USING ULTRAVIOLET LIGHT FOR SURFACE DISINFECTION

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THE UNIVERSITY OF BRITISH COLUMBIA

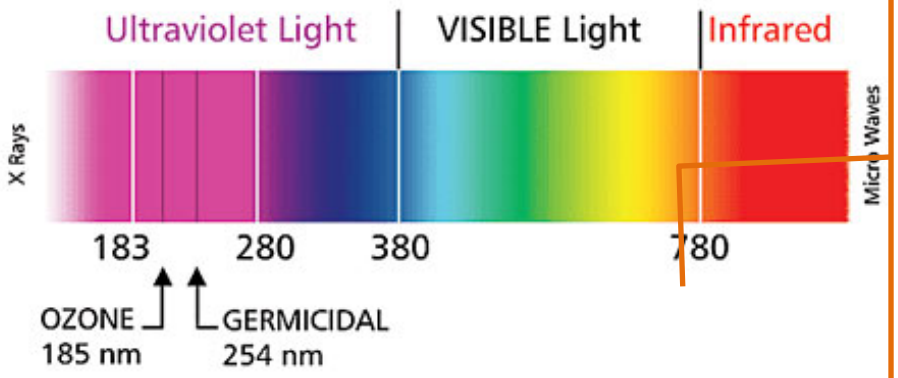

DISCLOSURE
Research Biomerieux, Teck

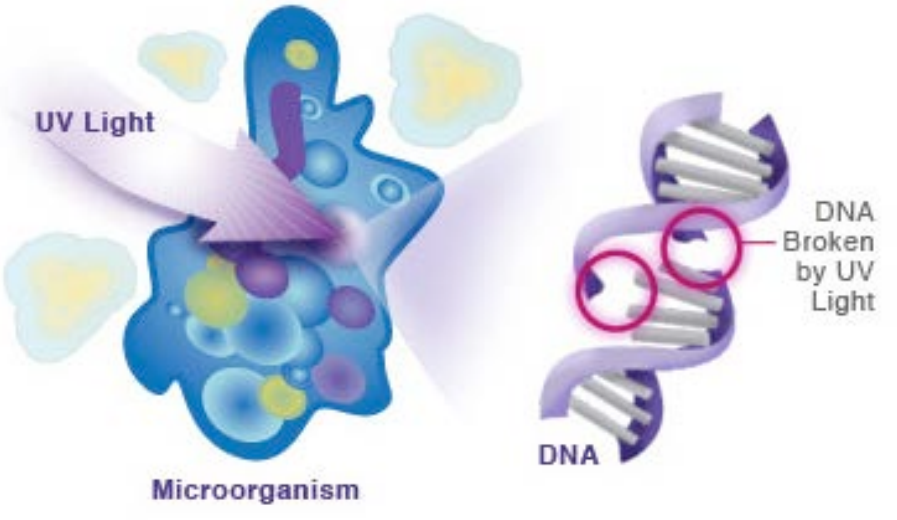
Objectives

1. Describe how UVC light works
2. Discuss UVC strategies to reduce HAIs
3. Review the evidence that support use of UVC to reduce HAIs

- Risk of an ARO increases with prior occupancy by a patient with an ARO
- Manual cleaning is imperfect
- UVC may be an effective adjunct


The Power of Light





UV Surface Disinfection

used in laboratories for years

new literature demonstrates value as an adjunct to cleaning

reduces CD spores, MRSA, VRE in hospital rooms

evaluation must include ability to integrate technology into workflow

Common Questions

IS IT SAFE?

Yes, sensors and barriers prevent accidental human exposure
UVC does not penetrate glass

DOES IT WORK?

Yes, both in laboratory and clinical setting

Types of UVC Technology Available

Continuous UCV

Low pressure mercury 254 nm
Cycle time:5 to >60 min
Machines as to how they determine the length of a cycle
One study suggests more effective than pulsed xenon
Purchase prices vary significantly

Pulsed Xenon

Pulsed light from 200 to 320 nm
Cycle time 5-7 min
As per continuous UVC

Full Disclosure!

Effect of Variation in Test Methods on Performance of Ultraviolet-C Radiation Room Decontamination

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OBJECTIVE. To determine the effect of variation in test methods on performance of an ultraviolet-C (UV-C) room decontamination device.

