# Three Wise Men on Disinfection

A discussion on surface decontamination in healthcare



Dr. Jon Otter



Prof. Curtis Donskey



Prof. Jean-Yves Maillard

Discussion moderator ...
**Martin Kiernan**

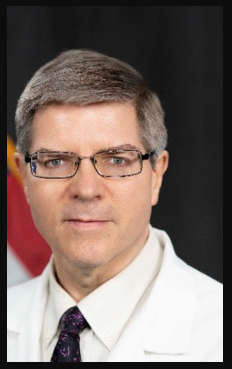


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## Lab testing vs. real life

How confident can we be that the efficacy demonstrate in laboratory testing translates into effective environmental decontamination in busy healthcare settings, where conditions are rarely ideal?



# Evaluation of disinfectants and disinfection technologies

- Lab testing (microbiologic plausibility)
- EPA or FDA registration
- Real-world testing
  - Decrease environmental contamination
  - +/- Decrease infections
- Guidelines (CDC, SHEA, APIC)

Donskey CJ. Decontamination devices in health care facilities: Practical issues and emerging applications. Am J Infect Control 2019;47S:A23-A28.



# Continuously active quaternary ammonium disinfectants

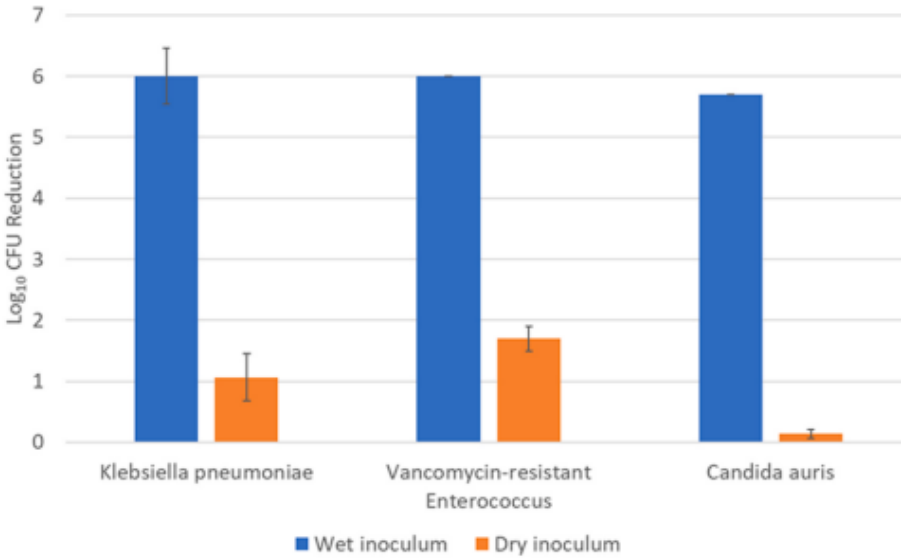
| Level of evidence | Continuous quats |
|---|---|
| Lab testing (microbiologic plausibility)[1] | • Effective against multiple pathogens<br>• Persists despite "wear" testing |
| Effective in real-world clinical settings | • Decreased contamination with application every 4 months [2]<br>• Decreased HAIs (36% decrease)[2] |
| EPA registration for residual activity | • Yes (2 products) |
| Recommended in guidelines (CDC, SHEA, APIC) | • No |

1. Rutala WA. Antimicrobial activity of a continuously active disinfectant against healthcare pathogens. ICHE 2019. 2. Ellingson KD. Impact of a novel antimicrobial surface coating on health care-associated infections and environmental bioburden at 2 urban hospitals. Clin Infect Dis 2020; 3. Cadnum JL. Why is there a discrepancy between laboratory test results and real-world efficacy of continuously active quaternary ammonium disinfectants? ICHE 2024.



# Continuously active quaternary ammonium disinfectants

## Lab testing exaggerates efficacy




Donskey CJ. Continuous surface and air decontamination technologies: Current concepts and controversies. AJIC 2023.



# Continuously active quaternary ammonium disinfectants

- Heavy application required (wiping not sufficient)
- Clinical studies: mixed results
- 2 products EPA approved
  - 1 - no longer commercially available
  - 1 – EPA revoked approval

Easily removed



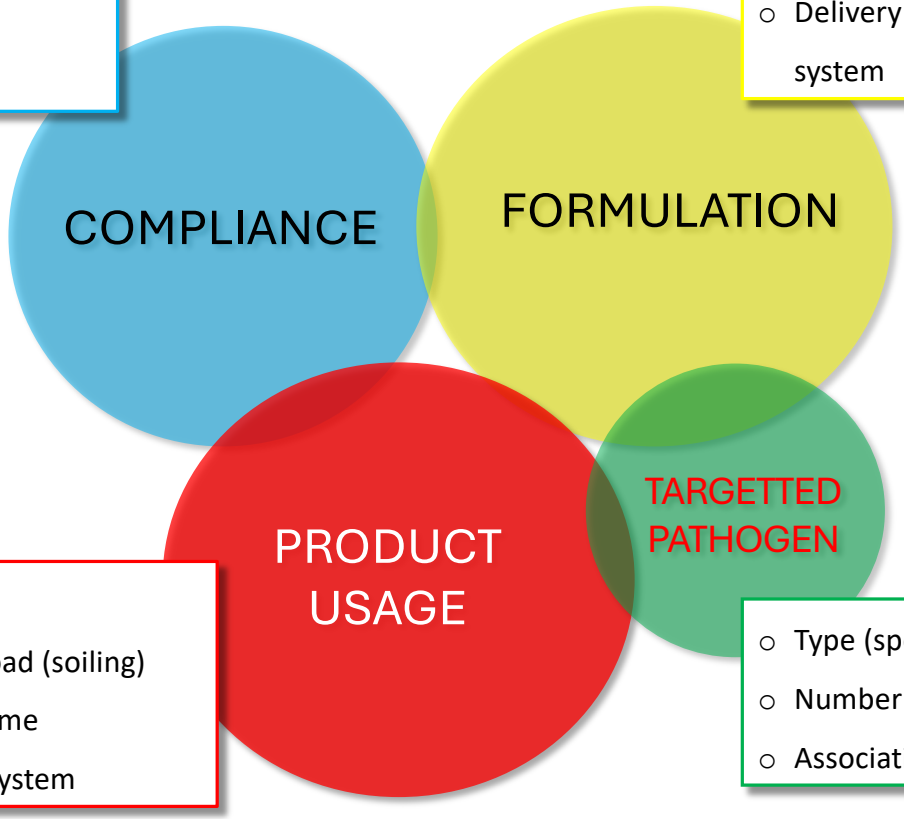

Cadnum JL. Why is there a discrepancy between laboratory test results and real-world efficacy of continuously active quaternary ammonium disinfectants? Infect Control Hosp Epidemiol 2024.



# Factors impacting efficacy

- Manufacturer's Instructions
- Ready to use *vs*. dilution
- Contact time
- Delivery system

- Concentration
- Formulation
- Delivery system




- Surface
- Organic load (soiling)
- Contact time
- Delivery system

- Type (spore, virus, bacteria)
- Number
- Association (biofilms)



# Realistic conditions (EN testing)

| EN standard | Activity tested | Test format | Practical relevance |
|---|---|---|---|
| EN 14885 | Overall framework | Application standard | Defines the EN tests needed to support antimicrobial claims |
| EN 13727 | Bactericidal | Suspension test | Baseline evidence of activity against vegetative bacteria |
| EN 13624 | Yeasticidal / fungicidal | Suspension test | Baseline evidence of activity against yeasts and moulds |
| EN 14348 | Mycobactericidal / tuberculocidal | Suspension test | Relevant where activity against mycobacteria is claimed |
| EN 17126 | Sporicidal | Suspension test | Relevant to bacterial spores, including Clostridioides difficile |
| EN 14476 | Virucidal | Suspension test | Supports enveloped, limited-spectrum or full virucidal claims |
| EN 16615 | Bactericidal / yeasticidal | Surface test with wiping | Four-field test for disinfectant wipes and mopping systems |
| EN 17387 | Bactericidal / yeasticidal / fungicidal | Surface test without wiping | Relevant to sprays and liquids applied without mechanical action |
| EN 16777 | Virucidal | Surface test without wiping | Demonstrates viral efficacy on non-porous surfaces |
| EN 17846 | Sporicidal | Surface test with wiping | Four-field test for disinfectant wipes and mopping systems |



