Antimicrobial lighting technology in a school bathroom

Case Study Abstract

Partner/Study Location: Magnet school system in New England.

Study Objective: Demonstrate efficacy of Vital Vio's antimicrobial lighting at reducing surface bioburden in an actively used school bathroom.

Test Parameters: PUR-Blue swabs (World Bioproducts) were used to sample 3 different surfaces throughout the bathroom for the duration of the testing period. Samples were taken one time per day for 10 days of pre-install data before the lights were installed. After the antimicrobial light was installed, 4 days of sampling at the same sites was taken at 4 weeks post-install and 6 days were sampled during week 5 of post-install. Swabs were sent back to Vital Vio's in-house laboratory for processing, plating, counting, and analysis.

Conducted by: Samples taken by local Vital Vio staff member and samples were processed and analyzed by Drs. Sara Shelley and Ed Kiegle of Vital Vio.

Study Conclusions: This study showed an average decrease in surface bioburden of 2.31 logs, or 99.5%, by post-installation week 4 compared to the baseline or pre-install values. By week 5 post-install, the surface bioburden had decreased by an average of 4.69 logs, or 99.998%. Vital Vio's antimicrobial lighting was able to significantly decrease surface bioburden levels in the actively used Pre-K bathroom.

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A study was performed in an actively used pre-K bathroom in a magnet school system in New England. A single 2' x 4' fixture was installed in the bathroom in early February 2020. The 2' x 4' light was dual mode with the Antimicrobial + Light mode for illumination when the room was occupied and an Enhanced Antimicrobial violet mode for when the room was empty.

Methods:

Samples were taken in the bathroom to establish baseline levels of surface bioburden before the antimicrobial technology was installed. Samples were taken with non-selective swabs (World Bioproducts, PUR-Blue™) at three different surfaces throughout the room in approximately 10 cm x 10 cm squares. These sites included the upper sink, the lower sink, and the toilet (Figure 1).

Figure 1. Sampling sites in pre-K bathroom. (A) Sink location. Same spot was swabbed on both upper and lower sinks. (B) Toilet location. Left side was swabbed.

Samples were taken once per day for a total of 10 days. Once baseline testing was completed the light was installed. A single 2' x 4' fixture was installed in early February 2020. The 2' x 4' light was a dual mode fixture containing Antimicrobial + Light mode for illumination when the room was occupied and an Enhanced Antimicrobial violet mode for when the room was empty.

Once the lights were installed, post-installation sampling could occur. Post-install samples were taken at 4 and 5 weeks after the light was installed and in use. Samples were taken at the same sites, once per day. Samples were taken for four days at post-installation week 4 and six days at post-installation week 5. Swabs were processed at the in-house laboratory at Vital Vio. Swabs were vortexed, diluted as needed, and plated on nutrient agar. After incubation, the number of colonies were counted, and surface bioburden was calculated. Geometric means were calculated for each sampling point across all days and sites.

Results:

Data shows that Vital Vio's antimicrobial technology was able to significantly reduce surface bioburden by both 4- and 5-weeks post-installation. Both post-installation times show an average colony count that is statistically lower than the baseline values across all sites sampled. Baseline sampling showed a geometric mean across the 10 days and 3 sites of 3.72×10^9 CFU/swab. By post-installation week 4 that average had decreased by 2.31 logs and by post week 5 it showed continued reductions to 4.69 logs less average surface bioburden than pre-installation counts (Figure 2). It should be noted that the antimicrobial fixture was kept in the violet Enhanced Antimicrobial mode most of the time, even when occupied, because the kids thought the color was fun.