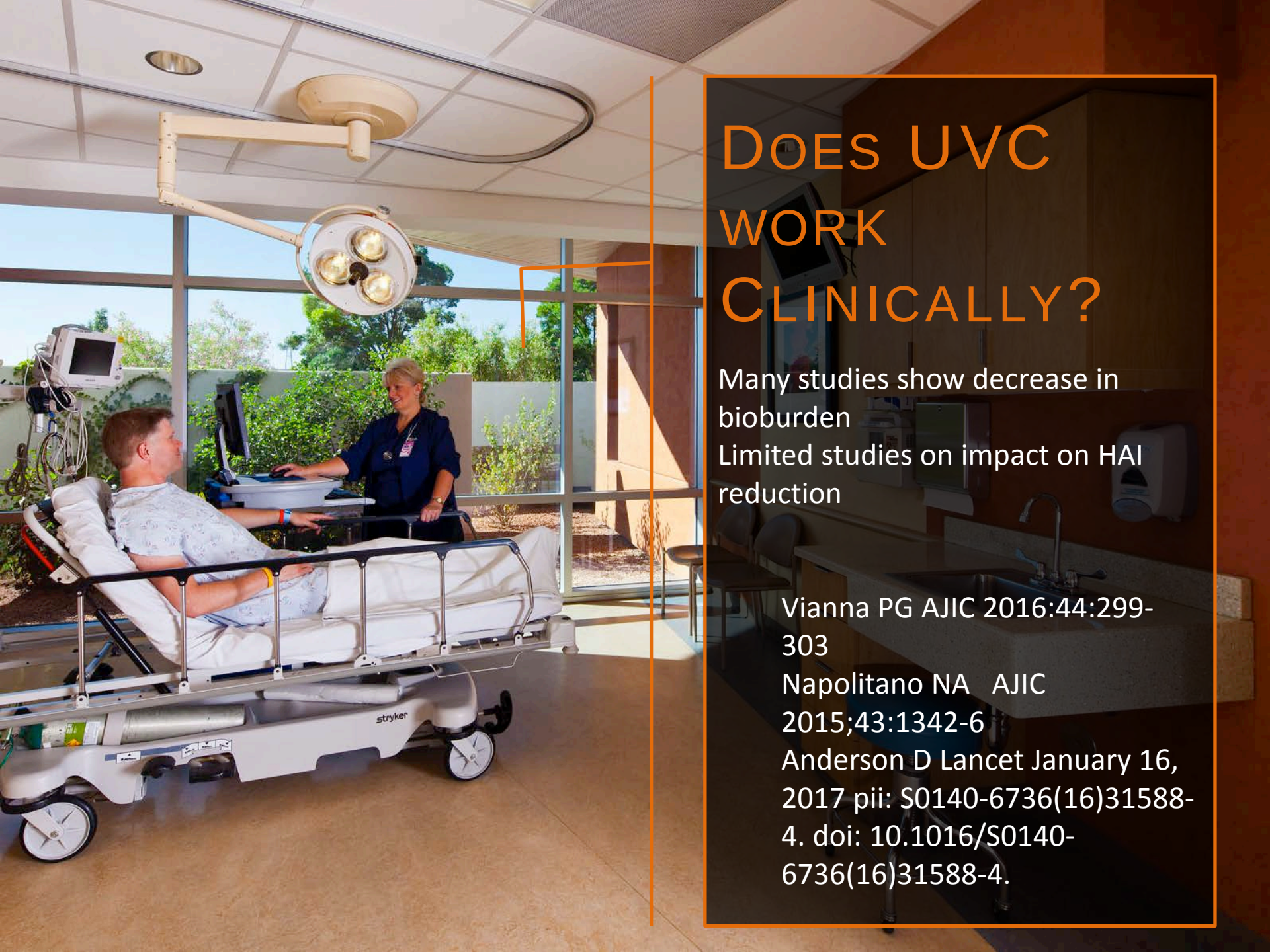
DESIGN. Laboratory evaluation.

METHODS. We compared the efficacy of 2 UV-C room decontamination devices with low pressure mercury gas bulbs. For 1 of the devices, we evaluated the effect of variation in spreading of the inoculum, carrier orientation relative to the device, type of organic load, type of carrier, height of carrier, and uninterrupted versus interrupted exposures on measured UV-C killing of methicillin-resistant *Staphylococcus aureus* and *Clostridium difficile* spores.

RESULTS. The 2 UV-C room decontamination devices achieved similar $\log_{10}$ colony-forming unit reductions in the pathogens with exposure times ranging from 5 to 40 minutes. On steel carriers, spreading of the inoculum over a larger surface area significantly enhanced killing of both pathogens, such that a 10-minute exposure on a 22-mm^2 disk resulted in greater than 2 log reduction in *C. difficile* spores. Orientation of carriers in parallel rather than perpendicular with the UV-C lamps significantly enhanced killing of both pathogens. Different types of organic load also significantly affected measured organism reductions, whereas type of carrier, variation in carrier height, and interrupted exposure cycles did not.

CONCLUSIONS. Variation in test methods can significantly impact measured reductions in pathogens by UV-C devices during experimental testing. Our findings highlight the need for standardized laboratory methods for testing the efficacy of UV-C devices and for evaluations of the efficacy of short UV-C exposure times in real-world settings.

Infect Control Hosp Epidemiol 2016;37:555–560



Does UVC work Clinically?

