Environmental Contamination: We Control the Future

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DISCLOSURES

2022

- **Consultations**
  - PDI (Professional Disposables International)
- **Honoraria**
  - PDI
- **Other**
  - Kinnos, Ideate Medical

Objectives

- Role of environment in disease transmission
- Why we need continuous room decontamination
- Discuss continuous room decontamination technologies
- Evaluate a continuously active disinfectant

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Environmental Contamination Leads to HAIs

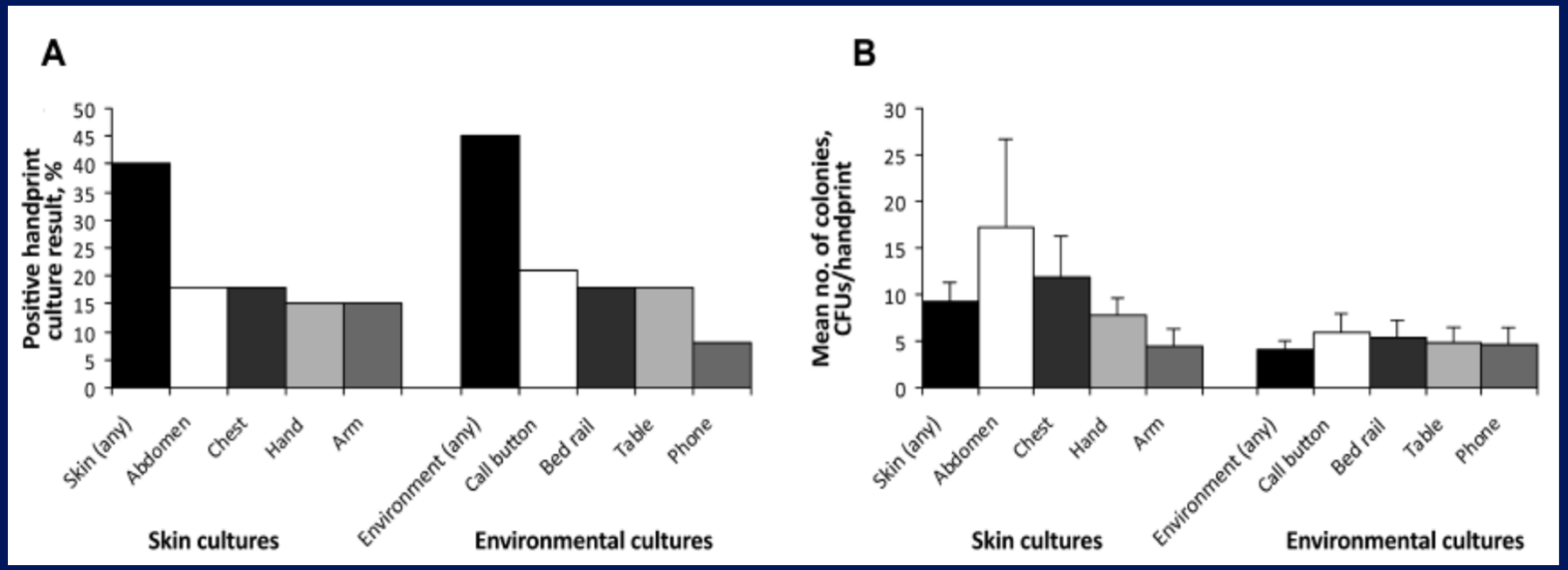
Weber, Kanamori, Rutala. Curr Op Infect Dis .2016.

Evidence environment contributes

- Role-MRSA, VRE, *C. difficile*
- Surfaces are contaminated-~25%
- EIP survive days, weeks, months
- Contact with surfaces results in hand contamination; contaminated hands transmit EIP to patients
- Disinfection reduces contamination
- Disinfection (daily) reduces HAIs

FREQUENCY OF ACQUISITION OF MRSA ON GLOVED HANDS AFTER CONTACT WITH SKIN AND ENVIRONMENTAL SITES

No significant difference on contamination rates of gloved hands after contact with skin or environmental surfaces (40% vs 45%; p=0.59)



Stiefel U, et al. ICHE 2011;32:185-187

Acquisition of EIP on Hands of Healthcare Providers after Contact with Contaminated Environmental Sites and Transfer to Other Patients

Acquisition of EIP on Hands of Patient after Contact with Contaminated Environmental Sites and Transfers EIP to Eyes/Nose/Mouth

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Weber, Kanamori, Rutala. Curr Op Infect Dis .2016.

Evidence environment contributes

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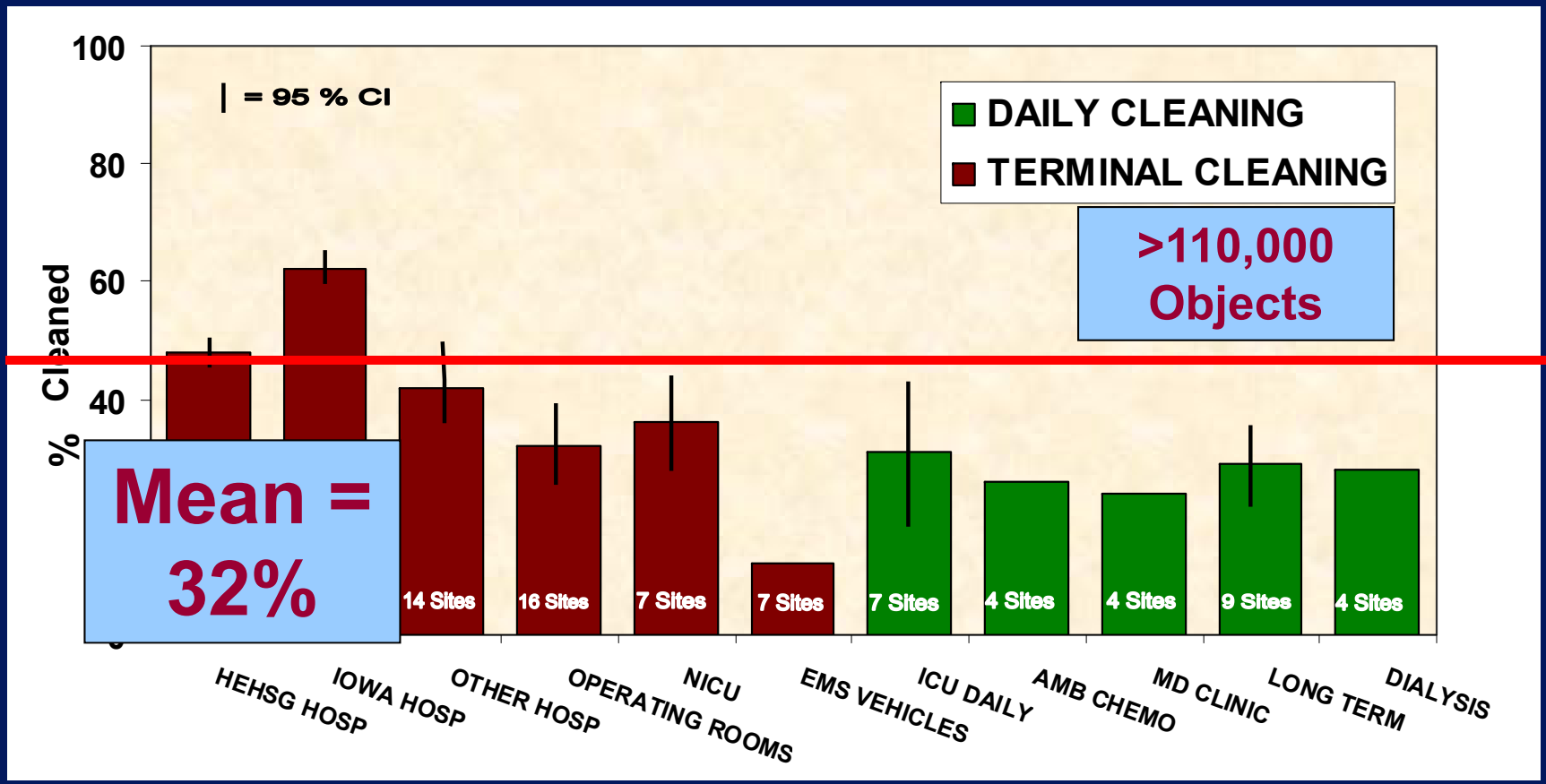
- Surfaces are contaminated-~25%
- EIP survive days, weeks, months
- Contact with surfaces results in hand contamination; contaminated hands transmit EIP to patients
- Disinfection reduces contamination
- Disinfection (daily) reduces HAIs
- Rooms not adequately cleaned

