Perspectives on assessing UV efficacy by biological measurements

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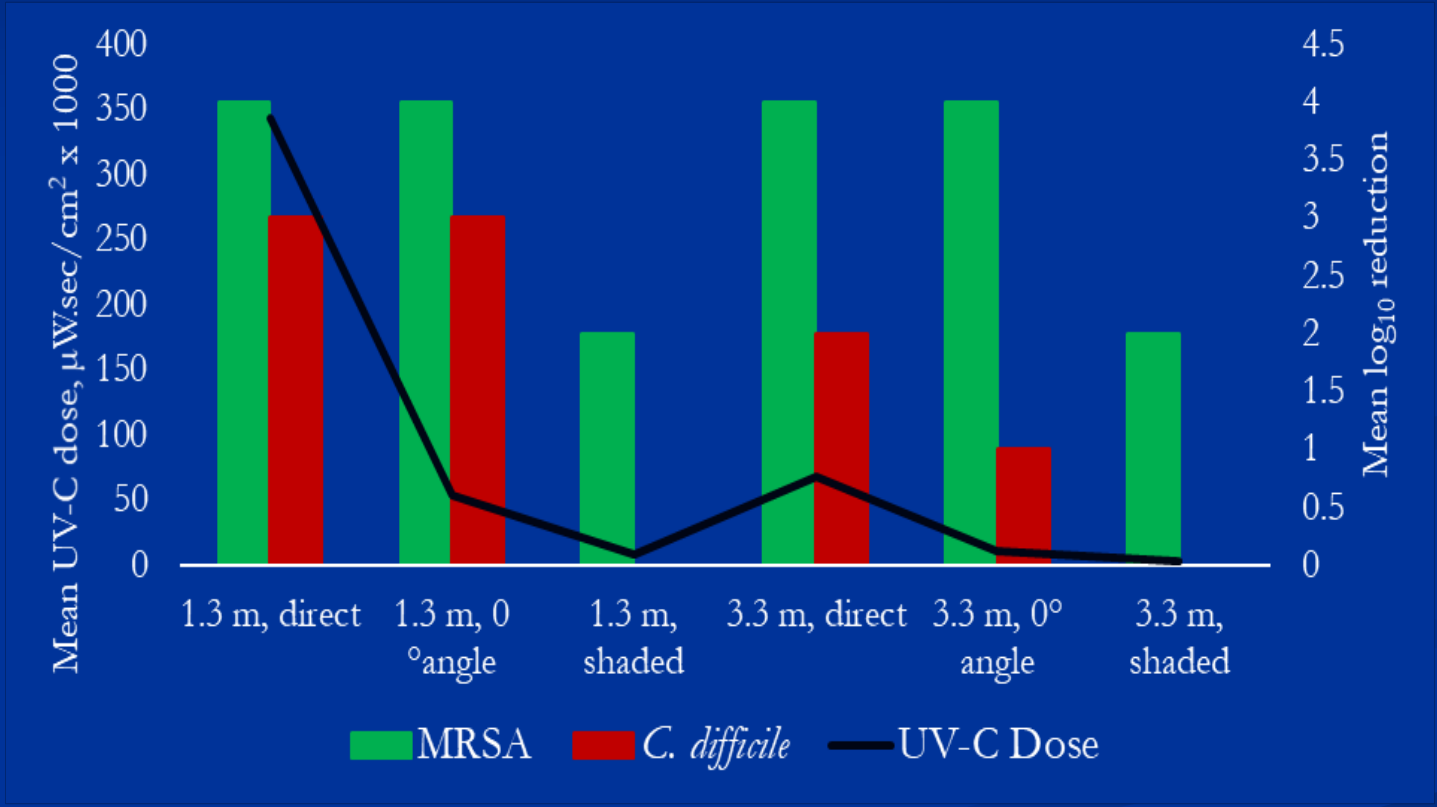
Objectives

- Provide a general overview of methods for assessment of UV efficacy
- Discuss practical issues in assessing UV

Why do healthcare facilities need practical methods to assess UV-C?

Assess UV-C dosing to different locations

UV-C doses and log reductions with 5-minute exposure



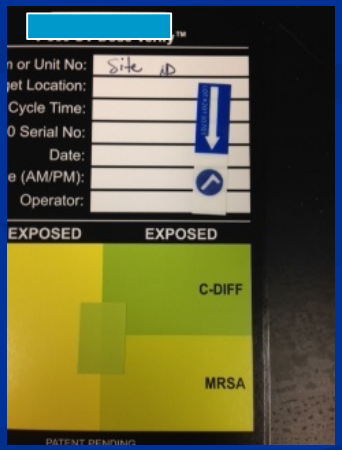
Boyce JM, Donskey CJ. Understanding ultraviolet light surface decontamination in hospital rooms: A primer. ICHE 2019.

Why do healthcare facilities need practical methods to assess UV-C?

