PHIT Force, December 2025

DS: New Technology, New Research

William A. Rutala, Ph.D., M.P.H., C.I.C

Director, Statewide Program for Infection Control and Epidemiology and Professor of Medicine, University of North Carolina at Chapel Hill, NC, USA

Former Director, Hospital Epidemiology, Occupational Health and Safety, UNC Health Care, Chapel Hill, NC (1979-2017)

Room Decontamination and Low-Level Disinfection:
New Strategies to Keep Patients Safe

- Seven articles/topics were selected for presentation as they represented current issues, new research and/or new technologies in room decontamination, environmental cleaning/disinfection (CD), low-level disinfection
  - PubMed data was searched for all studies on room decontamination, low-level disinfection, environmental CD, HLD, sterilization in past 6 years
  - >2,500 abstracts reviewed

Disinfection and Sterilization
New Technology; New Research

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

Infection Control & Hospital Epidemiology (2025), 1–23
doi:10.1017/ice.2025.41

SHEA

SHEA Expert Guidance

Multisociety guidance for sterilization and high-level disinfection

Erica S. Shenoy MD, PhD[1,*], David J. Weber MD, MPH[2,*], Kathleen McMullen MPH, CIC[3], Zachary Rubin MD[4], Priya Sampathkumar MD[5], Joshua K. Schaffzin MD, PhD[6], Emily Sickbert-Bennett PhD, MS, CIC[2], Laraine Washer MD[7], Deborah S. Yokoe MD, MPH[8], Audrey H. Calderwood MD, MS[9], Raymond Chinn MD[10], Michelle Day RN, MSN, CGRN[11], Sylvia Garcia-Houchins RN, MBA, CIC[12], Waleed Javaid MD, MBA, MS[13], Susan Klacik BS[14], Erin Kyle DNP, RN, CNOR[15], Rekha K. Murthy MD[16], Amber Wood MSN, RN, CNOR, CIC[15] and William A. Rutala PhD, MPH, CIC[2]

[1]Harvard Medical School, Massachusetts General Hospital, Mass General Brigham, Boston, MA, USA, [2]University of North Carolina at Chapel Hill, Chapel Hill, NC, USA, [3]Mercy, St. Louis, St. Louis, MO, USA, [4]Los Angeles Department of Public Health, UCLA Health, Los Angeles, CA, USA, [5]Mayo Clinic, Rochester, MN, USA, [6]University of Ottawa Faculty of Medicine, Children's Hospital of Eastern Ontario, Ottawa, ON, Canada, [7]University of Michigan Medical School, Ann Arbor, MI, USA, [8]University of California San Francisco (UCSF) School of Medicine, UCSF Medical Center, San Francisco, CA, USA, [9]Dartmouth Health, Lebanon, NH, USA, [10]County of San Diego Health and Human Services Agency, San Diego, CA, USA, [11]Hartford Hospital, Hartford, CT, USA, [12]Nash Healthcare Consulting, El Paso, TX, USA, [13]Icahn School of Medicine at Mount Sinai, New York, NY, USA, [14]Healthcare Sterile Processing Association (HSPA), Chicago, IL, USA, [15]Association of periOperative Registered Nurses, Denver, CO, USA and [16]Cedars Sinai Medical Center, David Geffen UCLA School of Medicine, Los Angeles, CA, USA

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 is not always sufficient to eliminate risk posed by contaminated surfaces
- UVC robots developed to overcome shortcomings (e.g., staff shortage)
- UVC potential to go CP pt room-to-CP pt room as directed by discharge service/bed control with motion detectors to prevent exposures

- AI driven; microbial reductions > manual CD; huge potential but needs further development

UVC High-Level Disinfection for Endocavitary and External Ultrasound Probes

- FDA-cleared HLD (Chronos)
- HLD achieved in sealed chamber
- Automated cycle controls key parameters: dose, temperature, and time
- HLD cycle takes 90 seconds

Disposable Chlorine Dioxide Wipes

Tofanelli et al. Am J Otolaryngol 2020

- 320ppm chlorine dioxide
- Registered as HLD for manual application using wipes; 2 min at 20°C
- Per FDA, for processing endocavitary transvaginal, transrectal and skin surface transducers only

Chlorine Dioxide

- First HLD FDA-cleared for ophthalmic and optical medical devices
- Lenses, tonometers prisms, pachymeters
- Proven effective against wide range of microbes in 2 minutes

Clinical Infectious Diseases

MAJOR ARTICLE

IDSA Infectious Diseases Society of America

hivma hiv medicine association

OXFORD

Rapid Environmental Contamination With *Candida auris* and Multidrug-Resistant Bacterial Pathogens Near Colonized Patients

