

Surface Disinfection: Current Issues, New Research and New Technologies

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**Former Director, Hospital Epidemiology, Occupational Health and Safety, UNC Health
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DISCLOSURES

2018-2019

- **Consultations**

- ASP (Advanced Sterilization Products), PDI

- **Honoraria**

- PDI, ASP, 3M

- **Scientific Advisory Board**

- KinnoS

- **Grants**

- CDC
-

www.disinfectionandsterilization.org

Objective

Institute Practices that Prevent All Infectious
Disease Transmission via Environment

Disinfection Publications from Jan 2018-May 2019

- AJIC (56), ICHE (24) and JHI (51) -131 publications
 - Most common topics (excludes device reprocessing)
 - UV-31
 - Surface disinfection-23
 - Continuous room decontamination-5
 - Biofilms-4
 - Cleaning thoroughness-4
-

Surface Disinfection: Current Issues, New Research and New Technology

Lecture Objectives

- Continuous room decontamination
 - Surface disinfection
 - *C. difficile*-sporicidal disinfectant
 - Colorized disinfectant
 - Biofilms
-

Environmental Contamination Leads to HAIs

Weber, Kanamori, Rutala. Curr Op Infect Dis 2016:29:424-431



- Evidence environment contributes
- Role-MRSA, VRE, *C. difficile*
- Surfaces are **contaminated**-~25%
- EIP **survive** days, weeks, months
- Contact with surfaces results in **hand contamination**
- Disinfection **reduces contamination**
- Disinfection (daily) **reduces HAIs**
- Rooms **not adequately cleaned**

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 previous patient's pathogen by 39-353%
- For example, increased risk for *C. difficile* is 235% (11.0% vs 4.6%)
- **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)

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



Environmental Contamination Leads to HAIs

- By contaminating hands/gloves via contact with the environment and transfer to patient or the patient self inoculates
 - **Surface should be hygienically clean (not sterile)-free of pathogens in sufficient numbers to prevent human disease**
 - Two environmental surface concerns
 - Discharge/terminal-"no touch" protects new patient in room
 - **Daily room decontamination-Recontamination**
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Recontamination with MRSA after Decontamination with HP Vapor

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

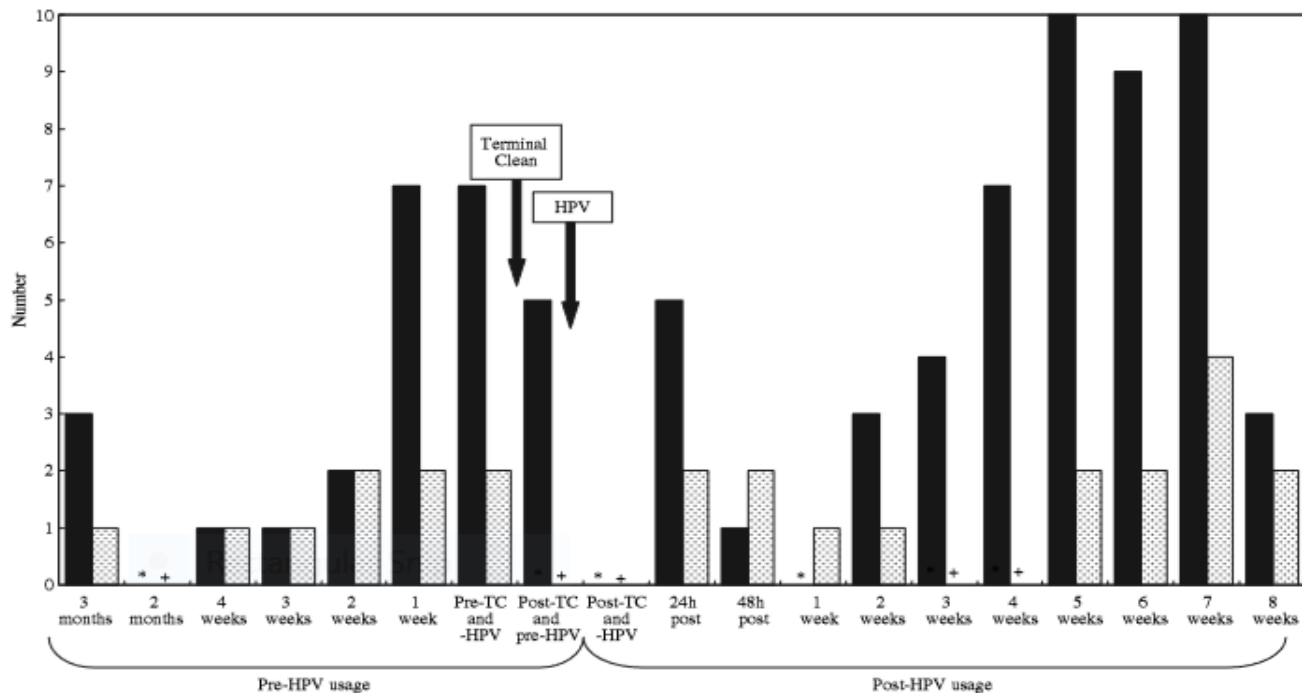


Figure 1 Number of environmental sites (■) contaminated with MRSA, and number of patients (▨) colonized with MRSA on intensive care units on each screen. *MRSA environmental samples all negative; †no patients colonized with MRSA. HPV, hydrogen peroxide vapour; TC, terminal clean.

Relationship Between Microbial Burden and HAIs

Rutala WA et al. ICHE 2018;38:1118-1121; Salgado CD, et al. ICHE 2013;34:479-86

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 |
| Colonization/Infection (rate) ^a | 2.3 | 1.5 | 1.9 | 2.2 |
| Reduction (%) | | 35 | 17 | 4 |

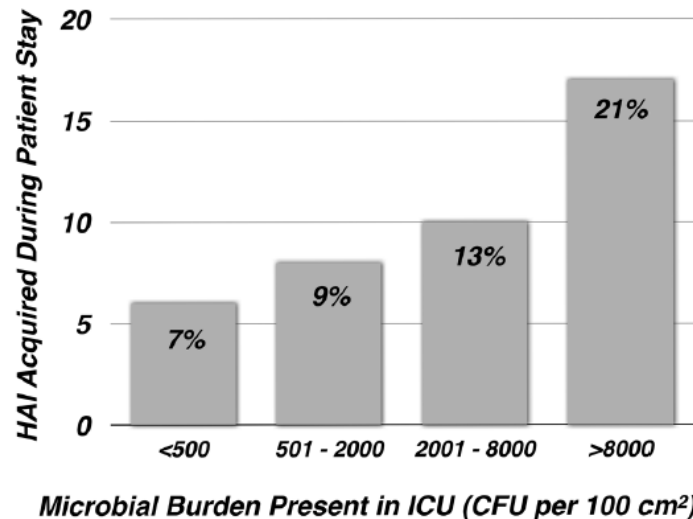


FIGURE 2. Quartile distribution of healthcare-acquired infections (HAIs) stratified by microbial burden measured in the intensive care unit (ICU) room during the patient's stay. There was a significant association between burden and HAI risk ($P = .038$), with 89% of HAIs occurring among patients cared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

To reduce microbial contamination

Continuous Room Decontamination
Technology

Surface Disinfection: Current Issues, New Research and New Technology

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-

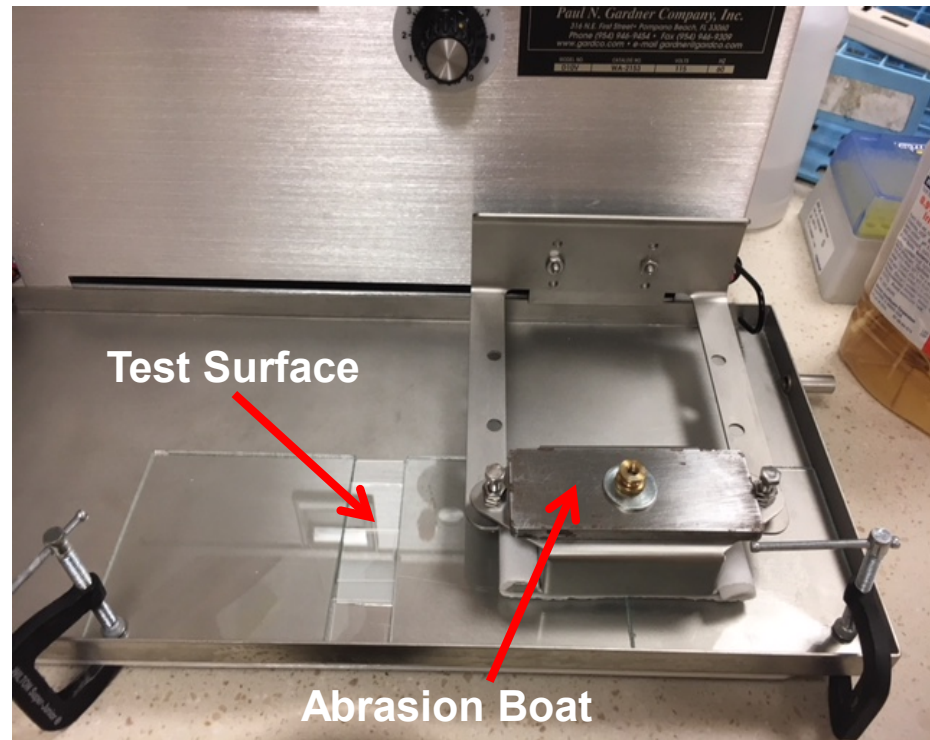
Continuous Room Decontamination Technologies for Disinfection of the Healthcare Environment

- Visible light disinfection through LEDs
 - Low concentration hydrogen peroxide
 - Self-disinfecting surfaces
 - **Continuously active disinfectant (CAD) or persistent disinfectant that provides continuous disinfection action**
 - Allows continued disinfection (may 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”

