Best Practices in Disinfection of Noncritical Surfaces in the Health Care Setting: Creating a Bundle for Success

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Disclosures: 3M Speaker bureau, 3M Consultant
Objectives

- Describe the level of contamination in the healthcare environment
- Discuss the role of the environment in transmission of pathogens
- Review best practices for cleaning and disinfection
- Identify challenges in sustaining the gains
- Define monitoring methods for evaluating Cleanliness
- Discuss No Touch Room Disinfection Systems
Contamination in the “Patient Zone”

Frequency of Environmental Contamination: MRSA Present in Stool versus No MRSA in Stool

### How long do organisms survive?

<table>
<thead>
<tr>
<th>Organism</th>
<th>Survival time</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Clostridium difficile</em> (spores)</td>
<td>5 months</td>
</tr>
<tr>
<td><em>Acinetobacter</em> spp.</td>
<td>3 days to 5 months</td>
</tr>
<tr>
<td><em>Enterococcus</em> spp. including VRE</td>
<td>5 days – 4 months</td>
</tr>
<tr>
<td><em>Pseudomonas aeruginosa</em></td>
<td>6 hours – 16 months</td>
</tr>
<tr>
<td><em>Klebsiella</em> spp.</td>
<td>2 hours to &gt; 30 months</td>
</tr>
<tr>
<td><em>Staphylococcus aureus</em>, inc. MRSA</td>
<td>7 days – 7 months</td>
</tr>
<tr>
<td>Norovirus (and feline calicivirus)</td>
<td>8 hours to &gt; 2 weeks¹</td>
</tr>
<tr>
<td>SARS Coronavirus</td>
<td>72 hours to &gt;28 days²</td>
</tr>
<tr>
<td>Influenza</td>
<td>Hours to several days³</td>
</tr>
</tbody>
</table>

Adapted from Kramer et al. *BMC Infect Dis* 2006;6:130.

Increased risk from the prior room occupant

- *Nseir A. baumannii*: +71%
- *Shaughnessy C. difficile*: +58%
- *Drees VRE*: +55%
- *Drees VRE (2 weeks)*: +49%
- *Nseir P. aeruginosa*: +42%
- *Huang VRE*: +37%
- *Huang MRSA*: +28%

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Conventional Terminal Cleaning/Disinfection
“Bundle” for Success

- Develop policies and procedures
- Select cleaning products
- Determine product application
- Educate personnel
- Monitor performance
- Provide feedback

Policies and Procedures

• Delineate responsibilities
  ➢ What to Clean
  ➢ When to Clean
  ➢ Who’s to Clean
Policies and Procedures

- List the processes needed
  - Daily versus terminal cleaning
- Category of worker responsible
  - Environmental services or nursing
- Items to be cleaned
  - Detailed list of all items to be cleaned
- Products to be used
  - Disinfectant type
  - Manufacturer’s recommendations
- Comments as required
  - Requirements for C. difficile, norovirus, outbreak situations

Low Level Disinfection

Process that eliminates many or all pathogenic microorganisms, except bacterial spores, on inanimate objects

Factors that affect efficacy include:

- Prior cleaning
- Organic and inorganic load present
- Type and level of microbial contamination
- Concentration and exposure time of germicide
- Physical nature of item
- Presence of biofilm
- Temperature and pH of the environment
Select Disinfection Products

- Disinfectant
- Concentration
- Contact time
- Application
**Desired Disinfectant Characteristics**

<table>
<thead>
<tr>
<th>Function</th>
<th>Safety</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broad spectrum antimicrobial efficacy</td>
<td>Low toxicity to humans</td>
</tr>
<tr>
<td>Short contact time</td>
<td>Non-allergenic and non-sensitizing</td>
</tr>
<tr>
<td>Good cleaner</td>
<td>Non-hormone disrupting</td>
</tr>
<tr>
<td>Compatible with materials</td>
<td>Environmentally sound</td>
</tr>
<tr>
<td>Non-corrosive</td>
<td>Low Volatile Organic Compounds (VOC)</td>
</tr>
<tr>
<td>Long shelf life</td>
<td>Safe to transport</td>
</tr>
<tr>
<td></td>
<td>Safe and easy to store</td>
</tr>
</tbody>
</table>
## Available Products