Clean/Disinfect at Least Daily (surfaces not wiped thoroughly)

Thoroughness of Environmental Cleaning

P Carling. AJIC;2013:41:S20-S25



Admission to Room Previously Occupied by Patient C/I with Epidemiologically Important Pathogen

- Results in the newly admitted patient having an increased risk of acquiring that pathogen by 39-353%
- For example, increased risk for *C. difficile* is 235% (11.0% vs 4.6%; Shaughnessy et al. ICHE 2011;32:201)
- Exposure to contaminated rooms confers a 5-6 fold increase in odds of infection, hospitals must adopt proven methods for reducing environmental contamination (Cohen et al. ICHE. 2018;39:541-546)

Surfaces should be hygienically clean (not sterile)-free of pathogens in sufficient numbers to prevent human disease

Environmental Contamination Leads to HAIs

- By contaminating hands/gloves via contact with the environment and transfer to patient or patient self inoculation
- Surfaces should be hygienically clean (not sterile)-free of pathogens in sufficient numbers to prevent human disease
- Two environmental surface concerns
  - Discharge/terminal-prevent infection to new patient in room
  - Daily room decontamination

Key Pathogens Where Environmental Surfaces May Play a Role in Transmission

- MRSA
- VRE
- *Acinetobacter* spp.
- *Clostridium difficile*
- Norovirus
- Rotavirus
- SARS

Best Practices in Disinfection of Noncritical Surfaces in the Healthcare Setting: A Bundle Approach

NL Havill AJIC 2013;41:S26-30; Rutala, Weber. AJIC 2019;47:A96-A105

A Bundle Approach to Surface Disinfection

- Develop policies and procedures
- Select cleaning and disinfecting products
- Educate staff-environmental services and nursing
- Monitor compliance (thoroughness of cleaning, product use) and feedback
- Implement "no touch" room decontamination technology and monitor compliance (and new strategies)

Effective Surface Decontamination Reduces Microbial Contamination (all touchable surfaces not just high-touch)

Product and Practice = Perfection

LOW-LEVEL DISINFECTION FOR NONCRITICAL EQUIPMENT AND SURFACES

Rutala, Weber. Infect Control Hosp Epidemiol. 2014;35:855-865; Rutala, Weber. AJIC 2019;47:A3-A9

Exposure time ≥ 1 min

Germicide	Use Concentration
Ethyl or isopropyl alcohol	70-90%
Chlorine	100ppm (1:500 dilution)
Phenolic	UD
Iodophor	UD
Quaternary ammonium (QUAT)	UD
QUAT with alcohol	RTU
Improved hydrogen peroxide (HP)	0.5%, 1.4%
PA with HP, 4% HP, chlorine (*C. difficile* spores)	UD

UD=Manufacturer's recommended use dilution; others in development/testing-electrolyzed water; polymeric guanidine; cold-air atmospheric pressure plasma (Boyce Antimicrob Res IC 2016. 5:10)

Clean/Disinfect at Least Daily (surfaces should be wiped thoroughly)

These interventions (effective surface disinfection, thoroughness indicators) not enough to achieve consistent and high rates of cleaning/disinfection

No Touch

(supplements but do not replace surface cleaning/disinfection)

Enhanced Disinfection Leading to Reduction of Microbial Contamination and a Decrease in Patient Col/Infection

Anderson et al. Lancet 2017;289:805; Rutala et al. ICHE 2018;39:1118

	Standard Method		Enhanced method	
	Quat	Quat/UV	Bleach	Bleach/UV
EIP (mean CFU per room)[a]	60.8	3.4	11.7	6.3
Reduction (%)		94	81	90
Colonization/Infection (rate)[a]	2.3	1.5	1.9	2.2
Reduction (%)		35	17	4

All enhanced disinfection technologies were significantly superior to Quat alone in reducing EIPs. Comparing the best strategy with the worst strategy (i.e., Quat vs Quat/UV) revealed that a reduction of 94% in EIP (60.8 vs 3.4) led to a 35% decrease in colonization/infection (2.3% vs 1.5%). Our data demonstrated that a decrease in room contamination was associated with a decrease in patient colonization/infection. First study which quantitatively described the entire pathway whereby improved disinfection decreases microbial contamination which in-turn reduced patient colonization/infection.

Clinical Trials of "No Touch" Methods for Terminal Disinfection

Year, author	Device/system	Study design	Setting	Selected results[a]
2016, Vianna *et al.* [44]	UV-PX	Before–after	Community hospital	Facility wide: ↓*C. difficile*, ↓all MDROs (MRSA, VRE, CDI)
2015, Horn and Otter [45]	HP vapor	Before–after	Hospital	↓CDI, ↓VRE, ↓ESBL GNB
2015, Anderson *et al.* [46]	UV-C	RCT	9 hospitals	↓All MDROs (MRSA, VRE, CDI)
2015, Pegues *et al.* [47]	UV-C	Before–after	Academic center	↓CDI
2015, Nagaraja *et al.* [48]	UV-PX	Before–after	Academic center	↓CDI
2015, Miller *et al.* [49]	UV-PX	Before–after	Nursing home	↓CDI
2014, Mitchell *et al.* [50]	Dry HP vapor	Before–after	Hospital	↓MRSA colonization and infection
2014, Haas *et al.* [51]	UV-PX	Before–after	Academic center	↓CDI, ↓MRSA, ↓VRE, ↓MDRO GNB, all MDROs
2013, Manian *et al.* [52]	HP vapor	Before–after	Community hospital	↓CDI
2013, Passaretti *et al.* [53]	HP vapor	Prospective cohort	Academic center	↓VRE, ↓all MDROs (MRSA, VRE, CDI)
2013, Levin *et al.* [54]	UV-PX	Before–after	Community hospital	↓CDI, ↓MRSA,
2011, Cooper *et al.* [55]	HP vapor	Before–after (2 cycles)	Hospitals	↓CDI (cases; incidence not significant)
2008, Boyce *et al.* [56]	HP vapor	Before–after	Community hospital	↓CDI

CDI, *Clostridium difficile* infection; ESBL, extended spectrum beta-lactamase producers; GNB, Gram negative bacteria; HP, hydrogen peroxide; MDRO, multidrug-resistant organism; MRSA, methicillin-resistant *Staphylococcus aureus*; UV-C, ultraviolet light – C; UV-PX, ultraviolet light – pulsed xenon; VRE, vancomycin-resistant *Enterococcus*.