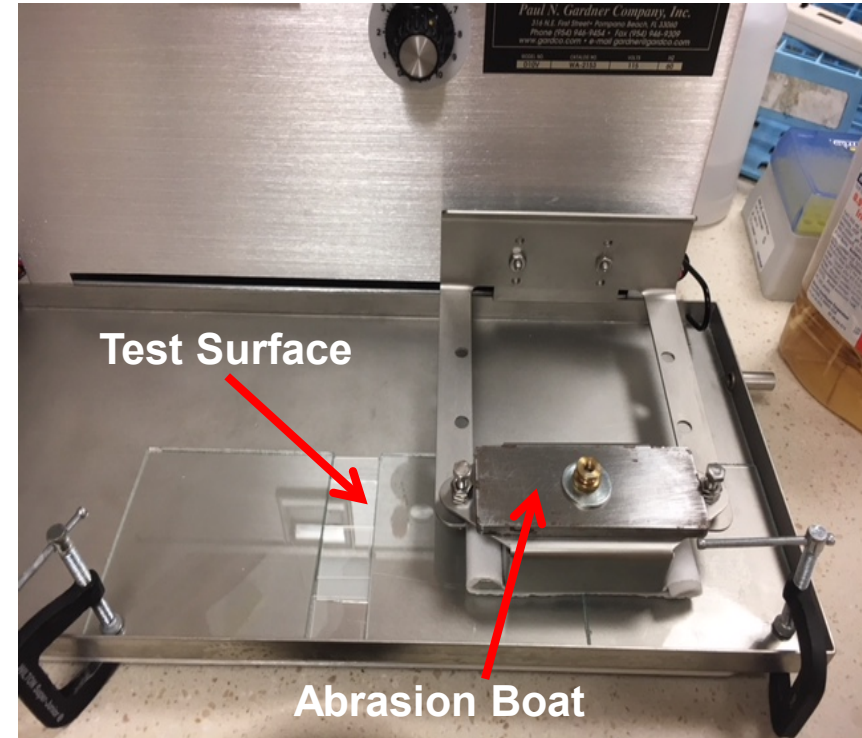
Abrasion Tester



Evaluation of a Continuously Active Disinfectant

“EPA Protocol for Residual Self-Sanitizing Activity of Dried Chemical Residuals on Hard, Non-Porous Surfaces”

- 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 (10^3 , 30min dry) over 24hr
- At the end of the study and at least 24 hours later, the ability of the test surface to kill microbes (99.9%) within 5 min is measured using the last inoculation (10^6)



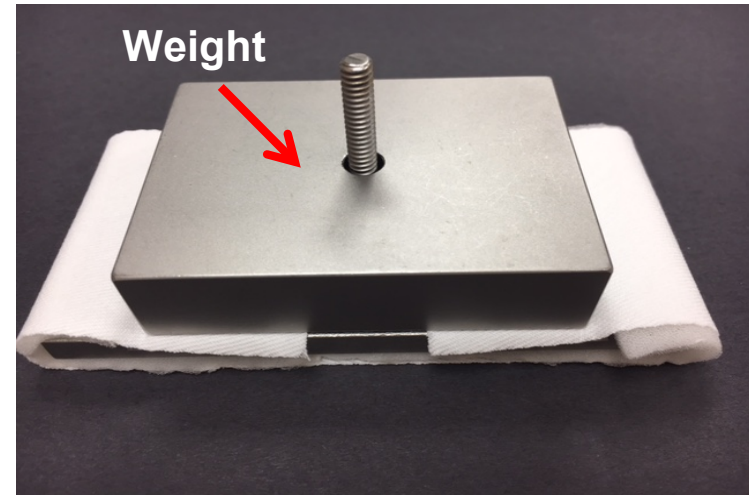
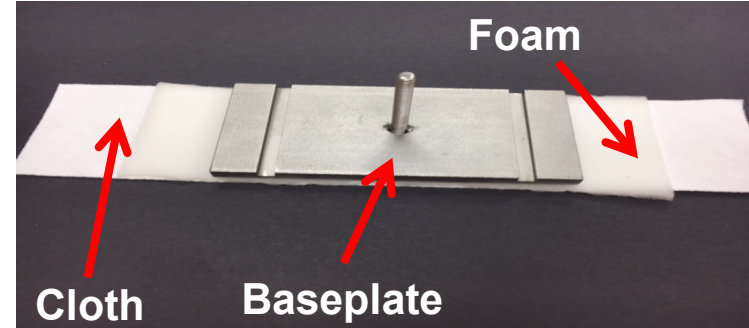
Evaluation of a Continuously Active Disinfectant

“EPA Protocol for Residual Self-Sanitizing Activity of Dried Chemical Residuals on Hard, Non-Porous Surfaces”

Abrasion Tester



Abrasion Boat



Evaluation of a Continuously Active Disinfectant



Efficacy of a Continuously Active Surface Disinfectant

Rutala WA, Gergen M, Sickbert-Bennett E, Anderson D, Weber D. ID Week 2018

4-5 log₁₀ reduction in 5min over 24hr for most pathogens; ~99% reduction with *Klebsiella* and CR *Enterobacter*.

| Test Pathogen | Mean Log ₁₀ Reduction , 95% CI n=4 |
|-----------------------------------|---|
| <i>S.aureus</i> * | 4.4 (3.9, 5.0) |
| <i>S.aureus</i> (Formica) | 4.1 (3.8, 4.4) |
| <i>S.aureus</i> (stainless steel) | 5.5 (5.2, 5.9) |
| VRE | ≥4.5 |
| <i>E.coli</i> | 4.8 (4.6, 5.0) |
| <i>Enterobacter sp.</i> | 4.1 (3.5, 4.6) |
| <i>Candida auris</i> | ≥5.0 |
| <i>K pneumoniae</i> | 1.5 (1.4, 1.6) |
| CR <i>E.coli</i> | 3.0 (2.6, 3.4) |
| CR <i>Enterobacter</i> | 2.0 (1.6, 2.4) |
| CR <i>K pneumoniae</i> | 2.1 (1.8, 2.4) |

*Test surface glass unless otherwise specified

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

Rutala WA, Gergen M, Sickbert-Bennett E, Anderson D, Weber D. ID Week 2018

| 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 a Continuously Active Disinfectant

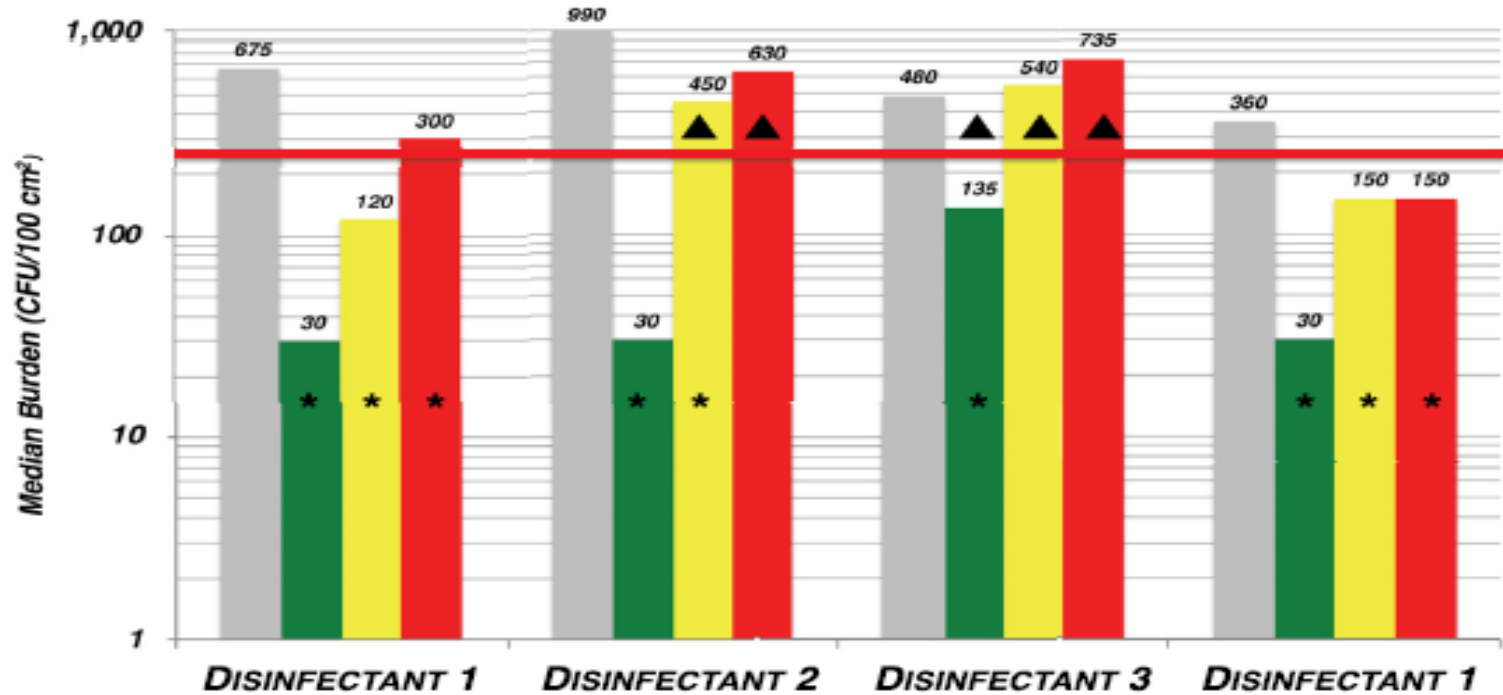
Summary

- Preliminary studies with a new continuously active disinfectant are promising (e.g., 4-5 \log_{10} reduction in 5min over 24hr)
 - Unclear why 99% reduction with *Klebsiella* and CR *Enterobacter*; most surfaces have <100 CFU/Rodac
 - Continuously active disinfectants may reduce or eliminate the problem of recontamination.
-

Evaluation of Three Disinfectants for Ability to Limit Establishment of Bioburden After Disinfection

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

The CAD was able to significantly control bioburden on bed rails, a critical touch surface



Why do we need to consider continuous room decontamination technology?

To reduce microbial contamination
(associated with **suboptimal CD practices
and recontamination**)

Evaluation of Three Disinfectants for Ability to Limit Establishment of Bioburden After Disinfection

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

- The use of a continuously active disinfectant (CAD) offers the infection prevention community a new opportunity to limit the re-establishment of bacteria on touch surfaces in the hospital environment
 - Several studies (Salgado et al., Anderson et al, Rutala et al) were able to demonstrate that when the microbial bioburden of a patient room was kept low, the risk of acquisition of HAIs was reduced
-

Relationship Between Microbial Burden and HAIs

Rutala WA et al. ICHE 2018;38:1118-1121; Salgado CD, et al. ICHE 2013;34:479-86

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.