- Truth-in-advertising: comparison of different UV devices
- Training of EVS staff
- Ongoing monitoring of device efficacy
- New applications
  - Surgery, radiology, portable equipment, small devices
- Safety

Methods for monitoring UV-C devices

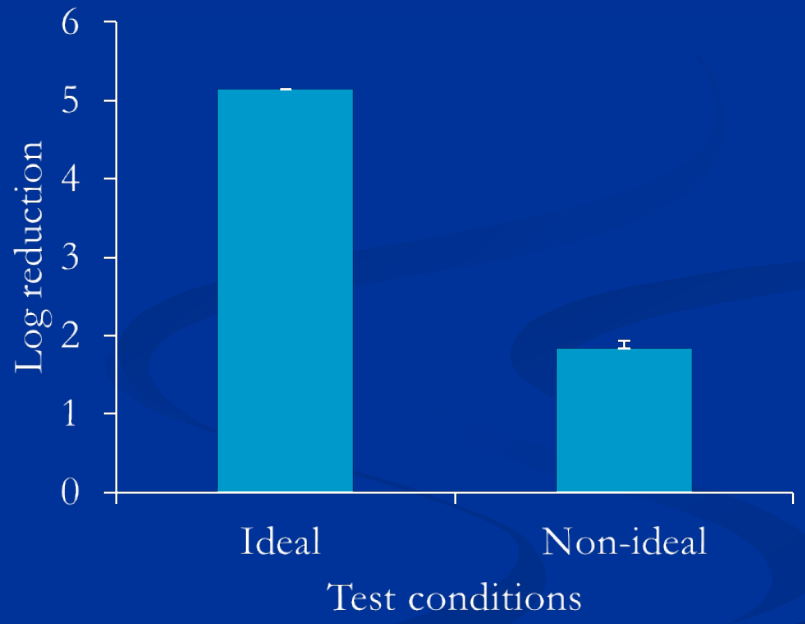
- Reductions in test organisms on carriers
- Cultures for pathogens
- Radiometric sensors
- Colorimetric indicators



ASTM E3135-18. Standard practice for determining antimicriobial efficacy of UV germicidal irradiation against microorganisms on carriers with simulated soil; Masse V, et al. Antimicrob Resistance Infect Control 2018;7:29

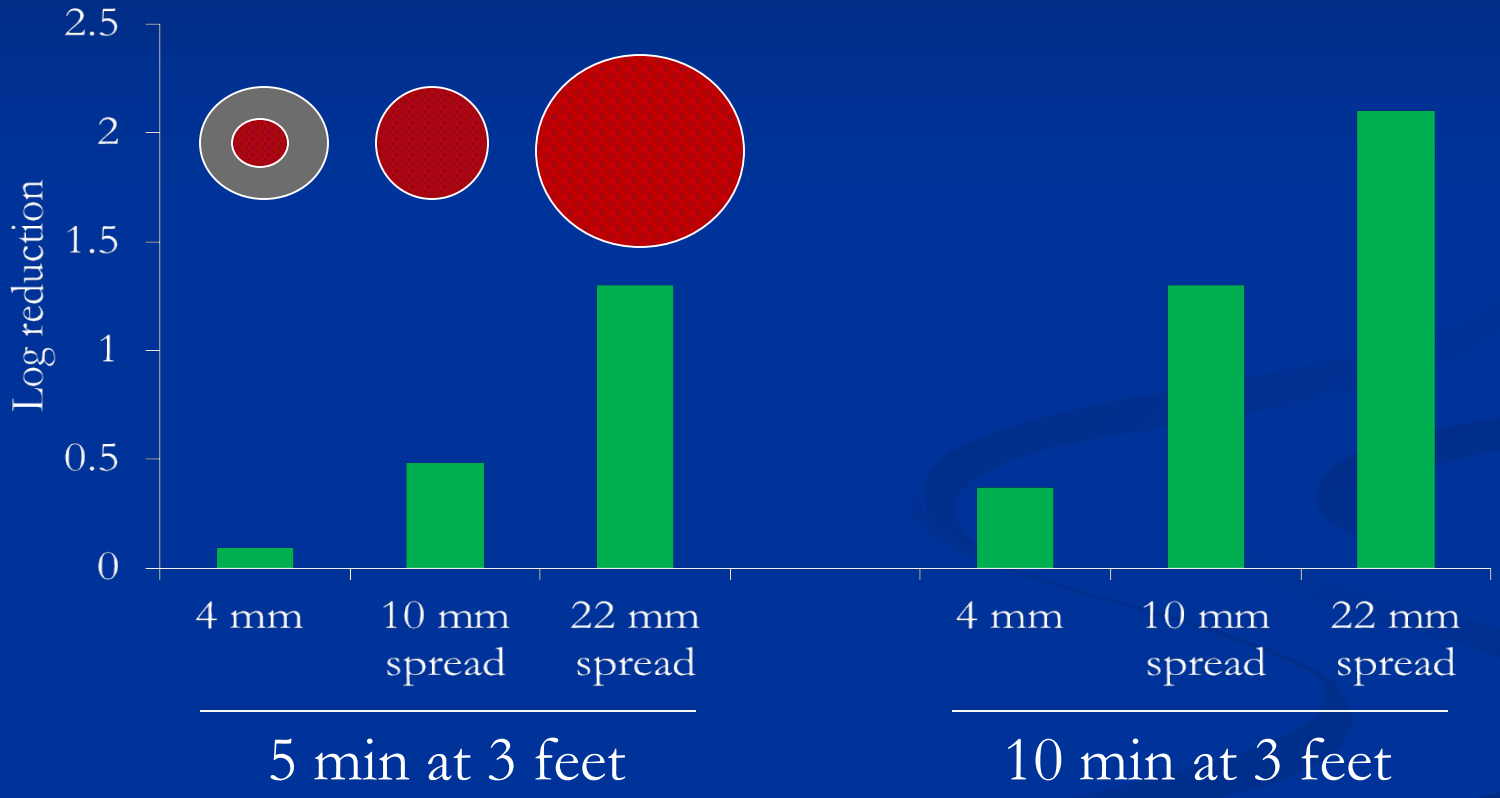
Reduction in MRSA with ideal versus non-ideal test conditions