[a]All listed results were statistically significant (see reference for more details).

Weber DJ, Rutala WA, et al. Curr Opin Infect 2016;29:424-431

This technology (“no touch”-e.g., UV/HP) should be used (capital equipment budget) for terminal room disinfection (e.g., after discharge of patients on Contact Precautions).

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- Two environmental surface concerns
  - Discharge/terminal-new patient in room
  - Daily room decontamination (referred to “trash and dash”) suboptimal and recontamination

Recontamination Rate with MRSA After Terminal Disinfection with HP System

Hardy et al. J Hosp Infect 2007;66:360-368

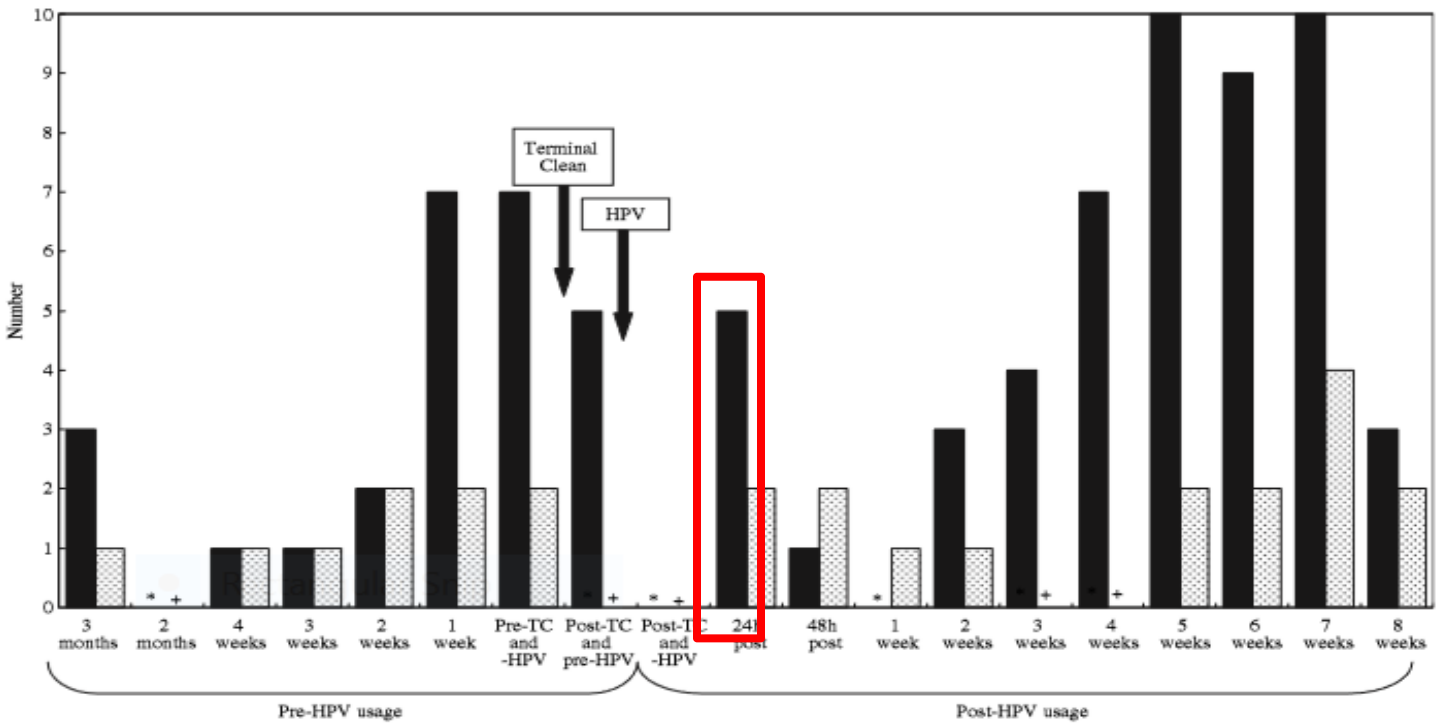


Figure 1 Number of environmental sites (■) contaminated with MRSA, and number of patients (□) colonized with MRSA on intensive care units on each screen. *MRSA environmental samples all negative; ⁻no patients colonized with MRSA. HPV, hydrogen peroxide vapour; TC, terminal clean.

Microbial Assessment of Recontamination with MDR *Acinetobacter* in Patient Room Environment in Burn Units