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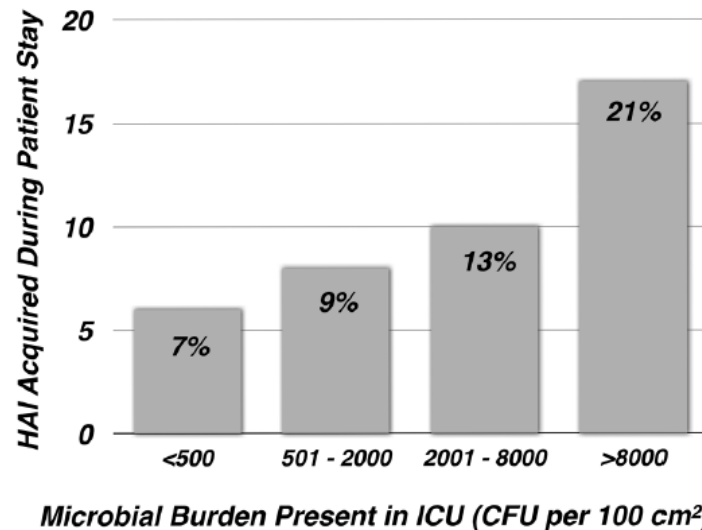


FIGURE 2. Quartile distribution of healthcare-acquired infections (HAIs) stratified by microbial burden measured in the intensive care unit (ICU) room during the patient's stay. There was a significant association between burden and HAI risk ($P = .038$), with 89% of HAIs occurring among patients cared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

Environmental Disinfection in Health Care Facilities

Recommendations

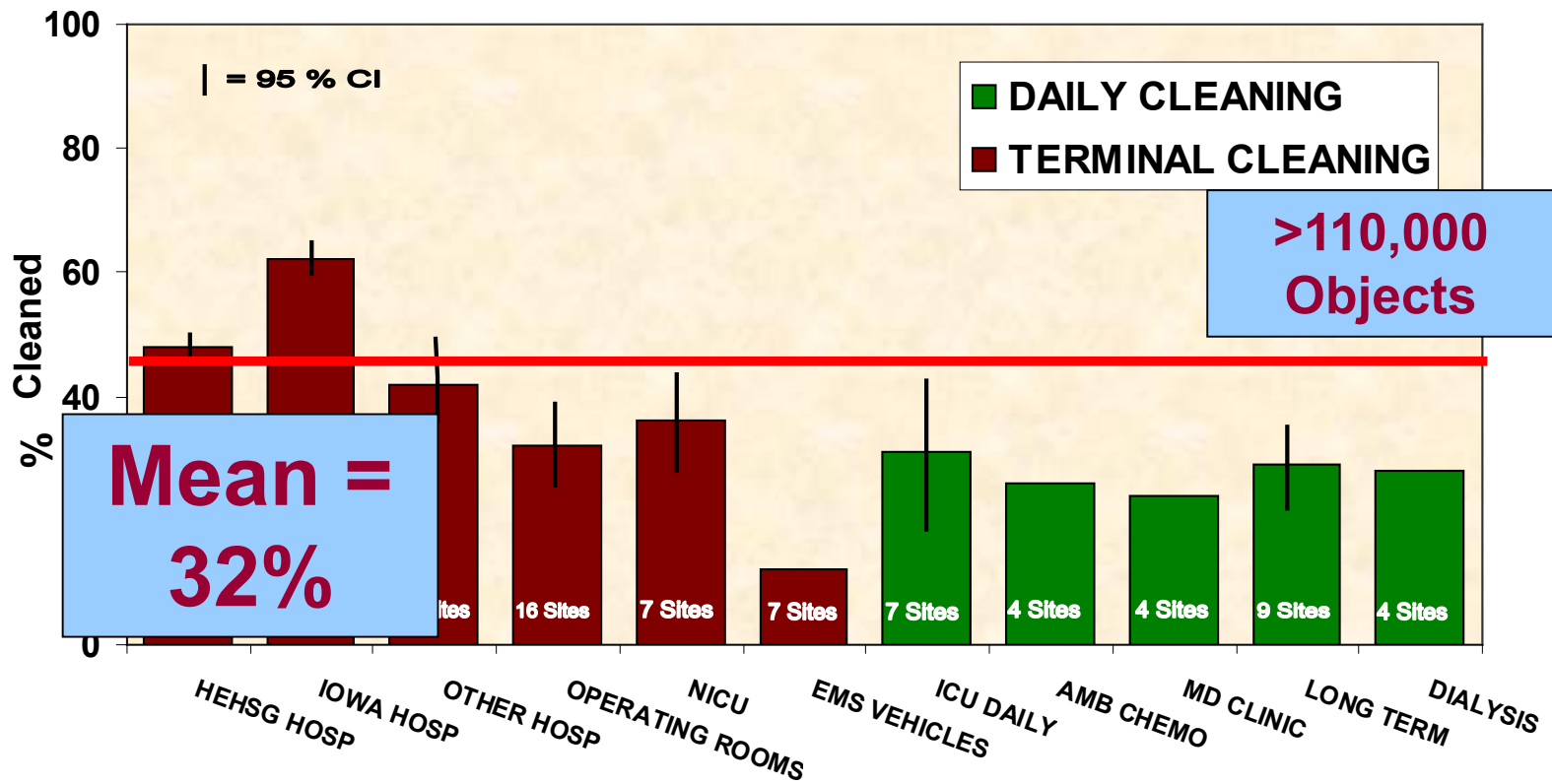
- Decontaminate **surfaces in patient room** that are touched by health care workers and patients (**daily, terminal**)
 - **Decontaminate portable equipment** that is shared among patients such as medication carts, wheelchairs, portable x-ray machines, etc. **after each patient use**
-

Environmental Disinfection in Health Care Facilities

- Environmental disinfection is suboptimal
 - Patient rooms are contaminated due to suboptimal cleaning/disinfection and recontamination
 - Portable equipment not decontaminated per policy
 - Outbreaks and environmental-mediated infections occur
-

Thoroughness of Environmental Cleaning

Carling et al. ECCMID, Milan, Italy, May 2011



Portable Equipment

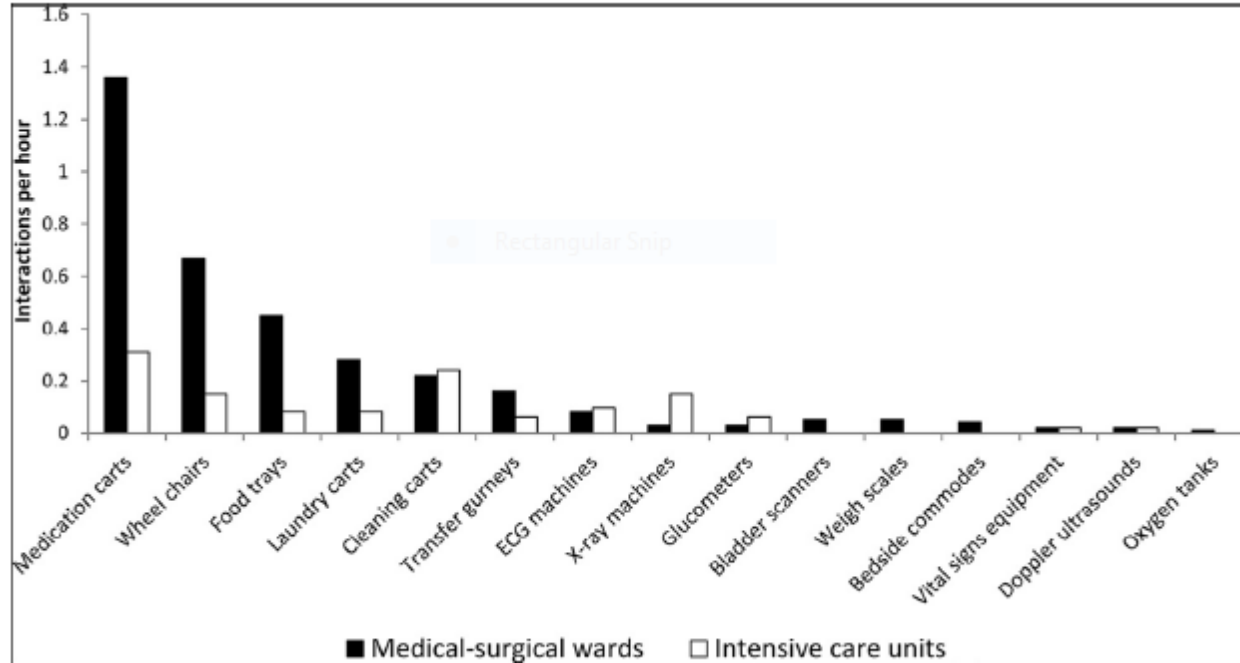
(decontaminate after each patient use)



Interactions Between Patients and Shared Portable Equipment

Suwantarat N, et al. AJIC 2017;45:1276

Of 360 interactions between portable equipment and patients, 42% involved equipment or fomites that made direct contact with the patient or surfaces in the room



Frequency of Recovery of Healthcare Pathogens from Portable Equipment

Suwantarat N, et al. AJIC 2017;45:1276

Of 80 items cultured, 12 (15%) were contaminated with ≥ 1 healthcare pathogen

Frequency of recovery of health care-associated pathogens from portable equipment and fomites on medical-surgical wards and in intensive care units

| Portable equipment and fomites | MRSA | VRE | <i>Clostridium difficile</i> |
|--------------------------------|-----------|----------|------------------------------|
| Medication carts | 2/31 (7) | 1/31 (3) | 1/31 (3) |
| Wheelchairs | 1/12 (8) | 0/12 (0) | 0/12 (0) |
| ECG machines | 1/8 (13) | 1/8 (13) | 0/8 (0) |
| Food trays | 0/7 (0) | 0/7 (0) | 0/7 (0) |
| Laundry carts | 3/5 (60) | 2/5 (40) | 1/5 (20) |
| Bladder scanners | 0/3 (0) | 2/3 (67) | 0/3 (0) |
| Portable x-ray machines | 1/3 (33) | 0/3 (0) | 0/3 (0) |
| Weight scales | 0/3 (0) | 0/3 (0) | 0/3 (0) |
| Doppler ultrasound machines | 0/2 (0) | 0/2 (0) | 0/2 (0) |
| Glucometers | 0/2 (0) | 0/2 (0) | 0/2 (0) |
| Transfer gurneys | 0/2 (0) | 0/2 (0) | 0/2 (0) |
| Vital sign machines | 0/2 (0) | 0/2 (0) | 0/2 (0) |
| Total | 8/80 (10) | 6/80 (8) | 2/80 (3) |

NOTE. Values are the no. of positive samples/no. sampled (%).

ECG, electrocardiogram; MRSA, methicillin-resistant *Staphylococcus aureus*; VRE, vancomycin-resistant enterococci.