<table>
<thead>
<tr>
<th>Disinfectant Agent</th>
<th>Use Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethyl or isopropyl alcohol</td>
<td>70% - 90%</td>
</tr>
<tr>
<td>Bleach</td>
<td>100 ppm to 1000 ppm</td>
</tr>
<tr>
<td>Phenolic</td>
<td>UD</td>
</tr>
<tr>
<td>Iodophor</td>
<td>UD</td>
</tr>
<tr>
<td>Quaternary ammonium compound</td>
<td>UD</td>
</tr>
<tr>
<td>Improved hydrogen peroxide</td>
<td>0.5%, 1.4%</td>
</tr>
</tbody>
</table>

UD=Manufacturer’s recommended use dilution

http://www.cdc.gov/hicpacc/Disinfection_Sterilization/acknowledg.html
Product Application

- Cotton cloth, disposable wipe, microfiber
  - Laundering
  - Cost
- Sufficient wetness to achieve contact time
  - Size of wipe
- Durable - will not easily tear or fall apart
Practice Not Product
Transfer of *C. difficile* Spores from Wipes

- Fresh hypochlorite wipe
- Used hypochlorite wipe
- Quaternary ammonium wipe

“Bundle” for Success

- Develop policies and procedures
- Select cleaning products
- Determine product application
- **Educate personnel**
- Monitor performance
- Provide feedback

Educate

✓ What items are to be cleaned
✓ Which disinfectant to use
✓ What concentration to be used
✓ What contact times are recommended
✓ Right techniques
✓ Order in which to clean items
✓ How often to change cleaning cloths or mop heads or disposable wipes
✓ Personal protective equipment
✓ Importance to infection prevention
✓ Role of the environment in disease transmission
✓ Team effort
Educate, Observe, and Supervise

Percentage of Positive Environmental Cultures for *Clostridium difficile* after Housekeeping Cleaning with Bleach

- Table edge
- Bedrails
- Drawer handle

Guerrero D et al. Decennial 2010, Abstract 60
Challenges in Sustaining Your Gains

- Variation in cleaning practices
  - Technique
  - Time
- Confusion on who cleans what
  - Housekeeping
  - Nursing
- What products are to be used
  - Bleach versus quaternary ammonium compound
Median RLU Readings for Five High-Touch Surfaces Cleaned by Housekeepers A-D

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Monitoring Cleaning Practices

- Visual inspection
- Aerobic colony counts
- Fluorescent marker system
- ATP bioluminescence assays
# Advantages and Disadvantages of Methods for Assessing Cleaning Practices

<table>
<thead>
<tr>
<th>Method</th>
<th>Advantages</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual inspection</td>
<td>Simple</td>
<td>Not reliable measure of cleanliness</td>
</tr>
<tr>
<td>Aerobic colony counts</td>
<td>Relatively simple</td>
<td>More expensive</td>
</tr>
<tr>
<td></td>
<td>Can detect presence of pathogens</td>
<td>Results not available for 48 hrs later</td>
</tr>
<tr>
<td>Fluorescent marker system</td>
<td>Inexpensive</td>
<td>Must mark surfaces before cleaning and check them after cleaning</td>
</tr>
<tr>
<td></td>
<td>Minimal equipment needed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Can improve practices</td>
<td></td>
</tr>
<tr>
<td>ATP bioluminescence assay systems</td>
<td>Provides quantitative measure of cleanliness</td>
<td>More expensive</td>
</tr>
<tr>
<td></td>
<td>Quick results</td>
<td>Requires special equipment</td>
</tr>
<tr>
<td></td>
<td>Can improve practices</td>
<td></td>
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Monitoring and Feedback of Cleaning Practices

- 1404 objects were evaluated before the intervention
- 744 objects were evaluated after the intervention
- Proportion of objects cleaned
  - Before intervention: 47%
  - After interventions: 76 - 92%
- Technique improved in all 3 hospitals (p < 0.001)
- This method has been used to improve cleaning practices in several larger studies

Carling PC et al. Infect Control Hosp Epidemiol 2008;29:1
Carling PC et al. Crit Care Med 2010;38:1054
Is it Clean Enough?

If given a choice between improving infection control by changing human behavior or new technology, go with new technology every time.

Robert Weinstein, MD
No Touch Room Disinfection
iPads, iPhones and Tablets
Cleaning efficacy

![Graph showing cleaning efficacy for C. difficile and MRSA](image)

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Thank you!

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