification of fungal colonies was determined based on colony morphology.

Results. Heavy contamination was discovered on 90% of interrogated eye washers, while the other 10% showed low to no growth at 37°C and 25°C. Gram-positive rods were the most abundant bacteria present in all tested units at 37°C. At 25°C, the most abundant bacteria were Gram-negative rods. 21 strains with high diversity were found on Mycology plates – Aspergillus, Fusarium, Mucor, Cladosporium, and Penicillum.

Conclusion. The presence of potentially pathogenic microbiota on eyewashers may pose a threat to the user, given that the nature of use is linked to eye injury. In future studies, sequencing will be necessary in identifying bacteria and fungi, in order to more accurately match them with known pathogenic species.

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507. Sinks in Healthcare Facilities Are a Potential Source for Dissemination of Candida Species

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Background. Healthcare facility sinks have been implicated in transmission of healthcare pathogens, including multidrug resistant Gram-negative bacilli. However, it is not known if sinks might also be an important source for dissemination of Candida species.

Methods. In 4 Cleveland area hospitals, we determined the frequency of dissemination of Candida species from sink drains to the sink bowl and countertop. The sink drain, bowl, and adjacent countertop were cultured; the sink bowl and countertop were then disinfected and additional cultures were collected from the sink bowl and countertop after running the water for 30 seconds. Candida species recovered were identified using MALDI-TOF.

Results. A total of 194 sets of cultures were collected from the 4 hospitals (range, 40 to 74 cultures per hospital). As shown in the figure, Candida species were frequently recovered from the sink bowls and countertops at baseline and dissemination to these sites occurred frequently when the water was run. Candida parapsilosis was the most frequent Candida species recovered, followed by Candida tropicalis and Candida lusitaneae.

Conclusion. Our findings suggest that sinks may be an under-appreciated reservoir for dissemination of Candida species in hospitals.

Figure: