
PHIT Force, May 2025

DS: New Technology, New Research

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Disinfection and Sterilization

Current Issues, New Research and New Technology

- PubMed data was searched for all studies on disinfection and sterilization in past 5 years
- About 2,500 abstracts reviewed
- Ten articles were selected for presentation as they represented current issues, new research and new technology





Disinfection and Sterilization

New Technology; New Research

- SHEA HLD and sterilization guidance
- Mobile UVC robotic systems
- Disinfectants for mpox inactivation
- Disposable chlorine dioxide wipes
- Rapid environmental contamination with *C. auris*
- Efficacy of disinfectants against *C. auris* 4 major clades
- Far UVC

SHEA Expert Guidance

Multisociety guidance for sterilization and high-level disinfection

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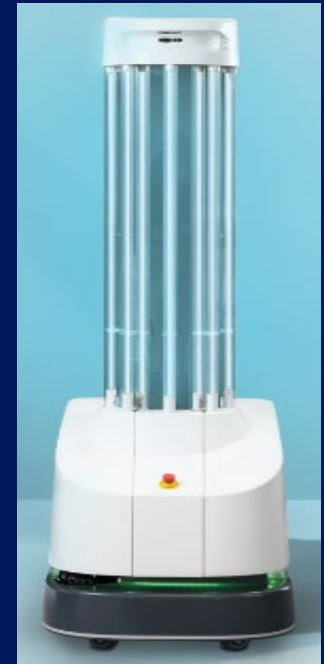
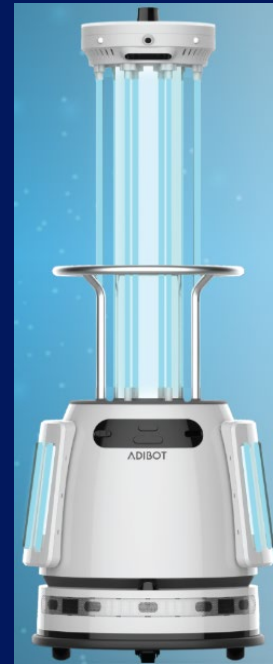
Abstract

SHEA, in partnership with ASGE, APIC, AAMI, AORN, HSPA, IDSA, SGNA, and The Joint Commission, developed this multisociety infection prevention guidance document for individuals and organizations that engage in sterilization or high-level disinfection (HLD). This document follows the *CDC Guideline for Disinfection and Sterilization in Healthcare Facilities*. This guidance is based on a synthesis of

Mobile UVC Robotic Systems

Astrid et al Anti Resist IC. 2021; Russo et al Int J Env Res Pub Hlt 2021; Casini et al. Int J Env Res Publ Hlt 2023; Bratu at al. Sensors. 2024.

- Contaminated hospital environment is a reservoir for various pathogens
- May serve as a source of HAIs
- Conventional manual CD are not always sufficient to eliminate risk posed by contaminated surfaces
- Humans are a contributing factor
- UVC robots developed to overcome shortcomings
- AI driven; microbial reductions > manual CD; huge potential but needs further development



Efficacy of Disinfectants for Mpox Inactivation

(mpox outbreak highlights need intervention, transmission via surfaces)

Pitol et al. Environ Sci Technol 2024;58:19981

- Conducted on porous carriers (ceramic, wood); wiped in triplicate; 1 min contact
- NaOCl and ethanol effective
- Conducted on non-porous carriers (SS, glass, plastic, latex)
- 99.97% reduction except HP
- Use NaOCl or ethanol on clean surfaces



Disposable Chlorine Dioxide Wipes

Tofanelli et al. Am J Otolaryngol 2020

- Infrared coagulator
- Lightguide damaged by immersion in HLD
- Using immersion not an option
- 320ppm chlorine dioxide
- Registered for manual application using wipes; 2 min at 20°C
- Per FDA, for processing endocavitary transvaginal, transrectal and skin surface transducers only