Sarah E. Sansom,[1,a] Gabrielle M. Gussin,[2,a] Michael Schoeny,[3] Raveena D. Singh,[2] Hira Adil,[4] Pamela Bell,[1] Ellen C. Benson,[1] Cassiana E. Bittencourt,[5] Stephanie Black,[4] Maria Del Mar Villanueva Guzman,[1] Mary Carl Froilan,[1] Christine Fukuda,[1] Karina Barsegyan,[2] Ellen Gough,[1] Meghan Lyman,[6] Jinal Makhija,[1] Stefania Marron,[1] Lydia Mikhail,[7] Judith Noble-Wang,[8] Massimo Pacilli,[4] Robert Pedroza,[2] Raheeb Saavedra,[2] D. Joseph Sexton,[6] Julie Shimabukuro,[5] Lahari Thotapalli,[1] Matthew Zahn,[7] Susan S. Huang,[2,b] and Mary K. Hayden[1,b]

[1]Division of Infectious Diseases, Rush University Medical Center, Chicago Illinois, USA; [2]Division of Infectious Diseases, University of California, Irvine School of Medicine, Irvine California, USA; [3]College of Nursing, Rush University Medical Center, Chicago Illinois, USA; [4]Disease Control Bureau, Chicago Department of Public Health, Chicago Illinois, USA; [5]Department of Pathology and Laboratory Medicine, University of California, Irvine School of Medicine, Irvine California, USA; [6]Mycotic Diseases Branch, Centers for Disease Control and Prevention, Atlanta Georgia, USA; [7]Division of Epidemiology and Assessment, Orange County Health Care Agency, Santa Ana, California, USA; and [8]Division of Healthcare Quality Promotion, Centers for Disease Control and Prevention, Atlanta Georgia, USA

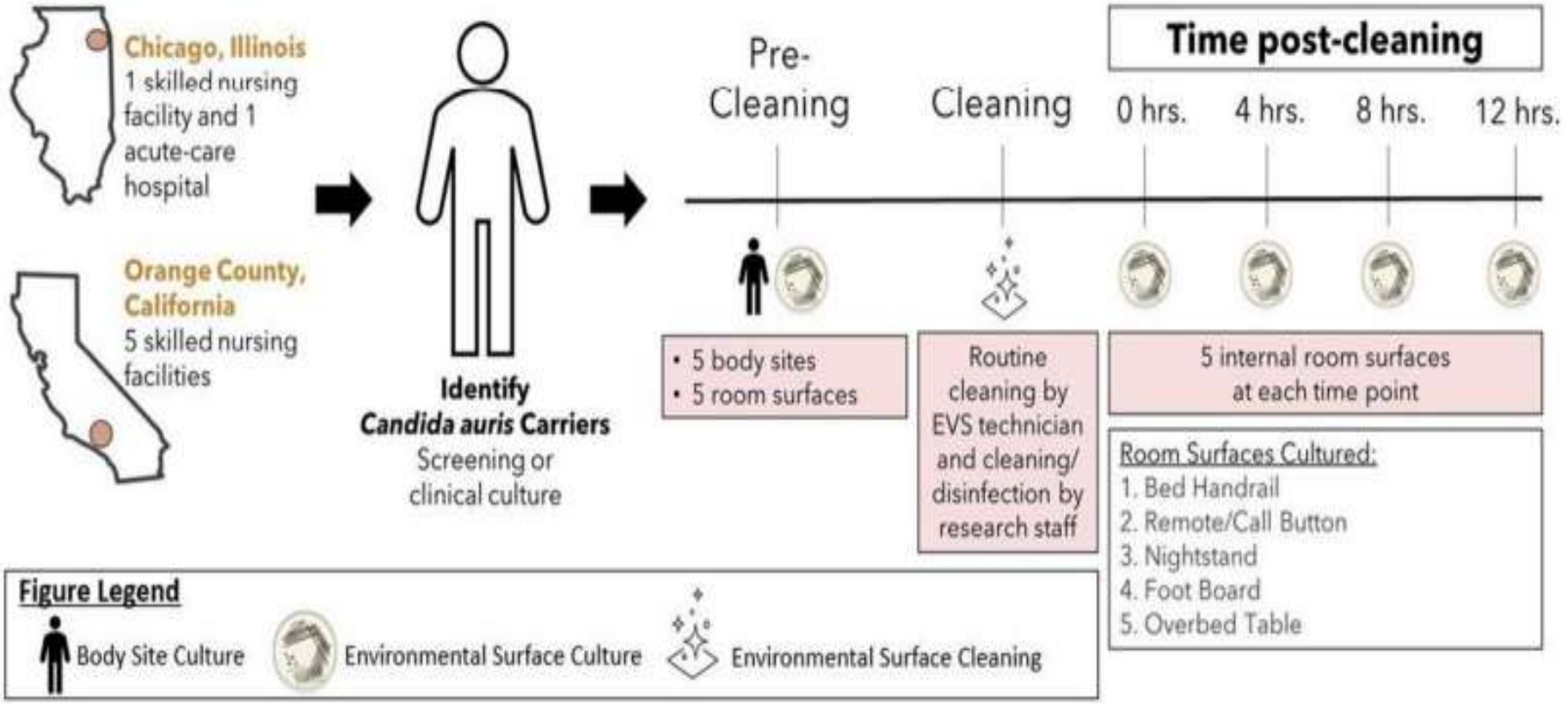
Rapid Environmental Contamination with *Candida auris* and MRDO Near Colonized Patients

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

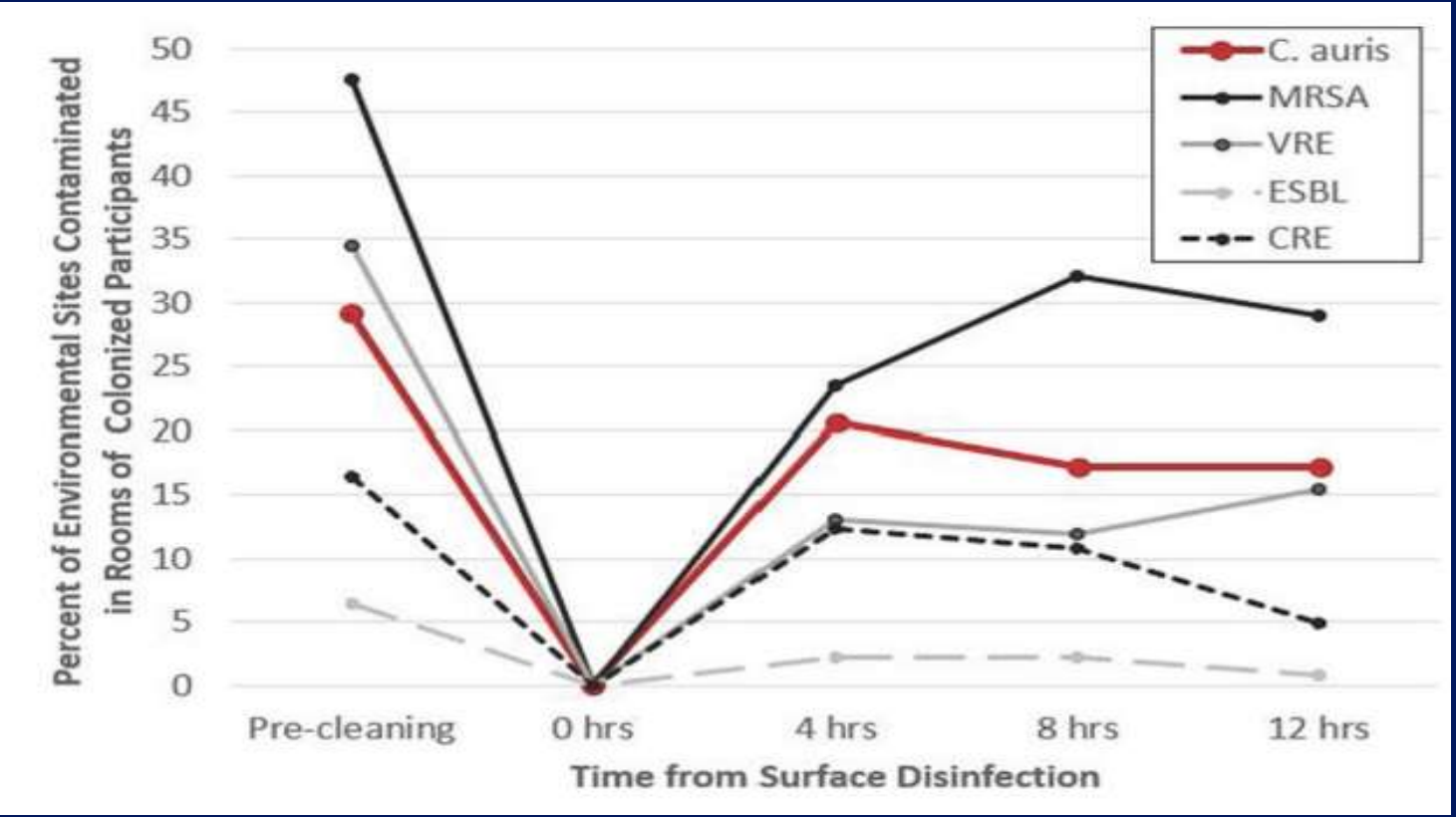
Rapid Environmental Contamination with *Candida auris* and MRDO Near Colonized Patients

Sansom et al. Clin Infect Dis 2024



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

Sansom et al. Clin Infect Dis 2024



Background. Environmental contamination is suspected to play an important role in *Candida auris* transmission. Understanding speed and risks of contamination after room disinfection could inform environmental cleaning recommendations.

Methods. We conducted a prospective multicenter study of environmental contamination associated with *C. auris* colonization at 6 ventilator-capable skilled nursing facilities and 1 acute care hospital in Illinois and California. Known *C. auris* carriers were sampled at 5 body sites followed by sampling of nearby room surfaces before disinfection and at 0, 4, 8, and 12 hours after disinfection. Samples were cultured for *C. auris* and bacterial multidrug-resistant organisms (MDROs). Odds of surface contamination after disinfection were analyzed using multilevel generalized estimating equations.

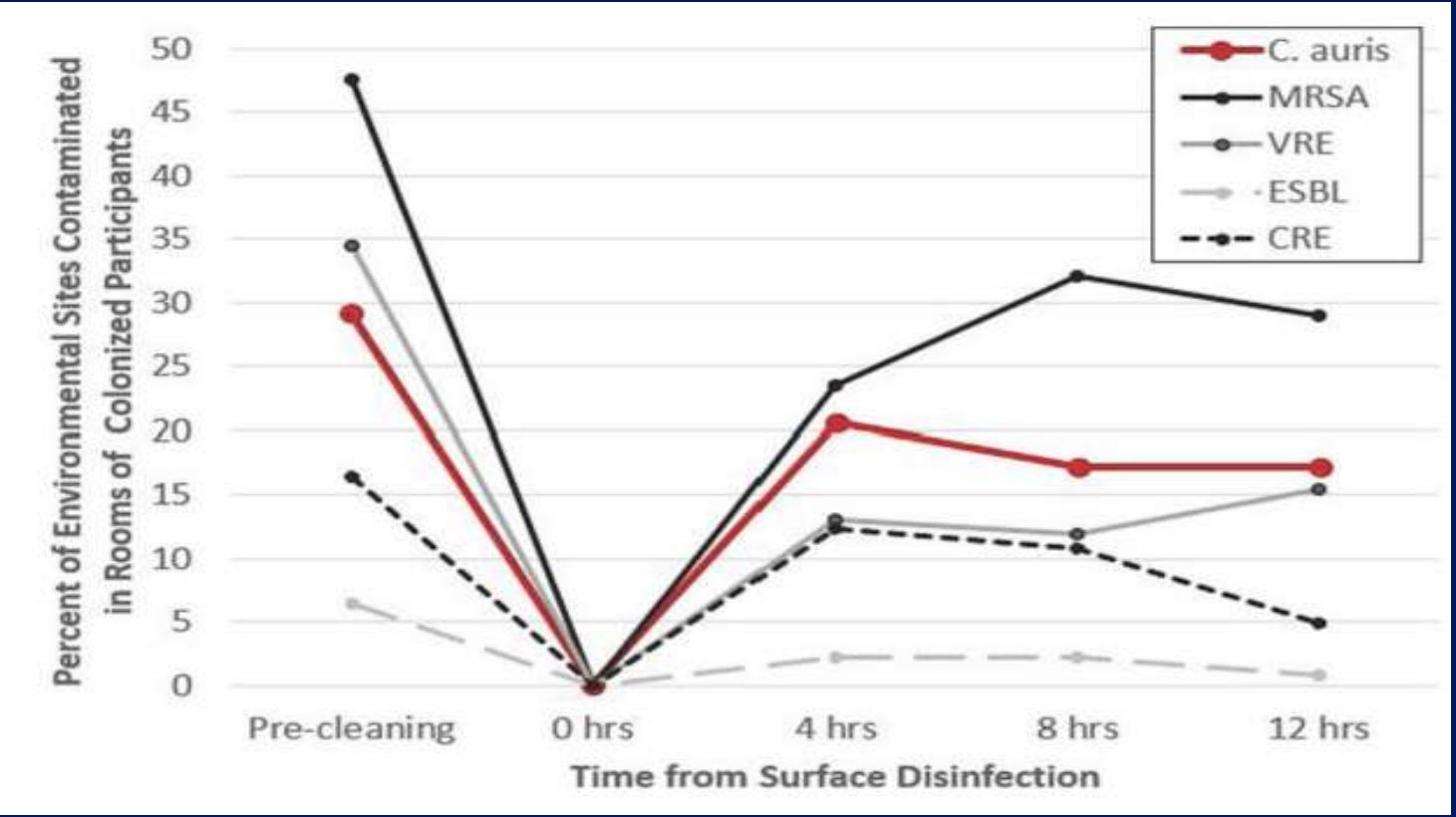
Results. Among 41 known *C. auris* carriers, colonization was detected most frequently on palms/fingertips (76%) and nares (71%). *C. auris* contamination was detected on 32.2% (66/205) of room surfaces before disinfection and 20.5% (39/190) of room surfaces by 4 hours after disinfection. A higher number of *C. auris*–colonized body sites was associated with higher odds of environmental contamination at every time point following disinfection, adjusting for facility of residence. In the rooms of 38 (93%) *C. auris* carriers co-colonized with a bacterial MDRO, 2%–24% of surfaces were additionally contaminated with the same MDRO by 4 hours after disinfection.

