CLOROX HEALTHCARE®

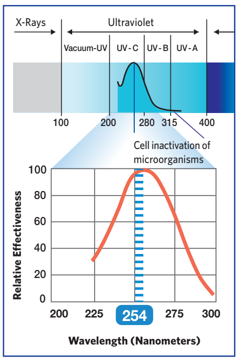
Get the Facts Straight on UV Disinfection

Myth

Broad-spectrum pulsed-xenon UV (200-320nm) is more effective than single wavelength UV-C (254nm)

Fact

Pulsed-xenon UV devices emit broad-spectrum UV and generate non-useful UV energy



Studies demonstrate that the effective UV wavelength for killing microorganisms is near 260nm. At this wavelength, pyrimidine dimerization, the primary mechanism for microorganism inactivation by UV-C light, occurs. The EPA reports that, “Pyrimidine dimers are the most common form of nucleic acid damage, being 1000 times more likely to occur than [other mechanisms of action].” Thus, pulsed-xenon UV devices that emit broad-spectrum UV actually generate non-useful UV energy, which is a detriment to pathogen reduction. Additionally, other possible mechanisms of cellular damage, as described by pulsed-xenon manufacturers, are only marginally relevant for pathogen reduction. Furthermore, studies have shown that low-pressure mercury UV lamps operate at a significantly higher efficiency than pulsed-xenon UV lamps.[1]

The Clorox Healthcare® Optimum-UV Enlight® operates predominantly at 254nm UV-C, ensuring maximum pathogen reduction efficiency.

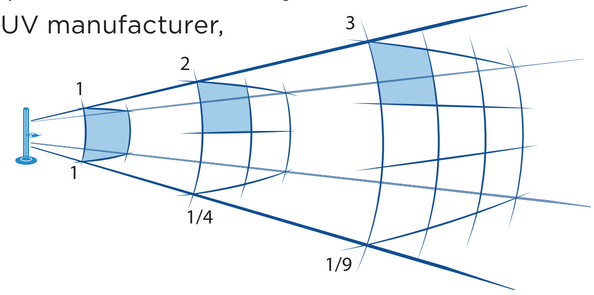
Myth

Shorter UV cycle times are always superior

Fact

Cycle time and distance from the surface impact the level of pathogen reduction

A clear relationship exists between UV treatment duration, distance of pathogens from the device, and the percentage of microorganisms that are killed—pathogen reduction increases as the target surface gets closer to the UV device and is exposed to UV for longer. Many UV manufacturers, however, do not accompany their short cycle time recommendations with effective distance and pathogen reduction data verified by third party laboratory testing, making it difficult to objectively compare device performance. Should you hear a particularly short cycle time claim from a UV manufacturer, investigate whether the effective distance will reach target surfaces in your facility rooms to achieve the desired efficacy. If not, additional cycles and placements may be required.



The Clorox Healthcare® Optimum-UV Enlight® has been validated by a 3rd party micro-efficacy laboratory to kill more than 30 HAI-causing pathogens in 5 minutes at 8 feet.

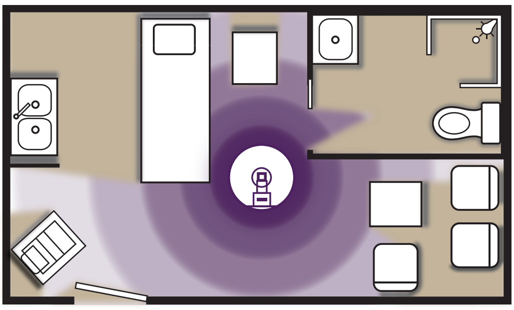
Myth

A single placement of a UV device can disinfect all areas of a room as effectively as multiple placements

Fact

Placing a UV device in several locations increases the likelihood that all room surfaces are disinfected

UV technology fundamentally operates via line of sight. While some surface materials can reflect limited amounts of UV-C, many surfaces absorb most or all UV-C energy. Thus, if a target surface is “shadowed” and not in direct line of sight of the UV device (for example, those in a patient bathroom), that surface is likely to receive little to no UV treatment, limiting pathogen reduction efficacy. UV manufacturers with single placement protocols attempt to remedy this through significantly higher UV cycle times. However, 30+ minute cycle times place greater stress on room turnover, result in lengthy restarts if the UV treatment is inadvertently interrupted, and surfaces close to the UV device may become overexposed, potentially resulting in surface discoloration or damage.