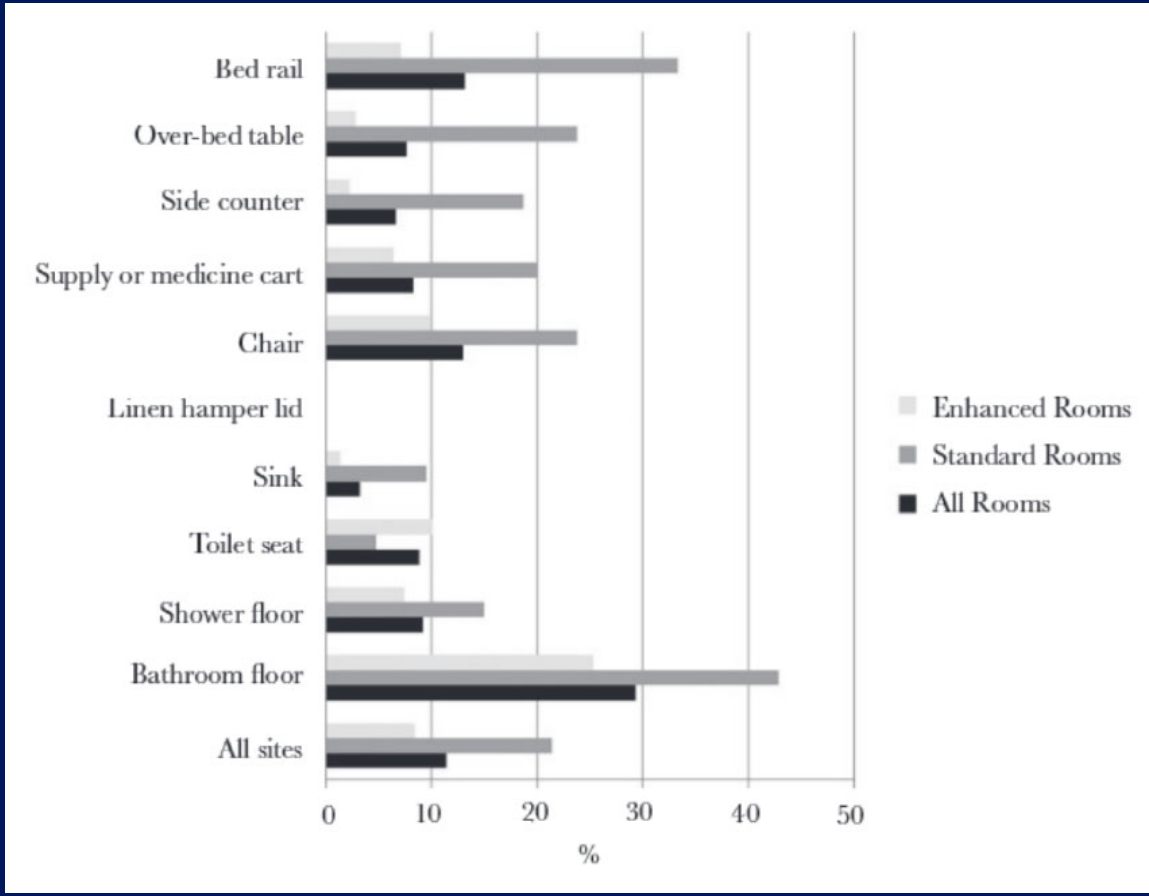
Rutala et al. AJIC. 2020; 48 Suppl;S20

- Purpose: assess how much environmental sites (e.g., chair, bedrail, overbed table, stock cabinet, IV pump, etc.) become recontaminated with *Acinetobacter* over time after cleaning/disinfection.
- Results:
- At baseline all environmental sites sampled except overbed table were contaminated with *Acinetobacter*.
- No *Acinetobacter* were detected except bed rail just after cleaning/disinfection.
- First time to recontamination with *Acinetobacter* was 3 hours at chair, 2 hours at overbed table, 3 hours at stock cabinet, and 2 hours at IV pump. No recontamination was observed at the monitor.
- The level of *Acinetobacter* contamination on surfaces was occasionally high (e.g., when a stock cabinet was sampled at 5 hours, 75 of 96 CFU were *Acinetobacter*).
- The amount of recontamination with aerobes and *Acinetobacter* on some surfaces tended to increase over time.

Frequency of Environmental Sites Positive for EIP after Terminal Room Disinfection

Kanamori H, Rutala WA et al. OPID. 2021 DOI: 10.1093/ofid/ofab008

Overall, the frequency of all environmental sites positive for EIP was 21% in all rooms.



Microbial Bioburden of Inpatient Area Beyond Patient Hospital Rooms

Cadnum et al. ICHE 2021 doi:10.1017/ice.2021.309

In hospitals (outside patient rooms-ED, clinics, Radiology, waiting), 9.1% of surfaces were positive for 1 or more bacterial pathogens and 4% positive for *Candida* spp.

Table 1. Environmental Contamination in 4 Hospitals in Areas Outside Patient Rooms

Organism	Hospital 1 (N=327)	Hospital 2 (N=291)	Hospital 3 (N=300)	Hospital 4 (N=277)	Total Hospitals (N=1,195)
Any MRSA, VRE, *C. difficile*, GNB[a]	36 (11.0)	16 (5.5)	15 (5.0)	42 (15.2)	109 (9.1)
MRSA	15 (4.6)	1 (0.3)	4 (1.3)	10 (3.6)	30 (2.5)
VRE	10 (3.1)	2 (0.7)	2 (0.7)	3 (1.1)	17 (1.4)
C. difficile	5 (1.5)	8 (2.7)	5 (1.7)	5 (1.8)	23 (1.9)
GNB[a]	10 (3.1)	9 (3.1)	5 (1.7)	29 (10.5)	53 (4.4)
Candida spp	17 (5.2)	13 (5.9)	10 (3.3)	8 (2.9)	48 (4.0)
Marker removal, no. removed/no. placed (%)	82/285 (28.4)	87/274 (31.8)	N/A	92/232 (39.7)	261/791 (33.0)

Note. GNB, gram-negative bacilli; MRSA, methicillin-resistant *Staphylococcus aureus*; *C. difficile*, *Clostridioides difficile*; VRE, vancomycin-resistant enterococci.
[a]GNB included Enterobacteriaceae, *Pseudomonas aeruginosa*, *Acinetobacter baumannii*, and *Stenotrophomonas maltophilia*.

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In outpatient facilities, 6.2% of sites were positive for 1 or more bacterial pathogens

Table 3. Environmental Contamination in Outpatient Clinics

Organism	Clinic 1 (N=104)	Clinic 2 (N= 66)	Clinic 3 (N=55)	Clinic 4 (N=55)	Surgery Center (N=205)	Total Samples (N=485)
Any MRSA, VRE, *C. difficile*, GNB	16 (15.4)	4 (6.1)	5 (9.1)	1 (1.9)	4 (2.0)	30 (6.2)
MRSA	3 (2.9)	0 (0)	0 (0)	0 (0)	1 (0.5)	4 (0.8)
VRE	5 (4.8)	0 (0)	1 (1.9)	0 (0)	0 (0)	6 (1.2)
C. difficile	5 (4.8)	0 (0)	2 (3.6)	1 (1.9)	1 (0.5)	9 (1.9)
GNB[a]	3 (2.9)	4 (6.1)	2 (3.6)	0 (0)	2 (1.0)	11 (2.3)
Candida spp	22 (21.2)	5 (7.6)	4 (7.3)	6 (10.9)	8 (3.9)	45 (9.3)
Marker removal (%), no. removed/no. placed (%)	4/54 (7.4)	35/98 (35.7)	21/61 (34.4)	28/44 (63.6)	82/99 (82.8)	170/367 (46.3)

Note. GNB, gram-negative bacilli; MRSA, methicillin-resistant *Staphylococcus aureus*; *C. difficile*, *Clostridioides difficile*; VRE, vancomycin-resistant enterococci.
[a]GNB included Enterobacteriaceae, *Pseudomonas aeruginosa*, *Acinetobacter baumanii*, and *Stenotrophomonas maltophilia*.

Increasing Bioburden Associated with Increasing HAIs and Decreasing Bioburden Associated with Deceased HAIs

Table 1. Epidemiologically-important pathogens (EIP) by intervention and contamination in 92 patient rooms during the benefits of enhanced terminal room disinfection study.

Room type	Pathogen	Mean CFU/125 cm² (5 Rodacs) per room by treatment type				P-value		
		Quat (N=21 rooms)	Quat/UV (N=28 rooms)	Bleach (N=23 rooms)	Bleach/UV (N=20 rooms)	Quat vs Quat/UV	Quat vs Bleach	Quat vs Bleach/UV
Patient room only	MDR-*Acinetobacter*	8.76	0.18	0.39	0.25			
	C. difficile	0	0.07	0.04	0			
	MRSA	2.33	0.11	2.13	0.05			
	VRE	8.62	0.07	0.78	0.35			
	EIP[a]	19.71	0.43	3.35	0.65	0.013		
Bathroom only	MDR-*Acinetobacter*	0.19	0	0	0	0.018	0.032	0.045
	C. difficile	3.76	2.79	4.43	3.25			
	MRSA	6.19	0	2.26	0.80	0.044		
	VRE	30.95	0.14	1.65	1.55			
	EIP[a]	41.10	2.93	8.35	5.60	0.015		
Patient/Bathroom[b]	MDR-*Acinetobacter*	8.95	0.18	0.39	0.25	0.017	0.035	
	C. difficile	3.76	2.86	4.48	3.25			
	MRSA	8.52	0.11	4.39	0.85	0.032		
	VRE	39.57	0.21	2.43	1.90	0.034		
	EIP[a]	60.81	3.36	11.70	6.25	0.001		

Table 2. Relationship between microbial reduction of epidemiologically-important pathogens (EIP) and colonization/infection in a patient subsequently admitted to a room of a patient colonized/infected with an EIP by decontamination method.