Conclusions. *C. auris* can contaminate the healthcare environment rapidly after disinfection, highlighting the challenges associated with environmental disinfection. Future research should investigate long-acting disinfectants, antimicrobial surfaces, and more effective patient skin antisepsis to reduce the environmental reservoir of *C. auris* and bacterial MDROs in healthcare settings.

Keywords. *Candida auris*; environmental contamination; colonization; disinfection.

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

Sansom et al. Clin Infect Dis 2024



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

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

Antimicrobial Stewardship & Healthcare Epidemiology (2024), **4**, e123, 1–3
doi:10.1017/ash.2024.388

SHEA

Concise Communication

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

Samir Memic BS[1,2], Jennifer L. Cadnum BS[2], Andrew Osborne BS[3], William A. Rutala PhD[4,5] and Curtis J. Donskey MD[3,6]

[1]Department of Systems Biology, Case Western Reserve University School of Medicine, Cleveland, OH, USA, [2]Research Service, Louis Stokes Cleveland VA Medical Center, Cleveland, OH, USA, [3]Department of Medicine, Case Western Reserve University School of Medicine, Cleveland, OH, USA, [4]Statewide Program for Infection Control and Epidemiology, University of North Carolina School (UNC) of Medicine, Chapel Hill, NC, USA, [5]Division of Infectious Diseases, UNC School of Medicine, Chapel Hill, NC, USA and [6]Geriatric Research, Education, and Clinical Center, Louis Stokes Cleveland VA Medical Center, Cleveland, OH, USA

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 222nm

Continuous decontamination of air and surfaces (not UV-C 254nm)

- Filters block >230nm; placed on wall
- Kill microbes (3 $\log_{10}$ reduction in 45m) in air and on surfaces when within 2-3m
- Safe for skin and eyes when used within regulatory limits [e.g., ACGIH for far-UVC 222nm is 22 mJ/cm^2 for eyes] for occupied areas
- Proposed as continuous, safe decontamination for air and surface contamination in occupied spaces
- Long-term safety needs to be investigated

> 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

Muhammed F Haq [1], Basya S Pearlmutter [1], Jennifer L Cadnum [1], Curtis J Donskey [2 3]

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*.

Table 2. Mean (SE) Log_{10} Reductions in *Candida auris* and *Candida albicans* for the 23 Tested Disinfectants

Product	Clade II	Clade I	Clade IV	Clade III	*Candida albicans*[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)

Table 2. Mean (SE) Log_{10} Reductions in *Candida auris* and *Candida albicans* for the 23 Tested Disinfectants

Product	Clade II	Clade I	Clade IV	Clade III	*Candida albicans*[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)

Efficacy of 23 Disinfectants Against *C. auris* from 4 Major Clades

Haq et al. ICHE 2024. 45:127-131

- Clades-distinct genetic lineages (descendants of a given genetic sequence), I common; clade II (initially recommended for standard testing)
- Clade III and clade IV might have reduced effectiveness compared to clade II
- Chlorine-based disinfectants and PA consistently reduced all strains
- Most iHP reduced all test strains (>5log)
- 2 of 4 Quat with alcohol >5log
- None of Quat only achieved >5log
- Quat-alcohol, iHP varied effectiveness
- Sporicidal disinfectants effective

Disinfection and Sterilization
New Technology; New Research

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

THANK YOU!

www.disinfectionandsterilization.org