ClorDiSys

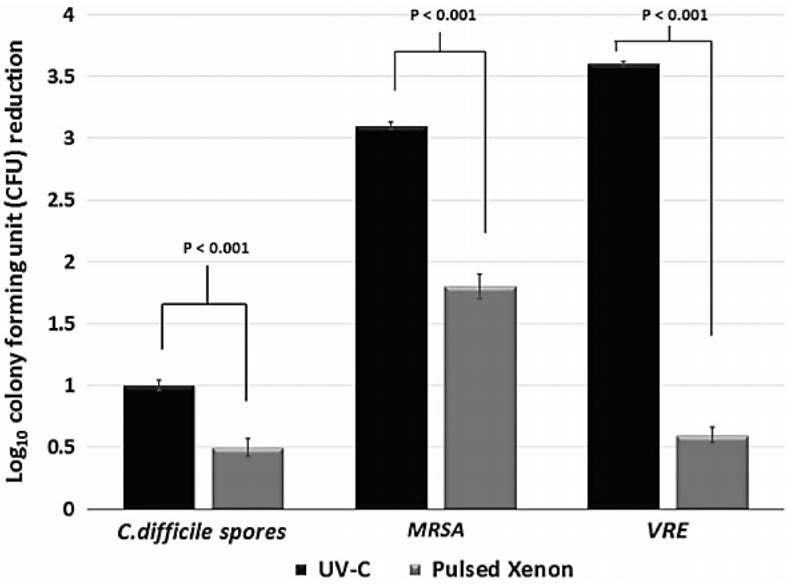
"The Chlorine Dioxide People"

Application Note #45

Continuous vs. Pulsed Ultraviolet Light

Not all ultraviolet disinfection is alike. In fact, not all ultraviolet light is alike. Ultraviolet light is divided into UV-A, UV-B, and UV-C rays. It is the wavelengths in the UV-C spectrum which offer the greatest germicidal potential. Some UV disinfection systems, like pulsed xenon UV, use the full spectrum of ultraviolet light to disperse germ-killing energy. It is claimed that the pulsed xenon is a more effective way to kill harmful bacteria because of its similarities to punching a wall, more punches will weaken it better than one. However, light is not a fist. It is a form of energy, and continual energy is more effective than turning it on and turning it off. Additionally, bulbs generating UV-A, UV-B, and UV-C wavelengths are inherently less effective in disinfection than continuous UV-C.

Automated room disinfection technologies are increasingly being used to supplement standard cleaning in healthcare facilities. Given the increasing use of UV disinfection devices and variations in recommended cycle times, there was a need for evaluations of the real-world performance and comparative effectiveness of different devices. The US Veterans Administration commissioned an infection prevention research team led by Curtis Donskey, M.D., to conduct an independent study of continuous UV-C disinfection versus pulsed xenon UV disinfection.[1] The efficacy of these differing technologies was assessed for killing of *methicillin-resistant Staphylococcus aureus*, *vancomycin-resistant Enterococcus*, and *clostridium difficile* spores on carriers placed in hospital rooms and for reducing naturally occurring contamination on high-touch surfaces. The study tested a continuous UV-C robot which was run for the same length of time from the same point in the room as a pulsed xenon (PU-UV) unit.



A comparison of the log_{10}CFU reduction/cm^2 of *Clostridium difficile* spores, *methicillin-resistant Staphylococcus aureus* (MRSA), and *vancomycin-resistant Enterococcus* (VRE) by PX-UV and continuous UV-C is shown. Carriers contained 5 log_{10}CFU of each pathogen. The carriers were irradiated for 10 minutes at a distance of 4 feet from the devices.

Reprinted from *Evaluation of a Pulsed Xenon Ultraviolet Disinfection System for Reduction of Healthcare-Associated Pathogens in Hospital Rooms*, by M.M. Nerandzic et al., 2015, Infection Control & Hospital Epidemiology, 36 (2), p.196[2]

The results showed surprisingly low pathogen kill rates for the pulsed xenon device, about .5 log for both *C. difficile* and VRE, even as close as 4 feet. The continuous UV-C device demonstrated a much higher CFU reduction for the pathogens *C. difficile*, MRSA and VRE. The study states, "PX-UV was less effective than continuous UV-C in reducing pathogen recovery on glass slides with a 10-minute exposure time in similar hospital rooms" and "the UV-C device achieved significantly greater $\log_{10}$ CFU reductions than the PX-UV device" (Batts 2015). Although the PX-UV device reduced contamination on surfaces, residual contamination was not uncommon. Not only did the continuous UV-C device in the study show much stronger disinfectant results, but that it was not run for its entire cycle time. The study calls attention to the dangers of bold claims and trying to complete a disinfectant procedure too quickly. Further studies are needed to determine whether the level of reduction in contamination provided by the PX-UV device is sufficient to reduce rates of infection.

References

1. Batts, C. (2015). VA Funded Study Validates Continuous UV-C Technology for Pathogen Reduction *PR Newswire*. Retrieved from https://www.prnewswire.com/news-releases/va-funded-study-validates-continuous-uv-c-technology-for-pathogen-reduction-300057832.html

2. Nerandzic, M. M., Thota, P., Sankar, T., Jencson, A., Cadnum, J. L., Ray, A.J., … Donskey, C. J.(2015) Evaluation of a Pulsed Xenon Ultraviolet Disinfection System for Reduction of Healthcare Associated Pathogens in Hospital Rooms. *Infection Control & Hospital Epidemiology, 36 (2),* 192 – 197.