Current Issues in Disinfection and Sterilization

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Disclosure

This educational activity is brought to you in part, by Advanced Sterilization Products (ASP) and Ethicon. The speaker receives an honorarium from ASP and Ethicon and must present information in compliance with FDA requirements applicable to ASP.

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- Current Issues
  - Environmental Hygiene
  - New Approaches to Room Decontamination
    - Ultraviolet
    - Hydrogen peroxide vapor/aerosol
  - Citations-TJC and CMS
    - 20m/20°C glutaraldehyde
    - ≥ 1 minute surface disinfection
  - Multi-Society Endoscope Reprocessing Guideline, 2011
The Role of the Environment in Disease Transmission

- Over the past decade there has been a growing appreciation that environmental contamination makes a contribution to HAI with MRSA, VRE, and *C. difficile*
- Surface disinfection practices are currently not effective in eliminating environmental contamination
- Inadequate terminal cleaning of rooms occupied by patients with MDR pathogens places the next patients in these rooms at increased risk of acquiring these organisms
- Improved methods of disinfecting the hospital environment are needed

Hand contamination was equally likely after contact with touched environmental surfaces as skin sites

Stiefel et al. ICHE 2011;32:185

Target Enhanced

Thoroughness of Environmental Cleaning
Cartier and coworkers, SHEA 2010
Risk of Acquiring MRSA, VRE, and C. difficile from Prior Room Occupants

- Admission to a room previously occupied by an MRSA-positive patient or VRE-positive patient significantly increased the odds of acquisition for MRSA and VRE (although this route is a minor contributor to overall transmission). Huang et al. Arch Intern Med 2006;166:1945.

- Prior environmental contamination, whether measured via environmental cultures or prior room occupancy by VRE-colonized patients, increases the risk of acquisition of VRE. Drees et al. Clin Infect Dis 2008;46:676.

- Prior room occupant with CDAD is a significant risk for CDAD acquisition. Shaughnessy et al. ICHE 2011:32:201

New Approaches to Room Decontamination

Ultraviolet Irradiation

EFFECTIVENESS OF UV ROOM DECONTAMINATION

<table>
<thead>
<tr>
<th>Organism</th>
<th>Total</th>
<th>VRE</th>
<th>MRSA</th>
<th>CDAD</th>
<th>LGBT</th>
<th>GNB</th>
<th>No. of samples</th>
<th>No. of samples</th>
<th>No. of samples</th>
<th>No. of samples</th>
<th>No. of samples</th>
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</thead>
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<tr>
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<td>40</td>
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<tr>
<td>VRE</td>
<td>500</td>
<td>200</td>
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<td>200</td>
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<td>100</td>
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<tr>
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<td></td>
<td>20</td>
<td>200</td>
<td>50</td>
<td>200</td>
<td>50</td>
</tr>
</tbody>
</table>

Rutala WA, Gergen MF, Weber DJ. Infect Control Hosp Epidemiol 2010;31:1025-8
Hydrogen Peroxide Vapor/Aerosol Decontamination

- Sterinis
  - Fine mist by aerosolizing solution of 5% HP, <50 ppm silver
- Steris
  - Vaporized HP from 35% HP
- Bioquell
  - HP vapor from 35% HP

Ray et al. ICHE 2010;31:1236. MDR Acinetobacter
Barbut et al. ICHE 2009;30:517. C. difficile
Bartels MD et al. J Hosp Infect 2008;70:35. MRSA
Boyce JM et al. ICHE 2008;29:723. C. difficile

Hydrogen Peroxide Vapor/Aerosol Decontamination


Decontamination with Hydrogen Peroxide Vapor
Boyce et al: ICHE 2008;29:723

- 5 wards with a high incidence of C. difficile
- HPV was injected into sealed wards and individual patient rooms using generators until approx 1 micron film of HP was achieved on the surface
- 11/43 (25.6%) surface samples yielded C. difficile compared to 0/27 (0%) after HPV decontamination
- The incidence of nosocomial CDAD was significantly lower during the intervention period
- Conclusion: HPV was efficacious in eradicating C. difficile from contaminated surfaces
Summary

- MRSA, VRE, *C. difficile*, MDR-*Acinetobacter* comprise a growing reservoir of epidemiologically important pathogens that have an environmental mode of transmission.
- UV and HP vapor/aerosol have been demonstrated to be effective against various HA pathogens (including *C. difficile* spores) and offer an option for room decontamination.
- Since contamination of surfaces is common, even after surface disinfection, this technology should be considered in selected patient rooms and care areas when the environmental mode of transmission is significant.