- Ideal conditions: no organic load, vertical orientation, spreading of the inoculum to cover 20 mm steel disk
- Cycle conditions: 3 minutes at a distance of 4 feet



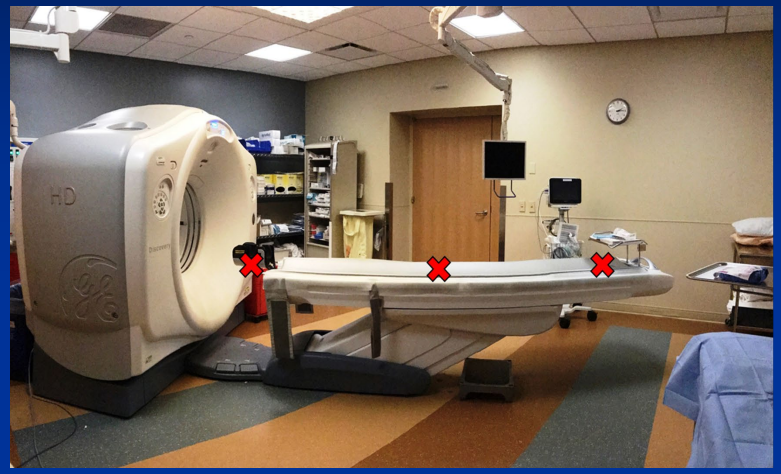
Donskey CJ. Decontamination devices in health care facilities: Practical issues and emerging applications. AJIC 2019.

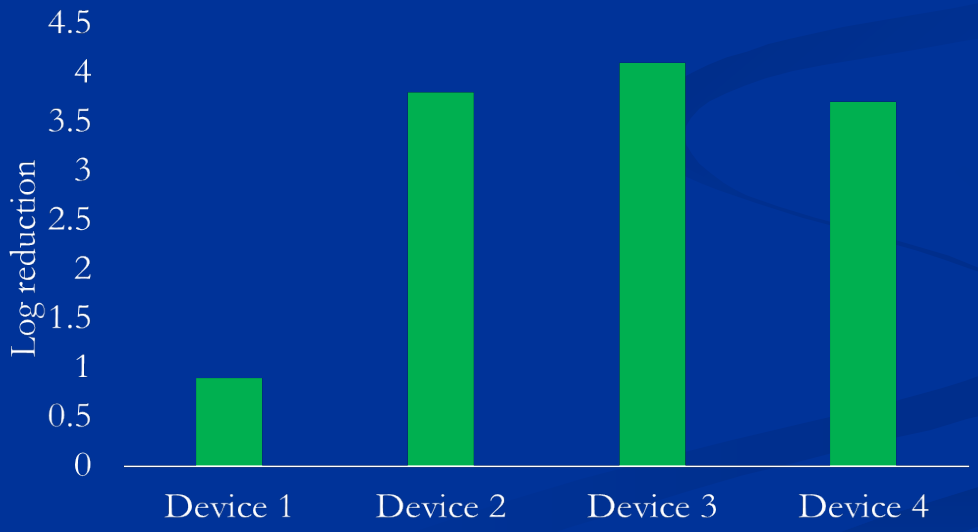
Effect of spreading of the inoculum on reduction of *C. difficile* spores by UV



Cadnum JL, et al. Effect of variation in test methods on performance of UV-C radiation room decontamination. ICHE 2016;37:555-60.