# EN testing: benefits and limitations

| Benefits | Limitations |
|---|---|
| Standardised and reproducible test methods | Laboratory conditions may not fully represent healthcare practice |
| Independent evidence to support efficacy claims | Results may not reflect variation in cleaning technique or compliance |
| Allows objective comparison between products | Does not directly measure impact on healthcare-associated infections |
| Covers key microbial groups including bacteria, fungi, viruses and spores | Limited assessment of biofilms and dry-surface contamination |
| Includes testing under clean and dirty conditions | Test organisms are surrogates and may not represent all clinical pathogens |
| Surface tests can simulate practical use on hard surfaces | Some products perform well in suspension tests but less well on surfaces |
| Supports procurement, regulatory and governance decisions | Does not assess safety, compatibility, sustainability or cost |
| Provides a common framework across manufacturers and healthcare systems | Should be interpreted alongside real-world and clinical evidence |



# Standard efficacy tests

Wesgate *et al*. *J Hosp Infect* 2016;93:256-262.

| 60 min contact time | $Log_{10}$ Reduction (± SD) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **BIOCIDES/PRODUCTS** | **BS EN 14347** | | **BS EN 13704** | | **AOAC 966.04** | | **ASTM E2197** | |
| **Clean condition** | *C. diff* | *B. sub* | *C. diff* | *B. sub* | *C. diff* | *B. sub* | *C. diff* | *B. sub* |
| Glutaraldehyde - 2% | 1.87 (0.50) | 0.56 (0.03) | 1.57 (0.12) | 0.44 (0.47) | 1.60 (0.22) | 0.12 (0.00) | 1.17 (0.08) | 0.66 (0.06) |
| *Ortho*-phthalaldehyde-0.55% | >6.11 (0.33) | 0.62 (0.11) | >5.96 (0.17) | 0.48 (0.63) | 5.05 (0.08) | 0.19 (0.00) | 5.83 (0.02) | 0.29 (0.06) |
| *Ortho*-phthalaldehyde-0.65% | >6.11 (0.33) | 0.56 (0.07) | >5.96 (0.17) | 0.77 (0.39) | 5.05 (0.08) | 0.12 (0.00) | >5.83 (0.00) | 0.20 (0.09) |
| Didecyldimehtyl ammonium chloride -1% | 0.69 (0.40) | 0.01 (0.18) | 0.23 (0.09) | 0.07 (0.72) | 0.44 (0.20) | 0.54 (0.00) | 0.39 (0.30) | 0.41 (0.05) |
| Bis(aminopropyl)laurylamine – 1% | 1.22 (0.90) | 0.66 (0.01) | 0.25 (0.09) | 0.60 (0.54) | -0.08 (0.17) | -0.07 (0.00) | 1.22 (020) | 0.40 (0.10) |
| Amine -1% + quaternary ammonium- 1% | 0.29 (0.60) | 0.88 (0.03) | 0.03 (0.03) | 0.68 (0.01) | 0.44 (0.04) | 0.11 (0.00) | 0.23 (0.17) | 0.48 (0.10) |
| Anoxy-Twin-1200 ppm | >6.11 (0.33) | >6.27 (0.00) | >5.96 (0.17) | >4.88 (0.10) | 5.05 (0.08) | >5.81 (0.00) | >5.83 (0.00) | >5.31 (0.02) |
| Aniosept Activ – 2% | 6.09 (0.54) | 6.81 (0.06) | >6.44 (0.03) | >6.18 (0.07) | 5.05 (0.08) | >5.81 (0.00) | >5.83 (0.00) | *5.06 (0.24)* |
| NaOCl 5000 ppm | >6.11 (0.33) | >6.27 (0.00) | 5.96 (0.17) | >4.88 (0.10) | 5.05 (0.08) | >5.81 (0.00) | >5.83 (0.00) | 4.28 (0.07) |



# Product claim



"Sporicidal 70% Alcohol Gel & Moisturiser (250ml) Kills 99.999% of bacteria
Sporicidal 70% Alcohol Hand Gel with moisturiser, 250ml with flip top cap - the only alcohol hand gel effective against C. Difficile spores."



"Product C to date has killed every virus, spore and bacteria it has been tested on including MRSA, C-Diff, Norovirus and many more pathogens in 1/5 of the EN1276 required time making it 1000 time more effective than EN1276 requirements - EN1276 is the chemical disinfectants and antiseptics."



# Product claim - observations

- Observation of usage in practice –cleaning staff in ITUs

  - use of wipes – surface area
  - contact
  - rotation

| Wipe Number | Surface initially wiped | Time applied (seconds) | Number of consecutive surfaces wiped (other surfaces) |
|---|---|---|---|
| 1 | Bed Rail | 4 | 5 (bedside table, monitor X2, monitor stand) |
| 2 | Steel Trolley | 6 | 2 (both shelves on the trolley wiped) |
| 1 | Monitor | 4 | 5 (monitors, two keypads, monitor stand) |
| 2 | Bed rail | 7 | 4 (table, monitor, keypad) |
| 3 | Bedside table | 10 | 4 (folder, two bed rails) |



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One wipe – one direction – one surface…bin it



# Product claim

- "SPORICIDAL" WIPES– efficacy testing against *C. difficile* NCTC12727

Siani *et al. AJIC* 2011; 39(3), 212-218

| Wipes[1] | Bacterial Removal ($log_{10}$ cfu/disk ± SD) 500 g surface pressure | Bacterial transfer following 10 s wiping time at 500 g surface pressure |
|---|---|---|
| **Negative control** | **1.13 (± 0.36)** | 5 consecutive transfers. TNTC |
| **NaOCl soaked wipe** | **2.02 (± 0.21)** | 5 consecutive transfers. TNTC |
| Clinell® sporicidal wipe | **4.09 (± 0.79)** | No spore transferred |
| TriGene Advance | **0.22 (± 0.07)** | **5 consecutive transfers. From 0 to TNTC** |
| AzoMaxActive™ | **1.30 (± 0.33)** | **5 consecutive transfers. From 0 to TNTC** |
| Sani-Cloth® Rapid | **0.57 (± 0.07)** | **5 consecutive transfers. From 1 to TNTC** |
| Activ8™ | **+0.08 (± 0.08)** | 5 consecutive transfers. TNTC |
| SuperNova® | **1.14 (± 0.65)** | 5 consecutive transfers. From 83 to TNTC |
| Tuffie | **0.67 (± 0.11)** | 5 consecutive transfers of ≤43 bacteria |
| Enduro Patient wipes | **0.88 (± 0.13)** | 5 consecutive transfers. From 2 to TNTC |
| NewGenn[2] | **0.84 (± 0.66)** | 5 consecutive transfers. From 40 to TNTC |

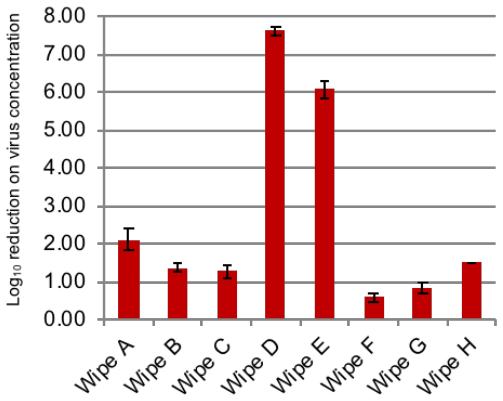
[1] At the time of testing i.e. 2010-2011 ; [2] no sporicidal claim



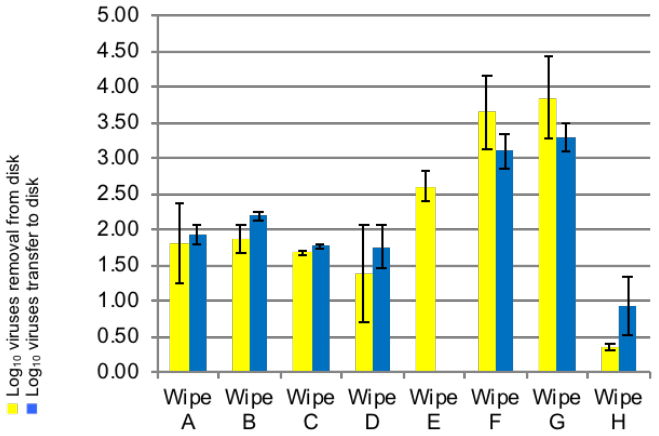
# Product efficacy

- Efficacy of antimicrobial wipes against viruses

Virucidal activity of expressed wipe solutions (n=3)




Virus removal from disks and virus transfer from wipes to disks. (n=3)