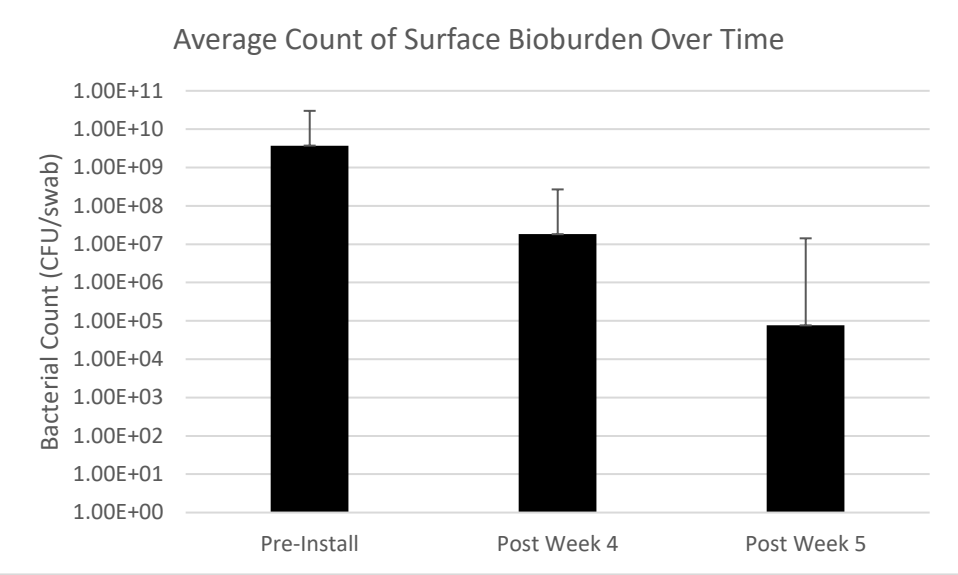

Figure 2. Geometric mean surface bioburden across all 3 sites before and after installation of Vital Vio's antimicrobial light fixture. Error bars are indicative of the standard errors at each time point.

These reductions were statistically significant compared to the baseline levels (Student's T-test, p=0.05 post week 4, p=0.01 post week 5). Converting this data to percent reductions compared to pre-installation levels shows a 99.51% reduction at post week 4 and a 99.998% reduction at post week 5 (Figure 3).

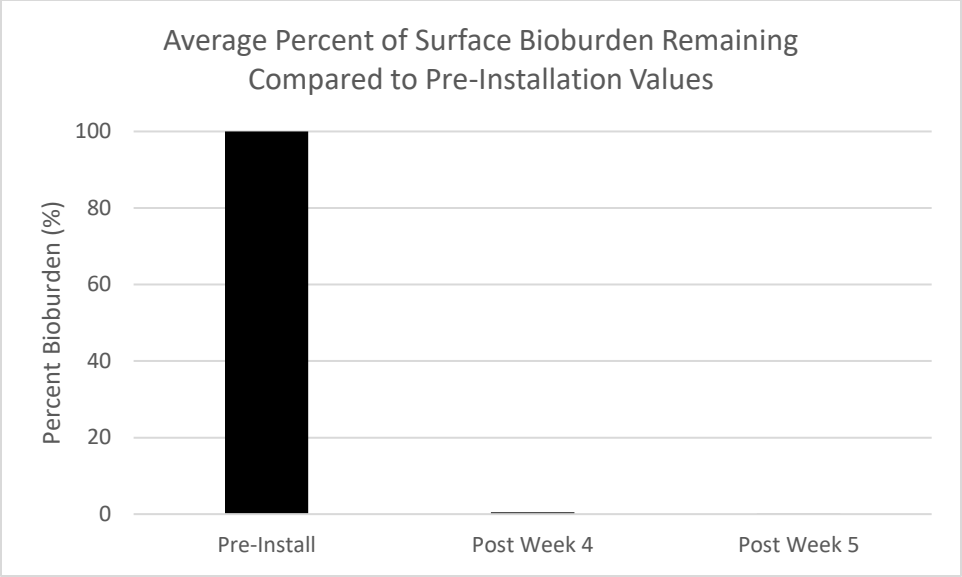

Figure 3. Comparison of the post-installation colony count data to baseline values. The baseline counts were used as 100% of the total and the percent of bioburden remaining on surfaces compared to that baseline value was calculated for each post-installation time point.

Overall, the installation of Vital Vio's antimicrobial light fixture demonstrated the ability to significantly reduce surface bioburden in an actively used pre-K bathroom.