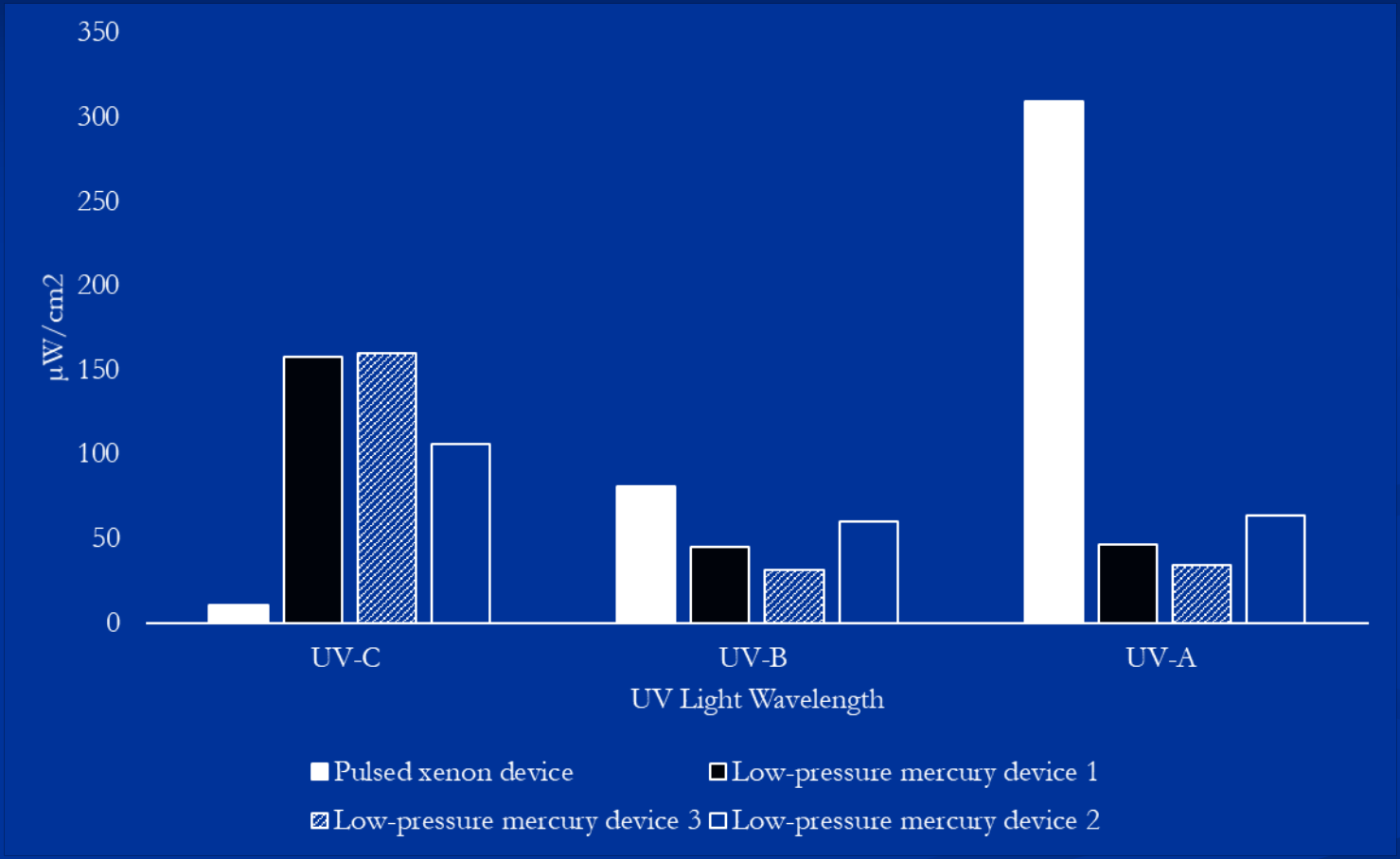
Reduction in VRE on a CT table





Cadnum JL, et al. A comparison of the efficacy of multiple ultraviolet light room decontamination devices in a radiology procedure room. ICHE 2019;40:158-163.

Measured UV irradiance



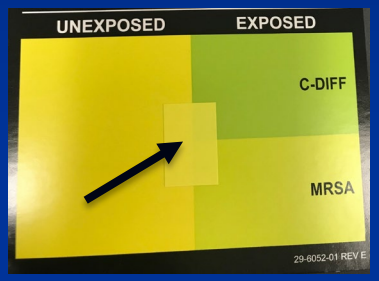
Cadnum JL, et al. A comparison of the efficacy of multiple ultraviolet light room decontamination devices in a radiology procedure room. ICHE 2019;40:158-163.

Positive high-touch surface cultures before versus after UV-C

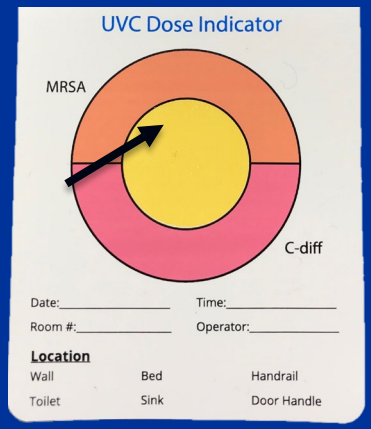
	VRE	MRSA	*C. difficile*
Study 1	Before: 7/261 (3%) After: 2/261 (1%)	Before: 28/261 (11%) After: 2/261 (1%)	Before: 9/261 (3%) After: 1/261 (.4%)
Study 2	Before: 4/113 (4%) After: 2/113 (1%)	Before: 11/113 (10%) After: 2/113 (2%)	Before: 22/113 (19%) After: 9/113 (8%)

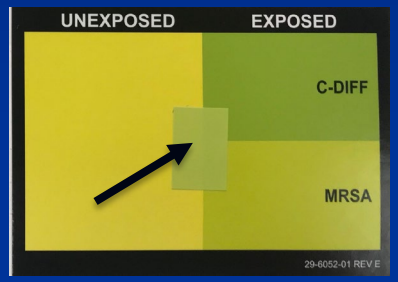
Nerandzic MM. BMC Infect Dis 2010;10:197;
Nerandzic MM. ICHE 2015;36:192-7.