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- Environmental disinfection is suboptimal
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 - Outbreaks and environmental-mediated infections occur
-

Environmental Disinfection in Healthcare Facilities

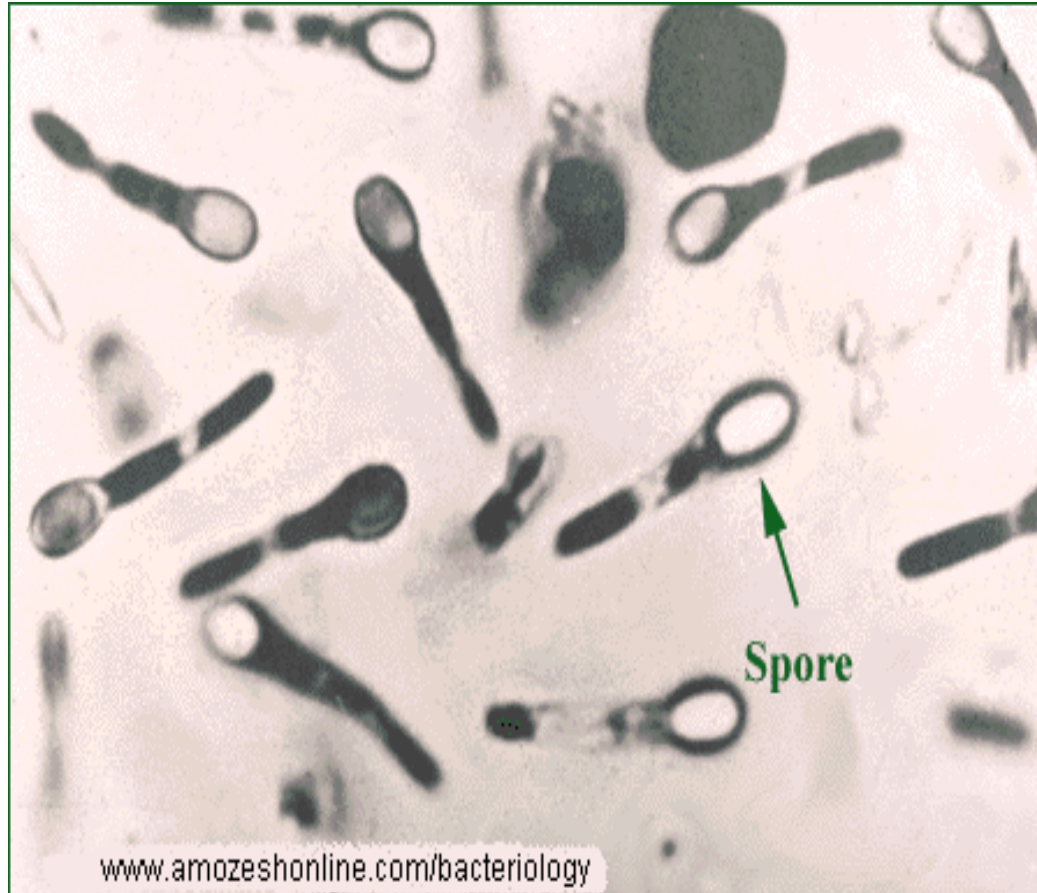
- Continuously active disinfectants could reduce bioburden
 - Whether a CAD translates in a reduction of HAIs remains to be determined
 - Continuously active disinfectants should not alter the frequency of cleaning and disinfection as one of the purposes of routine cleaning and disinfection is to remove dirt and debris in addition to the reduction of microbial contamination
-

Surface Disinfection: Current Issues, New Research and New Technology

Lecture Objectives

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 - Biofilms
-

C. difficile spores



Methods to Prevent CDI: Basic Principles

Strategies to Prevent CDI Infections In Acute Care Hospitals, SHEA Guideline, ICHE 2014

- Encourage appropriate use of antimicrobials
- Use contact precautions for infected patients
 - **Single room**
 - **Don gloves and gown when entering room; remove before exiting**
 - **Hand hygiene before and after glove use**
- Use dedicated equipment whenever possible
 - **If equipment is shared between patients do not bring into room (e.g., glucometer)**
 - **Clean and disinfect shared equipment after use**

Strategies to Prevent CDI Infections in Acute Care Hospitals: SHEA Guideline, ICHE, 2014

Methods to Prevent CDI: Basic Principles

Strategies to Prevent CDI Infections In Acute Care Hospitals, SHEA Guideline, ICHE 2014

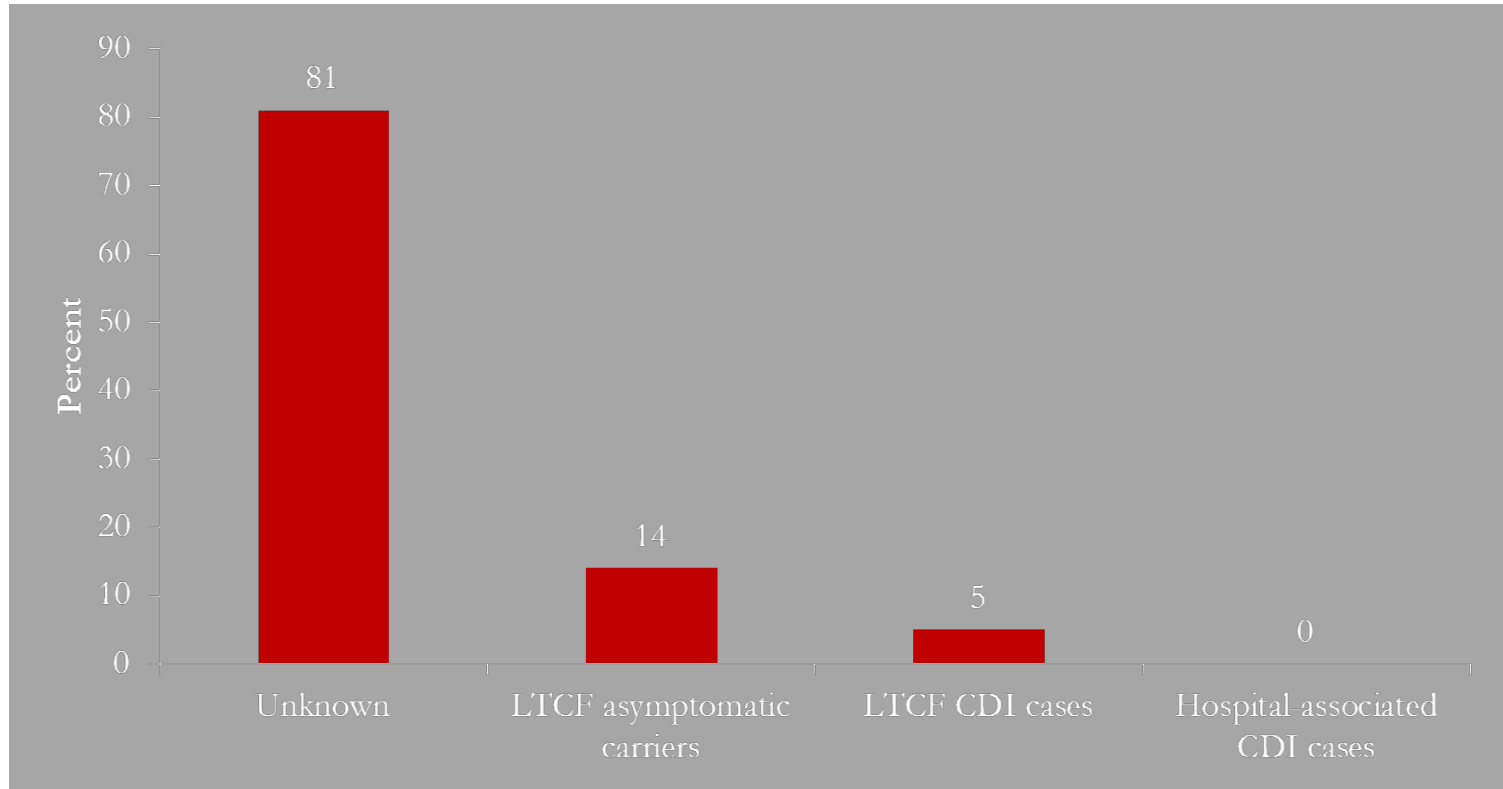
- Criteria for discontinuing isolation
 - **Duration of illness** (some experts recommend for at least **48 hours** after diarrhea resolves)
 - **Use an EPA-registered sporicidal agent for room disinfection in hyperendemic and outbreak situations**
 - **Ensure cleaning and disinfection of equipment** and the environment as potential reservoirs
 - **Assess adherence to protocols**
 - Implement **lab-based alert system** to provide immediate notification to IP and clinical personnel
 - **Educate** patients and their families about CDI
 - **Measure compliance** with hand hygiene and contact precaution recommendations
-

Rationale for the use of a sporicidal disinfectant for all cleaning/disinfection (CD) or postdischarge CD.

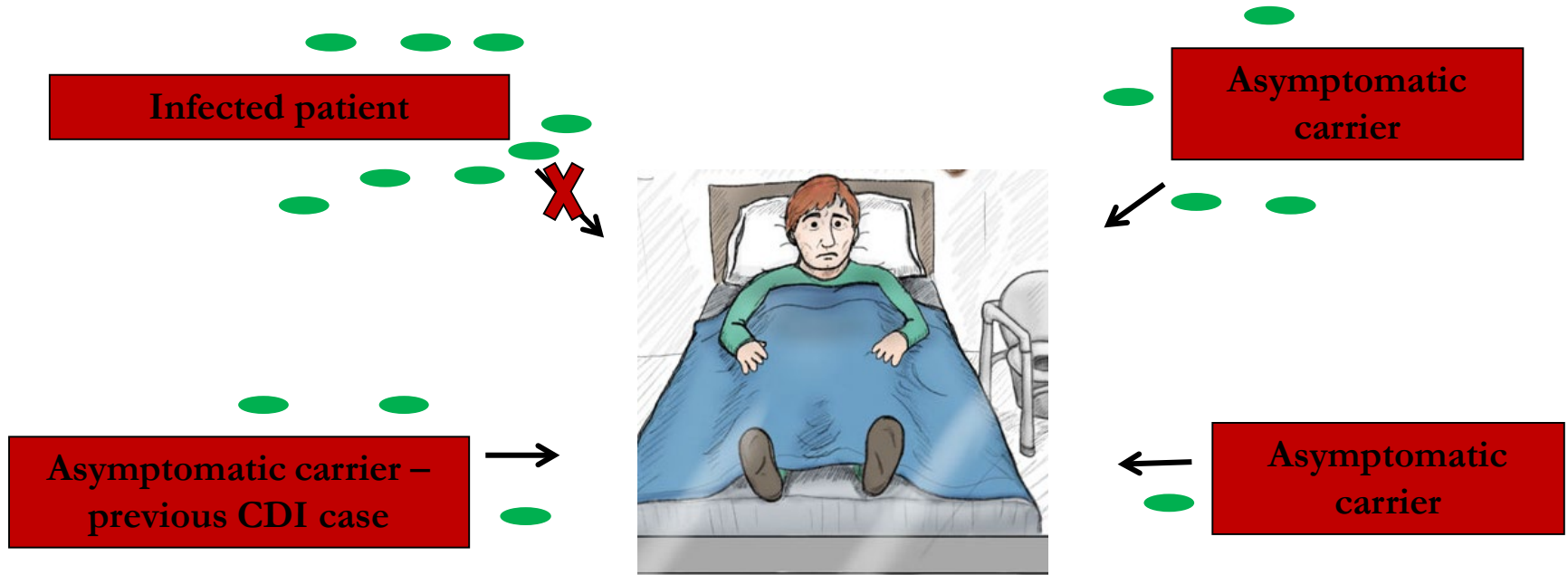
Reduce *C. difficile* (and other pathogens such as MRSA) in the environment, should reduce *C. difficile* infections (and other EIP) associated with the environment.

