



*Indigo-Clean Visible Light Disinfection:
A Safe, Clinically Proven Method for Reducing SSIs*



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Since the SARS-CoV-2 pandemic in 2020, companies have marketed various light-based disinfection methods, even resurrecting technologies that have been viewed as unsafe in the past. Indigo-Clean Visible Light Disinfection is **NOT UV**, and that's important. Here's why...

UV Disinfection works, but not everywhere you imagine

Ultraviolet light, specifically UVC, is an effective disinfection tool, but requires direct line of sight¹. This means any surface in shadow, or even exposed, but at an improper angle, will not be disinfected. Additionally, UV has been shown to be ineffective against biofilms², which are responsible for over 80 percent of microbial infections in the body³ and are largely responsible for infecting intravenous catheters, pacemakers and other implanted medical devices.

Indigo-Clean disinfection reaches the nooks & crannies

405nm visible light disinfection, however, reflects. It reaches areas in shadow and out of the direct line of sight, such as the folds of fabrics, the underside of equipment and other surfaces missed by UV or manual cleaning methods. Furthermore, 405nm light has been proven effective in degrading biofilms and destroying the pathogens they shield^{4,5}.

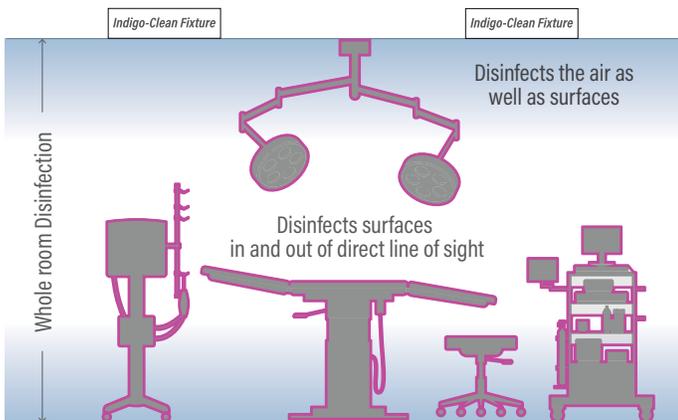
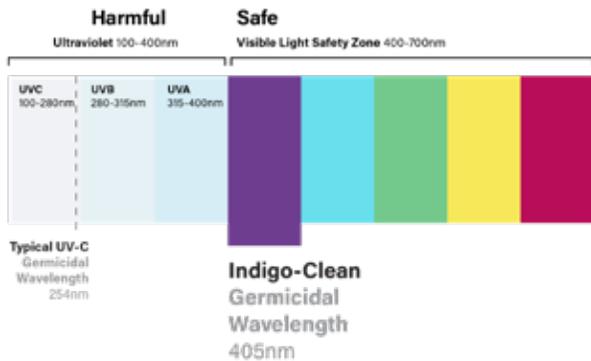
UV carries risk while in use

To human health, air quality & materials

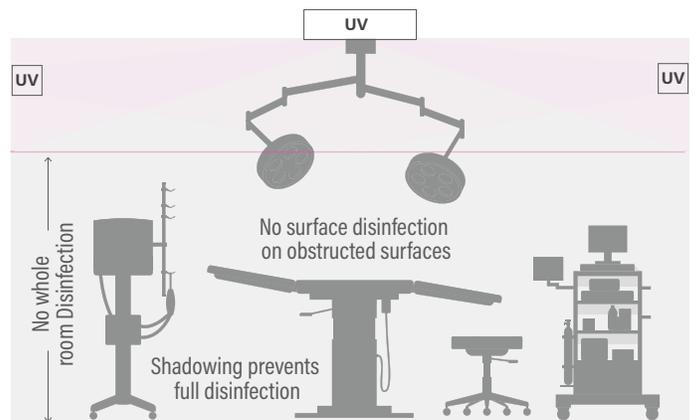
A quick internet search reveals why UVC is problematic. Exposure to UVC degrades materials, harms the skin and eyes, and produces ozone, which is irritating to breathe. According to the EPA, "Ozone at ground level is a harmful air pollutant, because of its effects on people and the environment..."⁶

"Far UVC" is being touted as "safe for humans" but does not yet have the body of scientific evidence or regulatory approvals needed to prove its safety.. Additionally, some have raised concerns about air quality, as it appears that the use of UVC produces ozone, which "can greatly affect the indoor air chemistry, consequently producing unwanted particles and gas phase compounds."⁷

The International Electrotechnical Commission's IEC 62471, the *only* safety standard that evaluates and rates the photobiological safety of lamps and lamp systems has determined 405nm to be "risk-exempt", whereas UV sources with sufficient germicidal activity typically fall into three risk groups, depending on the wavelength and exposure time. Depending on the risk group assigned, UV sources require led access, occupancy detection, time safeguards, warning stickers and specially trained technicians⁸.