Colorimetric indicators

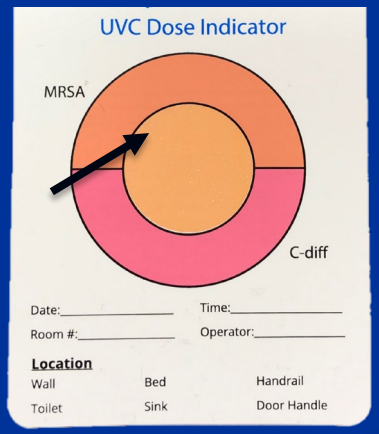


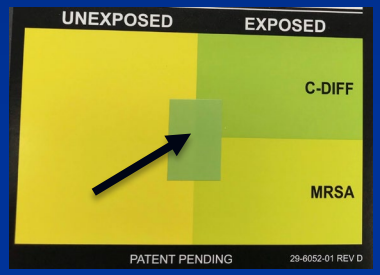
No Exposure



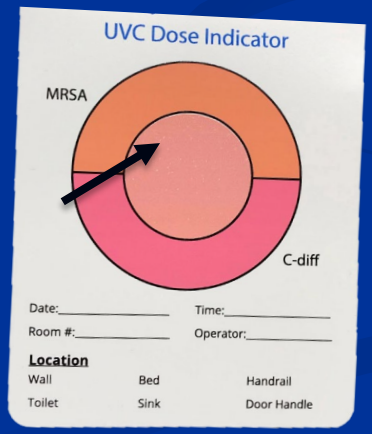


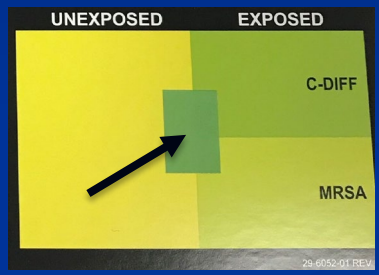
10,000 $\mu J/cm^2$



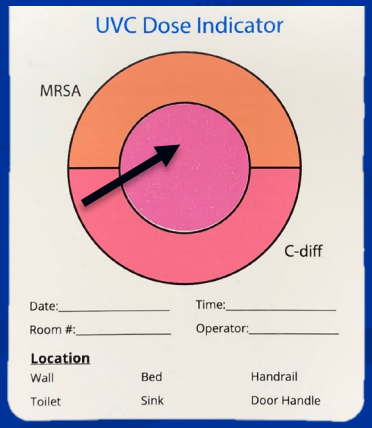


25,000 $\mu J/cm^2$



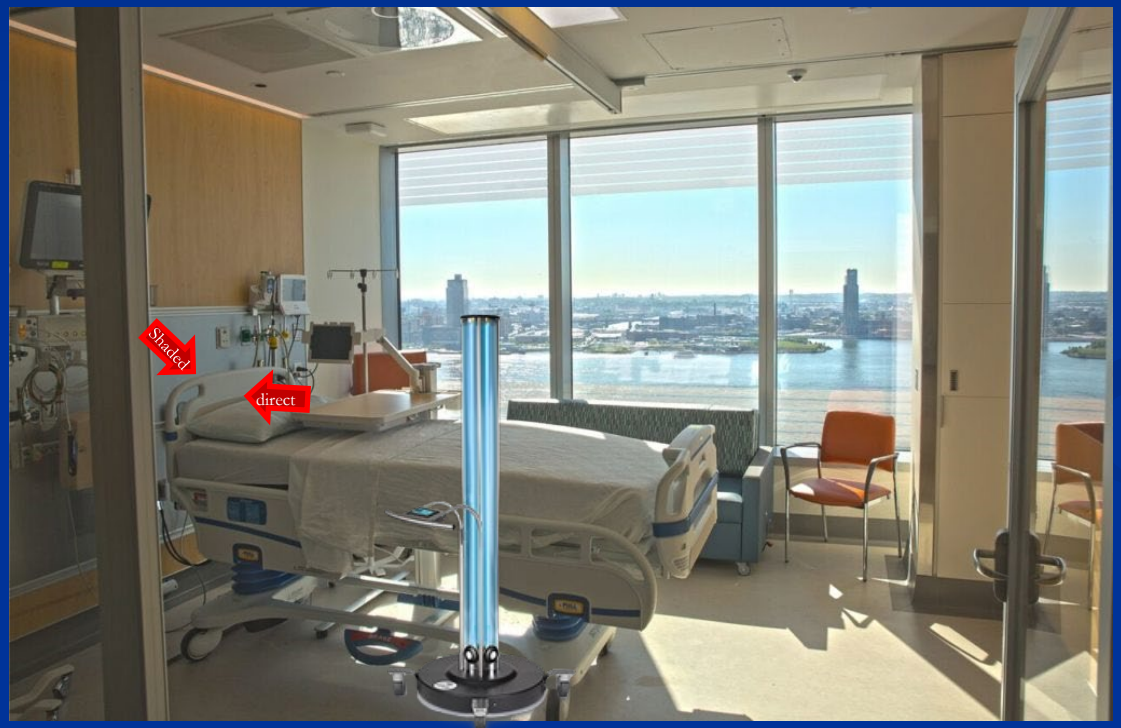