Sources of Healthcare-Associated CDI Cases Based on Whole Genome Sequencing

Donskey et al. ICHE. 2019;39:909-916

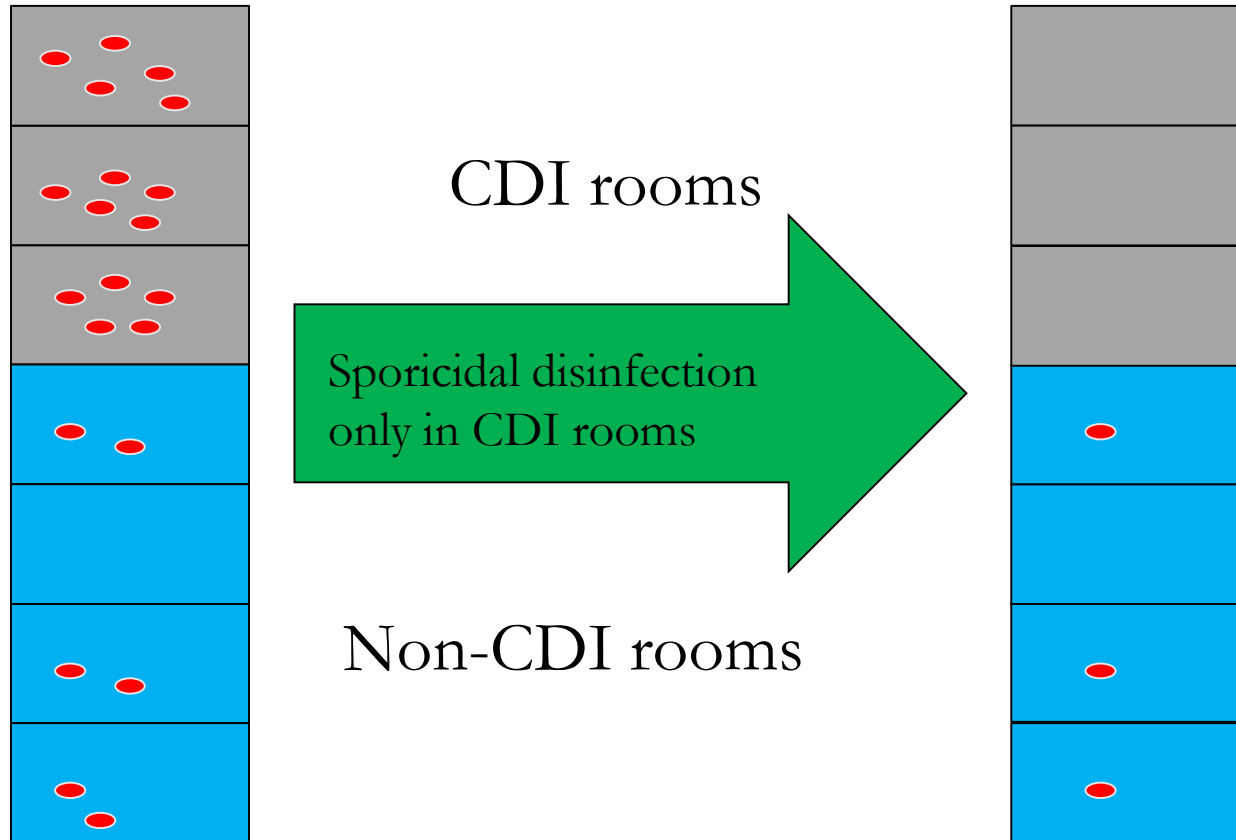


Asymptomatic Carriers Contribute to *C. difficile* Transmission (courtesy Dr. Donskey)

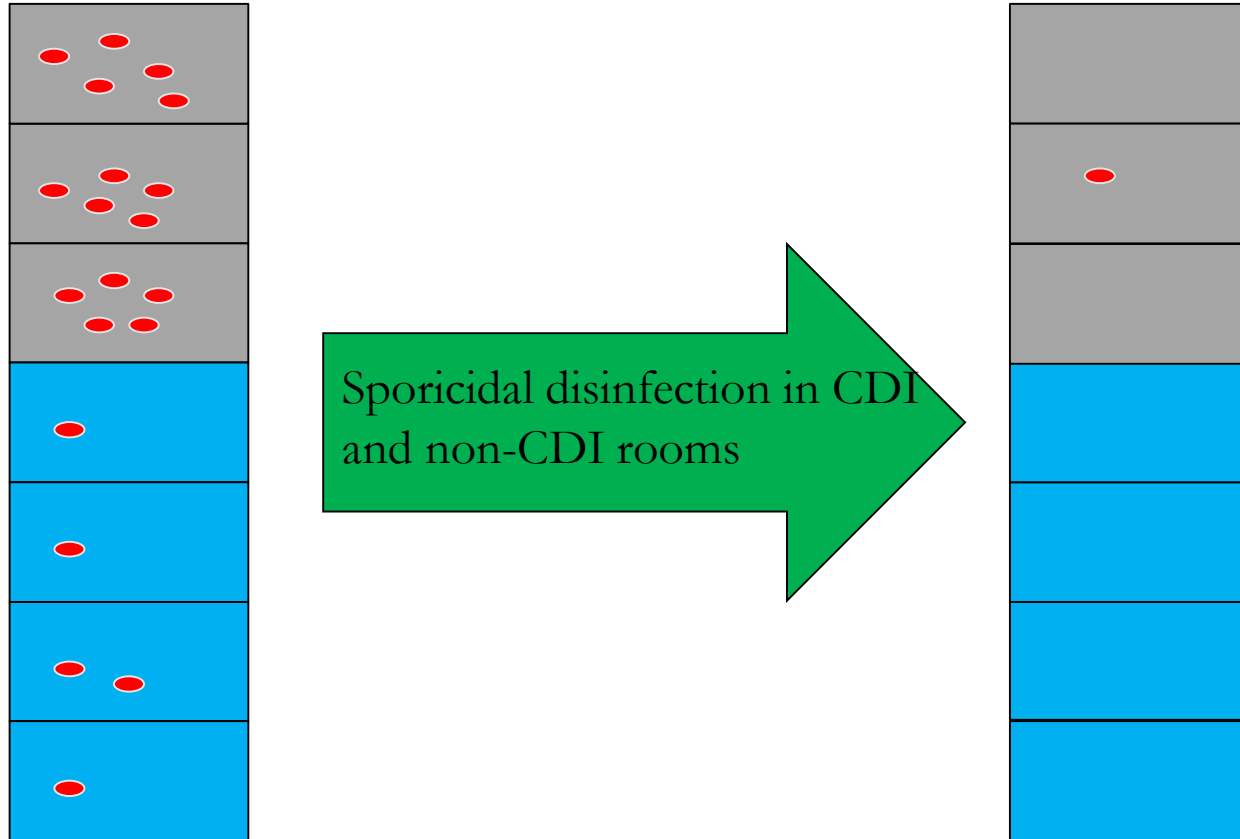


1. Curry SR. Clin Infect Dis 2013 (29% of hospital-associated CDI cases linked to carriers by MLVA);
2. Blixt T. Gastroenterol 2017;152:1031 (exposure to carriers increased CDI risk);
3. Longtin Y. JAMA Int Med 2016 (screening for and isolating carriers reduced CDI by 63%);
4. Samore MH. Am J Med 1996;100:32 (only 1% of cases linked to asymptomatic carriers - roommates and adjacent rooms - by PFGE/REA);
5. Eyre DW. PLOS One 2013;8:e78445 (18 carriers: no links to subsequent CDI cases);
6. Lisenmyer K. Clin Infect Dis 2018 (screening and isolation of carriers associated with control of a ward outbreak);
7. Paquet-Bolduc B. Clin Infect Dis 2018 (unit-wide screening and isolation of carriers not associated with shorter outbreak durations vs historical controls);
8. Donskey CJ. Infect Control Hosp Epidemiol 2018 (14% of healthcare-associated CDI cases linked to LTCF asymptomatic carriers);
9. Kong LY. Clin Infect Dis 2018 (23% of healthcare-associated CDI linked to carriers vs 42% to CDI cases and 35% to carriers or cases)

Interventions Focused on CDI rooms (courtesy Dr. Donskey)

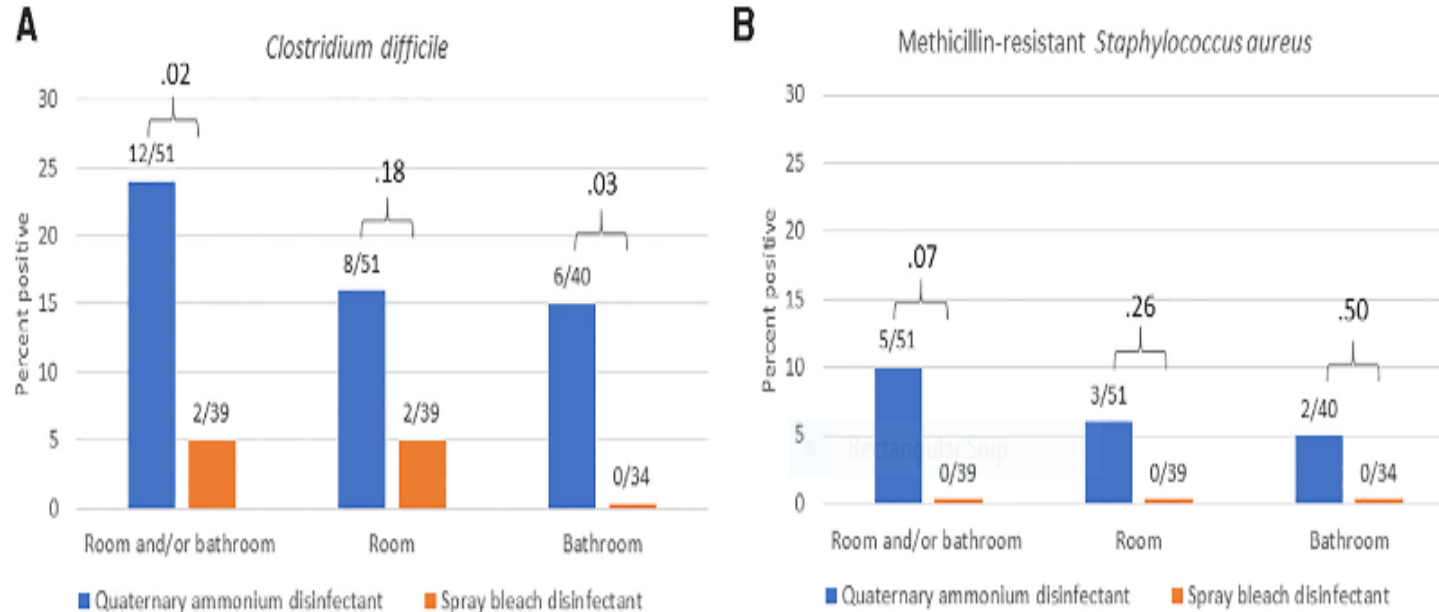


Interventions addressing CDI cases and asymptomatic carriers (courtesy Dr. Donskey)



Use of Sporicidal Disinfectant on *C. difficile* Spore Contamination in non-*C. difficile* Infection Rooms

Ng Wong et al. AJIC. 2019. In press



The percentage of rooms contaminated with *C. difficile* was significantly reduced during the period with a sporicidal product was used 5% vs 24%.