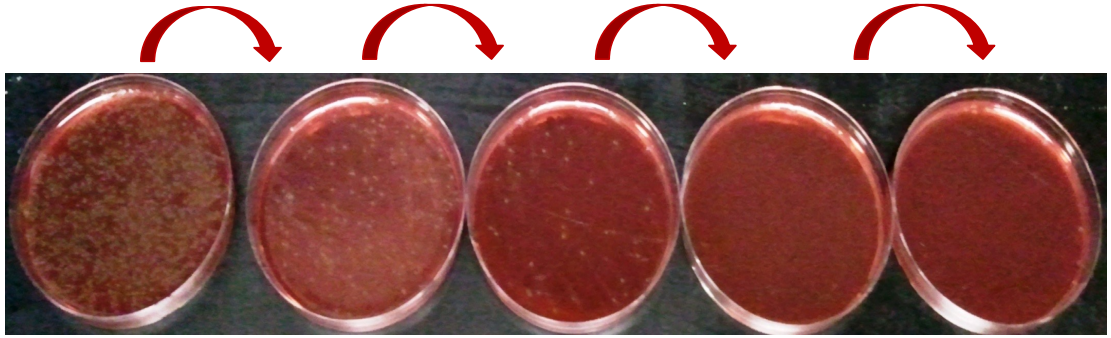

| | Mean removal | Range |
|---|---|---|
| *'Universal' wipes* | 1.68 $\log_{10}$ | 1.37-1.87 $\log_{10}$ |
| *Sporicidal wipes* | 3.13 $\log_{10}$ | 2.61- 3.65 $\log_{10}$ |
| *Detergent wipes* | 2.11 $\log_{10}$ | 0.36- 3.85 $\log_{10}$ |

## Contact time

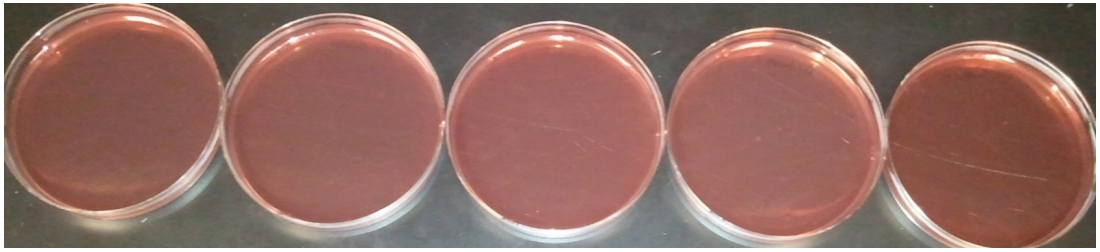
If using a disinfectant, how important is it to achieve the stated contact time in practice, and are we being realistic about what healthcare teams can consistently deliver at the point of care?



# Transfer of *C. difficile* spores by a bleach wipe with incorrect use



Bleach wipe after multiple uses

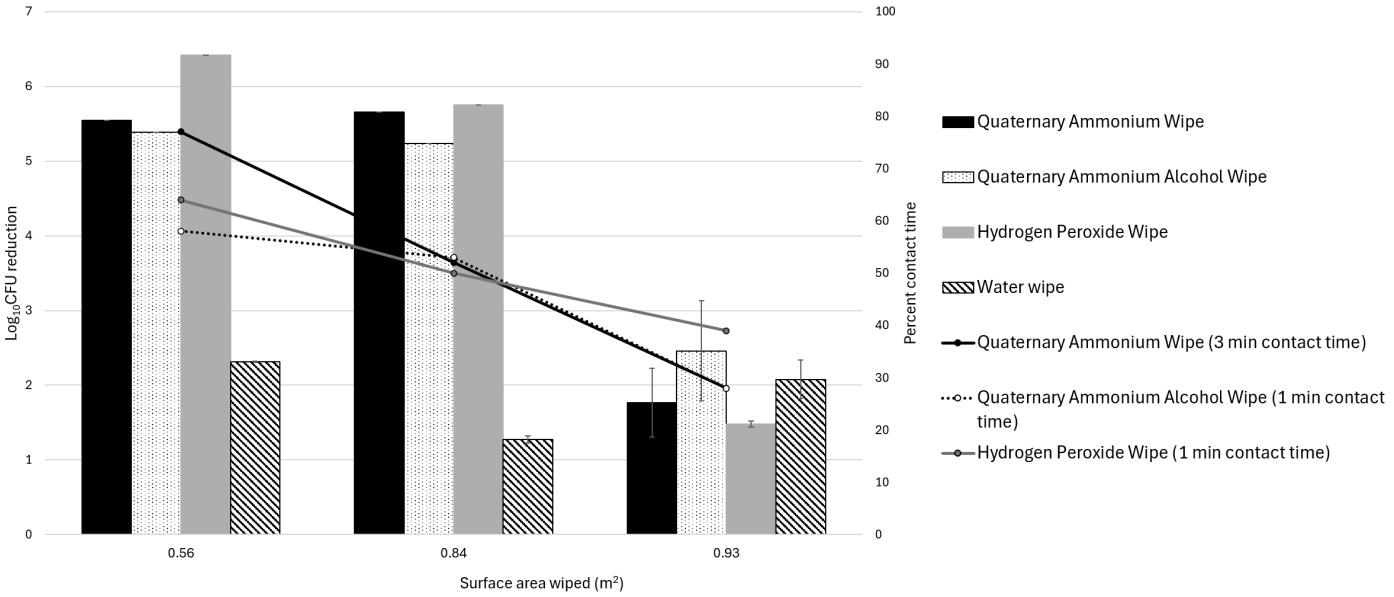


Fresh wet bleach wipe

Cadnum JL. Transfer of *C difficile* spores by nonsporicidal wipes and improperly used hypochlorite wipes: practice + product = perfection. Infect Control Hosp Epidemiol 2013.



# Ready-to-use wipe products remained effective with extended use even if surfaces did not remain visibly wet for the recommended treatment time




Cadnum JL. How long do ready-to-use disinfectant wipes maintain wet contact time and efficacy with extended use?



# Is it sporicidal?

- Tested 32 disinfectants against *Clostridioides difficile* spores under clean and dirty conditions.
- 16 products passed after 60 minutes, but only eight passed within a clinically realistic one-minute contact time.
- Organic soil substantially reduced the activity of many products.
- A “sporicidal” claim did not guarantee rapid efficacy under realistic conditions.
- Product selection should consider contact time, soiling and intended use, not simply the label claim.

| No. | Active agent | $Log_{10}$ reduction from $10^6$ challenge | | | |
|---|---|---|---|---|---|
| | | Clean (0.3% albumin) | | Dirty (3% albumin) | |
| | | 1 min | 60 min | 1 min | 60 min |
| 1 | Chlorine dioxide | >4 | >4 | >4 | >4 |
| 2 | Chlorine dioxide | >4 | >4 | >4 | >4 |
| 3 | Chlorine dioxide | >4 | >4 | >4 | >4 |
| 4 | Chlorine dioxide | >4 | >4 | >4 | >4 |
| 5 | Chlorine dioxide | >4 | >4 | 3 | >4 |
| 6 | Chlorine dioxide | >4 | >4 | 3 | >4 |
| 7 | Chlorine dioxide | >4 | >4 | 3 | 4 |
| 8 | Chlorine dioxide | 3 | >4 | 3 | >4 |
| 9 | Didecyldimethylammonium | 3 | >4 | <3 | >4 |
| 10 | Chlorine dioxide | 3 | >4 | <3 | 3 |
| 11 | Chlorine dioxide | 3 | >4 | <3 | <3 |
| 12 | Chlorine dioxide | 3 | >4 | <3 | <3 |
| 13 | Chlorine dioxide | 3 | >4 | <3 | <3 |
| 14 | Triamine | <3 | >4 | <3 | >4 |
| 15 | Chlorine | <3 | >4 | <3 | >4 |
| 16 | Chlorine | <3 | >4 | <3 | >4 |
| 17 | Chlorine | <3 | >4 | <3 | >4 |
| 18 | Hypochlorite-based mixture | <3 | >4 | <3 | 3 |
| 19 | Hypochlorite | <3 | >4 | <3 | 3 |
| 20 | Chlorine dioxide | <3 | >4 | <3 | <3 |
| 21 | Chlorine dioxide | <3 | >4 | <3 | <3 |
| 22 | Chlorine dioxide | <3 | >4 | <3 | <3 |
| 23 | Chlorine dioxide | <3 | >4 | <3 | <3 |
| 24 | Chlorine dioxide | <3 | >4 | <3 | <3 |
| 25 | Chlorine dioxide | <3 | >4 | <3 | <3 |
| 26 | Triamine (wipes)[a] | <3 | >4 | <3 | <3 |
| 27 | Peracetic acid (wipes)[b] | <3 | 4 | <3 | <3 |
| 28 | Triamine | <3 | 3 | <3 | <3 |
| 29 | Triamine | <3 | 3 | <3 | <3 |
| 30 | Chlorine dioxide | <3 | <3 | <3 | <3 |
| 31 | Benzalkonium chloride, didecyldimonium chloride, bronopol, polyaminopropyl biguanide hydrochloride | <3 | <3 | <3 | <3 |
| 32 | Benzalkonium chloride, didecyldimonium chloride, bronopol, polyaminopropyl biguanide hydrochloride | <3 | <3 | <3 | <3 |

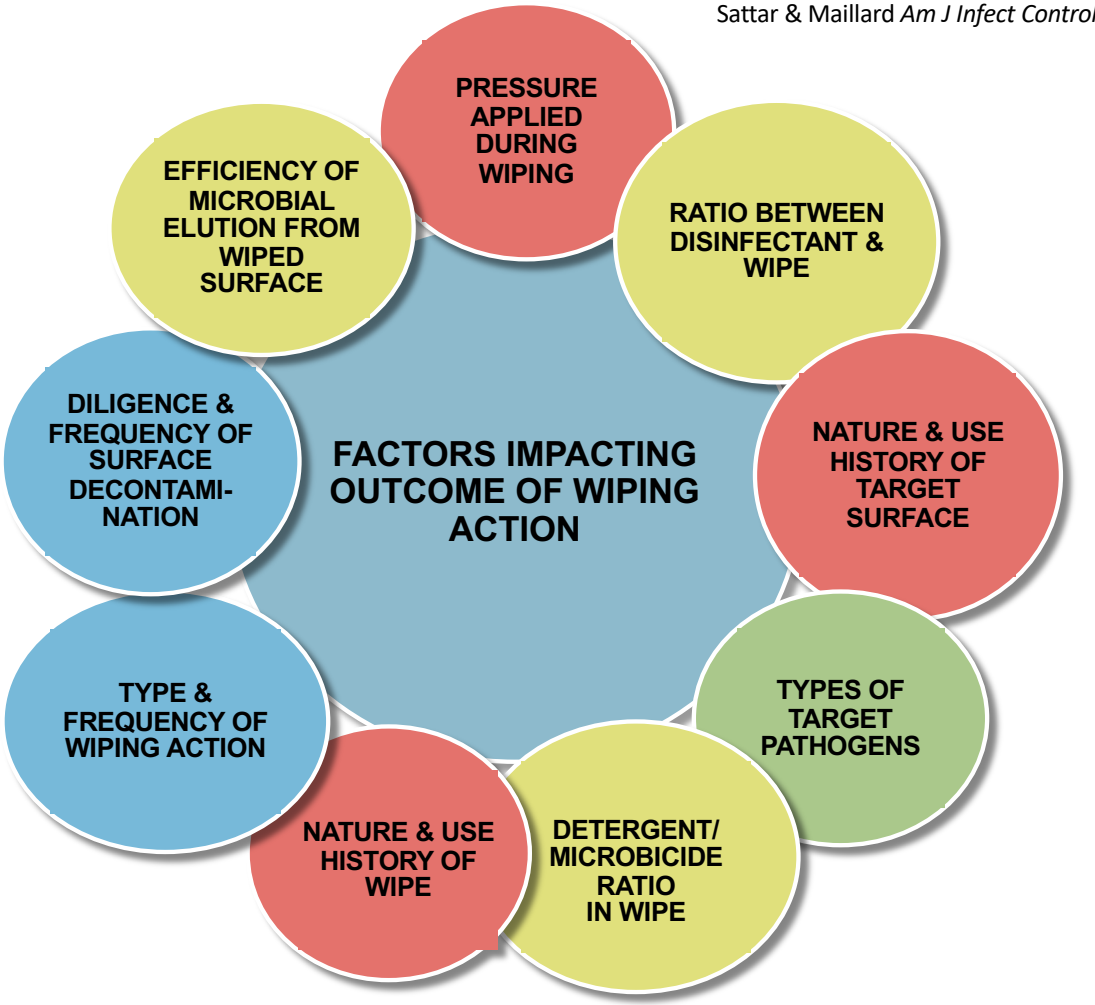
Background shaded products indicates those that did not achieve a 3 log reduction.
[a] Expressed and used neat.
[b] Wipe was immersed into 75 mL hard water and then rinsed three times to express the fluid used for the test.

Speight et al. J Hosp Infect 2011.



# Surface disinfection - Wiping

Sattar & Maillard *Am J Infect Control* 2013 41;S97-S104





# Product claim

- Wipe-based products

Laboratory test report downloaded from www Sept 2011

ITEMS: XXX Sporicidal Wipe Liquid

TESTS: Disinfectant Test

METHOD: Bacteria – BS EN 13704:2002
Concentration: Neat
Temperature: 20 C
Contact Time: 15 and 30 mins
Interfering substance: Bovine Albumin 0.3 g/L
Recovery: Dilution neutralisation
Incubation media: Clostridial Agar



# Contact time

- Exposure to alcoholic hand rubs

Cheeseman *et al. J Hosp Infect* 2009; 72 (4): 319-325

| Number of Isolates | Time Point by which a bactericidal effect was observed (mean ≥99.99% reduction) | | |
|---|---|---|---|
| | Soft Care Med H5 | Cutan | Guest Medical |
| 1 (MSSA) | 10 s | 5 min | 30 s |
| 1 (MRSA) | 30 s | 5 min | 10 s |
| 9 (MRSA) | 30 s | 2 min | 30 s |
| 9 MRSA, 5 MSSA | 30 s | 5 min | 30 s |
| 8 MRSA, 6 MSSA | 30 s | 5 min | 1 min |
| 1 MRSA, 6 MSSA | 30 s | 5 min | 2 min |
| 2 MRSA, 2 MSSA | 30 s | 5 min | 5 min |
| 1 (MRSA) | 30 s | >5 min | 2 min |
| 2 MSSA | 1 min | 5 min | 1 min |
| 1 (MSSA) | 1 min | 5min | 2 min |
| 3 (MSSA) | 1 min | 5 min | 5 min |
| 1 (MSSA) | 1 min | 5 min | >5 min |

## Standardization

Should we strive for standardized environmental decontamination protocols across healthcare, or do differences in clinical risk, care settings, and available resources demand a more flexible risk-based approach?



# The case for universal disinfection

- Patients with unidentified infection risks
- Challenges of cleaning complex and intricate environment
- Dry surface biofilms
- Limited reduction in pre-post studies
- Evidence that they spread contamination around
- Emerging evidence of detergent-related surface damage
- Evidence that moving to routine disinfection reduces transmission risk

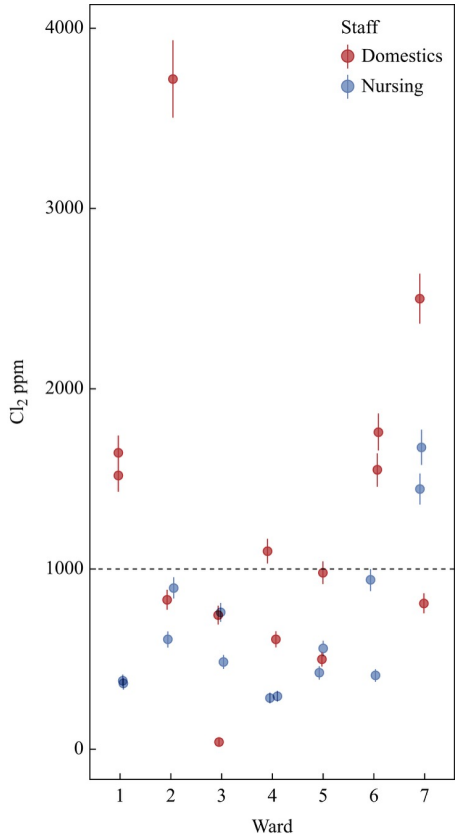
Kiernan et al. J Hosp Infect 2024



# Concentration

Garvey *et al. Am J Hosp Infect* 2025 155:37-39.

- Staff (important hidden variable)
  - Preparation of NaDCC (chlorine solutions) - aim: 1,000 ppm




Concentration range from 40 to 3720 ppm

- 68% <1000 ppm
- 7% between 1000 and 1500 ppm
- 25% >1500 ppm.

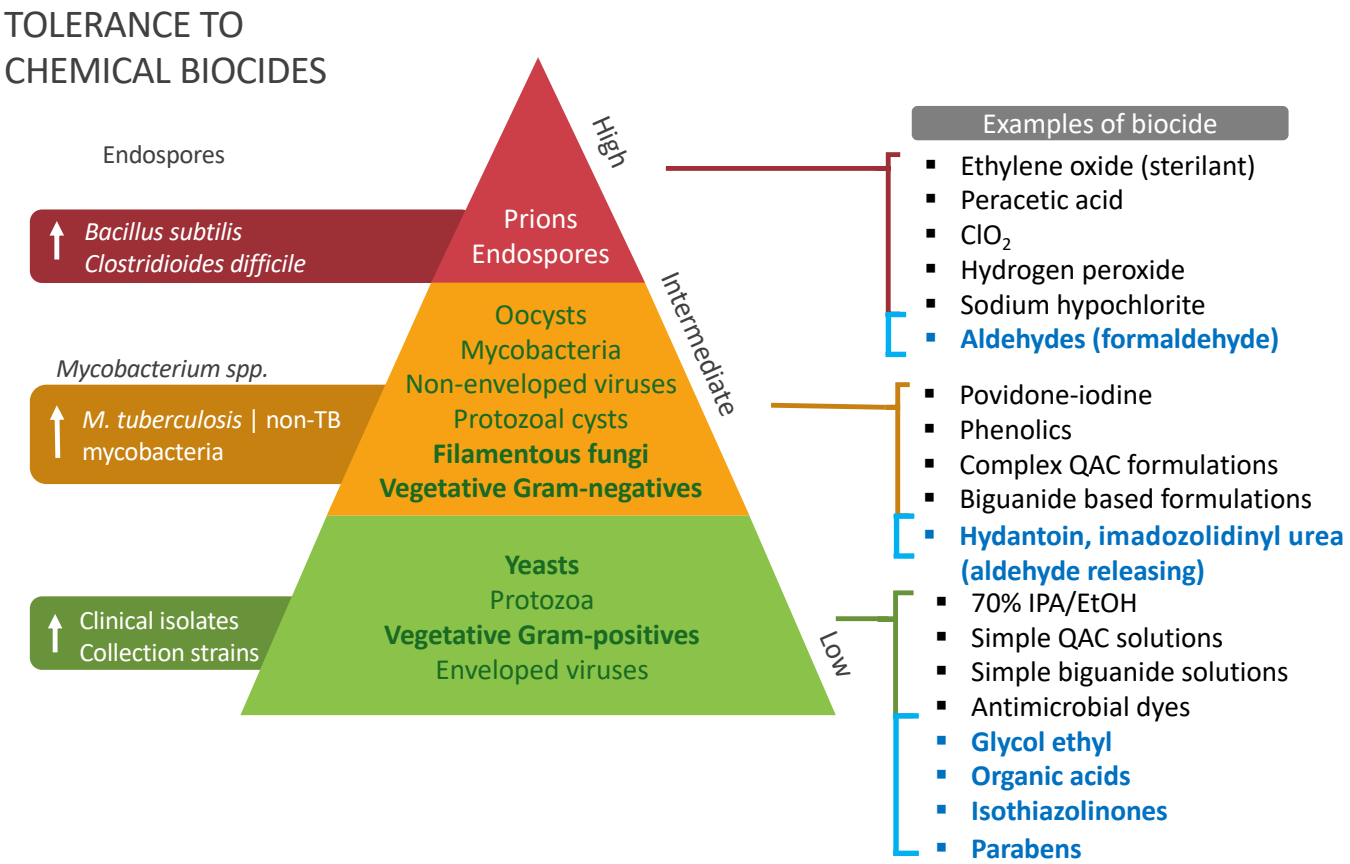
- Only that 7% of chlorine solutions collected were at the correct concentration of 1000–1500 ppm.

In environmentally clean conditions, NaDCC at 1000 ppm achieves >3 $\log_{10}$ reduction in 3 min,



# Microbial susceptibility to disinfectants

Maillard & Pascoe *Nature Review* 2023



## New technologies

With new technologies and approaches to environmental decontamination continuing to emerge, which of these offer genuine improvements in patient safety, and how do we distinguish meaningful innovation form solutions that add complexity without clear benefit?



# Cluster randomized trials of UV-C show modest or no reduction in HAIs

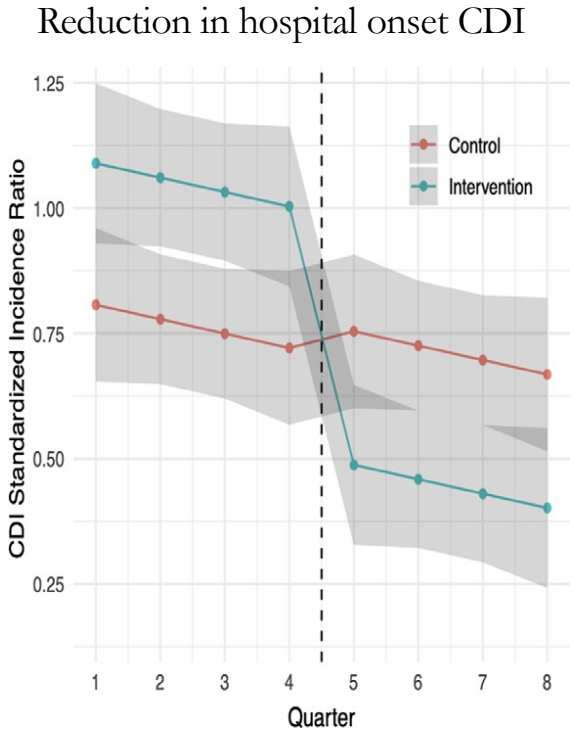
| Setting | Findings |
|---|---|
| Nine hospitals[1,2] | Decrease in MDROs and hospital-wide CDI (11%) and VRE (44%) when UV added to quat but not when added to bleach |
| 4 cancer wards & 1 organ transplant unit[3] | No reduction in new VRE infections or *C. difficile* infections |
| 15 wards in 2 hospitals (pulsed xenon devices)[4] | No reduction in clinical cultures positive for environmentally implicated HAIs (VRE, MRSA, resistant GNB) and CDI |

1. Anderson DJ. Enhanced terminal room disinfection and acquisition and infection caused by multidrug-resistant organisms and *C difficile* (the Benefits of Enhanced Terminal Room Disinfection study): a cluster-randomised, multicentre, crossover study. Lancet 2017; 2. Anderson DJ. Effectiveness of targeted enhanced terminal room disinfection on hospital-wide acquisition and infection with multidrug-resistant organisms and *C difficile*: a secondary analysis of a multicentre cluster randomised controlled trial with crossover design (BETR Disinfection). Lancet Infect Dis 2018; 3. Rock C. Ultraviolet-C Light Evaluation as Adjunct Disinfection to Remove Multi-Drug Resistant Organisms. Clin Infect Dis 2021; 4. Dhar S. Lowering the Acquisition of Multidrug-Resistant Organisms (MDROs) With Pulsed-xenon (LAMP) Study: A Cluster-Randomized, Controlled, Double-Blinded, Interventional Crossover Trial. Clin Infect Dis 2024.



# Will routine use of sporicidal disinfectants in all patient rooms reduce CDI?

- 8 hospitals switched to use of a peracetic acid disinfectant in all patient rooms + fluorescent marker monitoring
- Reduction in CDI in intervention but not control hospitals




Carling PC. Mitigating hospital-onset *C difficile*: The impact of an optimized environmental hygiene program in 8 hospitals. ICHE 2023;44:440-446.



# UVC disinfection

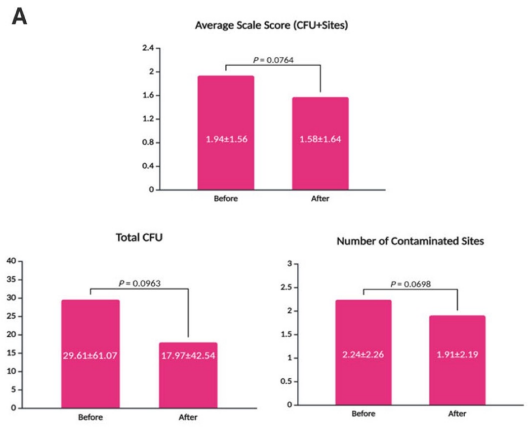
Fourman *et al. BMC Infectious Diseases* (2026) 26:295
https://doi.org/10.1186/s12879-025-12415-y

BMC Infectious Diseases

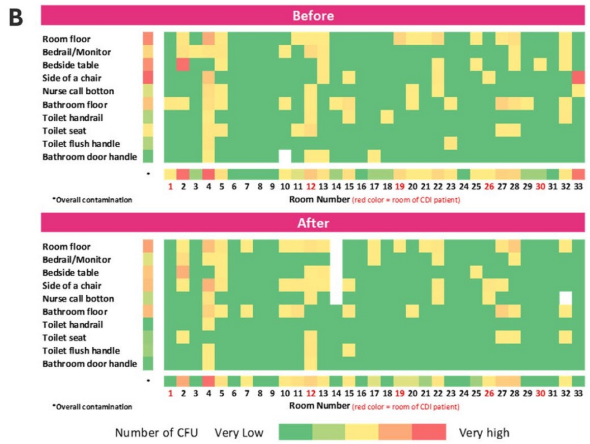
RESEARCH Open Access

Efficacy of UV-C devices in *Clostridioides difficile* environmental decontamination in a hospital setting: a before-after study

- Does adding UV disinfection after routine bleach cleaning further reduce environmental contamination with *Clostridioides difficile?*
- Environmental samples were collected from 10 high-touch sites in 33 hospital rooms occupied by patients with CDI or asymptomatic *C. difficile* carriers.




