

## Study Summary: Clorox® Total 360® System can help reduce absenteeism rates and bioburden in elementary schools

### **Purpose:**

To examine the impact of the Clorox® Total 360® System on absenteeism rates and environmental surface cleanliness at elementary schools in the Flagler 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.<sup>1,2</sup> The bacteria and viruses that cause these illnesses can live on surfaces for weeks or even months,<sup>3</sup> 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.<sup>4</sup> 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 student absenteeism rates and environmental cleanliness. Daily use of the system over the course of a school year resulted in a 14% decrease in the average absenteeism rate as compared to the previous school year when the system was used monthly. The average absenteeism rate in December (during peak flu season) decreased by 53% as compared to the previous year. Environmental swabbing of a variety of surfaces in the same school showed that the Clorox® Total 360® System reduced bacteria, yeast and mold levels even further than manual cleaning.

### **Method:**

The Clorox® Total 360® System was used daily in an elementary school in the Flagler Public School System throughout the 2019 school year (SY19). Due to the size of the school, a portion of the school was treated each day such that each individual room in the school received treatment on average once per week. All rooms in the school were manually disinfected daily during the school week.

Absenteeism rates for SY19 were compared with absenteeism rates for the previous school year, SY18, during which the Clorox® Total 360® System was used monthly with the exception of absenteeism spikes due to illness. In these instances, which occurred twice SY18 (in December and May), the Clorox® Total 360® System was used daily until absenteeism rates declined. As a point of comparison, absenteeism rates were also examined for another elementary school in the same system with similar demographics and enrollment, where the Clorox® Total 360® System was used monthly during both SY18 and SY19. This school also followed a temporary daily use protocol when illness absences spiked, which occurred in February and May in SY18 and in February of SY19.

To assess the impact of the Clorox® Total 360® System on environmental cleanliness, high touch surfaces in eight rooms including classrooms, the nurse's station, the cafeteria, restrooms, a shared kitchen, and a physical therapy room, were swabbed before manual disinfection with a dilutable quaternary ammonium solution, after manual disinfection, and again following application of either the Clorox Commercial Solutions® Clorox® Total 360® Disinfectant Cleaner<sub>1</sub> or Clorox Commercial Solutions® Anywhere®, sprayed through the Clorox® Total 360® System.

Five high touch surfaces per room were swabbed, including chairs, desks, door handles, soap dispensers, toilet seats, water fountains, light switches 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, a shared kitchen and a physical therapy room were swabbed to quantify bacteria, yeast and mold levels before disinfection, following manual disinfection, and again following the use of the Clorox® Total 360® System. Examples of sites swabbed are indicated with yellow arrows.

**Results:**

In the study school where the Clorox® Total 360® System was used daily in SY19 and monthly in SY18, the average annual absenteeism rate in SY19 was 14% lower than the average annual rate in SY18 (not statistically significant). The comparison school that used the Clorox® Total 360® System monthly in both SY18 and SY19 also saw a decline in the average annual absenteeism rate, but the drop was lower, at 4%. Looking at the average monthly absenteeism rates, daily Clorox® Total 360® use resulted in low, steady rates during SY19, while the comparison school had one rate increase due to illness in February of SY19. For both schools, using the Clorox® Total 360® System during illness spikes helped to reduce the rates quickly, with students returning to school after a few days (Figure 2). The December absenteeism rate (during peak flu season) for the study school decreased by 53% for SY19 compared to SY18. A similar 53% decrease occurred in May.