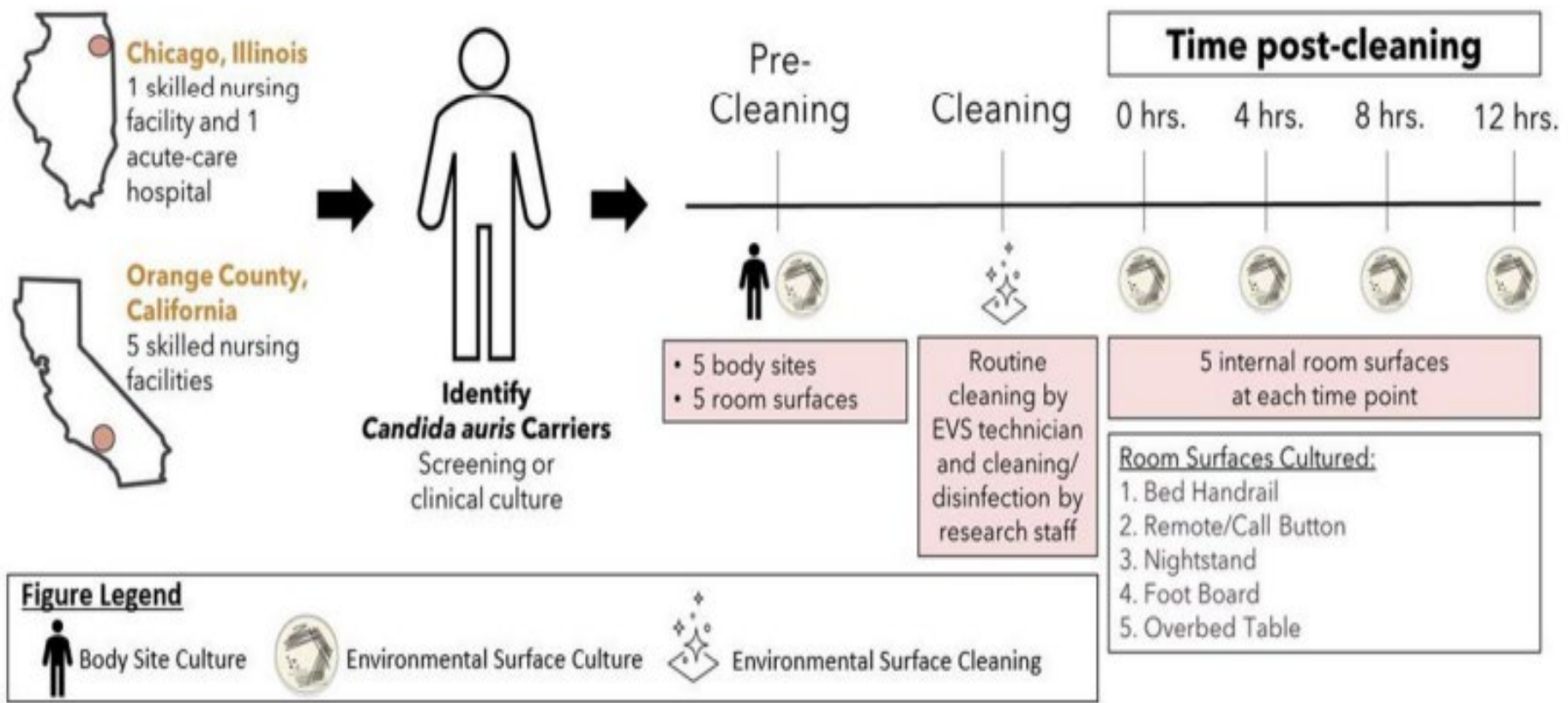
Rapid Environmental Contamination with *Candida auris* and MRDO Near Colonized Patients

Sansom et al. Clin Infect Dis 2024

- Environmental contamination is suspected to play an important role in *C. auris* and MDRO transmission
- Understanding how *C. auris* colonization contributes to environmental contamination is critical to inform infection prevention and outbreak response.
- This study measured time to environmental contamination to determine whether more cleaning/disinfection of high touch objects should be recommended to reduce transmission risk from *C. auris* and MDRO carriers