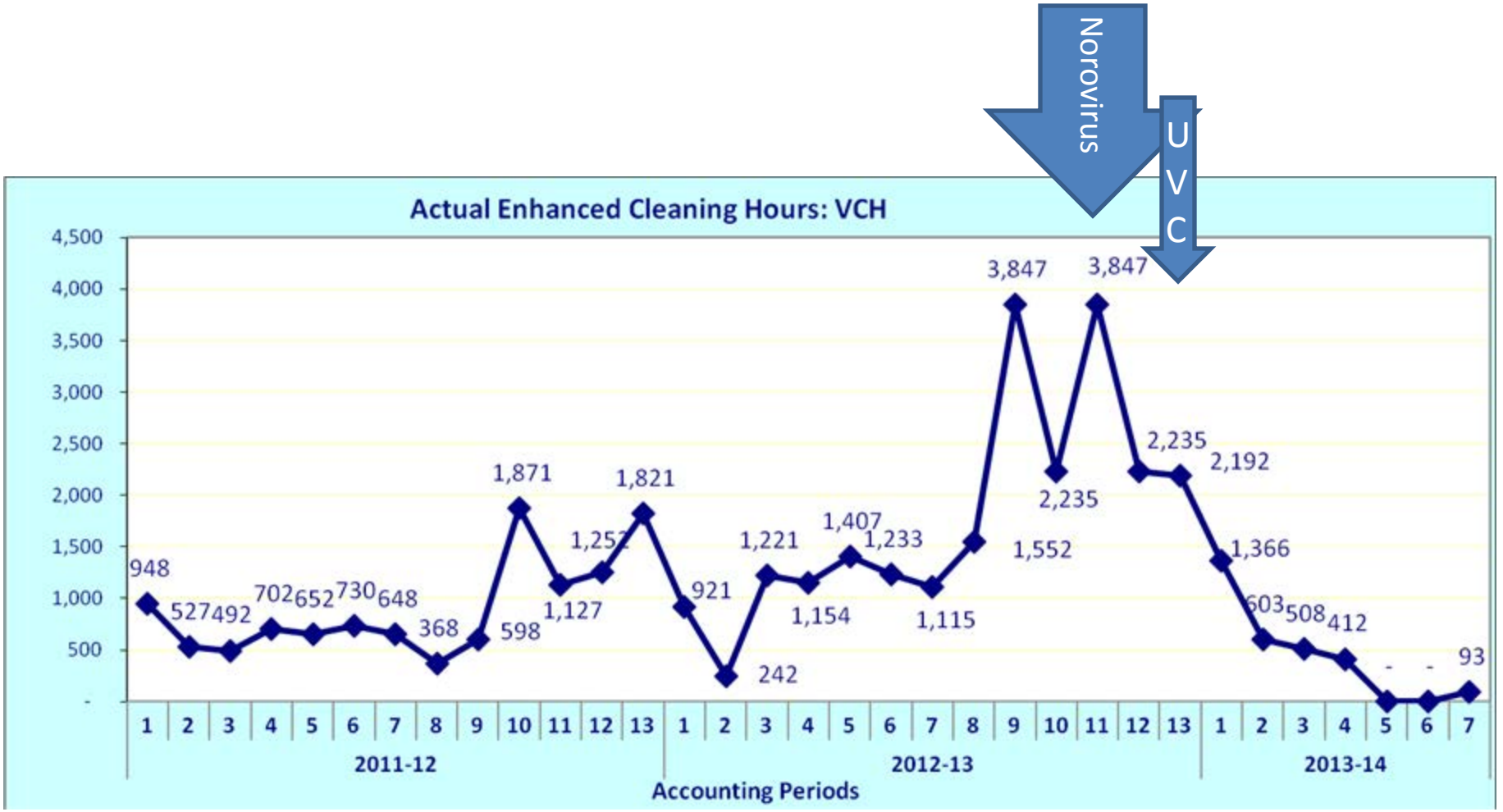
Many studies show decrease in bioburden

Limited studies on impact on HAI reduction

Vianna PG AJIC 2016:44:299-303

Napolitano NA AJIC 2015;43:1342-6

Anderson D Lancet January 16, 2017 pii: S0140-6736(16)31588-4. doi: 10.1016/S0140-6736(16)31588-4.



Please note that the decluttering and VRE risk management approach began with Wave 1 in September 2012.

Southmedic Inc. :: Portal

dev.steriliz.us/VGH/dashboard.php

Apps | New Tab | Mycology Online | Lect... | https://leadershipdev... | The Camping View , C... | The University of Britis...

Vancouver General Hospital		
10/29/2015	**Hot Spot Alert**	JPN 02, JPS 02, JPS 06, JPS 09, JPS 11, JPS 14
10/29/2015	**Device Event Alert**	RD-205: [14] Possible lamp failure, count[15]
10/28/2015	**Hot Spot Alert**	CP 06, CP 08, JPN 02, JPS 06, JPS 09, JPS 10
10/27/2015	**Hot Spot Alert**	JPS 02, JPS 07, JPS 09, JPS 10, JPS 12

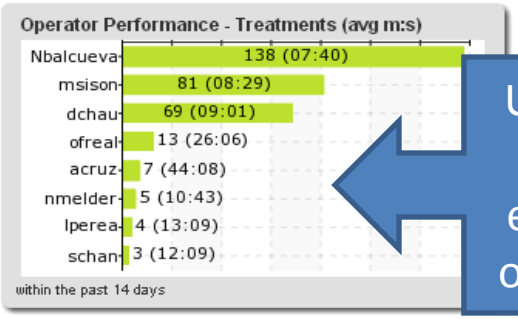
R-D Unit	Renewal	Amount	Status
Vancouver General Hospital			
203	11/12/2015	$5,000	Expires in 15 days
205	11/12/2015	$4,000	Expires in 15 days
206	11/12/2015	$4,000	Expires in 15 days

ESA provides access to this portal, your services and misc services including maintenance and support.