	Standard Method	Enhanced method		
	Quat	Quat/UV	Bleach	Bleach/UV
EIP (mean CFU per room)[a]	60.8	3.4	11.7	6.3
Reduction (%)		94	81	90
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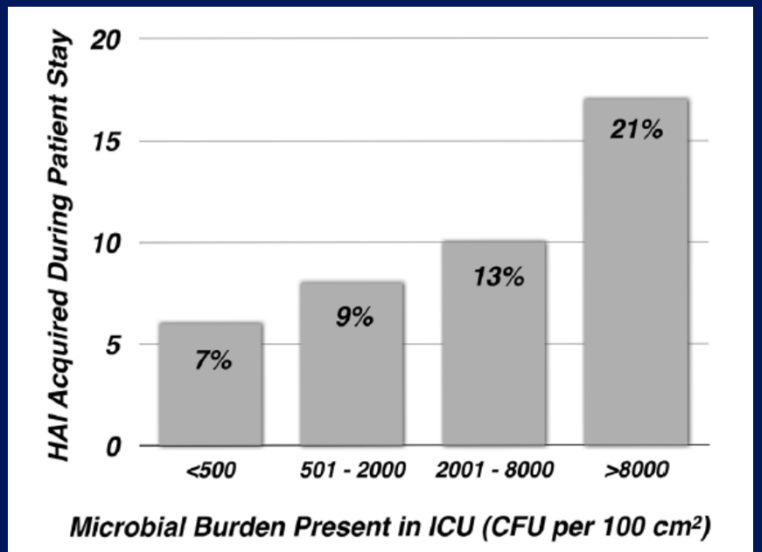

FIGURE 2. Quartile distribution of healthcare-acquired infections (HAIs) stratified by microbial burden measured in the intensive care unit (ICU) room during the patient's stay. There was a significant association between burden and HAI risk ($P = .038$), with 89% of HAIs occurring among patients cared for in a room with a burden of more than 500 colony-forming units (CFUs)/100 cm².

Rutala WA et al. ICHE 2018;39:1118-1121

Salgado CD, et al. ICHE 2013;34:479-86

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- Discuss continuous room decontamination technologies
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Rationale for Continuous Room Decontamination Methods

- Key issues in daily room disinfection and rationale for improving daily room disinfection
  - Environmental contamination leads to HAIs
  - Suboptimal disinfection
  - Rapid recontamination of surface occurs after disinfection
  - EIP are present on environmental surfaces (via prevalence survey, after terminal disinfection)
  - All touchable surfaces are equally contaminated
  - Increased surface bioburden is associated with an increased rate of HAIs and decreasing the bioburden (terminal disinfection) reduces HAIs
- Need to evaluate continuous room disinfection

Continuous Room Decontamination Technologies for Disinfection of the Healthcare Environment

Weber, Rutala et al. AJIC. 2019;47:A72; Rutala et al. ICHE 2019; Weber D, Rutala W. AJIC 2013;41:S31

- Visible light disinfection through LEDs
- Dry/dilute hydrogen peroxide; hydroxyl radicals, free reactive oxygen
- Self-disinfecting surfaces (e.g., heavy metals-copper, silver)
- Far UV 222 nm
- Bipolar ionization
- Multijet cold air plasma
- Continuously active disinfectant (CAD) or persistent disinfectant that provides continuous disinfection action
  - Allows continued disinfection and may eliminate the problem of recontamination
  - Patients, staff and visitors can remain in the room

Surfaces should be hygienically clean (not sterile)-free of pathogens in sufficient numbers to prevent human disease

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Antimicrobial Activity of a Continuous Visible Light Disinfection System

- Visible Light Disinfection uses the blue-violet range of visible light in the 400-450nm region generated through light-emitting diodes (LEDs)
- Initiates a photoreaction with endogenous porphyrin found in microorganisms which yield production of reactive oxygen species inside microorganisms, leading to microbial death
- Overhead illumination systems can be replaced with Visible Light Disinfection counterparts

Visible Light Disinfection in a Patient Room

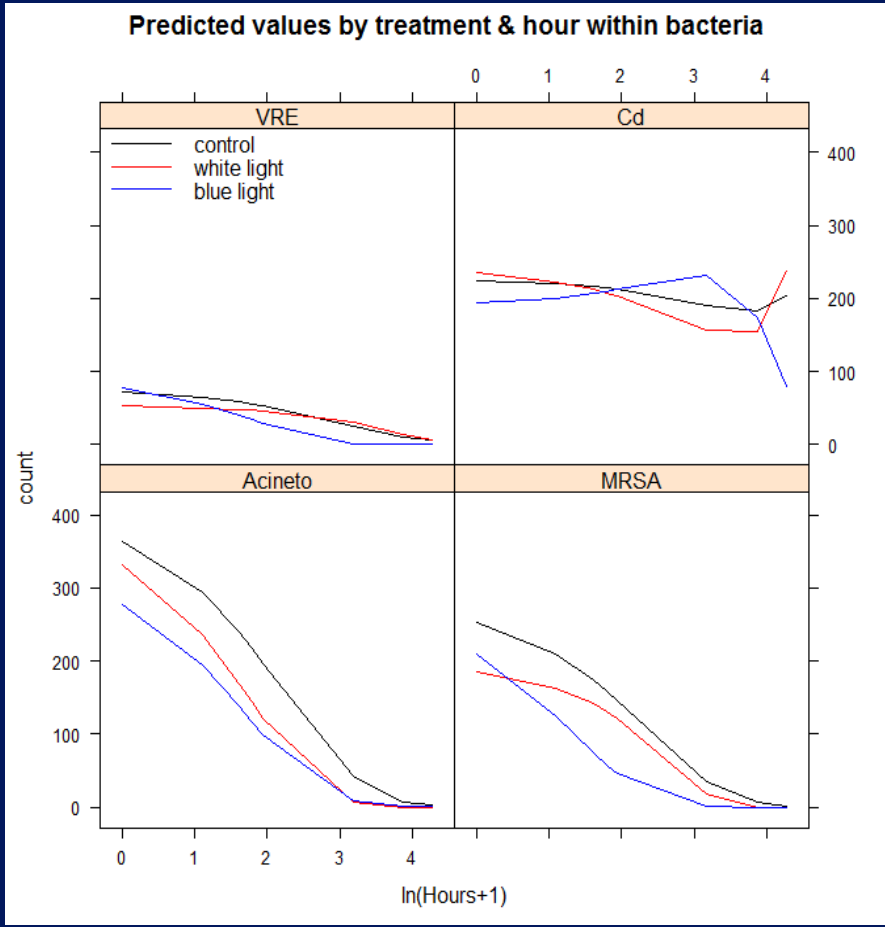
(automatic switching between modes performed by wall-mounted controls)

White light ~0.12 mW/cm^2-0.16 mW/cm^2

Blue light ~0.34-0.44 mW/cm^2; increase kill

Percent Reduction of Epidemiologically-Important Pathogens with a Visible Light Disinfection System

Rutala et al. Infect Control Hosp Epidemiol 2018;39:1250-1253



- Blue and white light significantly reduced the three test bacteria (MRSA, VRE, MDR-A), and blue significantly reduced *C. difficile* spores
- Safe
- Could augment episodic disinfection
- Could be considered for several healthcare decontamination applications

Time to Specified Percent Reductions (Hours) of Epidemiologically-Important Pathogens with "Blue" Light and "White" Light

Rutala et al. Infect Control Hosp Epidemiol 2018;39:1250-1253

MRSA, VRE, and MDR-*Acinetobacter* were reduced on Formica surfaces but slowly (>90% at 24-48h, 25-50% in 3-5h)