Results suggest sporicidal disinfectant in all postdischarge rooms could potentially be beneficial in reducing the risk *for C. difficile* transmission from contaminated surfaces

Effective Surface Decontamination

Product and Practice = Perfection

LOW-LEVEL DISINFECTION FOR NONCRITICAL EQUIPMENT AND SURFACES

Rutala, Weber. Infect Control Hosp Epidemiol. 2014;35:855-865

Exposure time \geq 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% |
| Chlorine, HP, PA with HP (<i>C. difficile</i>) | 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)

Surface Disinfection: Current Issues, New Research and New Technology

Lecture Objectives

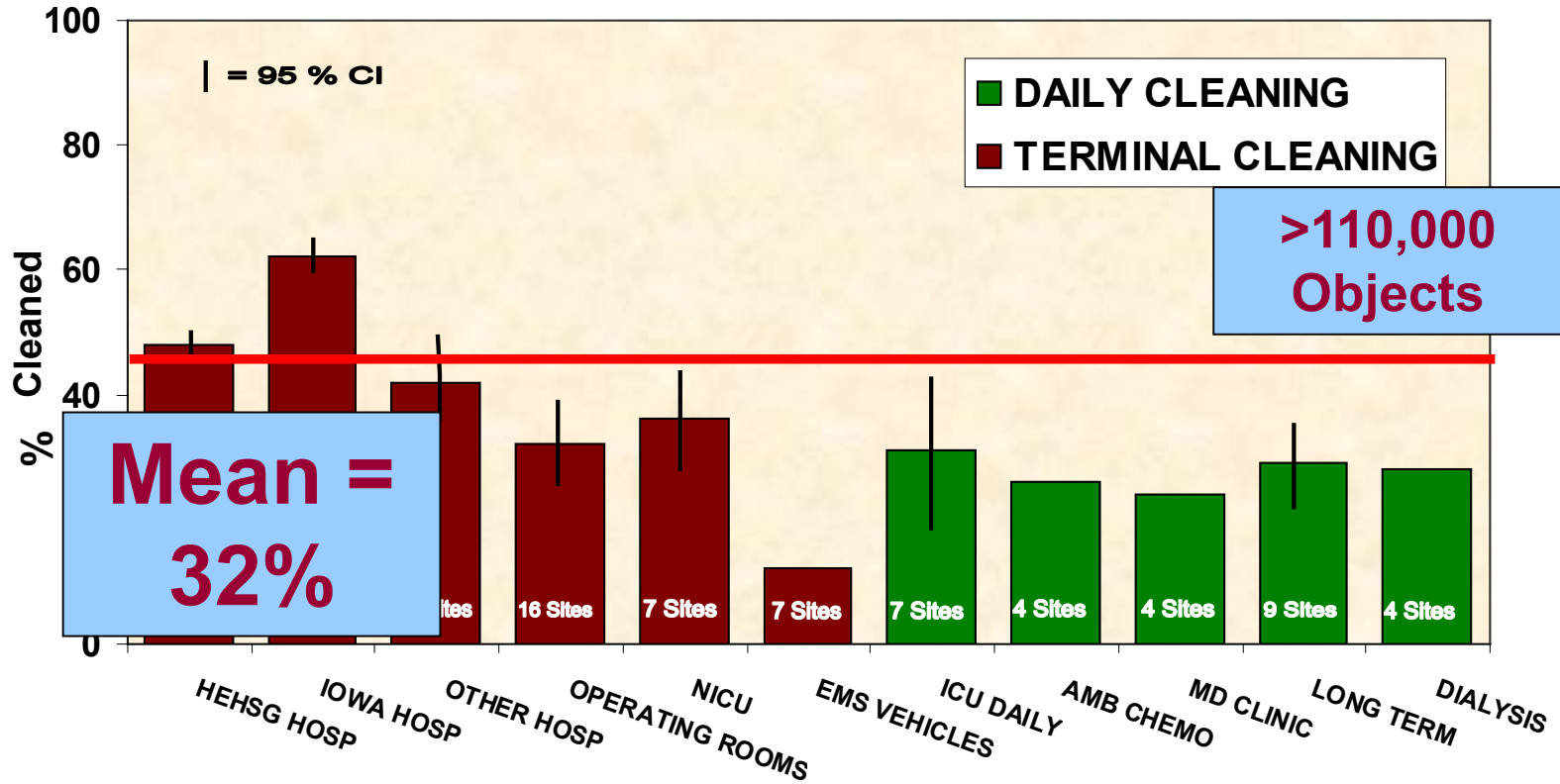
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Effective Surface Decontamination

Product and **Practice** = Perfection

Thoroughness of Environmental Cleaning

Carling et al. ECCMID, Milan, Italy, May 2011



MONITORING THE EFFECTIVENESS OF CLEANING

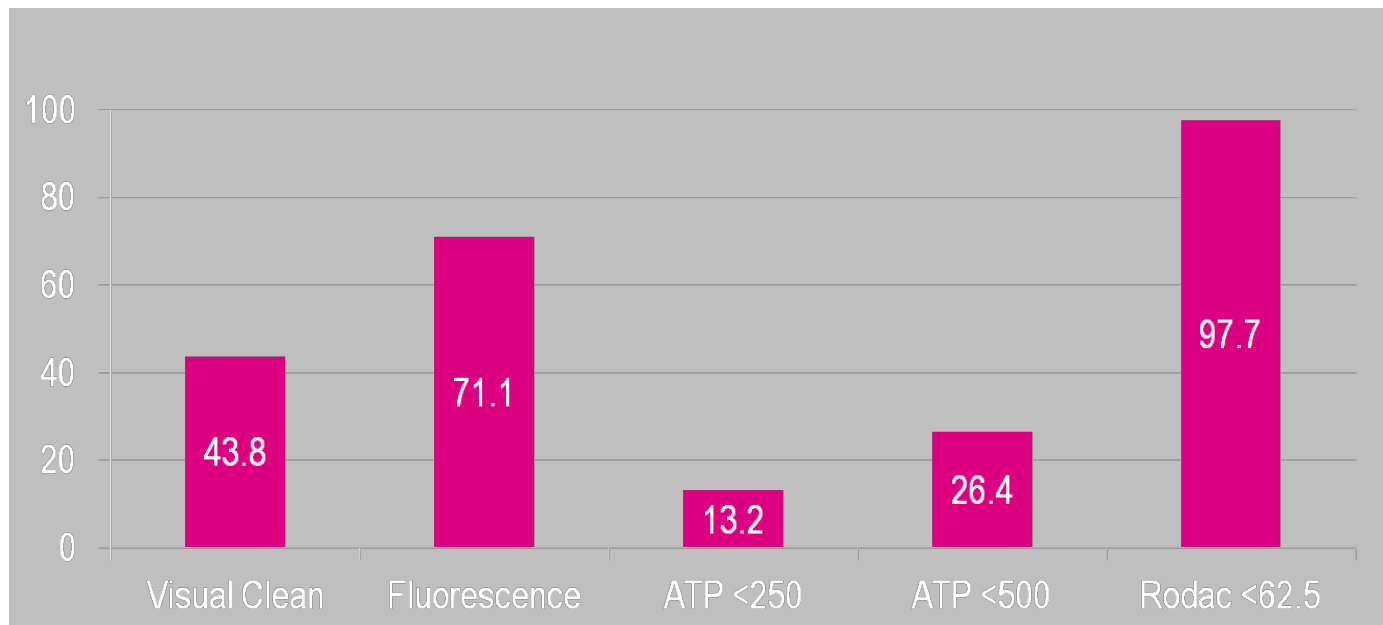
Cooper et al. AJIC 2007;35:338

- Visual assessment-not a reliable indicator of surface cleanliness
 - **ATP bioluminescence**-measures organic debris (each unit has own reading scale, <250-500 RLU)
 - Microbiological methods-<2.5CFUs/cm²-pass; can be costly and pathogen specific
 - **Fluorescent marker-transparent, easily cleaned, environmentally stable marking solution that fluoresces when exposed to an ultraviolet light** (applied by IP unbeknown to EVS, after EVS cleaning, markings are reassessed)
-

Percentage of Surfaces Clean by Different Measurement Methods

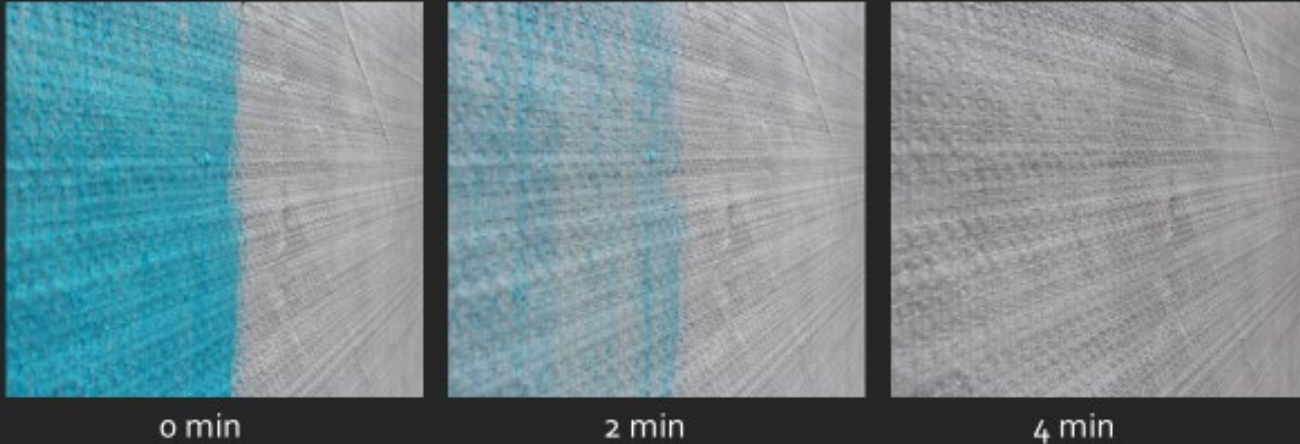
Rutala, Kanamori, Gergen, Sickbert-Bennett, Huslage, Weber. APIC 2017.

Fluorescent marker is a useful tool in determining how thoroughly a surface is wiped and mimics the microbiological data better than ATP



Future May Have Methods to Ensure Thoroughness Such as Colorized Disinfectant

Colorized disinfection – contact time compliance



- Color-fading time matched to disinfectant contact time --> enforces compliance
- Provides real-time feedback when disinfection is complete
- Trains staff on importance of contact time as they use the product

Colorized disinfection – improved coverage

Regular disinfectant wipes



Colorized wipes



- Increased visibility when disinfecting surfaces, fewer missed spots
- Real-time quality control that allows staff to monitor thoroughness of cleaning

Novel Chemical Additive That Colorizes Disinfectant to Improve Visualization of Surface Coverage

Mustapha et al . AJIC;2018:48:191-121

By improving thoroughness will it reduce microbial contamination and reduce transmission?