Recent Sync:

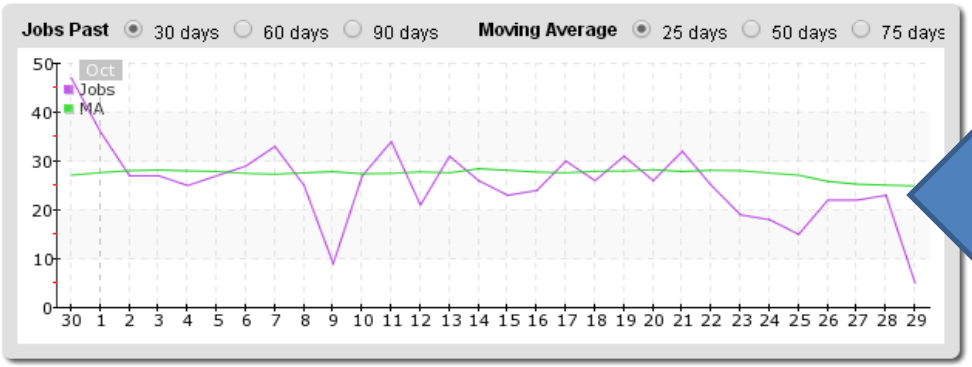
R-D Unit	Last Sync	Installed	Last Job
203	18 hrs	11/12/14	10/28/15 6:05 pm
205	2 hrs	11/12/14	10/29/15 10:17 am
206	1:28 m:s	11/12/14	10/29/15 5:44 am

Last Synchronization State	Period	Last Job State	Period
Ok	< 5 minutes		< 2 days
Slow	< 2 hours		< 1 week
Late	< 2 days		< 2 weeks
None	> 2 days		> 2 weeks
Unknown	Never synced	Unknown	



Use of a non-existent operator

Pending Work Requests		
Location	Date	Comments



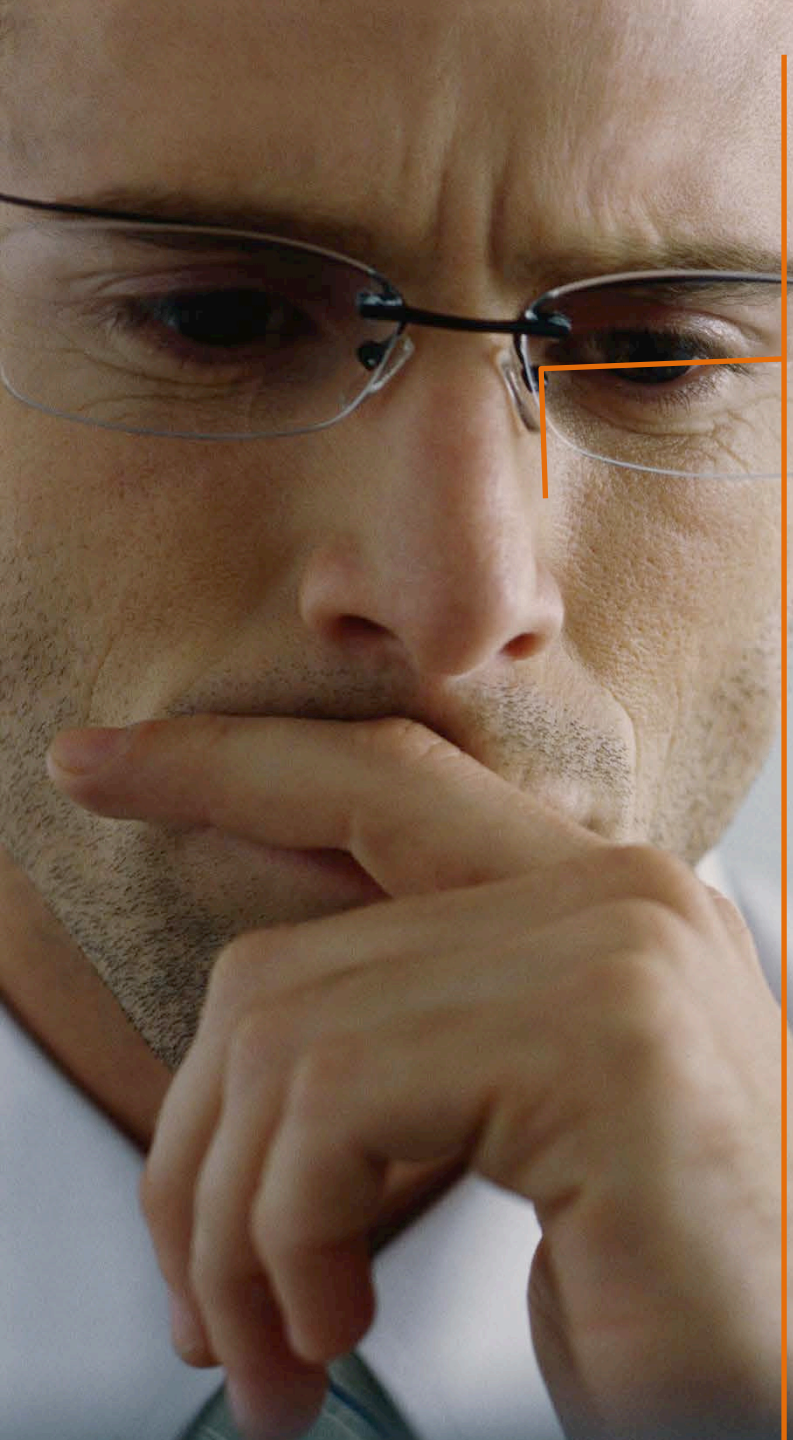
Decline in UVC use with shift to new HK team

