

Ultraviolet Light for Patient Room Disinfection Post-Terminal Clean

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Abstract # 7139 SHEA 2015

Background

- UV-C light reduces micro-organism bio-burden in the hospital environment.
- Surfacide® UV-C Disinfection System reduced known quantities of CFUs carried in on a variety of surfaces.
 - MRSA and VRE needed only 400mJ or less to achieve a 3 log CFU reduction
 - Acinetobacter* and CRKP required 800mJ for a 3 log reduction in CFUs
 - C. difficile* spores required 1200-1400mJ for a 3 log reduction in CFUs
- Objective:** Analyze the number of CFUs present pre and post UV-C treatment with the Surfacide® multi-emitter system using EZ Reach polyurethane sponges (sampling a large surface area) in the following:
 - Terminally cleaned inpatient hospital rooms and operating rooms (ORs)
 - Portable computers, not pre-cleaned
 - Bathrooms of patients with *C. difficile* colitis, also not pre-cleaned.

Methods

Inpatient and Operating Rooms (ORs)

- Private, vacant, rooms were terminally cleaned *prior to* this study
- Five surfaces (e.g. bedrail, IV pole, wardrobe and medicine cabinet handles, computer mouse, sink) were selected; sampling depended on type of room and configuration.
- The right 1/2 of each surface was swabbed with a 4.4x3.8cm EZ Reach PU sponge before treatment.
- Rooms were treated with 3 UV-C emitters at a medium energy setting for 30-60 minutes to deliver a target dose of 800mJ/cm².
- The left 1/2 of the same surface was then swabbed post UV-C treatment.
- Swabs were refrigerated overnight, and cultured the next day.

Portable Computer (no pre-cleaning)

- The computer on wheels (x3) were arranged in front of 2 emitters. The left 1/2 of the keyboard was swabbed with the PU sponge.
- Keyboards were treated with 400mJ with the scrub option. Emitters were programmed to disinfect one area and not rotate around to disinfect the whole room.
- The other 1/2 was then swabbed.
- Samples were cultured on the same day.

Bathrooms (no pre-cleaning)

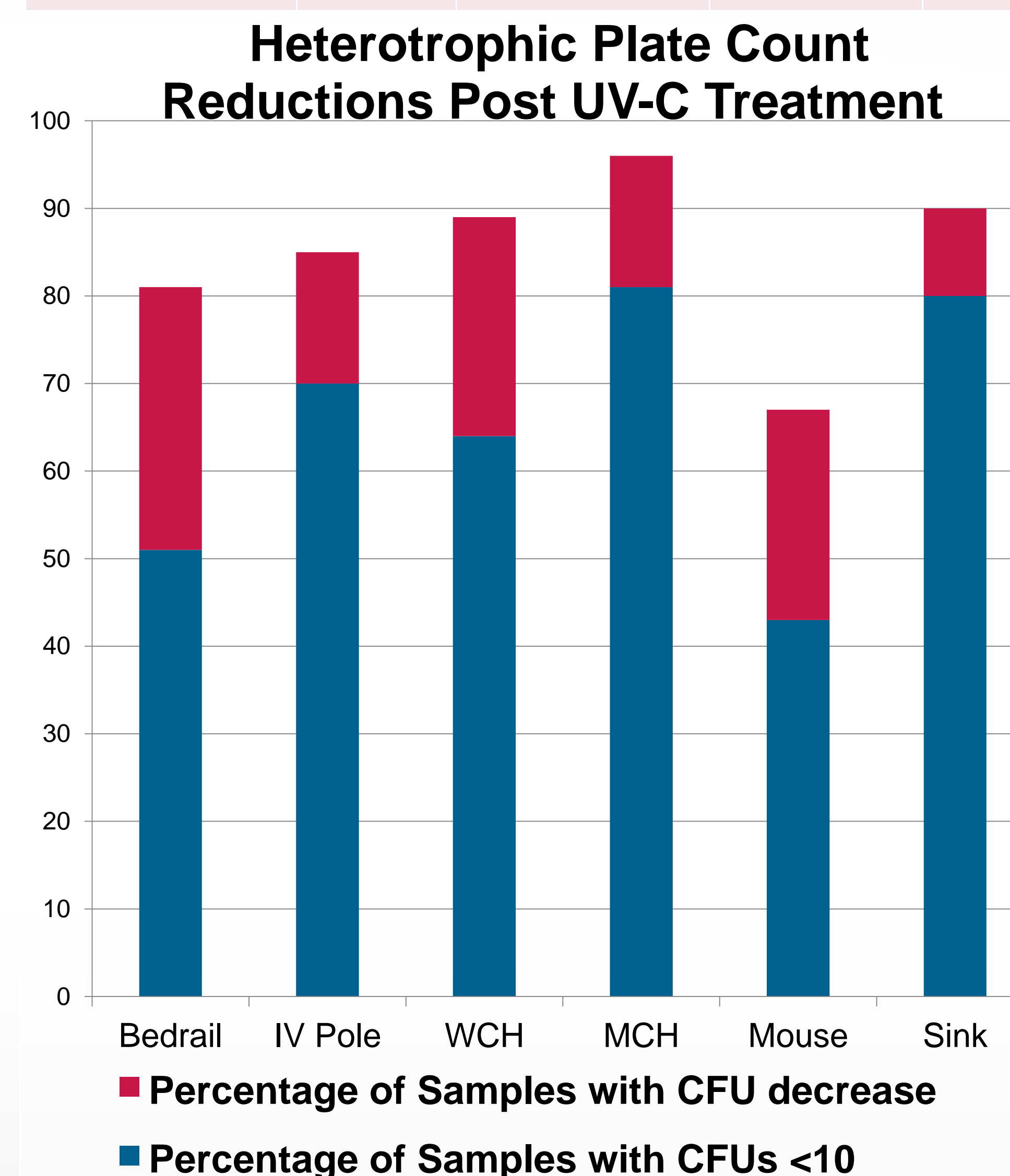
- Occupied rooms of patients with suspect/confirmed *C. difficile*, (Enteric Isolation) were selected for study.
- Bathrooms were cultured randomly during the day, while the patient was admitted.
- Swabbing procedure was done as above on the toilet seat, sink faucet or the toilet handrail, if no sink was present in bathroom.
- Bathrooms were treated with an estimated 1200mJ delivered in either a 10 or 20 minute cycle depending on bathroom size; longer duration for larger bathroom.
- Samples were cultured on the same day.