One-bed patient room

The Clorox Healthcare® Optimum-UV Enlight® operates in 5 minute cycles in 1–3 room placements, ensuring both rapid UV treatment and complete surface coverage.

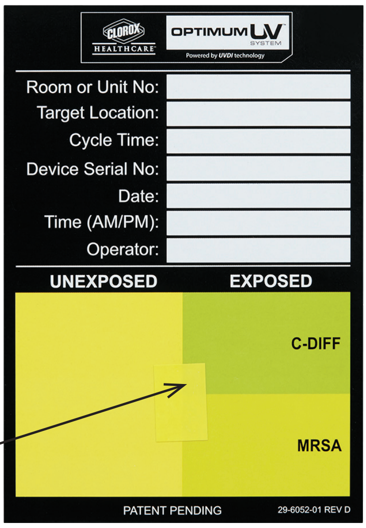
Myth

Automated UV dose measurement technology ensures greater treatment efficiency and coverage

Fact

UV measurement technology is insufficient because it does not provide information about the dose delivered to specific surfaces

UV devices with automated cycle time determination promising uniform, efficient distribution of UV energy are often based on measurements of reflected UV light that are not surface-specific. They do not give the operator information about the dose delivered to specific high-touch or shadowed locations, nor the required dose to kill specific HAI-causing pathogens. Typically, these devices have lengthy 30+ minute UV treatment cycles that vary widely between rooms, impacting room turnover time and challenging workflow consistency. Conversely, consistent cycle times simplify UV device usage and validation of efficacy can more accurately be accomplished by measuring UV dose delivered to specific target surfaces, ensuring that UV protocol has been optimized for the room.



Area of color change

The Clorox Healthcare® Optimum-UV Enlight® System's Dose Verify™ cards can be placed on specific surfaces to certify that the appropriate dose to treat MRSA and *C. difficile* has been delivered to that location.

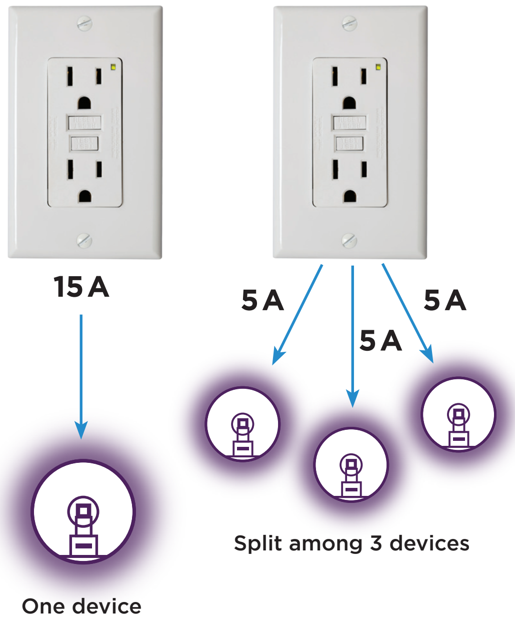
Myth

Multi-emitter UV systems provide more power and efficiency

Fact

Each tower in a multi-emitter UV system outputs less UV-C energy because power is divided between emitters

While multi-emitter UV systems address shadowed areas, enhancing UV efficacy, each emitter outputs less power than a single emitter system. Single emitter systems leverage a portion of the available 15 amps in a typical hospital room circuit, while multi-emitter systems have to distribute the same amps among two or three towers, meaning that each tower outputs less UV-C energy. Thus, despite using all emitters simultaneously rather than reposition a single emitter throughout the room, multi-emitter systems typically require longer cycle times to achieve the same disinfection results. Furthermore, additional time and effort is required to transport and setup multiple emitters, extending room turnover time.