Recent Jobs	Work Request
Location	Time
Vancouver General Hospital	
16430	10/29/15 10:17 am
16430A	10/29/15 10:10 am

Vancouver General Hospital			Job Report: 10/26/2015 to 10/31/2015					
Device	**Job ID**	**Create Time**	**Operator**	**Location**	**Dose**	**Sensor Readings**	**Elapsed Time**	**Final Status**
RD2 206	927	2015-10-28 19:01:09	dchau	2407	Spore (46000)	(2061) 150375 (2062) 46020 (2063) 142653 (2064) 149173	10m 14s	Completed
RD2 206	926	2015-10-28 18:23:20	dchau	2407	Spore (46000)	(2061) 97500 (2062) 46018 (2063) 71269 (2064) 94048	6m 42s	Completed
RD2 206	925	2015-10-28 12:44:15	dchau	2407	Spore (46000)	(2062) 46468 (2064) 46019	3m 20s	Completed
RD2 206	920	2015-10-28 01:56:15	acruz	2407	Spore (46000)	(2061) 50287 (2062) 46076 (2063) 57127 (2064) 54411	4m 0s	Completed
Records	4							

The advantages of software for process monitoring

And now of course, there's Angus to help!



Purchase Considerations

Canadian facilities work at 100% capacity. No ability to extend “down time” for rooms

Most UVC machines are microbiologically effective

Functionality, integration into workflow , operator considerations become the primary determinants for purchase
Cycle time may become paramount