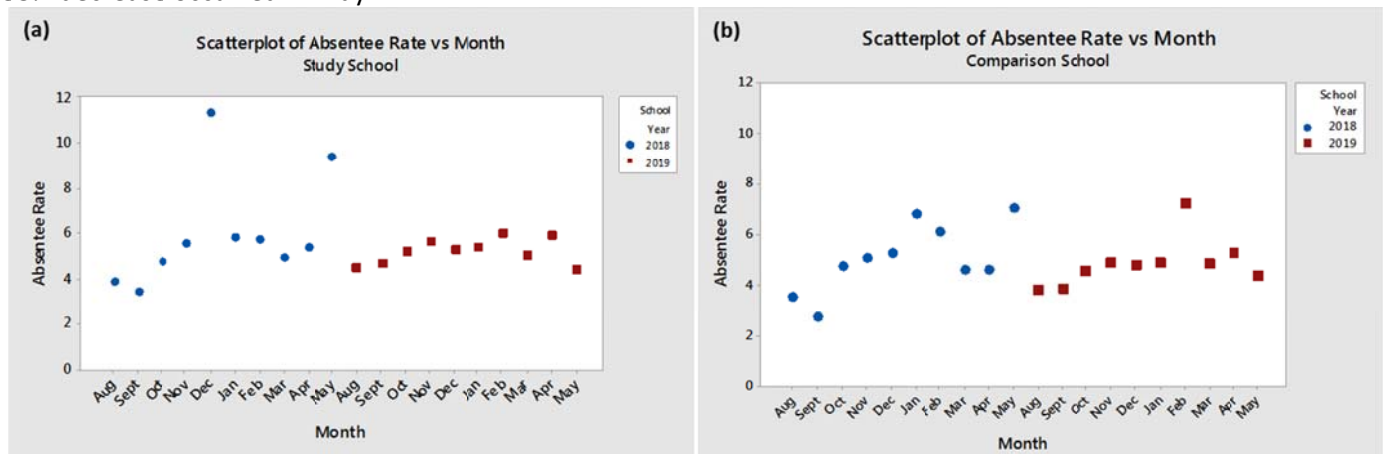


Figure 2. Average monthly absenteeism rates for (a) the study school, where Total 360® was applied daily in SY19 and monthly in SY18, and (b) a comparison school, where Total 360® was applied monthly in both SY18 and SY19.

Environmental swabbing showed a statistically significant decrease in total bacteria, yeast and mold counts following manual disinfection, and a further reduction after the Clorox® 360® System was used. Prior to disinfection, the mean bacteria, yeast and mold count for all surfaces combined was 15,071. Following manual disinfection, that number was reduced to 195, and following Total 360® application the mean counts were reduced even further to 38 (p-value=0.000), which is near the lower limit of detection of the test (i.e., 20 colony forming units or CFUs).

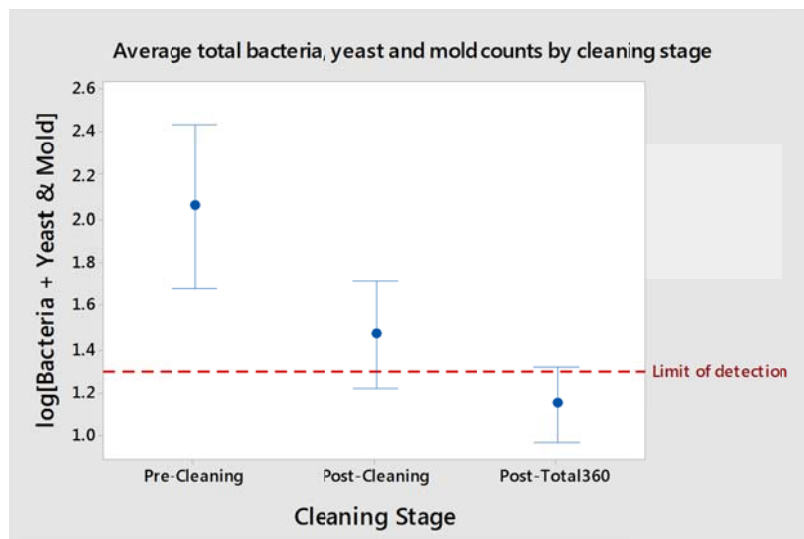


Figure 3. Average bacteria, yeast and mold counts for all surfaces combined, by cleaning stage (i.e., pre-cleaning, post-manual cleaning, and post-Total 360 application).

### Conclusions:

Cleaning and disinfection of surfaces in the Flagler Public School System with the Clorox® Total 360® System effectively reduced absenteeism rates and bacterial contamination, helping to eliminate the environment as a source of infection. Although other factors influence absenteeism rates, the frequency of use of the Clorox® Total 360® System was the only variable introduced during the study and it likely contributed to the decline in absenteeism rates. The surface sampling was conducted on a single day of sampling and does not show trends over time; repeated cleaning and disinfection would be expected to reduce the bacteria levels to zero or near zero in all cases. 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.