The Clorox Healthcare® Optimum-UV Enlight® leverages a single UV emitter with maximum-output UV-C lamps, resulting in only a few 5 minute cycles required to thoroughly disinfect a room.

Myth

Pulsed-xenon lamps are safer because they do not contain mercury

Fact

Enlight® lamps contain less mercury than typical fluorescent lamps and are certified by the EPA as non-hazardous waste

Measures to reduce mercury in hospitals are typically aimed at high mercury content devices that contact patients, such as blood pressure monitors (70-90k mg of mercury) and thermometers (500 mg of mercury). By comparison, Enlight® UV-C lamps contain less than 14 mg of mercury per lamp, half the amount found in typical overhead fluorescent lamps. At this level, Enlight® lamps have been certified by the EPA as non-hazardous waste, safe for handling and disposal under federal law[2]. As an extra precaution, Enlight® lamps are polymer-encapsulated, ensuring no staff or patient exposure to mercury from lamp breakage. Information asserting that the EPA, WHO, or other regulatory and healthcare organizations require elimination of mercury-based UV-C lamps from hospitals is false[3,4]. While pulsed-xenon lamps do not contain mercury, they can emit toxic ozone known to cause lung damage, requiring a frequently replaced ozone filter to safely operate the UV device.

Amount of mercury found in a typical T8 fluorescent bulb

Polymer Encapsulation on broken lamp

The Clorox Healthcare® Optimum-UV Enlight® lamps are certified as non-hazardous waste by the EPA, and have a unique polymer encapsulation that prevents mercury from escaping in case of lamp breakage.

Myth

Surface and equipment damage can result from use of mercury-based UV devices

Fact

Testing shows that mercury-based UV-C will not damage common hospital surfaces

Surface compatibility with UV is affected by the wavelength of light that the device emits and the amount of light surfaces are exposed to. UV-C is short wavelength UV and only penetrates into surfaces with a depth less than 20 microns[5]. This means that UV-C will not damage common hospital surfaces since it doesn't penetrate as far into the surface as other forms of UV light that extend further along the UV spectrum, including those generated by pulsed-xenon. While some UV devices require lengthy UV cycles that are more likely to cause surface damage, the Enlight® operates via short cycles that have been shown to have no known surface compatibility issues. Any surface changes that might occur are generally cosmetic, similar to normal fading over time, and will not impact the function of the equipment or surface. Information asserting that Enlight® has significantly damaged hospital surfaces or equipment is likely misleading and should be verified with those facilities.

Optimum-UV Enlight® Compatibility Testing

Polymers	Glass	Metals	Hard Porous Surfaces	Soft Surfaces
e.g., Mattress covers, Electronic screens	e.g., Glass partitions	e.g., Stainless steel fixtures	e.g., Glazed ceramic tiles, Formica counters	e.g., Polyester privacy curtains
★★/★★★	★★★	★★★	★★/★★★	★★/★★★

The Clorox Healthcare® Optimum-UV Enlight® has been tested against a wide range of healthcare materials, including metals, plastics, rubber and counter surfaces, and been found to produce no damage upon prolonged exposure to UV-C.

Myth

UV devices can subject staff and patients to harmful UV exposure

Fact

UV-C devices can be safely implemented when used according to manufacturer instructions

While UV-C does not penetrate skin significantly or cause the damage associate with UV-A and UV-B radiation, excessive exposure can cause temporary skin and eye discomfort. However, when used according to manufacturer instructions in unoccupied rooms, UV-C devices with robust safety features can safely be deployed. UV-C is transmitted through air and quartz, but is absorbed by ordinary glass, so viewers behind a window are protected. Furthermore, Clorox Healthcare testing has shown that exposure through typical under-door gaps does not pose a hazard. UV-C devices often include safety features to prevent UV exposure, including motion sensors that shut the device off automatically if a person enters the room during UV treatment, as well as warning signs to deter entry during use. Safety features should be a key consideration parameter when evaluating UV systems.