Consider how your facilities operates when selecting UVC machines

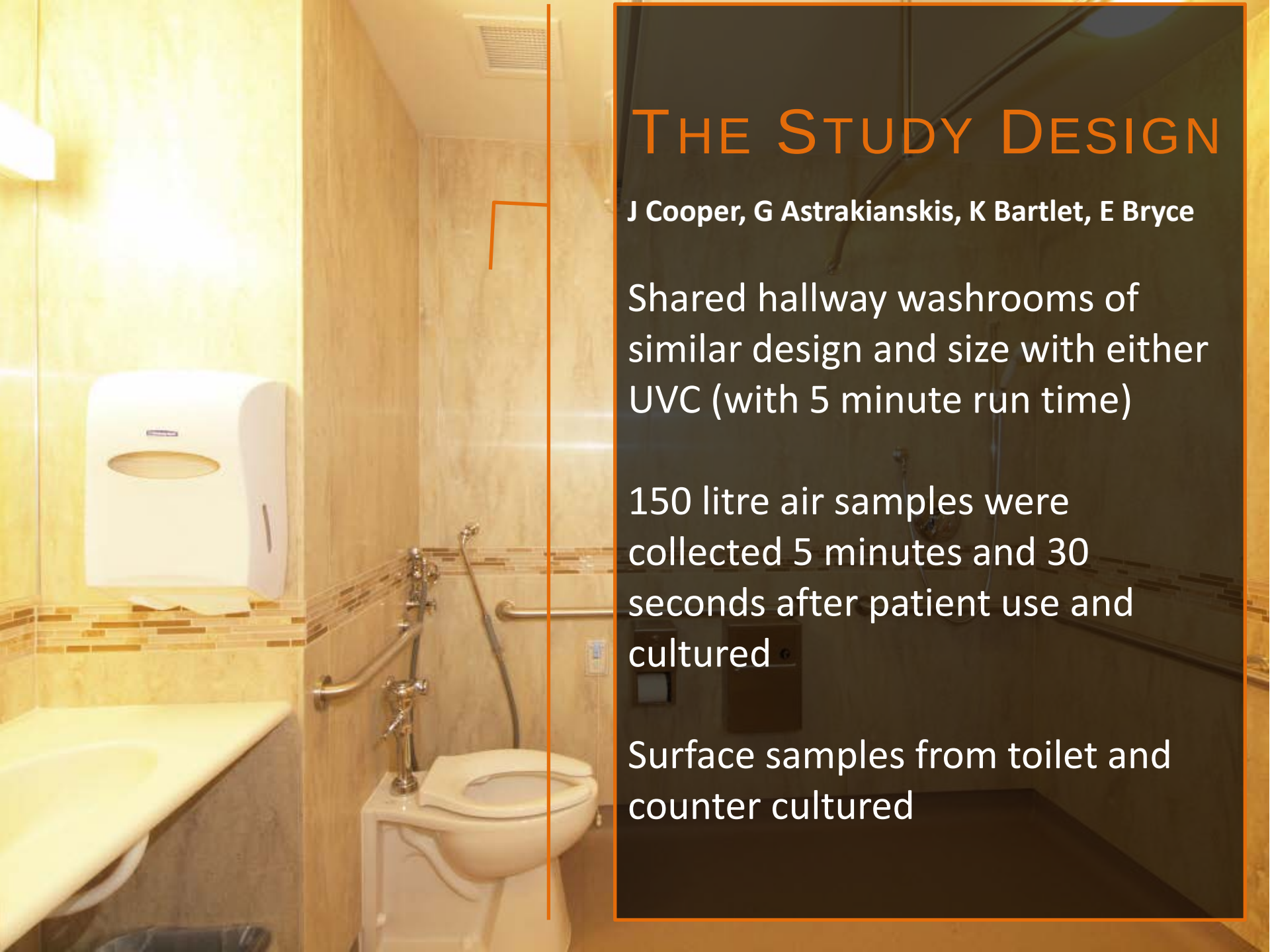
Permanent UVC Installation in Bathrooms

J Cooper, G Astrakianskis, K Bartlet, E Bryce

The Problem: Common shared hallway bathrooms with limited sink access

The background: Toilets generate aerosols of bacteria and viruses that follow air currents for long distances or land on surfaces.

The question: Is permanently installed UVC light effective in decreasing microorganisms in the air and on surfaces



The Study Design

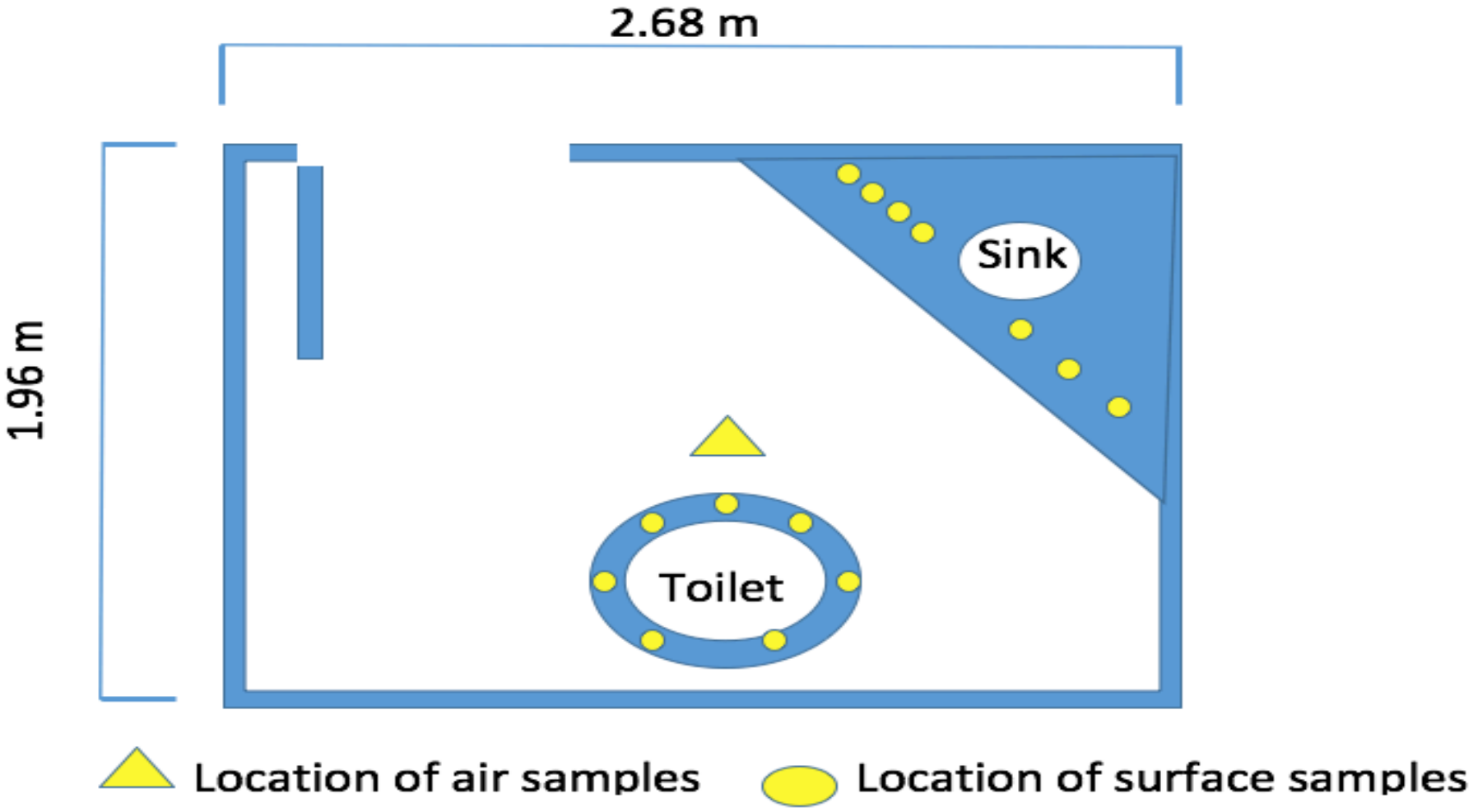
J Cooper, G Astrakianskis, K Bartlet, E Bryce

Shared hallway washrooms of similar design and size with either UVC (with 5 minute run time)

150 litre air samples were collected 5 minutes and 30 seconds after patient use and cultured