Difference in room decontamination scale




Heat map number of cfu in patient room and high touch sites – Green: O; red: > 200 room in red with patient with C. diff



# UVC disinfection

Journal of Hospital Infection 159 (2025) 32–41

Available online at www.sciencedirect.com

Journal of Hospital Infection

journal homepage: www.elsevier.com/locate/jhin

Review

**Impact of ultraviolet light disinfection on reducing hospital-associated infections: a systematic review in healthcare environments**

A. Maugeri [a,*], B. Casini [b], E. Esposito [b], S. Bracaloni [b], M. Scarpaci [b], F. Patanè [a], G. Milazzo [a], A. Agodi [a], M. Barchitta [a]

**Does UV environmental disinfection actually reduce HAIs?**

**25 studies** (UV-C, pulsed-xenon UV and unspecified UV technologies).

## Findings

- Decreased CDI rates when PX-UV was added to terminal cleaning protocols - results vary across settings, with some studies not observing significant improvements.
- UV-C disinfection also reduced HAIs but more effective when used in conjunction with other infection control strategies.

## Key message

- The clinical evidence for UV is promising but heterogeneous work best as part of a broader infection-prevention program rather than as a replacement for conventional cleaning
- Indication of potential usefulness in high-risk settings



# The quest for the holy grail: continuous decontamination between episodes of manual cleaning

- Surfaces and air
- Automated
- Effective
- Safe
- Reasonably priced



Donskey CJ. In search of the holy grail of environmental cleaning and disinfection: Effective and safe continuous air and surface disinfection technologies. Am J Infect Control 2026.



# Candidate technologies

- Antimicrobial gases

  (e.g., dry hydrogen peroxide)
- Glycol vapor
- Far UV-C light



Donskey CJ. In search of the holy grail of environmental cleaning and disinfection: Effective and safe continuous air and surface disinfection technologies. Am J Infect Control 2026.

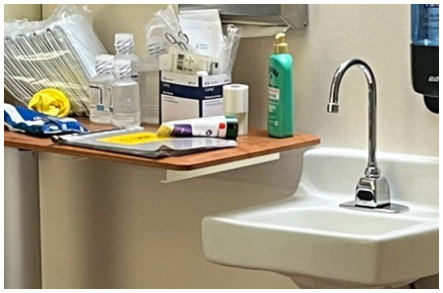


# Potential applications of far UV-C light

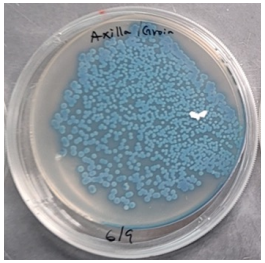
## Equipment rooms



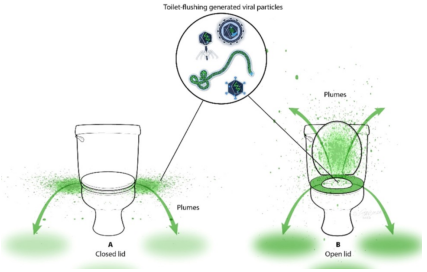
## Sinks



## Emerging pathogens (*C. auris*)



## Bathrooms

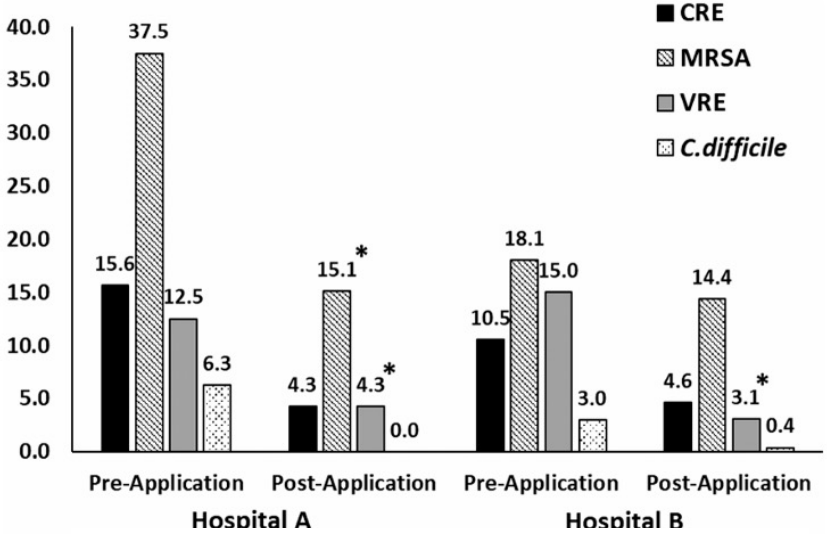


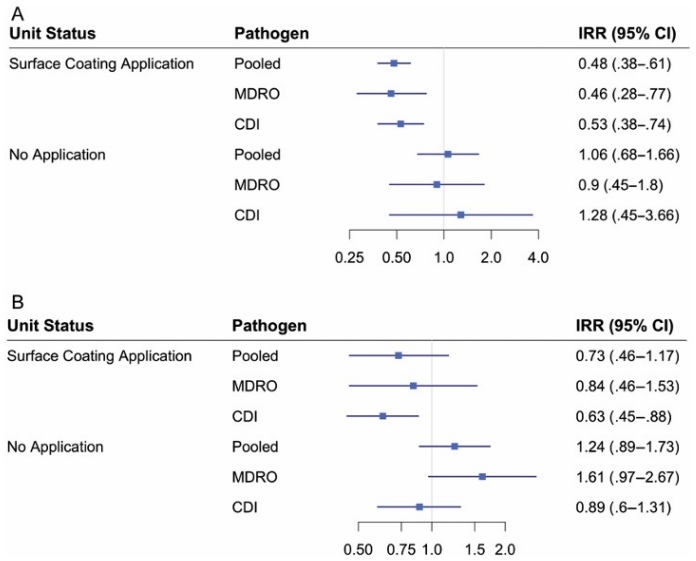

Kaple CE. A far UV-C light technology is effective for decontamination of items in proximity to sinks and is enhanced by a far UV-C reflective surface. ICHE 2024; Kaple CE. Efficacy of a far UV-C light technology for decontamination of bathrooms. ARIC 2024; Memic S. Evaluation of an automated wall-mounted far UV-C light technology for continuous or intermittent decontamination of *Candida auris* on surfaces. Pathogens and Immunity 2024; Memic S. Evaluation of a far ultraviolet-C device for decontamination of portable equipment in clinical areas. Submitted.



# Impact of antimicrobial surfaces

- **Design:** Controlled before-and-after study in two US hospitals
- **Intervention:** Persistent antimicrobial coating applied across six clinical units
- **Results:** 75–79% reduction in bacterial burden and fewer pathogen-positive surfaces
- **Clinical impact:** 36% reduction in pooled MDRO bloodstream infections and *C. difficile* infections
- **Limitations:** Non-randomised design, variable results between hospitals and no environmental sampling in control units




Ellingson et al. Clin Infect Dis 2020.