Treatment		25%	50%	90%	100%	Max Reduction
Blue	MRSA		3	48	48	100
	VRE	5	24	24	48	100
	MDR-Acinet	1	5	NA	NA	88
	C. difficile	5	72	NA	NA	65
White	MRSA	7	24	48	72	100
	VRE	24	NA	NA	NA	47
	MDR-Acinet	6	24	48	72	100
	C. difficile	5	NA	NA	NA	25

NA-not achieved

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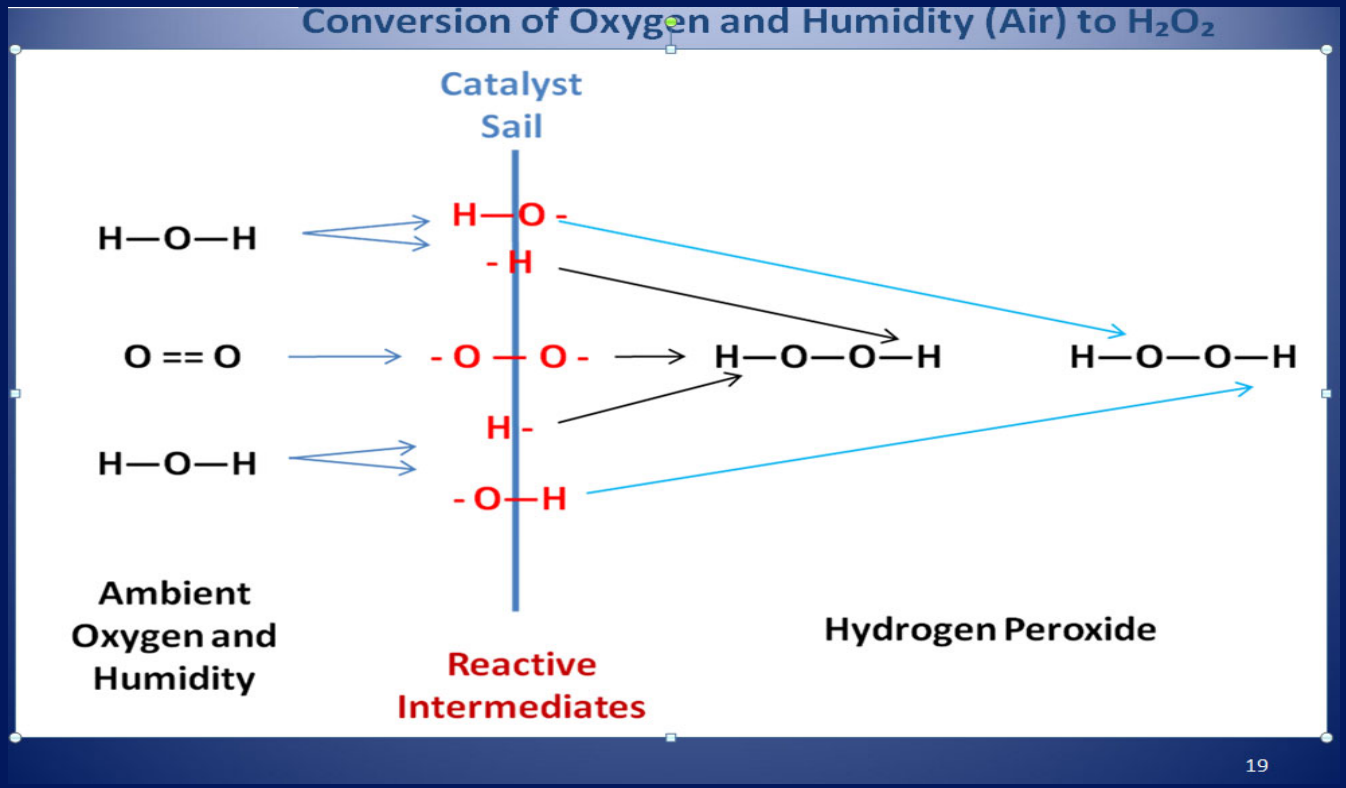
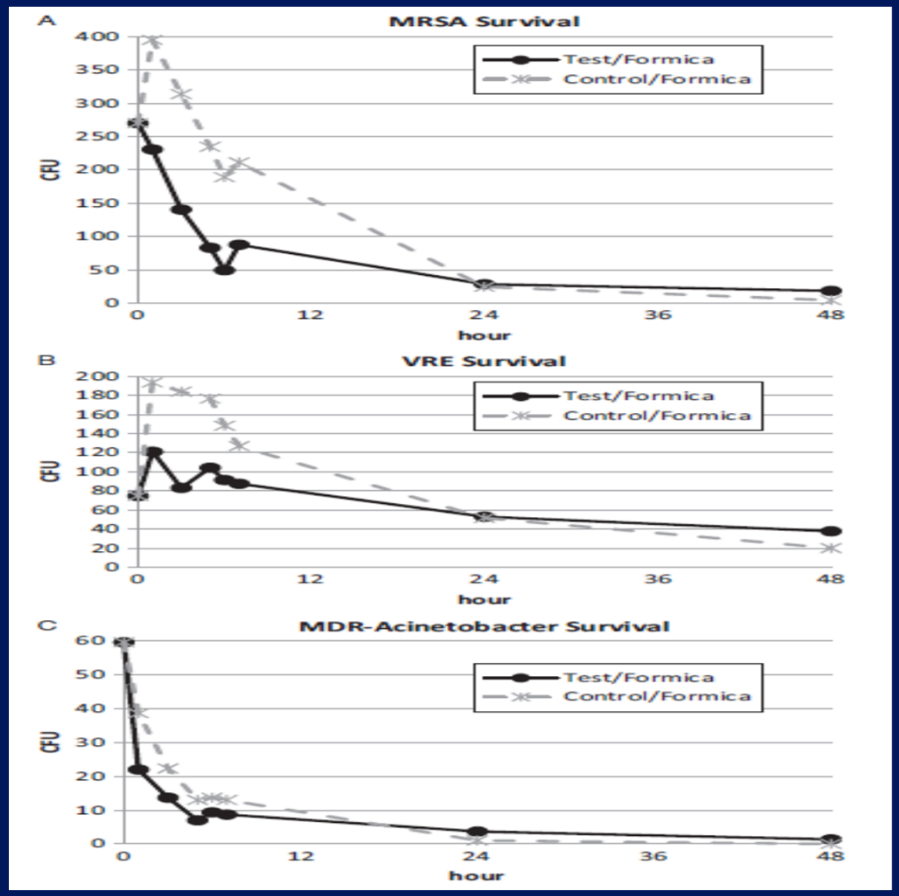
Dilute Hydrogen Peroxide Technology

UV activates the catalyst which creates H ion and hydroxyl radical and free electron, hydroxyl radicals removed from catalyst and combine to form HP; also H_2 and O_2 and electron make HP



Evaluation of a Dilute HP System for Continuous Room Decontamination

Rutala et al. 2019; Infect Control Hosp Epidemiol. 40:1438-1439



Methods

- HPH units were installed in ceilings of a model room and the hallway in front of the room.
- An estimated 100-500 CFU for each test organisms was inoculated and spread on each Formica sheet then exposed to the DHP gas released into the room air
- Triplicate samples were collected at times 0, 1, 3, 5, 6, 7, 24, 48 hrs

Results

- **There were no statistical differences in survival between the DHP intervention and control groups except for very few time points**
- **Our preliminary study using DHP demonstrated inconsistent microbicidal activity against MDRO on room surfaces, likely because we were unable to generate sufficient germicidal level under our test conditions. Requires further evaluation.**