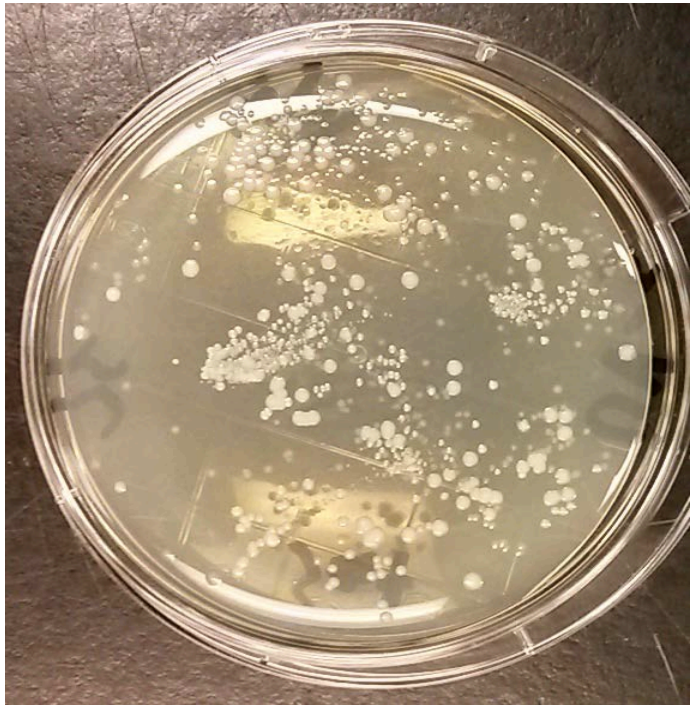
Surface samples from toilet and counter cultured

Washroom Layout and Sampling Locations

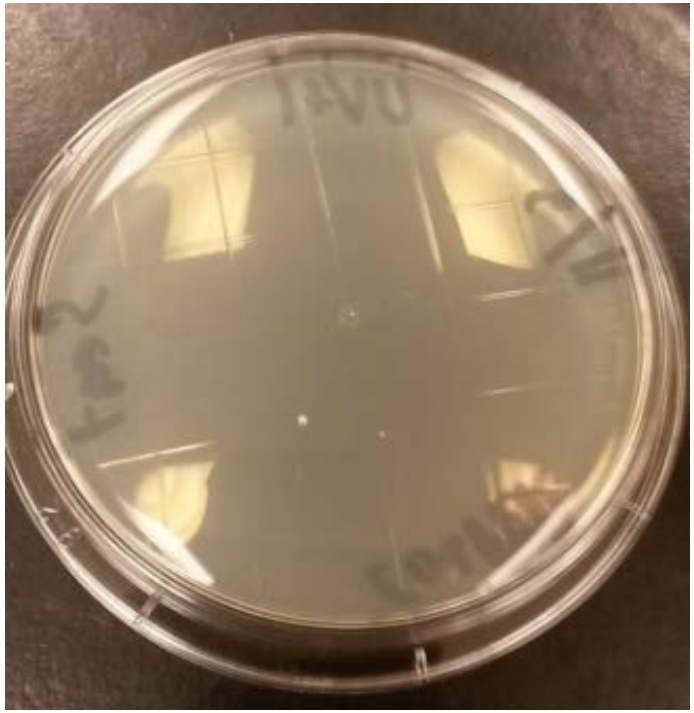


Sample	Geometric Mean Concentration	Geometric Standard Deviation	% Reduction in Mean Concentration
Seat Bacteria[1] UV+ve	7.7	5.5	97*
Seat Bacteria[1] UV-ve	224	7.5	
Counter Bacteria[1] UV+ve	1.6	2.2	95*
Counter Bacteria[1] UV-ve	31	3.1	
Anaerobic Bioaerosol[2] UV+ve	45	2.4	47.7**
Anaerobic Bioaerosol[2] UV-ve	86	2.8	
Aerobic Bioaerosol[2] UV+ve	153.2	1.7	35.2**
Aerobic Bioaerosol[2] UV-ve	236.5	1.4	

Counter Contact Plate
UV-ve



Counter Contact Plate
UV+ve



Study Conclusions

J Cooper, G Astrakianskis, K Bartlet, E Bryce

Automated, permanent UVC lights can decrease exposure to potential pathogens

Again, careful consideration of where these devices are placed – AND WHY – is required.