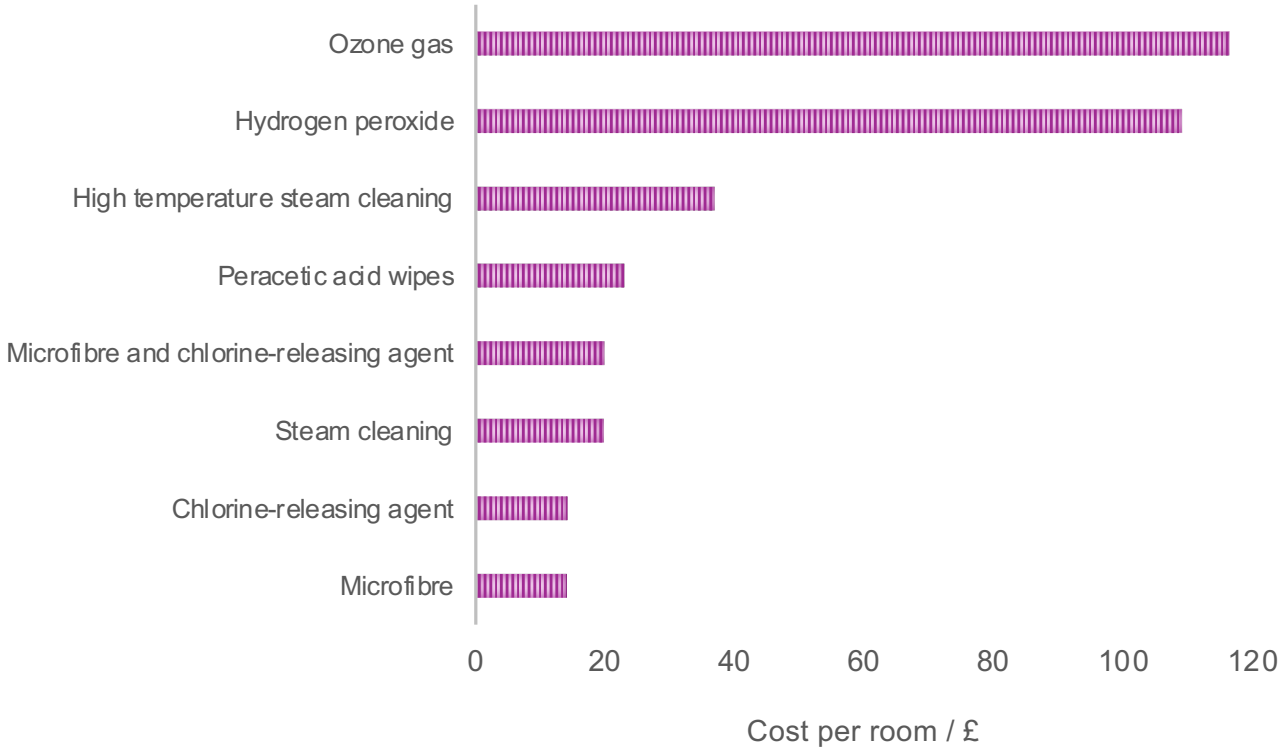
## Evidence of cost-effectiveness

Given the importance of environmental decontamination to patient safety, why do we still have so little robust comparative cost-effectiveness evidence, and what would it take to demonstrate the true economic value of different approaches?



# How much does it cost to clean a hospital room?

Includes staff cost + equipment + consumables for each method.

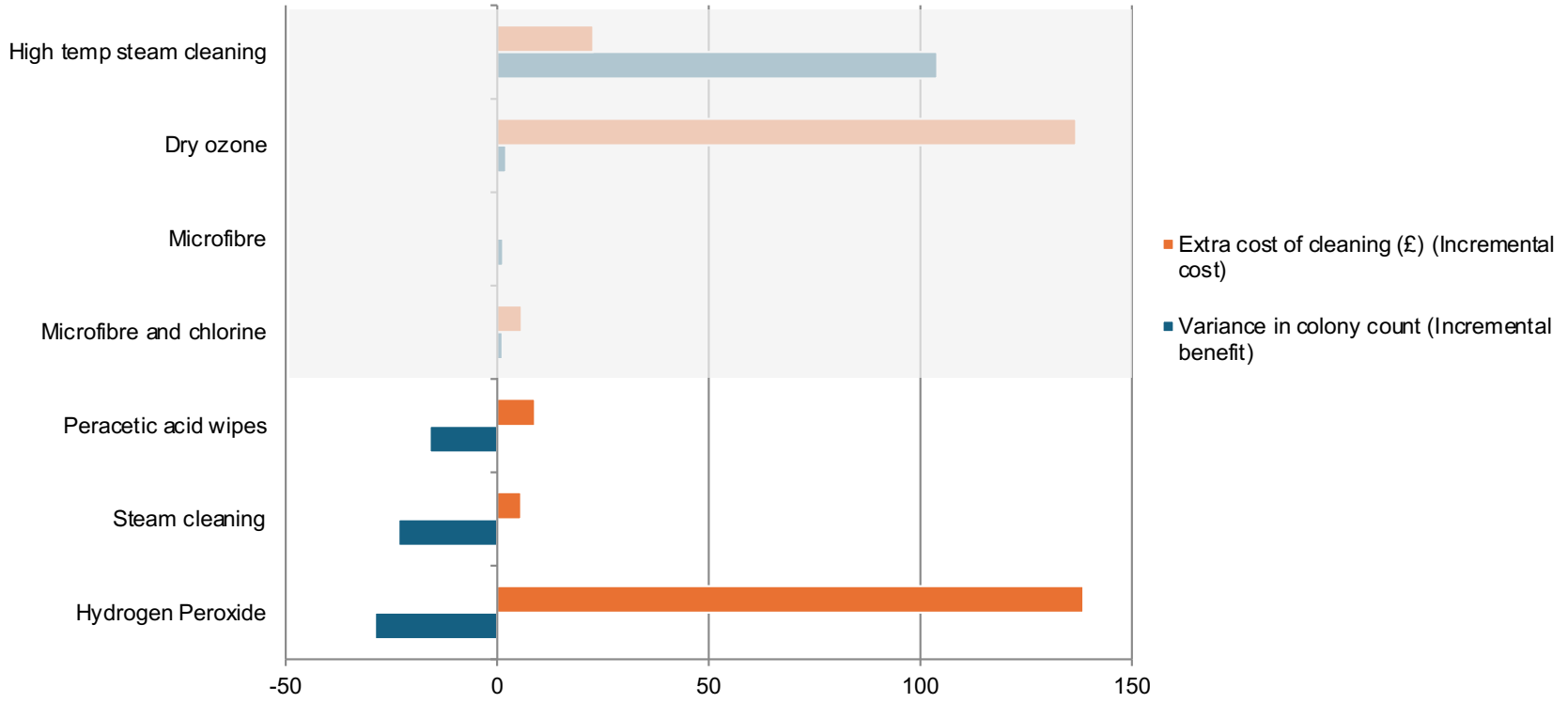



Doan *et al. J Hosp Infect* 2012;82:114-21.



# Comparative cost-effectiveness

A hospital room was experimentally contaminated with *C. difficile* spores and randomised to various disinfection methods. Cost and effectiveness was compared vs. chlorine (Actichlor Plus)

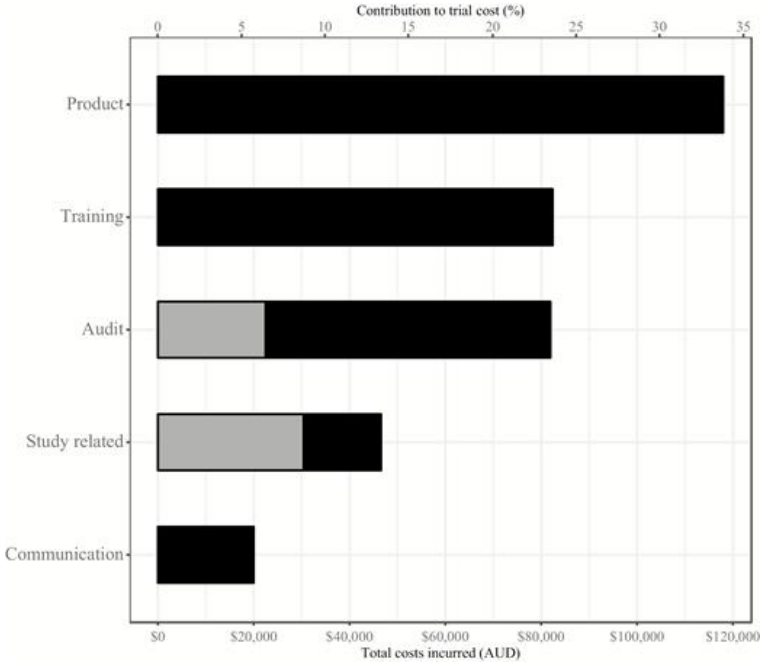



Doan *et al. J Hosp Infect* 2012;82:114-21.



# The cost-effectiveness of a cleaning bundle

Cost-effectiveness analysis of a randomised controlled trial of a cleaning bundle to reduce HCAI in 11 Australian hospitals.

