Computer Keyboard Covers Impregnated with a Novel Antimicrobial Polymer Significantly Reduce Microbial Contamination

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Abstract

Contact with contaminated computer keyboards may contribute to the transmission of healthcare-acquired infections. A novel antimicrobial polymer (Biosafe HM 4100) can be incorporated into a variety of materials, including the polyurethane (PU) used to make keyboard covers. This study was designed to determine whether plastic keyboard covers compounded with PU 4100 effectively or equivalently serve as a barrier to 12-142 viable bacterial transmission in a biofilm-like setting.

Polyurethane material with and without HM 4100 was obtained from the manufacturer (Biosafe, Inc. Pittsburgh, PA). Suspensions of approximately 1.5E+07 cfu/mL of four test organisms were prepared and 40 µL of the organism suspension was placed onto the material. Two organisms included Staphylococcus aureus (ATCC No. 25923), methicillin-resistant Staphylococcus aureus (MRSA; ATCC No. 43300), Pseudomonas aeruginosa (ATCC No. 27853), and Enterococcus faecalis (VREF, ATCC No. 51299). A cover-slip was placed on top of the inoculated material and viable bacteria were recovered at 0, 60, 120, and 240 minutes. The cover-slip and test material were then placed in Ringer’s solution and vortexed, and aliquots were plated on blood agar plates (Remel).

Comparison of the percent reduction on the test material at T= 0 vs. T=240 min.

0.5 McFarland suspensions (approx. 1.5E+07 cfu/mL) of each organism (MRSA, ATCC No. 43300; VREF, ATCC No. 51299; E. coli, ATCC No. 25922; and P. aeruginosa, ATCC No. 27853) were prepared and 40 µL of each of the 1.5E+07 cfu/mL inoculums was inoculated onto the PU control for MRSA, VREF, P. aeruginosa, and E. coli. The inoculum was 99.8%, 99.9%, 100%, and 91.9% respectively. Contaminated computer keyboards have been acknowledged as a potential source for bacterial transmission between healthcare providers and patients. The high rate of healthcare-associated infections. Biosafe HM 4100 is an antimicrobial polymer that can be incorporated into a variety of materials, including the polyurethane material used to make keyboard covers.

Background

Contaminated computer keyboards have been acknowledged as a potential source for bacterial transmission between healthcare providers and patients. The high rate of healthcare-associated infections. Biosafe HM 4100 is an antimicrobial polymer that can be incorporated into a variety of materials, including the polyurethane material used to make keyboard covers.

Results

All four test organisms exhibited a reduction in viability over the 240 minute time period. Figures 1 through 4 illustrate the log recovery of the test organisms MRSA, VREF, E. coli, and P. aeruginosa respectively. The log reduction for each organism at T=0 minute after inoculation (T= 0 min.), sixty minutes after inoculation (T= 60 min.), 120 minutes and 240 minutes after inoculation (T=120 min. and T= 240 min., respectively).

Objective

Demonstrate that Biosafe HM 4100 impregnated into polyurethane (plastic) keyboard covers can provide an antimicrobial surface that minimizes bacterial survival.

Materials and Methods

0.5 McFarland suspensions (approx. 1.5E+07 cfu/mL) of each organism (MRSA, ATCC No. 43300; VREF, ATCC No. 51299; E. coli, ATCC No. 25922; and P. aeruginosa, ATCC No. 27853) were prepared and 40 µL of each of the 1.5E+07 cfu/mL inoculums was inoculated onto the PU control for MRSA, VREF, P. aeruginosa, and E. coli. The suspension was then diluted 1:10 to yield approximately 1.5E+06 cfu/mL inoculums.

Polyurethane material squares with and without Biosafe HM 4100 were provided by the manufacturer (Biosafe, Inc. Pittsburgh, PA) and separately inoculated with 40 µL of each of the 1.5E+07 cfu/mL organism suspensions. A 22 mm x 22 mm cover-slip was placed on top of each inoculated material surface. The recovery of viable bacteria occurred immediately following inoculation (T= 0 min.), sixty minutes after inoculation (T=60 min.), 120 minutes and 240 minutes after inoculation (T=120 min. and T= 240 min., respectively).

The polyurethane material compounded with Biosafe HM 4100 demonstrated a 24-hour reduction in viable bacterial transmission compared to the PU control. The polyurethane material compounded with Biosafe HM 4100 demonstrated a 99.999% reduction of viable MRSA on Biosafe material at T= 240 min. The polyurethane material compounded with Biosafe HM 4100 demonstrated efficacy in reducing viability for all four test organisms. P. aeruginosa may be more resistant to the bactericidal properties of the antimicrobial polymer.

Discussion and Implications

Contaminated computer keyboards can be a potential source for bacterial transmission between healthcare providers and patients. The rank order of highest to lowest reduction in viability at T= 240 min was E. coli > MRSA > VREF > Pseudomonas. Computer keyboards compounded with Biosafe HM 4100 could reduce the transmission of pathogens due to hand carriage during contact with contaminated computer keyboards.

References