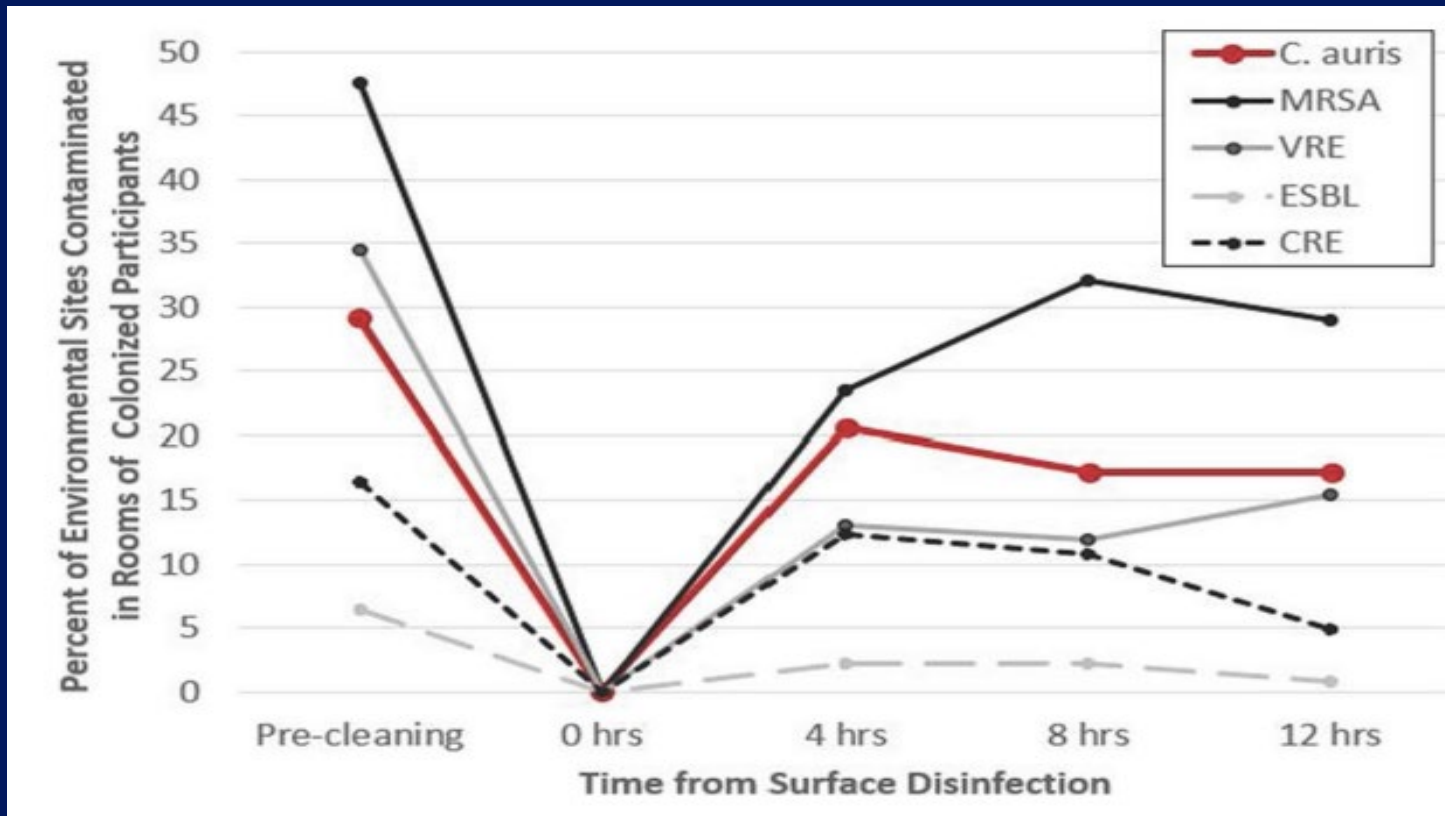
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Sansom et al. Clin Infect Dis 2024



Susceptibility of *C. auris* and *C. albicans* to 21 germicides used in healthcare facilities