46,000 $\mu J/cm^2$



Cadnum JL. ID Week 2019.

Direct versus shaded head of bed



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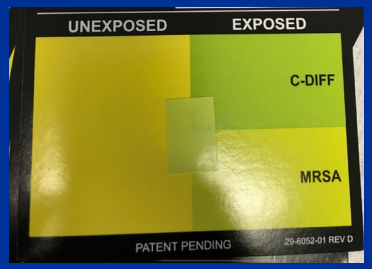
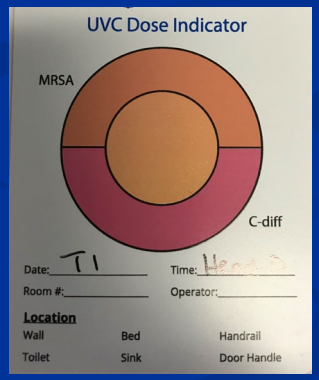
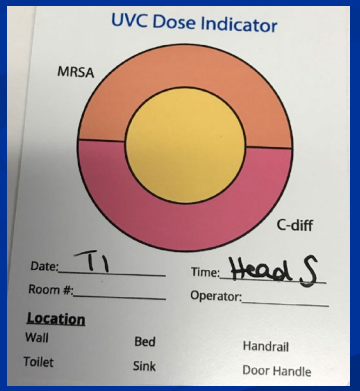
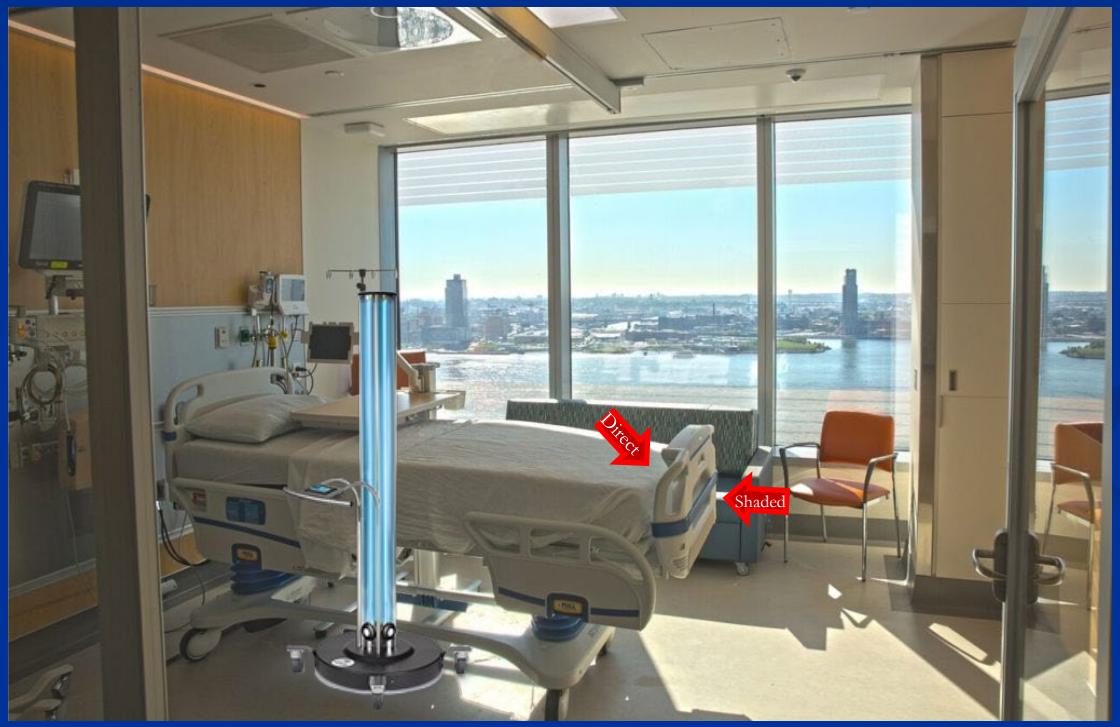