All cultures were done at an independent site, Richter International Inc. Columbus, OH.

Results

Heterotrophic Plate Counts Post UV-C Treatment In Inpatient and Operating Rooms: Post Terminal Cleaning

	Bedrail	IV Pole	Wardrobe Cabinet Drawers (WCD)	Medicine Cabinet Handles (MCH)	Mouse	Sink	All
Total surfaces sampled (N)	47	47	47	42	42	10	235
CFU Decrease	#/ %	#/ %	#/ %	#/ %	#/ %	#/ %	#/ %
<10 CFU	24 (51)	33 (70)	30 (64)	34 (81)	18 (43)	8 (80)	147(63)



Portable Computers No Pre-cleaning

	Untreated by UV-C		Treated by UV-C	
	GRAM - CFU/swab	GRAM + CFU/swab	GRAM - CFU/swab	GRAM + CFU/swab
1	440	1000	<10	30
2	<10	1020	<10	<10
3	170	330	<10	<10

Bathrooms No Pre-cleaning

Clostridium difficile CFUs			
ROOM	PRE CFUs	POST CFUs	Surface
1	<10	<10	Faucet
	<10	<10	Toilet
2	110	<10	Handrail
	3,700	30	Toilet
3	<10	<10	Faucet
	<10	<10	Toilet
4	<10	<10	Handrail
	<10	<10	Toilet
5	<10	<10	Faucet
	<10	<10	Faucet
6	<10	<10	Faucet
	30	<10	Toilet
7	<100	<10	Faucet
	280	<10	Toilet
8	<10	<10	Handrail
	<10	<10	Toilet
9	<10	<10	Faucet
	<10	<10	Toilet

Discussion

Post Terminal Cleaning UV-C treatment:

- In inpatient and ORs, 84% of surfaces had substantial CFU decreases to enhance terminal cleaning for these rooms.
- 63% of surfaces in inpatient rooms and the ORs had <10 CFUs post UV-C treatment.
- The computer mouse did disappointingly; likely due to a horizontal orientation; i.e. not hung vertically, to overcome shadows.
- Results did not vary by type of surface, as evidenced by handles of the medicine cabinet (plastic) vs. wardrobe (metal).

No pre-cleaning with UV-C treatment:

- Portable computers treated in a "scrub mode", showed almost all had <10CFUs post-treatment.
- Bathrooms had significant decreases in *C. difficile* spores to <10CFUs in 3 of the 4 cultures that were positive pre-treatment
 - Toilet seats accounted for 3 of 4 positive cultures obtained pre-cleaning.

Conclusion

- Terminally cleaned rooms continue to have evidence of microorganism bio-burden.
- Surfacide® UV-C disinfection system was effective in reducing micro-organism burden post-terminal cleaning, and led to significant declines in CFUs of frequently used hospital surfaces (ie. computers).
- This UV-C multi-emitter system is effective in substantially decreasing *C. difficile* in contaminated bathrooms even if not yet cleaned.

References

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Surfacide® Multi-Unit UV Emitters