- Goal: Assess susceptibility of *C. auris* to germicides
- Methods: Disc-based quantitative carrier testing
- Results: All of the FDA-cleared high-level disinfectants have a registration claim >1 minute (e.g., 8–45 minutes). **In summary, with the exception of a water-based QAC and a 1:50 dilution of sodium hypochlorite, our data demonstrate that most disinfectants (10 of 13, 77%) used in healthcare facilities are effective (>3-log₁₀ reduction) against *C. auris*.**

Rutala WA, et al. ICHE 2019;40:380-382

| Germicide name | Manufacturer, Location | Active ingredient | Formulation Tested | Classification | <i>C. auris</i> ^a | <i>C. albicans</i> ^a |
|--|-----------------------------------|--|------------------------|---|------------------------------|---------------------------------|
| Purell Advanced instant hand sanitizer | GOJO, Akron, OH | 70% ethanol | Undiluted | Antiseptic | 4.0 | 2.5 |
| Betadine solution | Purdue Products, Stamford, CT | 10% povidone-iodine/1% iodine | Undiluted | Antiseptic | 2.5 | 2.3 |
| Medicated Soft 'N Sare | Steris, St. Louis, MO | 0.5% triclosan | Undiluted | Antiseptic/Handwash | 1.4 | 1.7 |
| Soft Care Defend | Diversey, Charlotte, NC | 1% chloroxylenol | Undiluted | Antiseptic/Handwash | 2.8 | 3.9 |
| Avagard | 3M, St Paul, MN | 1% chlorhexidine gluconate solution, 61% ethyl alcohol | Undiluted | Antiseptic/Surgical hand scrub | 2.0 | 1.9 |
| Scrub-Stat 2% | Ecolab, St Paul, MN | 2% chlorhexidine gluconate solution | Undiluted | Antiseptic/Surgical hand scrub/handwash | 1.6 | 2.8 |
| Scrub-Stat 4% | Ecolab, St Paul, MN | 4% chlorhexidine gluconate solution | Undiluted | Antiseptic/Surgical hand scrub/handwash | 1.9 | 3.5 |
| Isopropyl rubbing alcohol 70% USP | MediChoice, Mechanicsville, VA | 70% isopropyl alcohol | Undiluted | Antiseptic/Disinfectant | 3.8 | 4.1 |
| Solution of hydrogen peroxide 3% USP | MediChoice, Mechanicsville, VA | 3% hydrogen peroxide | Undiluted | Antiseptic | 1.4 | 1.8 |
| Austin's A-1 Bleach 1:10 | James Austin Co, Mars, PA | 5.25% sodium hypochlorite (~6,100–6,700 ppm) | 1:10 dilution | Disinfectant | 4.1 | 4.0 |
| Austin's A-1 Bleach 1:50 | James Austin Co, Mars, PA | 5.25% sodium hypochlorite (~1,245 ppm) | 1:50 dilution | Disinfectant | 1.6 | 1.5 |
| Vesphene Ise | Steris, St Louis, MO | 9.09% o-phenylphenol, 7.66% p-tertiary amyphenol | 1:128 dilution | Disinfectant | 4.1 | 3.6 |
| Hydrogen peroxide cleaner disinfectant | Clorox, Oakland, CA | 1.4% hydrogen peroxide | Undiluted | Disinfectant | 4.1 | 4.1 |
| Lysol disinfectant spray | Reckitt Benckiser, Parsippany, NJ | 58% ethanol, 0.1% QAC ^b | Undiluted | Disinfectant | 3.8 | 4.1 |
| A-456 II disinfectant cleaner | Ecolab, St Paul, MN | 21.7% QAC ^c | 1:256 dilution | Disinfectant | 1.7 | 1.5 |
| Super Sani-Cloth wipe | PDI, Orangeburg, NY | 55% isopropyl alcohol, 0.5% QAC ^d | Undiluted ^e | Disinfectant | 3.9 | 4.1 |
| Prime Sani-Cloth wipe | PDI, Orangeburg, NY | 28.7% isopropyl alcohol, 27.3% ethyl alcohol, 0.61% QAC ^e | Undiluted ^e | Disinfectant | 4.1 | 4.1 |

