Biological Pathogen Reduction Study

Waterbrook Christian Academy

School Classroom and Bathroom

Authors:

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Study Objective:

This studies objective is to examine the effectiveness of a germicidal ultraviolet light C (UVC) disinfection device for the reduction of epidemiological important microorganisms within school classrooms and bathrooms environments.

Document Summary:

- Biological samples were collected in a student classroom and bathroom after routine chemical cleaning was completed.
- Biological samples were taken from three (3) locations on multiple surfaces in the student classroom and two (2) locations in the bathroom.
- These biological samples were collected before and after UVC treatments with the M15-120 device.
- There were ten (10) samples collected and cultured from five (5) locations under two different conditions. The data confirms that the automated UVC Cleaning Systems Inc. M15-120 UVC device can decrease the bio-burden of epidemiological important pathogens in real world settings such as student classrooms and bathrooms.

Introduction:

In school environments with high mixing rates of school children transmission between trace contacts is one of the primary modes in the spread of infectious diseases throughout the environment. Although hygiene is an essential method in preventing the spread of disease, germs can still spread very easily without proper sanitation being considered. Breaking the chain of infectious pathogens within a close-knit academic community is possible with the right environmental treatment tools at your disposal. UVC disinfection reduced pathogens in treatment areas surfaces by 99.99% effectively disinfecting over 100 types of bacteria, viruses, and fungi in minutes.

This test utilized UVC Cleaning Systems Inc. M15-120 whole room UVC disinfection devices. The equipment utilizes an amalgam based low-pressure mercury lamp that has peak germicidal effectiveness at 253.7 nanometers. The UVC radiation emitted by low press mercury bulbs is delivered in a continuous stream that gradually accumulates to a germicidal lethal dose depending on duration of exposure and distance from the primary field of radiation.

Given the increasing use of UVC devices and variations in recommended cycle times, there is a need for evaluations of real-world performance. In Independent lab settings, UVC Cleaning Systems Inc. products have resulted in effectively reducing the colonization of Methicillin Resistant Staphylococcus Aureus (MRSA), Listeria, and Clostridium Difficile by 99.99%*.

The objective of this study is to measure the effectiveness of the M15-120 device at reducing the bio-burden contamination found on high touch surfaces throughout student classrooms and bathrooms.

Materials and Methods:

Treatment Area Set Up Overview

- Model: M15-120 Ultraviolet C Disinfection Device

Figure 1 is a photograph of the automated UVC disinfection devices. Each device contains fifteen (15) UVC emitters that produce energy at a frequency of 253.7 nanometers. The device is designed for a single operator that can be run in tandem with up to seven (7) other devices for a total of eight (8) running at one time. Each device is approximately 2 feet by 2 feet by 5 feet and weighs about 125 pounds. The devices are remotely operated outside of the room via a remote control. Each device includes motion sensors, which turn off the device if motion is present in the treatment area. The device is transported into a strategic position located near the center of the room and/or next to high touch surfaces. It has an intelligent dosing algorithm that determines treatment cycle based on the properties of the room and the efficiency of the emitters. The disinfection process at the Waterbrook Christian Academy ran for fourteen (14) minutes in the classroom and six (6) minutes in the bathroom.

Figure 1

Sample Collection Method:

On June 2, 2016 this study was performed at Waterbrook Christian Academy located at 6100 Richfield Rd. Flint, Michigan. The processing of cultures taken from the sample locations were pre-determined and identified the based on high touch points. The initial identifier indicated the possibility of Biological Colony Forming Units being present in the environment was highly probable. Representatives from UVC Cleaning Systems Inc. and Westbrook Christian Academy reviewed the biological study plan.

- Cultures were taken at two separate times at each testing location.
- The culture samples were collected in each of the following cleaning points:
    - After standard manual cleaning process completed but before UVC treatments.
    - After standard manual cleaning plus use of UVC treatments.

Sample Collection Locations

- Two (2) independent test locations were utilized.
- The first location was the student classroom in which three (3) sample locations were tested.
- The three sample locations were:
    - Classroom student desk surface (10 feet)
    - Classroom student chair (8 feet)
    - Classroom chalkboard (12 feet)

- The second location tested was the student bathroom in which a total of two (2) locations were tested.
- The two testing locations in the student bathroom were:
    - Toilet seat surface (5 feet)
    - Cold water sink handle (5 feet)

Micro-biological Methods:

The samples were collected using Tryptic Soy Agar (TSA) with Lecithin and Tween 80, USP contact plates supplied by Hardy Diagnostics and used in locations listed by the study sponsors. The Samplers were then packaged under refrigerated conditions and shipped overnight for incubation. All plates were incubated at 30° +/- 2° degrees C for five (5) days, after which they were evaluated. All biological counts were confirmed and recorded by Microchem Laboratory LLC.

Results

Table 1 below indicates the levels of bacteria found before and after application of UVC light treatments. Pre UVC treatment, all five (5) locations had a significant amount of Colony Forming Unit bacteria present. Post UVC treatment all five (5) locations showed elimination, or significant reduction, of the amount of bacteria present in the testing locations.

Location	Pre UVC Treatment	Post UVC Treatment
Classroom Student Desk Surface	500+ CFUs	32 CFU
Classroom Student Chair Surface	15 CFUs	0 CFU
Classroom Chalkboard	43 CFUs	2 CFUs
Bathroom Cold Handle Sink	10 CFUs	0 CFUs
Bathroom Toilet Seat Surface	232 CFUs	12 CFUs

Conclusion:

Based on the results of this biological study adding whole room disinfection using UVC light technology, in addition to manual cleaning methods, significantly reduces the bacteria present in the room. By utilizing UVC light treatments the reduction of over 800 CFUs was obtained in all five (5) locations tested.

To further prove the outcome of this study additional biological sample will be collected and analyzed in the near future.

Works Cited:

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