Ultra Violet Light Efficacy in the Absence of Cleaning

Laura Y. Sifuentes, Alexandra Peterson, Trevor Pivo and Charles P. Gerba
The University of Arizona, Tucson, AZ.

ABSTRACT

Background: In recent years, environmental surfaces in hospital rooms have been shown to play an important role in the transmission of pathogens that cause nosocomial infections. Methicillin-resistant Staphylococcus aureus (MRSA), vancomycin-resistant Enterococcus (VRE), Clostridium difficile, and norovirus have all been shown to persist in the environment and pose an increased risk of infection to new patients entering a room that had been previously occupied by infected patients. The purpose of this study was to evaluate an ultraviolet emitting device ability to decontaminate patient rooms that were contaminated with pathogens of importance either naturally or by experimental inoculation.

Methods: Patient rooms in a skilled nursing wing of a long term care facility were disinfected using the Clorox optimum UV system prior to terminal cleaning. High touch surfaces in the patient room were tested before and after UV treatment along with Formica and stainless steel coupons seeded with MS2 coliphage, C. difficile spores, MRSA and VRE. UV exposure was 5 minutes in the bathroom, and 5 minutes on either side of the patient bed. The experiments were repeated using disinfection with hydrogen peroxide wipes followed by UV light

Results: Three rooms were tested before terminal cleaning. Naturally occurring total bacteria counts were still high after UV treatment indicating the occurrence of resistant organisms. Environmental C. difficile was isolated from sites prior to cleaning/chemical disinfection after UV treatment. In comparison, Formica and stainless steel coupons seeded with MS2 coliphage, C. difficile spores, MRSA and VRE all had significant reductions. Disinfecting with hydrogen peroxide wipes prior to UV light disinfection greatly enhanced the reduction of the test organisms in the patient rooms and on test coupons.

Conclusions: Overall the UV device was effective against all of the organisms tested in the laboratory and on coupons placed in patient rooms. However, it was less effective on naturally occurring bacteria in the patients rooms, unless first treated with hydrogen peroxide wipes. Different surface materials in the patient rooms resulted in different rates of inactivation. It is recommended that cleaning and disinfection of fomites be conducted before use of UV light devices to ensure optimal performance.

DISCUSSION

Findings for lab based data are not the same as those found in the long term care patient rooms. Some possibilities:
• Naturally occurring organisms could be more resistant than laboratory strains
• Different surface (fomites) materials in the patient rooms result in different rates of inactivation
• Suspension in different types of organic matter could affect the rate of inactivation
• Vertical or horizontal orientation of the surface towards UV light source

CONCLUSIONS
• Lower inactivation rates on vertical vs. horizontal surfaces.
• Surfaces should be cleaned before UV light disinfection
• Use of H2O2 wipes plus UV light gives the best results

Disclosure Statement: This study was supported by the Clorox Company though funding provided to the University of Arizona.