› [Infect Control Hosp Epidemiol. 2024 Jan;45\(1\):127-131. doi: 10.1017/ice.2023.157. Epub 2023 Aug 2.](#)

Efficacy of 23 commonly used liquid disinfectants against *Candida auris* isolates from the 4 major clades

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Affiliations + expand

PMID: 37528766 DOI: [10.1017/ice.2023.157](#)

Abstract

We tested the effectiveness of 23 disinfectants used in healthcare facilities against isolates from the 4 major clades of *Candida auris*. Sporicidal disinfectants were consistently effective, whereas quaternary-ammonium disinfectants had limited activity. Quaternary-ammonium-alcohol and hydrogen-peroxide-based disinfectants varied in effectiveness against *C. auris*.

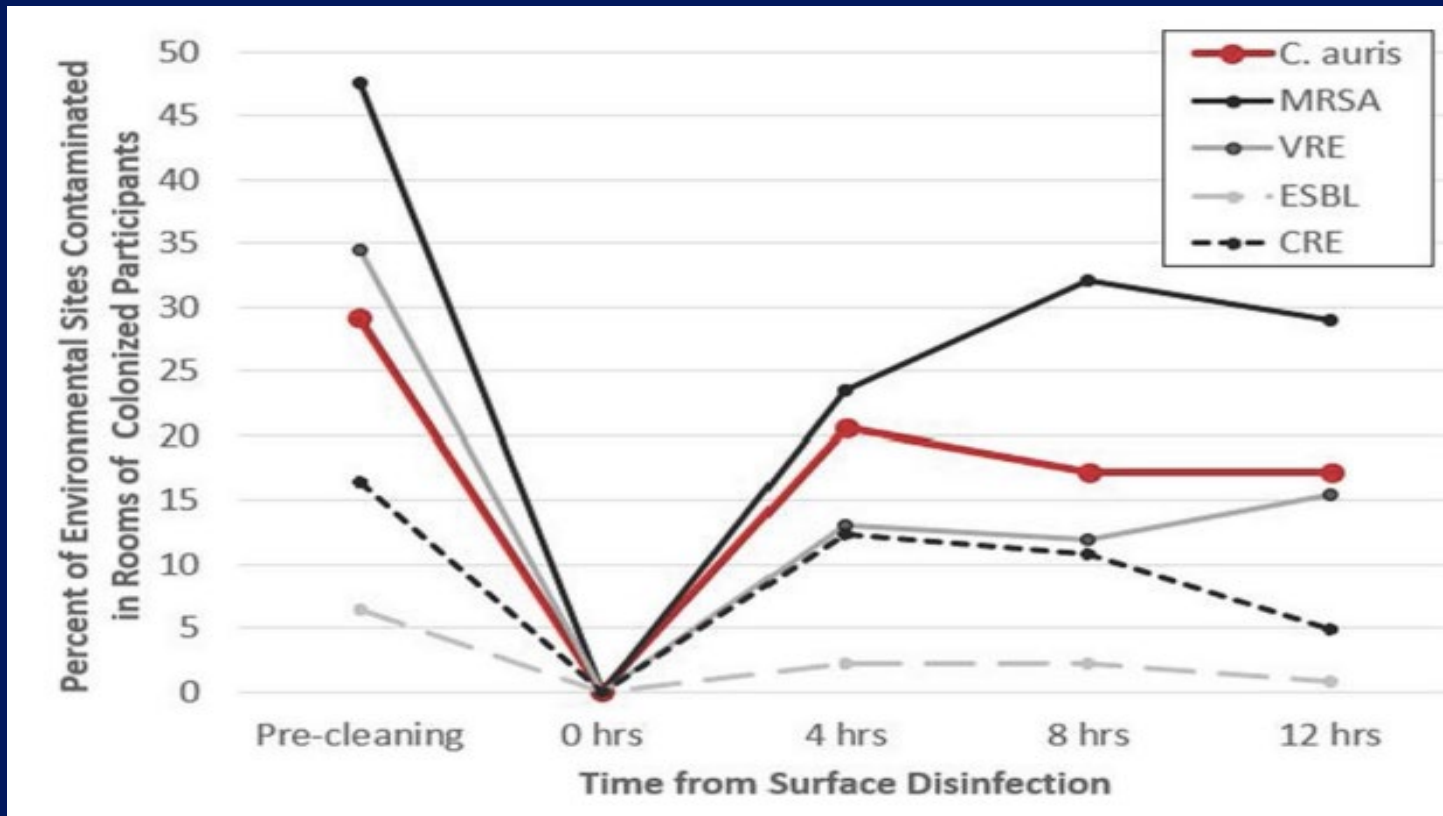
- Clade III and clade IV might have reduced effectiveness compared to clade II
- Chlorine-based disinfectants and PA consistently reduced all strains
- HP reduced all test strains (>5log)
- 2 of 4 Quat with alcohol >5log
- None of Quat only achieved >5log
- Quat-alcohol, HP varied effectiveness
- Sporidical disinfectants effective