Indigo-Clean does NOT require direct line of sight to disinfect.



UV requires direct line of sight to disinfect.

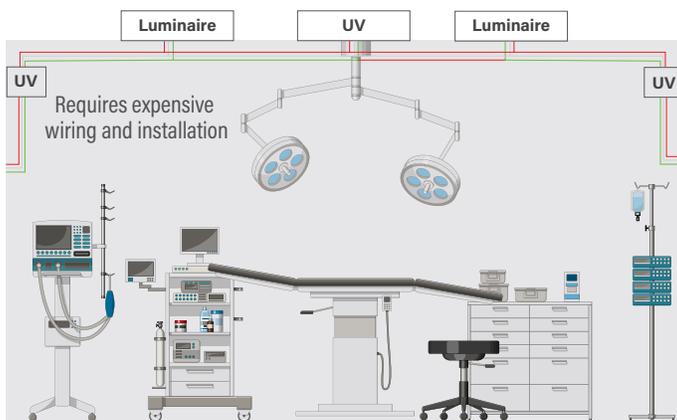
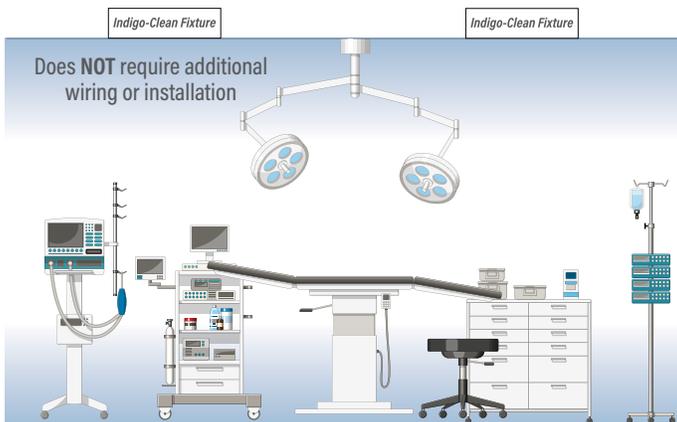
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UV comes with additional cost

UVC disinfection requires high voltage, low voltage, and control lines: installing a fixed UVC system in a sensitive area, such as a surgical suite, requires cutting additional holes in the ceiling to mount them and additional high-voltage/low-voltage lines to power and control them. Aside from the added installation cost, this could mean introducing unwanted pathogens, including dirt, dust and aspergillus⁹, into your sterile space. Indigo-Clean™ 405nm lighting installs into the existing luminaire space, with no additional power source required.

What's more, 405nm visible light disinfection is safe for room occupants, allowing activity to continue when the lights are on. Because UV disinfection sources are not safe and require downtime to be employed, room turnaround time is increased, which decreases the number of procedures that can be performed in a day; negatively impacting the facility's bottom line.

405nm light disinfection also boasts a much longer lamp life compared to UV; many UV sources are typically replaced every year depending upon the application, however, Indigo-Clean is designed to be used for 10 years under normal operating conditions. This reduces both input costs and labor hours to replace lamps.



Proven SSI reduction with 405nm visible light disinfection

Proving pathogen kill is one thing; proving a technology reduces surgical site infections (SSIs) is another. Indigo-Clean™ visible light disinfection has been clinically proven to reduce SSIs by 73%¹⁰. Visible light has also been shown to reduce transmission of organisms while the patient is in the room during the procedure¹¹. Finally, while UV manufacturers base all claims on the death of the pathogen, 405nm visible disinfection lighting can render a pathogen non-infectious before it is destroyed^{12, 13}.