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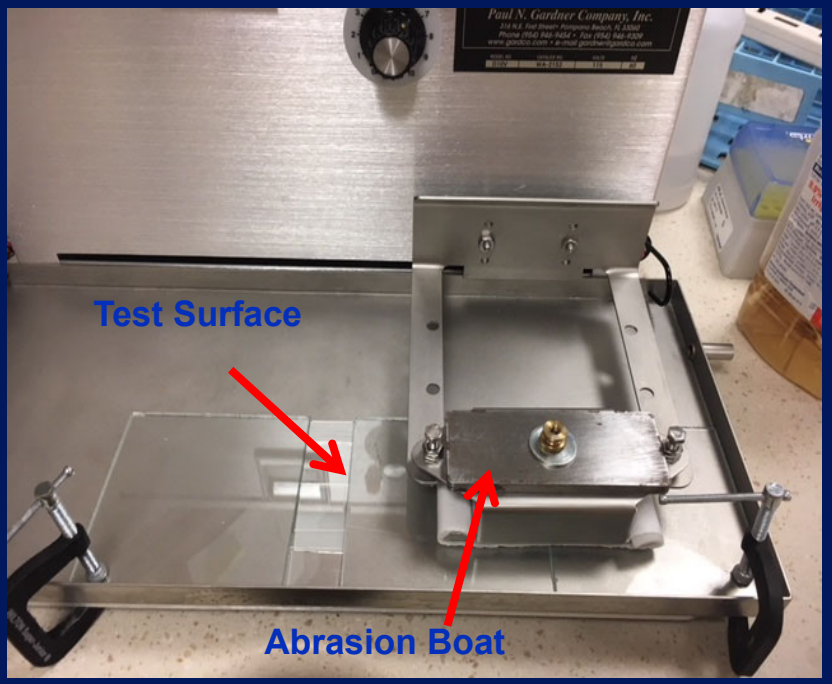
- Bipolar ionization
- Multijet cold air plasma
- Continuously active disinfectant (CAD) or persistent disinfectant that provides continuous disinfection action (polymer that retains Quat to surface)
  - Allows continued disinfection and may reduce or eliminate the problem of recontamination
  - Patients, staff and visitors can remain in the room

Evaluation of a Continuously Active Disinfectant "EPA Protocol for Residual Self-Sanitizing Activity of Dried Chemical Residuals on Hard, Non-Porous Surfaces"

Rutala et al. ICHE;2021: doi:10.1017/ice.2021.481; Rutala et al. ICHE 2019;40:1284

- Test surface inoculated (10^5), treated with test disinfectant, allowed to dry.
- Surface will undergo "wears" (abraded under alternating wet and dry conditions [24 passes, 12 cycles]) and 6 re-inoculations ($10^{\geq 3.75}$, 30min dry) over 48hr
- At the end of the study and at least 48 hours later, the ability of the test surface to kill microbes (99.9%) within 1 min is measured using the last inoculation (10^6)



Efficacy of a Continuously Active Disinfectant Against Healthcare Pathogens

Rutala WA et al. ICHE 2019;40:1284; Redmond et al. ICHE 2021, https://doi.org/10.1017/ice.2021.66

4-5 log_{10} reduction in 5 min over 24hr for HA pathogens; ~99% reduction with *Klebsiella* and CRE *Enterobacter*. Redmond et al. found 5 log_{10} reduction for CRE *Enterobacter, K. pneumoniae*, MRSA, VRE, and *C. auris*

Test Pathogen	Mean Log_{10} Reduction , 95% CI n=4
*S.aureus**	4.4 (3.9, 5.0)
S.aureus (formica)	4.1 (3.8, 4.4)
S.aureus (stainless steel)	5.5 (5.2, 5.9)
VRE	≥4.5
E.Coli	4.8 (4.6, 5.0)
Enterobacter sp.	4.1 (3.5, 4.6)
Candida auris	≥5.0
K pneumoniae	1.5 (1.4, 1.6)
CRE *E.coli*	3.0 (2.6, 3.4)
CRE *Enterobacter*	2.0 (1.6, 2.4)
CRE *K pneumoniae*	2.1 (1.8, 2.4)

Comparison of CAD with Three Disinfectants Using EPA Method and *S. aureus*

Rutala WA, Gergen M, Sickbert-Bennett E, Anderson D, Weber D. ICHE 2019;40:1284

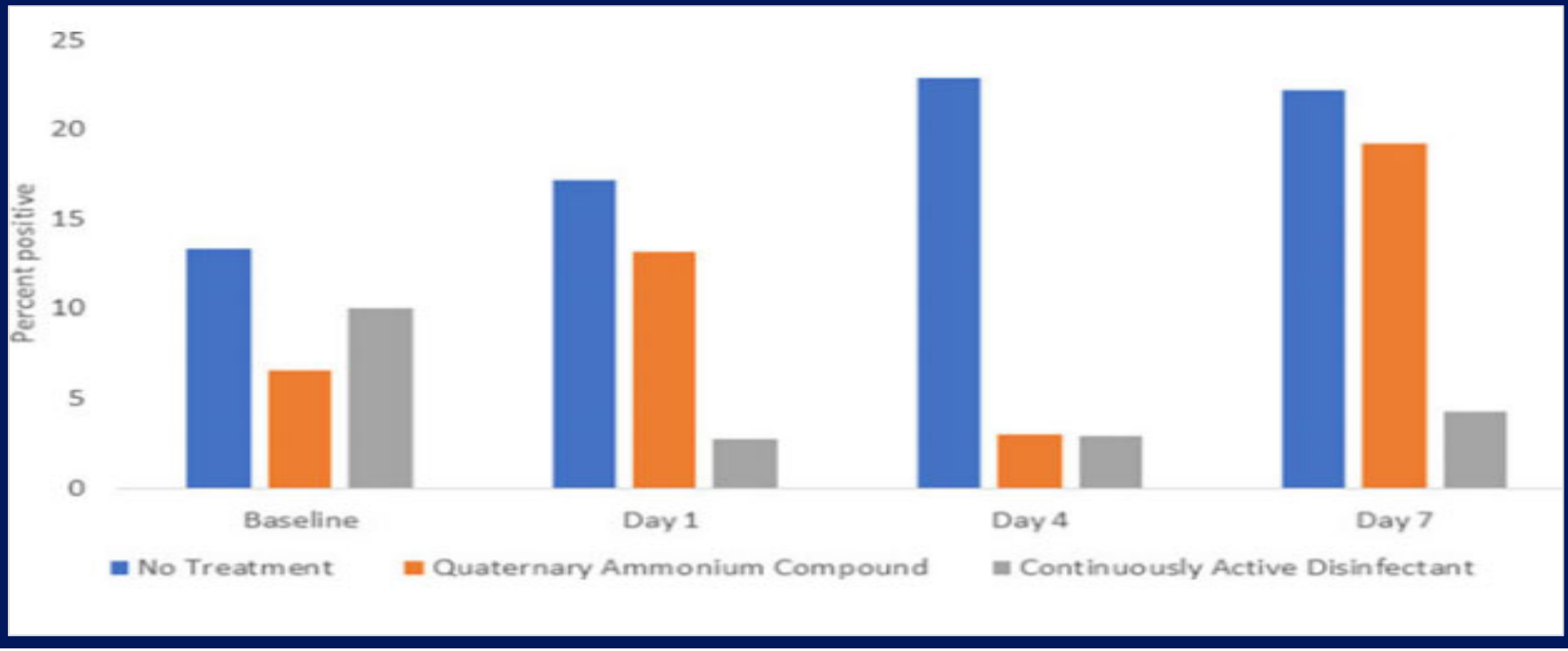
Test Disinfectant	Mean Log_{10} Reduction
Continuously Active Disinfectant	4.4
Quat-Alcohol	0.9
Improved hydrogen peroxide	0.2
Chlorine	0.1