Shaded



Direct versus shaded foot of bed



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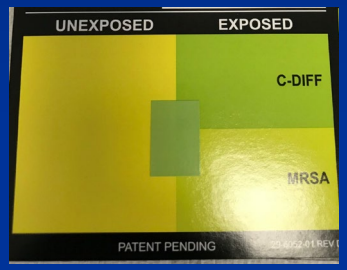

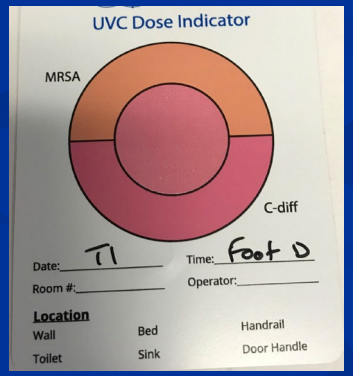

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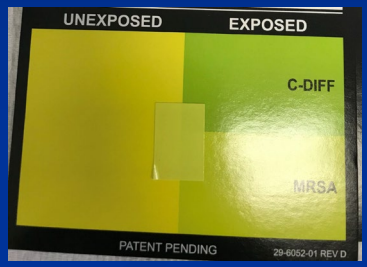
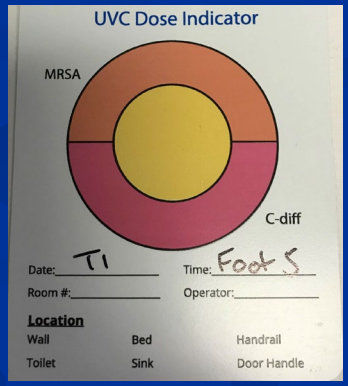
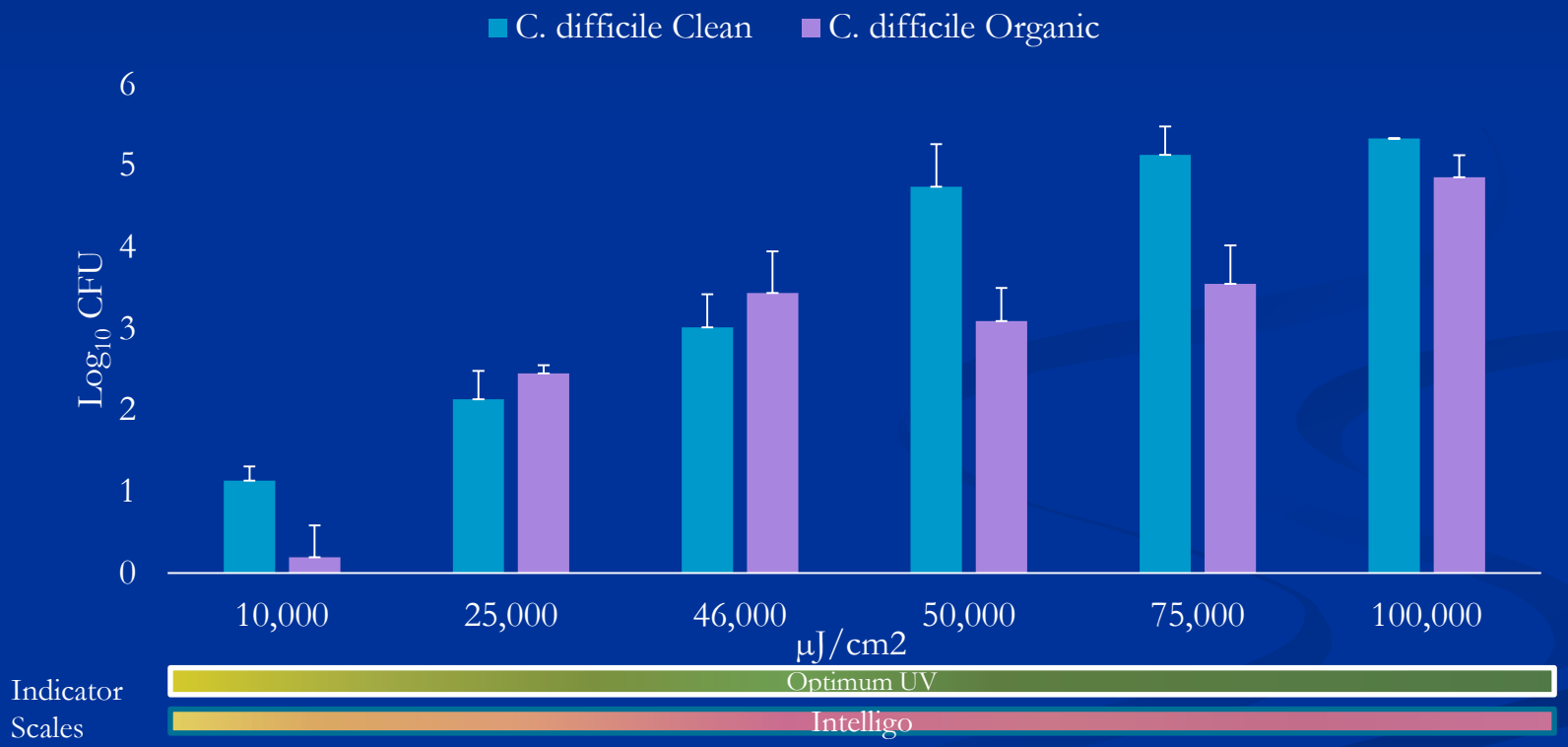