Table 2. Mean (SE) Log₁₀ Reductions in *Candida auris* and *Candida albicans* for the 23 Tested Disinfectants

| Product | Clade II | Clade I | Clade IV | Clade III | <i>Candida albicans</i> ^a |
|--|--------------|-------------|--------------|--------------|--------------------------------------|
| Chlorine-based disinfectants | | | | | |
| Clorox Healthcare bleach germicidal cleaner | 5.72 (0.00) | 5.87 (0.00) | ≥6.00 (0.00) | ≥6.00 (0.00) | 5.10 (0.00) |
| Clorox germicidal bleach wipe | 5.72 (0.00) | 5.49 (0.00) | 5.75 (0.00) | ≥6.00 (0.00) | 5.25 (0.00) |
| Clorox Dispatch Hospital cleaner disinfectant | 5.72 (0.00) | 5.25 (0.00) | 5.35 (0.00) | 5.72 (0.00) | 5.67 (0.00) |
| PDI Sani-Cloth bleach germicidal disposable wipe | 5.98 (0.00) | 5.91 (0.00) | ≥6.00 (0.00) | ≥6.00 (0.00) | 5.67 (0.00) |
| Artemis BioSolutions Defender disinfectant | 6.00 (0.00) | 5.20 (0.00) | 5.4 (0.00) | 5.4 (0.00) | 6.00 (0.00) |
| Peracetic acid-based disinfectant | | | | | |
| EcoLab OxyCide daily disinfectant | 5.3 (0.22) | 5.30 (0.00) | 5.42 (0.00) | 5.46 (0.00) | 5.9 (0.04) |
| Improved hydrogen peroxide | | | | | |
| Clorox Healthcare hydrogen-peroxide cleaner disinfectant | 5.22 (0.00) | 5.89 (0.00) | 5.10 (0.00) | 5.01 (0.00) | 5.10 (0.00) |
| Diversey Oxivir TB | 5.34 (0.00) | 5.89 (0.00) | 5.10 (0.00) | 5.01 (0.00) | 5.10 (0.00) |
| Diversey Alpha HP multisurface cleaner | 4.02 (0.29) | 1.48 (0.23) | 0.00 (0.09) | 0.17 (0.24) | 0.96 (0.24) |
| PDI Sani-Hypercide | ≥6.00 (0.00) | 5.89 (0.00) | 5.10 (0.00) | 5.01 (0.00) | 5.67 (0.00) |
| Quaternary-ammonium compound | | | | | |
| Diversey Virex II 256 | 2.50 (0.20) | 0.13 (0.10) | 0.10 (0.11) | 0.00 (0.03) | 0.33 (0.05) |
| Diversey Virex Plus | 2.50 (0.26) | 0.06 (0.59) | 0.00 (0.11) | 0.00 (0.17) | 0.00 (0.12) |
| Kinzua Shield Foam | 3.56 (0.17) | 3.89 (0.36) | 1.62 (0.42) | 1.98 (0.04) | 4.22 (0.31) |
| Diversey Crew nonacid disinfectant | 1.17 (0.24) | 0.16 (0.06) | 0.00 (0.18) | 0.41 (0.16) | 0.88 (0.15) |
| Kinzua TB | 5.22 (0.00) | 5.26 (0.23) | 1.93 (0.49) | 3.78 (0.31) | 4.39 (0.72) |
| Kinzua Shield Ultra | 0.40 (0.34) | 0.91 (0.24) | 0.00 (0.20) | 1.33 (0.16) | 0.00 (0.16) |
| Diversey Crew NA SC | 0.79 (0.14) | 0.66 (0.03) | 0.00 (0.29) | 0.71 (0.17) | 0.53 (0.27) |
| Diversey Crew Restroom Floor & Surface SC | 1.35 (0.15) | 4.50 (0.29) | 2.15 (0.23) | 3.25 (0.19) | 4.74 (0.22) |
| Quaternary-ammonium plus alcohol | | | | | |
| PDI Sani-Cloth germicidal wipes | 5.30 (0.00) | 5.74 (0.00) | ≥6.00 (0.00) | ≥6.00 (0.00) | 5.66 (0.00) |
| Kinzua KE 15 Citrus surface disinfectant | 5.30 (0.00) | 5.87 (0.00) | ≥6.00 (0.00) | ≥6.00 (0.00) | 5.10 (0.00) |
| Metrex CaviWipes ^b | 3.55 (0.32) | 2.98 (0.06) | 1.95 (0.24) | 1.84 (0.02) | 4.75 (0.27) |
| Metrex CaviCide spray ^b | 5.63 (0.14) | 4.06 (0.28) | 3.04 (0.56) | 2.10 (0.14) | 5.25 (0.00) |