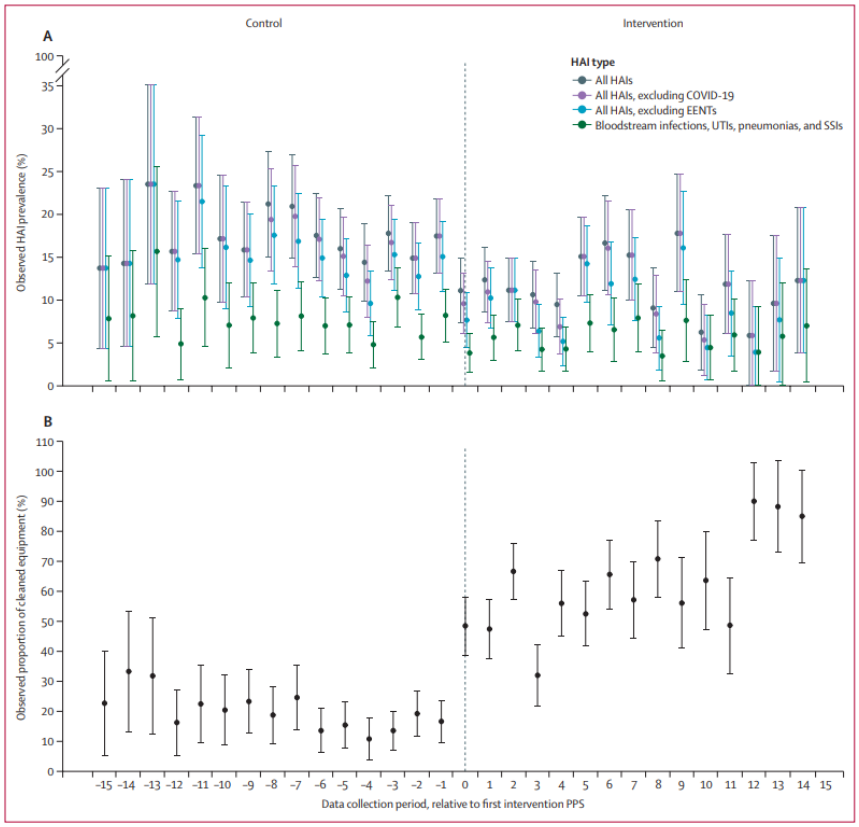



Summary of trial costs: grey = pre- intervention, black = intervention.

- Implementing the cleaning bundle cost AUD$349,000 and generated AUD$147,500 in cost savings.
- Infections prevented under the cleaning bundle returned a net monetary benefit of AUD$1.02 million and an incremental cost-effectiveness ratio of $4,684 per QALY gained.
- There was an 86% chance that the bundle was cost-effective compared with existing hospital cleaning practices.

White *et al. Clin Infect Dis* 2019






# Shared medical equipment (CLEEN study)

- **Design**: Stepped-wedge cluster RCT in 10 hospital wards (5,002 patients).
- **Intervention**: Dedicated equipment cleaning (3 hrs per day), training, audit and feedback.
- **Key findings**:
  - 35% relative reduction in HCAIs (14.9% to 9.8%; OR 0.62).
  - Cleaning compliance increased from 24% to 66%.
- **Limitations**: Single-site study with relatively high baseline HAI rates; transmission pathways not confirmed by genomic analysis.

Browne et al. Lancet Infect Dis 2024.



# Cost effectiveness (CLEEN study)

**Study design**

- Economic evaluation alongside the CLEEN stepped-wedge cluster RCT; 5,002 patients, 10 Australian wards.

**Methods**

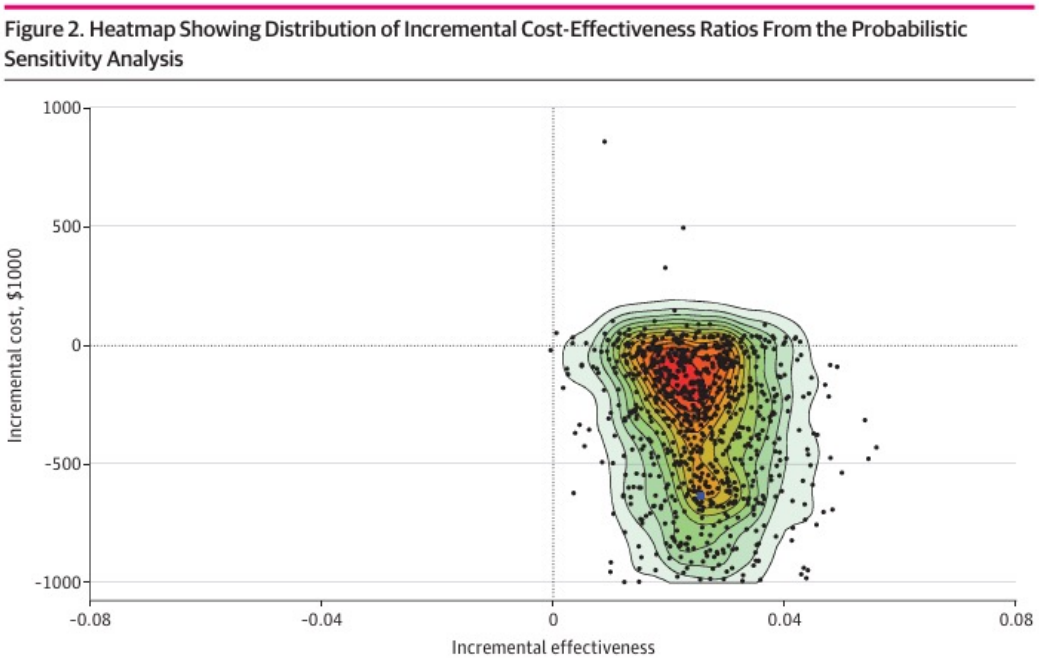
- Dedicated cleaning of shared medical equipment: +3 hours/day, education, audit and feedback vs usual care.

**Results**

- 30 fewer HAIs/1,000 patients (100 vs 130).
- A$642k saving/1,000 patients and 384 bed-days saved.
- 90.5% probability intervention was cost-saving.

**Limitations**

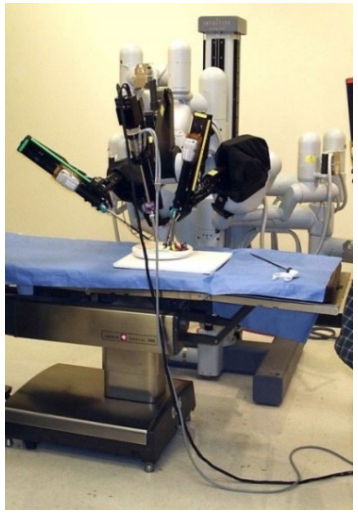
- Single centre; model limited to one HAI/patient.
- No QALYs or wider societal costs; limited generalisability.



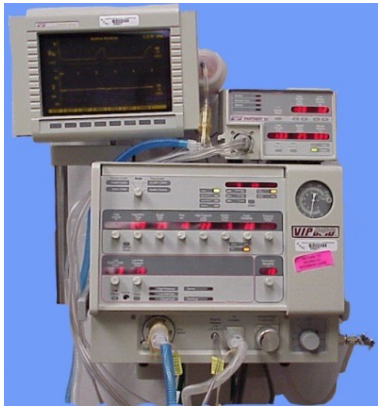

Brain et al. JAMA Open 2025.

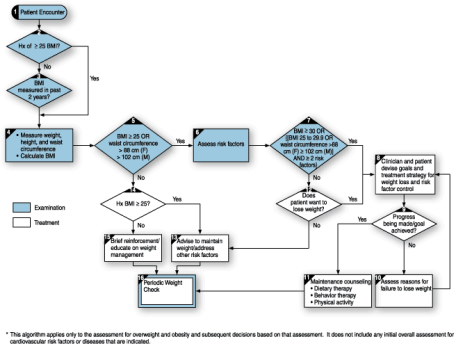


# Cost-perspectiveness













Have other questions?

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THU
**29**

October 29 @ 1:30 pm EDT

## Leveraging Artificial Intelligence to Transform Infection Prevention and Control: Evidence, Barriers, and a Practical Decision-Support Framework

**Presented by the International Federation of Infection Control (IFIC)**
**Silvana Gastaldi**, Independent Researcher, Italy, **Dr. Ermira Tartari Bonnici**, University of Malta, and **Giovanni Satta**, University College London Hospitals

**Free**

**November 2026**

THU
**5**

November 5 @ 1:30 pm EST

## Handwashing Song: A Musical Mnemonic to Recall Handwashing Technique Among Young Children



**Dr. Nisha Thampi**, Children's Hospital of Eastern Ontario (CHEO), Ottawa

**Free**

THU
**12**

November 12 @ 1:30 pm EST

## Antimicrobial Surfaces- Revisiting Their Role in Healthcare Settings



**Prof. Jean-Yves Maillard**, Cardiff University, Wales

**Free**

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