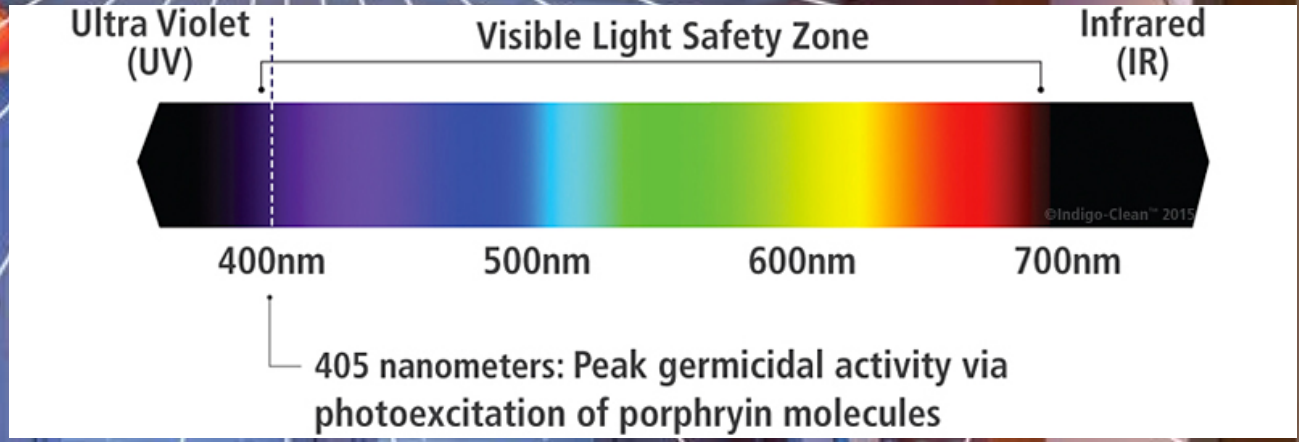
UVC for Mobile Equipment

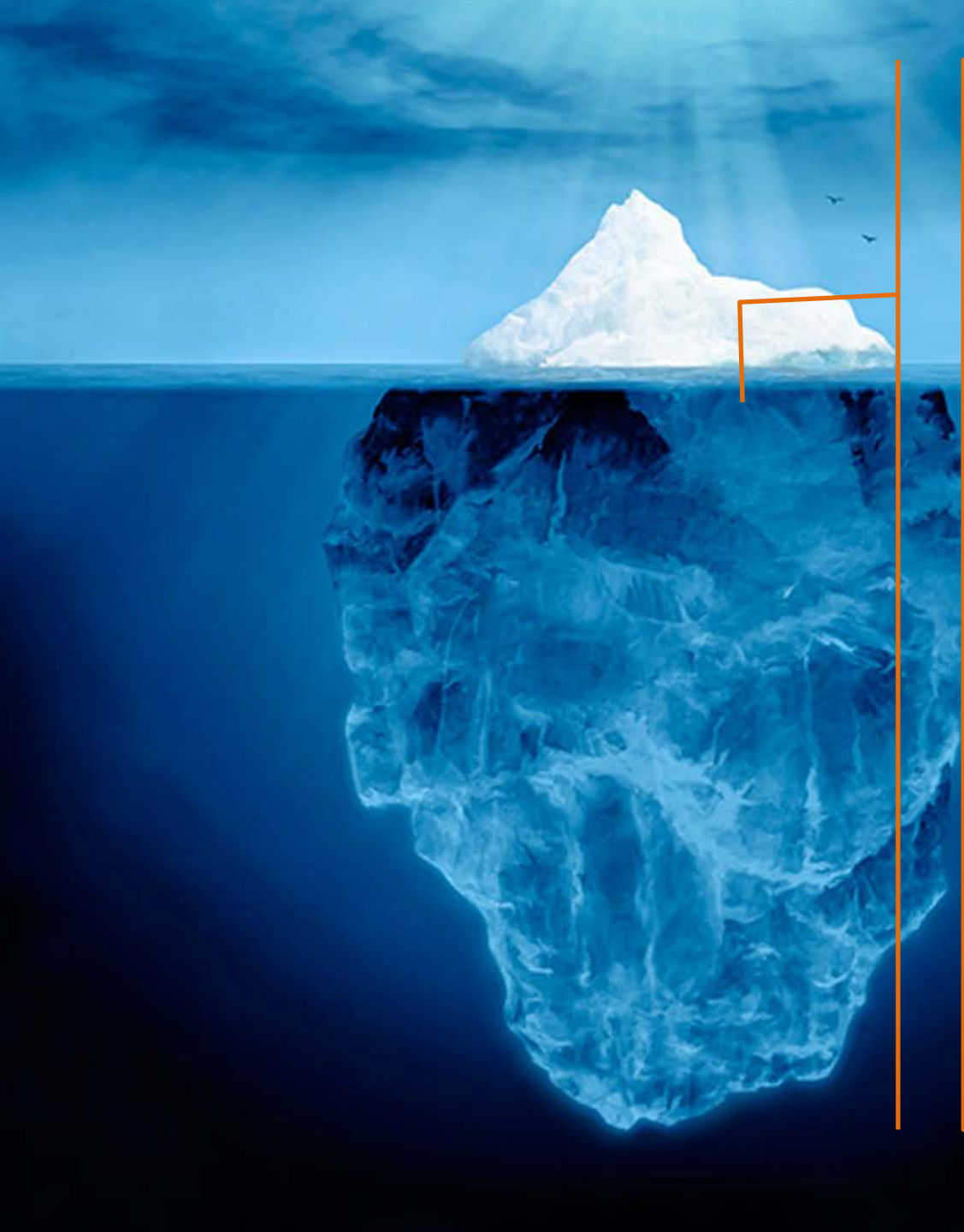
Li, Wong, Rose, Wickham, Bryce Am J Infect Control 2016

hand-held equipment can be fomites for microbe transmission

Aluvis machine is effective at disinfecting hand-held devices, but requires some human factors optimization

Ambient LED and White Light





Conclusion

We are entering into an exciting new world of technology

Need to balance cost with efficacy

And consider human factors into the equation

Thank You

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