Rapid Environmental Contamination with *Candida auris* and MRDO Near Colonized Patients

Sansom et al. Clin Infect Dis 2024



Continuous Room Decontamination Technology

- Advantages
 - Allows continued disinfection
 - May eliminate the problem of suboptimal CD and recontamination
 - Patients, staff and visitors can remain in the room
 - Does not require an ongoing behavior change or education of personnel
 - Self-sustaining once in place
 - Once purchased might have low maintenance cost
 - Technology does not give rise to health or safety concerns
 - No (limited) consumable products




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

Concise Communication

A novel approach for safe and automated implementation of far ultraviolet-C light decontamination in clinical areas

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Abstract

A novel wall-mounted far ultraviolet-C (UV-C) light technology providing automated delivery of far UV-C only when people are not present reduced methicillin-resistant *Staphylococcus aureus* in a patient room and equipment room. The safety feature that discontinues far UV-C output when people are detected was effective in preventing far UV-C exposure.

(Received 7 February 2024; accepted 30 May 2024)

Far UV-C 222

Continuous decontamination of air and surfaces



- Filters block $>230\text{nm}$
- Placed on wall
- Kill microbes ($3 \log_{10}$ reduction in 45m) in air and on surfaces when within 2-3m
- Safe for occupied areas
- Proposed as continuous, safe decontamination for air and surface contamination in occupied spaces
- Long-term safety needs to be investigated