Effect of varying UV-C doses on reduction of *C. difficile* and color of 2 UV-C dose indicators



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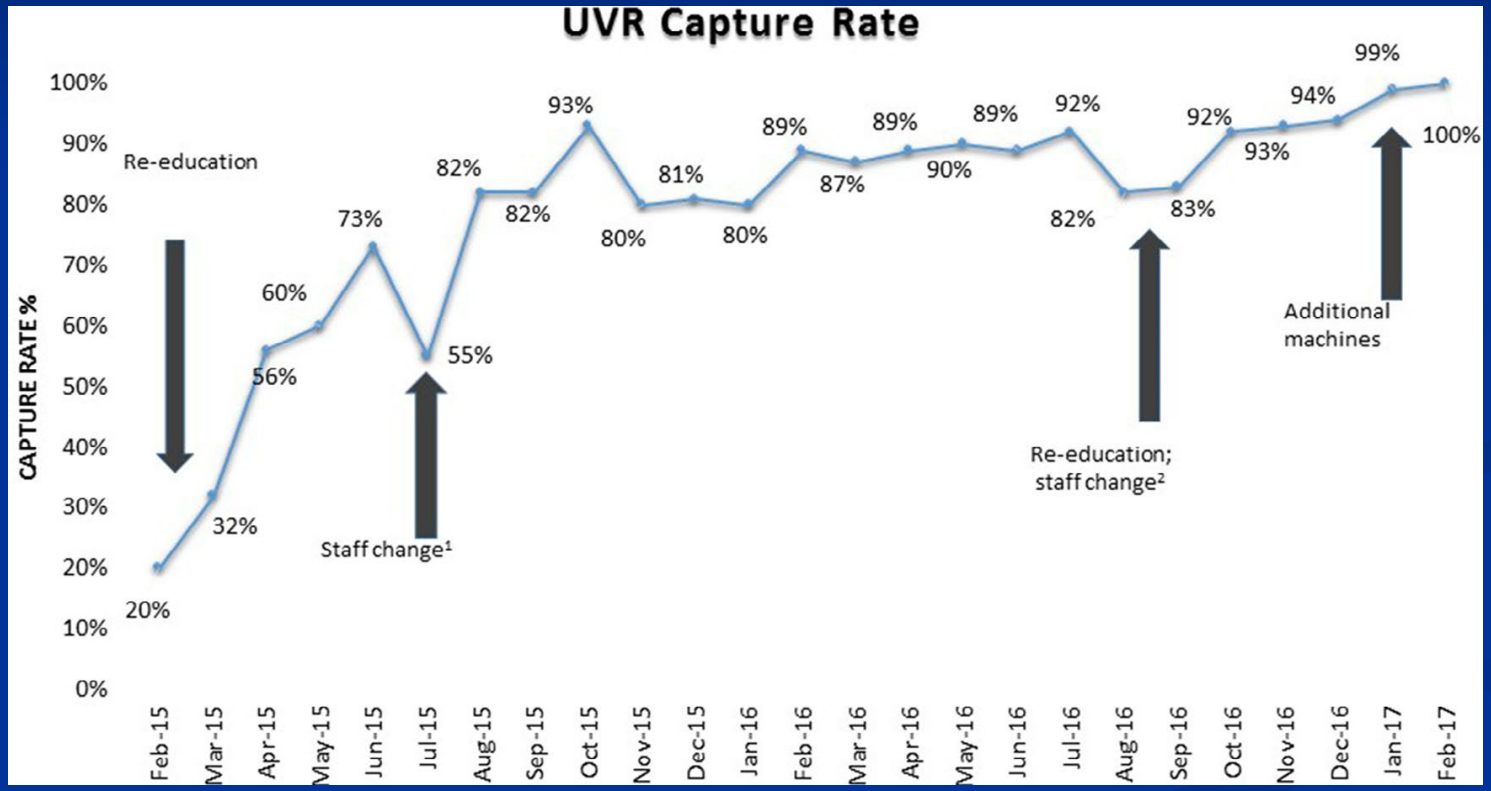
Effective implementation of UV-C devices requires monitoring and feedback



Fleming M. Deployment of a touchless UV light robot for terminal room disinfection: The importance of audit and feedback. AJIC 2018;46(2):241-243; Anderson DJ. Implementation Lessons Learned From the Benefits of Enhanced Terminal Room (BETR) Disinfection Study: Process and Perceptions of Enhanced Disinfection with Ultraviolet Disinfection Devices. ICHE 2018;39:157-163

Summary

- Healthcare facilities need practical methods to assess UV-C dosing
- Colorimetric indicators that provide a rough estimate of UV-C doses are promising because they are easy to use
- All methods used to assess UV-C efficacy require standardized testing protocols