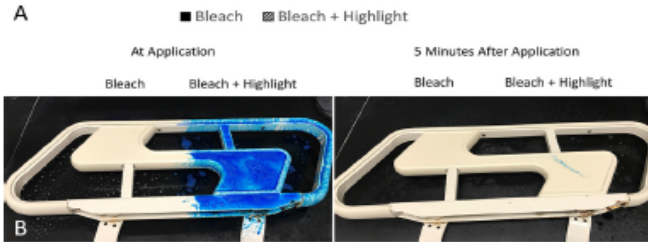
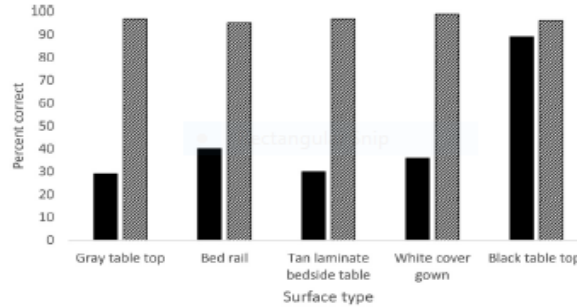


Fig 1. (A) Percentage of sites correctly identified by personnel as having or not having bleach application when testing occurred within 30 seconds based on whether Highlight solution (Kinross Inc, Brooklyn, NY) was added to colorize the bleach solution. (B) Image of a bed rail with applied bleach-plus-Highlight.

Novel Color Additive for Bleach Wipes Reduces Corrosive Damage to Stainless Steel

Tyan et al. 2018. J Hosp Infect

- Bleach wipes are corrosive to hospital surfaces and equipment
 - **Study measured the effect of bleach wipes, with and without color additive, on SS to quantify the rate of corrosion and reduce surface damage**
 - The two bleach wipes alone caused severe corrosion (> 5 mil per year [mpy], where 1 mil = 0.001 inch), while **the addition of color additive reduced the rate of corrosion significantly (<2 mpy) and prevented discoloration of the metal**
-

Novel Color Additive for Bleach Wipes Reduces Corrosive Damage to Stainless Steel

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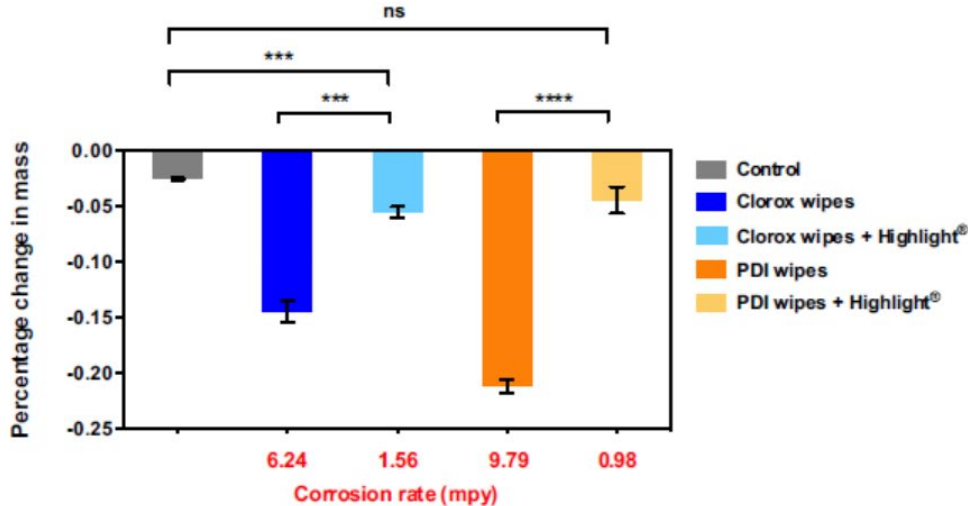


Figure 2. Comparison of percentage change in mass of stainless steel 316L coupons following 120 treatments with bleach wipes. Grey bar, control; dark blue bar, Clorox wipes; light blue bar, Clorox wipes + Highlight®; dark orange bar, PDI wipes; light orange bar, PDI wipes + Highlight®. Corrosion rate was calculated based on mass loss corrected by the control mass loss. Corrosion rate is expressed in the standard unit of mils per year (mpy), with 1 mil = 0.001 inch. Experiments were performed in triplicate for each group. Error bars show standard deviation. *** $P < 0.001$; **** $P < 0.0001$; ns, not significant.

Surface Disinfection: Current Issues, New Research and New Technology

Lecture Objectives

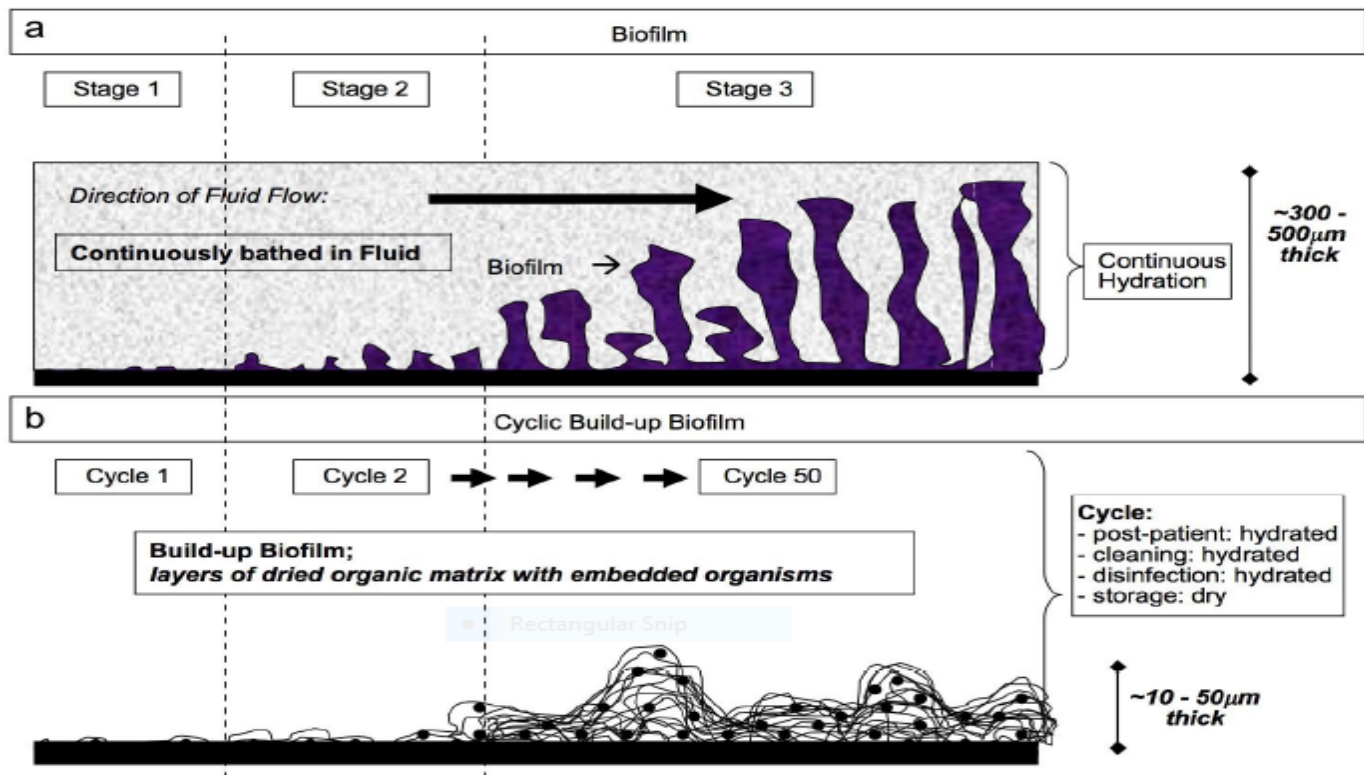
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Biofilms on Instruments and Environmental Surfaces

Alfa, AJIC 2019;47:A39-A45

- Three types of biofilm
 - Traditional hydrated biofilm (water content 90%)
 - Build-up biofilm—occurs in endoscope channels
 - Dry surface biofilm-heterogenous accumulation of organisms and other material in a dry matrix (water content 61%)
 - Raises questions about the inactivation of microbes with a dry surface biofilm by currently used cleaning/disinfecting methods
-

Figure 1 Comparison of traditional to cyclic build-up biofilm

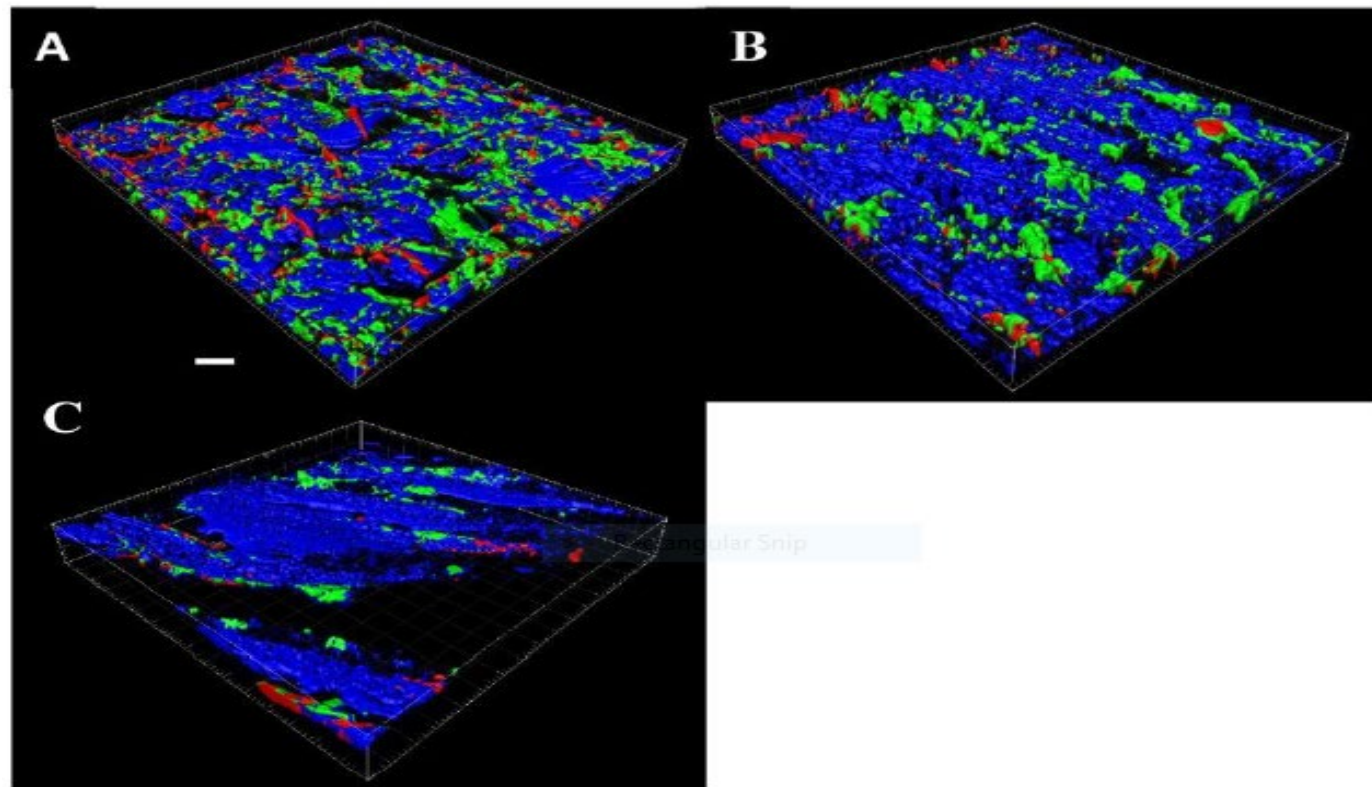


[Get permission from; Zhong W, Alfa M, Howie R, Zelenitksy S.

