Case Study: Clorox® Total 360® System can help reduce bioburden in elementary schools

Purpose:
To examine the impact of the Clorox® Total 360® System on environmental surface cleanliness at elementary schools in the Broken Arrow Public School system.

Background:
Proper disinfection of school surfaces can help keep absenteeism rates low, especially during cold and flu season when absences due to illness are typically highest.[1,2] The bacteria and viruses that cause these illnesses can live on surfaces for weeks or even months,[3] so killing and removing them regularly is crucial for keeping facilities clean and safe for students and staff. Although illness is only one of many factors that can keep students from attending school, the impact of the environment on student and staff illness is controllable and can be minimized by regularly disinfecting school surfaces. However, traditional manual cleaning and disinfection methods, while important, are not always sufficient, as some objects and areas can be missed, particularly if those areas are difficult to clean or hard to reach.[4] Electrostatic disinfection devices, which spray charged disinfectant quickly and evenly throughout a room, are one technology that facilities can use to supplement their current cleaning protocols to ensure that all surfaces are treated.

Overview:
The goal of this study was to examine the impact of the Clorox® Total 360® electrostatic sprayer system on environmental cleanliness in an elementary school in the Broken Arrow Public School system. The school used the Clorox® Total 360® System daily throughout the 2019 school year (SY19). Environmental swabbing of a variety of surfaces in the school showed that the Clorox® Total 360® System reduced bacteria, yeast and mold levels to near zero, including on hard to clean surfaces like door handles.

Method:
The Clorox® Total 360® System was used daily in elementary schools in the Broken Arrow Public School System throughout the 2019 school year (SY19). To assess the impact of the Clorox® Total 360® System on environmental cleanliness, high touch surfaces in nine rooms in one elementary school including classrooms, the nurse's station, the cafeteria, hallways, and restrooms, were swabbed before and after application of either the Clorox Commercial Solutions® Clorox® Total 360® Disinfectant Cleaner[1] or Clorox Commercial Solutions® Anywhere®, sprayed through the Clorox® Total 360® System. Five high touch surfaces per room were swabbed, including chairs, desks, tables, door handles, soap dispensers, toilet seats, water fountains, and other commonly touched objects present in the rooms (Figure 1). Levels of viable bacteria, yeast and mold, were quantified using standard microbiological techniques and are reported here as colony forming units (CFUs). Statistical analysis was performed on all data using Minitab® 18.1.

Figure 1. Surfaces in classrooms, a nurse's station, the cafeteria, hallways, and restrooms were swabbed to quantify bacteria, yeast and mold levels before and after sanitization and disinfection with the Clorox® Total 360® System. Examples of sites swabbed are shown above.

Results:

Environmental swabbing showed a statistically significant decrease in total bacteria, yeast and mold counts following use of the Clorox® Total 360® System. Prior to disinfection, the mean bacteria, yeast and mold count for all surfaces combined was 90,656. Following Clorox® Total 360® application the mean counts were reduced to 200 (p-value=0.000), which is near the lower limit of detection of the test (i.e., 20 colony forming units or CFUs).

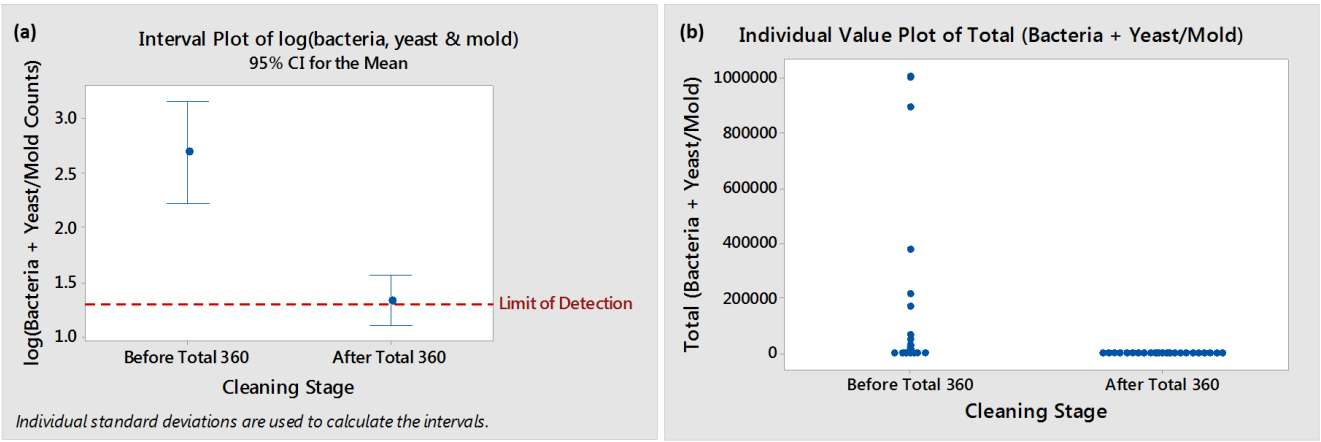

Figure 2. Average bacteria, yeast and mold counts for all surfaces combined, by cleaning stage (i.e., pre and post-Total 360 application). Graph (a) shows a log plot of the average bacteria, yeast and mold counts pre and post-Total 360 application, and graph (b) shows an individual value plot of the same data. Sites with colony forming units (CFUs) that were too numerous to count (TNTC) were counted as 300 CFUs for the purposes of statistical analysis.

Conclusions:

Cleaning and disinfection of surfaces in the Broken Arrow Public School System with the Clorox® Total 360® System effectively reduced bacterial contamination, helping to eliminate the environment as a source of infection. The surface sampling was conducted on a single day of sampling and does not show trends over time; it's important to remember that as students re-enter school spaces, recontamination can occur. Frequent cleaning and disinfection is therefore key to maintaining a safe environment for students, staff, and parents.

For more information on the Clorox® Total 360® System, please visit
https://www.cloroxpro.com/products/clorox/total-360/

References:

(1) Neuzil, K. M.; Hohlbein, C.; Zhu, Y. Illness Among Schoolchildren During Influenza Season. *Arch. Pediatr. Adolesc. Med.* **2002**, *156* (10), 986.

(2) Guidance for School Administrators to Help Reduce the Spread of Seasonal Influenza in K-12 Schools | CDC https://www.cdc.gov/flu/school/guidance.htm (accessed Jul 3, 2019).

(3) Kramer, A.; Schwebke, I.; Kampf, G. How Long Do Nosocomial Pathogens Persist on Inanimate Surfaces? A Systematic Review. *BMC Infect. Dis.* **2006**, *6*, 1–8.

(4) Carling, P. C.; Parry, M. M.; Rupp, M. E.; Po, J. L.; Dick, B.; Von Beheren, S. Improving Cleaning of the Environment Surrounding Patients in 36 Acute Care Hospitals. *Infect. Control Hosp. Epidemiol.* **2008**, *29* (11), 1035–1041.