To read the AJIC article, scan here

Indigo-Clean	UV
Disinfects the entire room	Disinfects in line of sight only
Safe for occupants and materials	Harmful to occupants and degrades materials
Integrated into luminaires	Additional electrical wiring & ceiling space required
10-year LED lifetime (no maintenance)	10-year LED lifetime (requires annual maintenance; contact mfr for details)
Proven to reduce surgical site infections	Unknown (contact mfr for details)

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Conclusion

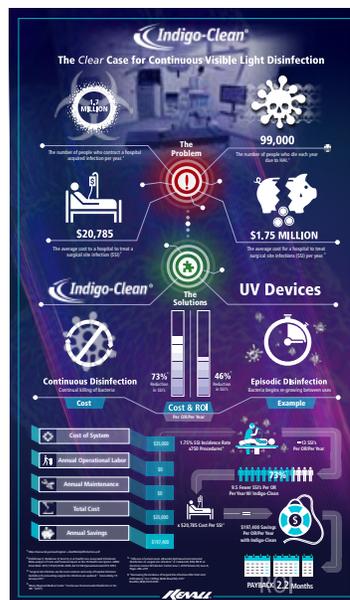
405nm is the safe, responsible and proven method for reducing SSIs. Unlike UV, 405nm Indigo-Clean lighting can be blended with white LEDs to provide comfortable ambient light when spaces are occupied: when the room is empty, Indigo-Clean will automatically switch to all indigo mode to maximize disinfection. Used continuously, Indigo-Clean provides 24/7 disinfection without the need for human intervention – no training, labor or compliance costs.

Which Indigo-Clean product is right for our facility?

	Indigo-Clean EX	Dual Mode	Single Mode
Bactericidal	X	X	X*
Sporicidal	X		
Viruses	X	X	X

*For greater efficacy, choose EX or Dual Mode

Indigo-Clean: A Significant ROI Saving Money, Saving Lives



To see how Indigo-Clean contributes to the bottom line, scan here

References

- ¹ NEA | Safety Guidelines for Use of UVC Devices in Commercial/Industrial Settings
- ² de Carvalho CCCR. Biofilms: Microbial Strategies for Surviving UV Exposure. *Adv Exp Med Biol.* 2017;996:233-239. doi: 10.1007/978-3-319-56017-5_19. PMID: 29124704.
- ³ What Are Biofilms? | Live Science
- ⁴ Halstead, F.D., Ahmed, Z., Bishop, J.R.B. et al. The potential of visible blue light (405 nm) as a novel decontamination strategy for carbapenemase-producing enterobacteriaceae (CPE). *Antimicrob Resist Infect Control* 8, 14 (2019). <https://doi.org/10.1186/s13756-019-0470-1>
- ⁵ Tsutsumi-Arai C, Arai Y, Terada-Ito C, Takebe Y, Ide S, Umeki H, Tatehara S, Tokuyama-Toda R, Wakabayashi N, Satomura K. Effectiveness of 405-nm blue LED light for degradation of Candida biofilms formed on PMMA denture base resin. *Lasers Med Sci.* 2019 Sep;34(7):1457-1464. doi: 10.1007/s10103-019-02751-2. Epub 2019 Feb 23. PMID: 30798389.
- ⁶ Ground-level Ozone Pollution | US EPA
- ⁷ Unwanted Indoor Air Quality Effects from Using Ultraviolet C Lamps for Disinfection. Frans Graeffe, Yuanyuan Luo, Yishuo Guo, and Mikael Ehn. *Environmental Science & Technology Letters* 2023 10 (2), 172-178. DOI: 10.1021/acs.estlett.2c00807
- ⁸ gla-uv-c-safety-position-statement.pdf (nema.org)
- ⁹ (PDF) Infection Prevention for Construction and Renovation in the Operating Room (researchgate.net)
- ¹⁰ Influence of a visible-light continuous environmental disinfection system on microbial contamination and surgical site infections in an orthopedic operating room - *American Journal of Infection Control* (ajicjournal.org)
- ¹¹ <https://legrand.webdamdb.com/directdownload.php?ti=57031270&tok=LNbRSuaItNAIGZweUZV5ewRR>
- ¹² Bache SE, Maclean M, Gettinby G, Anderson JG, MacGregor SJ, Taggart I. *J Hosp Infect.* 98: 67-73; 2018
- ¹³ Dougall L, Anderson JG, Timoshkin I, MacGregor SJ, Maclean M. Efficacy of Antimicrobial 405 nm Blue-light for Inactivation of Airborne Bacteria. *Proc. SPIE 10479, Light-Based Diagnosis and Treatment of Infectious Diseases, 104791G* 2018