Simulation of cyclic reprocessing buildup on reused medical devices. *Comput Biol Med* 2009

Jun; 39(6): 568-577.

Figure 3 Dry surface biofilm



The distribution of protein (blue), bacterial DNA (red) and glycoconjugate (green) in dry surface biofilm. Dry surface biofilm at 12 days (A) and 18 days (B) compared to clinical dry surface biofilm on a glove box (C).

Surface-Attached Cells, Biofilms and Biocide Susceptibility

Otter et al. J Hosp Infection, 2015:89

- **Biofilms are traditionally associated with wet environments** such as indwelling medical devices
 - **Biofilms are less susceptible to disinfectants (oxidizing agents more effective)**
 - **Causes of reduced susceptibility to antimicrobial agents in biofilms are multifactorial, including reduced penetration (due to cell density and EPS), slow growth, and changes in quorum sensing (gene expression in response to fluctuations in cell-population density)**
 - **Some suggest that biofilms have been discovered on dry hospital surfaces** and may explain why bacteria survive on surface for weeks to months
 - **Capacity of disinfectants to disrupt biofilms** may have an important and previously unrecognized role in determining their effectiveness
-

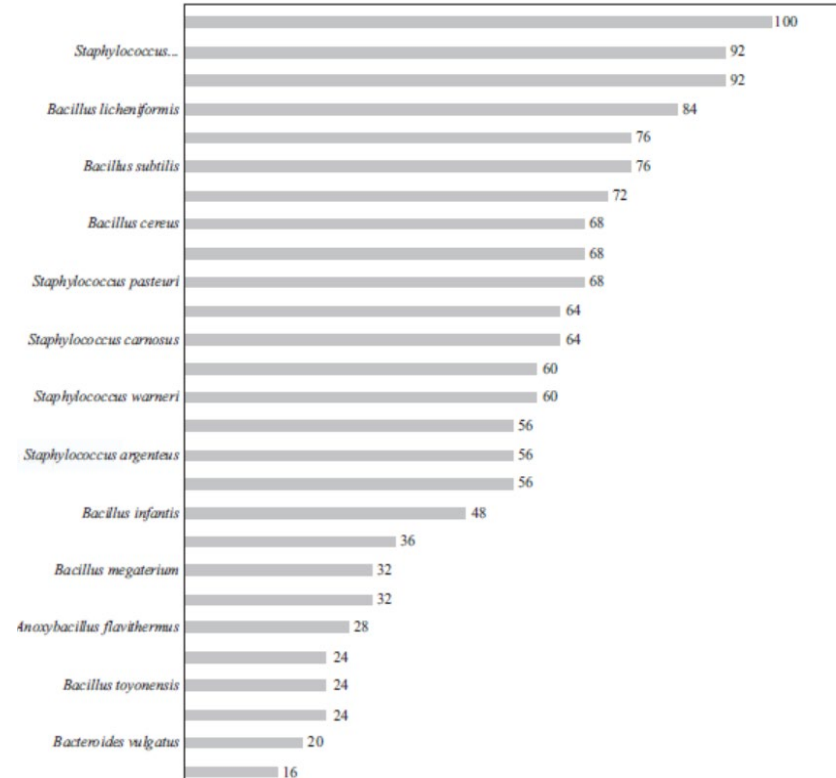
Dry Biofilms Containing Bacterial Pathogens on Multiple Healthcare Surfaces

Ledwoch et al. J Hosp Infect 2018;100:e47-e56

- Investigate the occurrence, prevalence and diversity of dry biofilms on hospital surfaces
 - **61 terminally cleaned rooms were investigated for the dry biofilms using culture-based methods and SEM**
 - **Multi-species dry biofilms were recovered from 95% of 61 samples**
 - **Dry biofilms were predominately formed by gram-positive bacteria, although occasional *Acinetobacter spp* were identified**
 - **Their role in transmission needs to be established**
-

Dry Biofilms on Healthcare Surfaces Percentage of Samples Containing Given Species Following DNA Analysis

Ledwoch et al. J Hosp Infect 2018;100:e47-e56



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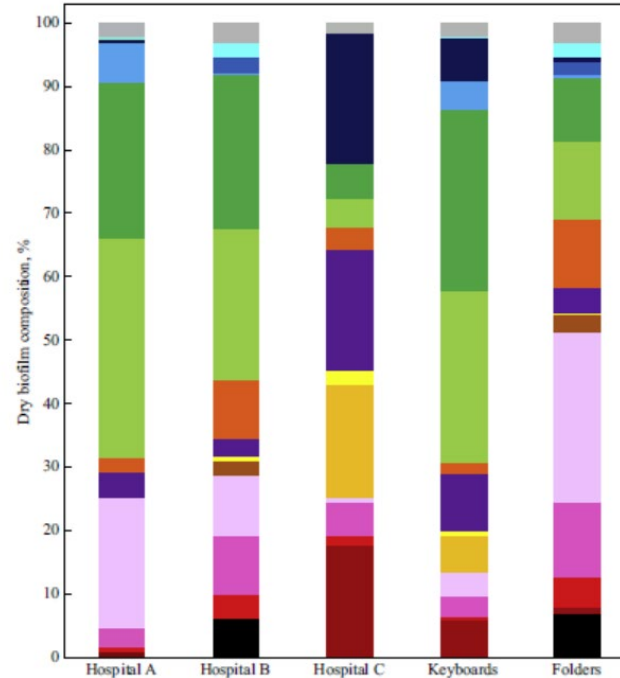


Figure 3. Difference in 'dry' biofilm composition between hospitals. ■, *Anoxybacillus flavithermus*; ■, *Bacillus amyloliquefaciens*; ■, *Bacillus anthracis*; ■, *Bacillus cereus*; ■, *Bacillus licheniformis*; ■, *Bacillus megaterium*; ■, *Bacillus pumilus*; ■, *Bacillus sp.*; ■, *Bacillus subtilis*; ■, *Bacillus thuringiensis*; ■, *Staphylococcus aureus*; ■, *Staphylococcus epidermidis*; ■, *Staphylococcus lugdenensis*; ■, *Staphylococcus pasteuri*; ■, *Staphylococcus saprophyticus*; ■, *Staphylococcus warneri*; ■, other.

Dry Biofilms on Healthcare Surfaces Percentage of Samples Containing Given Species Following DNA Analysis

Ledwoch et al. J Hosp Infect 2018;100:e47-e56

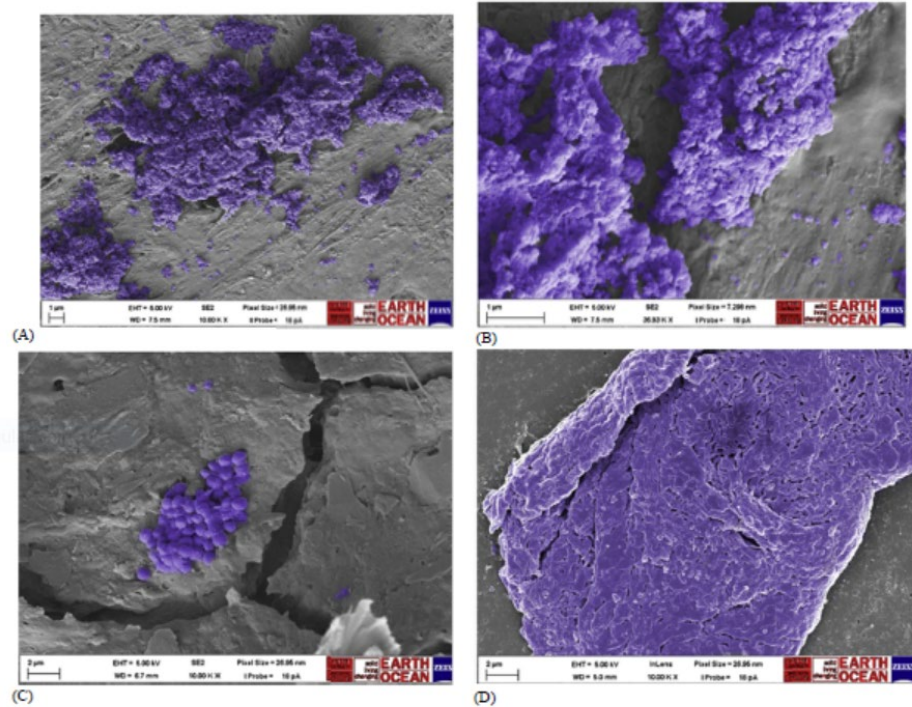


Figure 4. Examples of 'dry' biofilms recovered from surfaces; magnification $\times 10,000$. (A, B) Patient folders, (C) patient chair, (D) keyboard key. Images of biofilms were coloured in purple to help visualization and contrast using GNU Image manipulation program (GIMP 2.8) software. Images were not otherwise altered.

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Surface Disinfection: Current Issues, New Research and New Technology

Summary

- Continuous room decontamination
 - When microbial bioburden on surfaces is low, risk of acquisition of HAIs was reduced
 - CAD reduces microbial contamination over 24 hours
 - Surface disinfection
 - Sporicidal disinfectant in all postdischarge rooms reduces *C. difficile* on surfaces and could reduce transmission
 - Colorized disinfectant could improve thoroughness of cleaning
 - Biofilms
 - Dry surface biofilms recovered from 95% of 61 samples
 - Their role in transmission needs to be established
-

Surface Disinfection: Current Issues, New Research and New Technology

Lecture Objectives

- Continuous room decontamination
 - Surface disinfection
 - *C. difficile*-sporicidal disinfectant
 - Colorized disinfectant
 - Biofilms
-

THANK YOU!
www.disinfectionandsterilization.org