Far Ultraviolet-C

Memic et al. Antimicrob Steward Healthcare Epidemiol. 2024

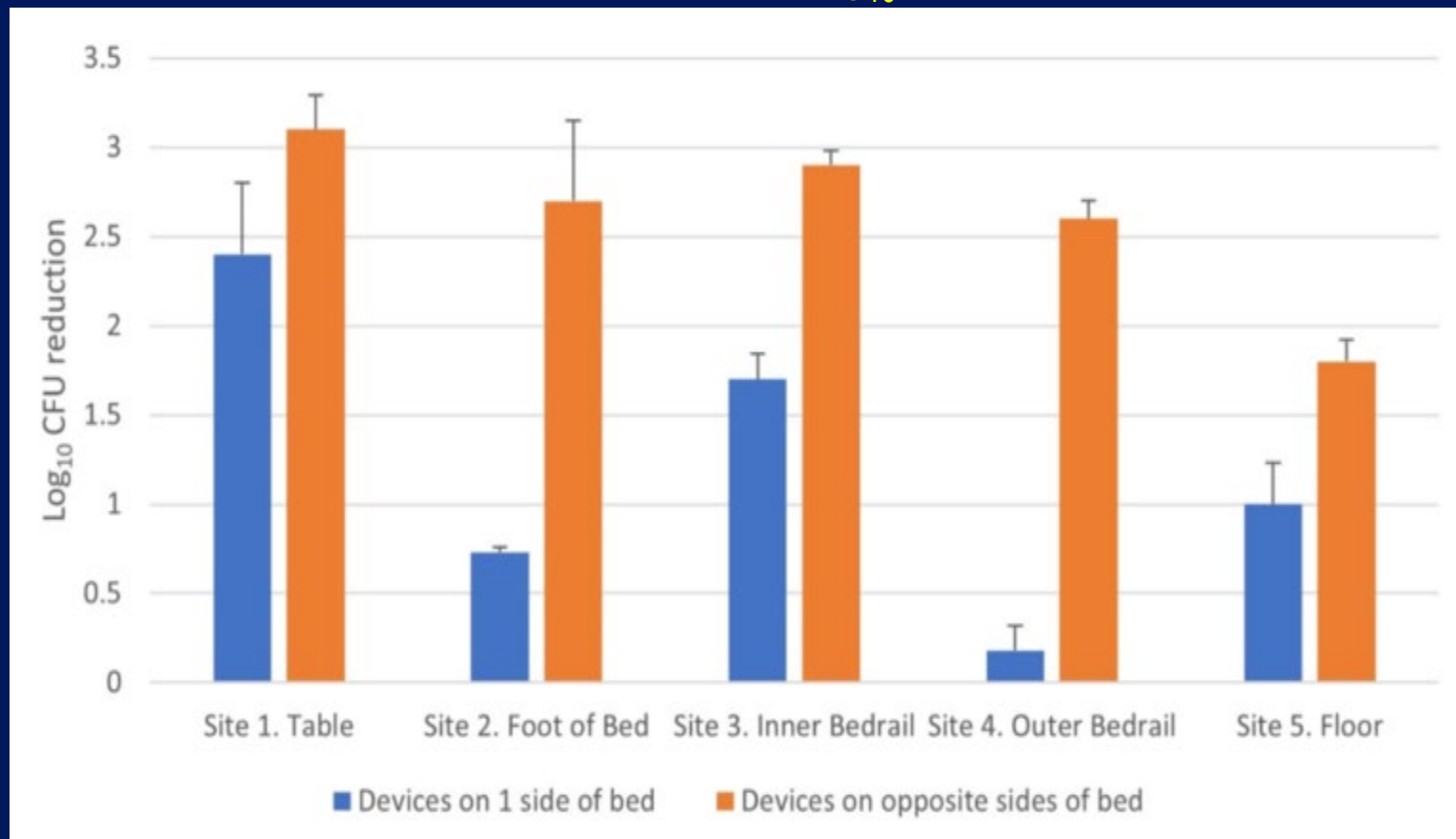
- Pictures of a patient room with 2 Far UVC devices positioned at opposite sides of the room on each side of the bed. Motion detector that discontinues Far UVC output when people in the room, which preventing exposure.



Far Ultraviolet-C

Memic et al. Antimicrob Steward Healthcare Epidemiol. 2024

- Reductions in MRSA after 45m of exposure $\sim 2.5 \log_{10}$ reduction



Disinfection and Sterilization

New Technologies; New Research

- SHEA HLD and sterilization guidance
- Mobile UVC robotic systems
- Disinfectants for mpox inactivation
- Disposable chlorine dioxide wipes
- Rapid environmental contamination with *C. auris*
- Efficacy of disinfectants against *C. auris* 4 major clades
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APIC Preconference Phoenix 15 June 2025

Disinfection, Sterilization and Antisepsis:
Principles, Practices, Current Issues, New
Research and New Technologies

THANK YOU!

www.disinfectionandsterilization.org