The Clorox Healthcare® Optimum-UV Enlight® features integrated 360° infrared motion sensors that shut the device off automatically upon entry, as well as a hard case and door hanging sign that can block entry at up to 3 doors of the room being treated.

Myth

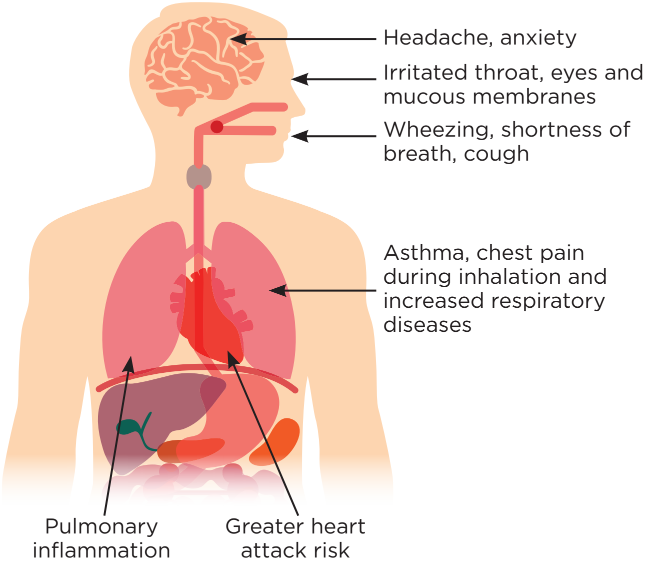
UV system lamps emit harmful compounds into the air

Fact

Mercury-based lamps do not emit ozone or unsafe levels of VOCs

Xenon-based lamps emit ozone, a toxic gas known to cause lung damage, at levels that are unsafe for humans to breathe in. For this reason, whole room disinfection devices containing xenon lamps require a frequently replaced ozone filter to safely operate the UV device. In contrast, mercury-based lamps do not emit ozone or unsafe levels of volatile organic compounds (VOCs) that can create ozone in the air. Every device manufacturer should provide testing results demonstrating that their system lamps do not release VOCs in the air at levels above EPA-established limits.[6] In addition to chemical emissions, pulsed-xenon devices emit pulsing sound and light that has been reported to be disruptive and irritating to patients and hospital staff. Mercury-based devices do not flash or produce excess noise when in operation.

ILL-EFFECTS OF OZONE INHALATION



The Clorox Healthcare® Optimum-UV Enlight® passed EPA testing concluding that all lamp emissions are negligible, and well below EPA-established limits for volatile organic compound (VOC) emissions in the air.

1. Schaefer, Raymond et al. Pulsed UV lamp performance and comparison with UV mercury lamps. J. Environ. Eng. Sci. Vol. 6, 2007: 303-310

2. Environmental Protection Agency. Method 1311 Toxicity Characteristic Leaching Procedure; 1992.

3. https://practicegreenhealth.org/about/press/blog/unauthorized-mercury-communication

4. https://www.epa.gov/ozone-pollution/health-effects-ozone-pollution

5. Kowalski W. (2009) UV Effects on Materials. In: Ultraviolet Germicidal Irradiation Handbook. Springer, Berlin, Heidelberg

6. EPA. 1999. "Air Method, Toxic Organics-15 (TO-15): Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, Second Edition: Determination of Volatile Organic Compounds (VOCs) in Air Collected in Specially-Prepared Canisters and Analyzed by Gas Chromatography/Mass Spectrometry (GC/MS)." EPA 625/R-96/010b.

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For more information, contact your Clorox sales representative or call **800-234-7700.**
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