Efficacy of Continuously Active Disinfectant for Portable Medical Equipment (PME)

Redmond et al. ICHE 2021, https://doi.org/10.1017/ice.2021.66

Comparison of *S. aureus* and enterococci recovered from PME at baseline, 1, 4, 7days

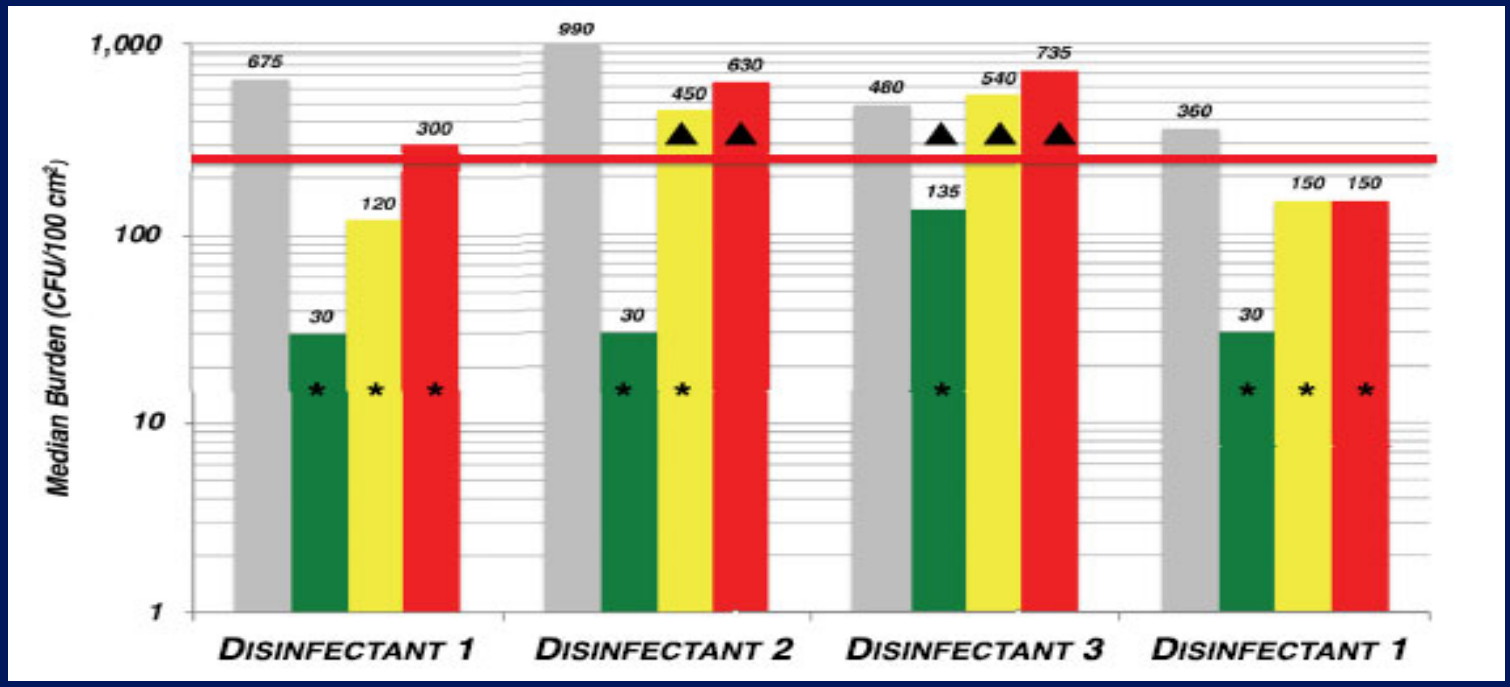
The percentage of sites positive for *S. aureus* and/or enterococci was significantly reduced on days 1-7 in the continuously active group (3 of 93, 3%) versus both the no treatment group (20 of 97, 21%) and the Quat group (11 of 97, 11%)



to Limit Establishment of Bioburden After Disinfection

Schmidt et al. Am J Infect Control 2019;47:732-4

The continuously active disinfectant was able to significantly control bioburden on bed rails, a critical touch surface.



Bioburden samples (bed rails) were collected before disinfection (gray) and at 1, 6, and 24 hours. Each disinfectant significantly controlled bioburden for the first hour. In comparison, the CAD (Disinfectant 1) was found superior for all time points compared to two other Quats.

Will the continuously active disinfectant kill viruses like coronaviruses?

Efficacy of a Continuously Active Disinfectant Against SARS-CoV-2 and Human Coronavirus, 229E, Evaluated after 48 hours

Rutala WA et al. ICHE, 2021 doi:10.1017/ice.2021.481

A novel disinfectant studied using an EPA protocol (wears/re-inoculations) demonstrated excellent continuous antiviral activity (i.e., >4.5-log_{10} reduction) in 1 minute after 48 hours for SARS-VoV-2 and human coronavirus, 229E

Table 1. Inactivation of SARS-CoV-2 and the Human Coronavirus 229E by a Continuously Active Disinfectant Following a 48-Hour Period of Wear and Abrasion Exposure

Carrier Treatment with Wears and Reinoculations	Contact Time	Mean Viral Recovery Titer per Carrier (Log_{10})	HCoV 229E Log_{10} Reduction	SARS-CoV-2 Log_{10} Reduction
Control (sterile ND water, n=3)	1 min	≥		NA
Continuously active disinfectant, n=3	1 min	≤ 1.50 ± 0.00	>4.50	>4.22

Note. NA, not available.

Efficacy of a Continuously Active Disinfectant

Summary

A continuously active disinfectant may reduce or eliminate the problem of recontamination of environmental surfaces and the role of contaminated environmental surfaces and equipment in transmission of healthcare pathogens including SARS-CoV-2.

Environmental Disinfection in Healthcare Facilities

- Continuously active disinfectants reduces bioburden
- CAD shows promise and could reduce the risk of infections associated with devices (portable medical equipment) and surfaces
- Whether a CAD translates in a reduction of HAIs remains to be determined
- Continuously active disinfectants should not alter the frequency of cleaning and disinfection as one of the purposes of routine cleaning and disinfection is to remove dirt and debris in addition to the reduction of microbial contamination

Objectives

- Role of environment in disease transmission
- Why we need continuous room decontamination
- Continuous room decontamination technologies
- Evaluate a continuously active disinfectant

How Will We Prevent Infections Associated with the Environment?

Summary

- **Implement evidence-based practices for surface disinfection**
  - Evidence-based policies (product, practice, train, compliance, "no touch"
  - Ensure use of safe and effective (against emerging pathogens such as *C. auris,* SARS-CoV-2 and CRE) low-level disinfectants
  - Ensure thoroughness of cleaning
- **Use "no touch" room decontamination technology** proven to reduce microbial contamination on surfaces and reduction of HAIs at terminal/discharge cleaning (e.g., Contact Precautions)
- **Continuous room decontamination technology (e.g., continuously active disinfectants, 5 $\log_{10}$ reduction in 5 min)** shows promise and could reduce the risk of infections associated with devices (portable equipment) and surfaces

THANK YOU!

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