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Surface Disinfection

- Exposure Time
  - CMS surveyors (CA) and TJC have been paying closer attention to cleaning the environment, including assurance that hospitals are following manufacturer's directions for disinfectant contact time.
  - Hospital cited for using a shorter contact time than manufacturer's label claim and appealed based upon published peer-reviewed literature supporting shorter exposure times.
  - Appeal denied.

How Do Hospitals Avoid Citations?

Risk Assessment
Risk Assessment

- Present best judgment for hospital when standards are unclear
- Demonstrates a clear thought process and understanding of why we do something a particular way
- Four steps
  - Review the requirements-regulations/guidelines
  - Review the literature
  - Review your own experience-any adverse events
  - Make your decision-the result of a thoughtful process

Surface Disinfection

Contact Time > 1 minute

Risk Assessment

- Requirements-CDC guidelines, EPA label registration
- Review the literature->15 scientific studies have demonstrated the efficacy of hospital disinfectants against HA pathogens with a contact time of 1 minute
- Review your own experience- no data that demonstrate improved infection prevention by a 10 minute contact time vs a 1 minute contact time and no HAIs attributed to noncritical items
- Make your decision- use of >1 minute for surface disinfection of noncritical environmental surfaces and patient care equipment (ensure all contaminated surfaces are wiped)
High-Level Disinfection

20°C at 20 minutes

Risk Assessment

- Requirements-CDC/Multi-Society guidelines, FDA label claims
- Review the literature—>40 scientific studies and professional organizations support the efficacy of 2% glutaraldehyde for 20m at 20°C in conjunction with cleaning prior to HLD
- Review your own experience—no published studies of transmission of infection when current guidelines followed
- Make your decision—use >2% glutaraldehyde at 20°C at 20 minutes

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Multi-Society Guideline for Reprocessing Flexible Gastrointestinal Endoscopes, 2011

- Since 2003, changes in
  - High-level disinfectants
  - Automated endoscope reprocessors
  - Endoscopes
  - Endoscopic accessories
- However, efficacy of decontamination and high-level disinfection is unchanged and the principles guiding both remain valid
- Additional outbreaks of infection related to suboptimal infection prevention practices during endoscopy or lapses in endoscope reprocessing (unfamiliarity with endoscope channels, accessories, attachments; gaps in infection prevention at ASC)

Multi-Society Guideline for Reprocessing Flexible Gastrointestinal Endoscopes, 2011

- Transmission categorized as:
  - Non-endoscopic and related to care of intravenous lines and administration of anesthesia or other medications
    - Multidose vials
    - Reuse of needles and syringes
    - Intravenous sedation tubing
  - Endoscopic and related to endoscope and accessories
    - Failure to sterilize biopsy forceps between patients
    - Lapses in reprocessing tubing used in channel irrigation

Multi-Society Guideline for Reprocessing Flexible Gastrointestinal Endoscopes, 2011

- Unresolved Issues
  - Interval of storage after which endoscopes should be reprocessed before use
    - Data suggest that contamination during storage for intervals of 7-14 days is negligible, unassociated with duration, occurs on exterior of instruments and involves only common skin organisms
    - Data are insufficient to proffer a maximal outer duration for use of appropriately cleaned, reprocessed, dried and stored endoscopes
    - Without full data reprocessing within this interval may be advisable for certain situations (endoscope entry to otherwise sterile regions such as biliary tree, pancreas)

Multi-Society Guideline for Reprocessing Flexible Gastrointestinal Endoscopes, 2011

- Unresolved Issues
  - Optimal frequencies for replacement of: clean water bottles and tubing for insufflation of air and lens wash water, and waste vacuum canisters and suction tubing
    - Concern related to potential for backflow from a soiled endoscope against the direction of forced fluid and air passage into clean air/water source or from tubing/canister against a vacuum into clean instruments
  - Microbiologic surveillance testing after reprocessing
    - Detection of non-environmental pathogens indicator of faulty reprocessing equipment, inadequate solution, or failed human process

Multi-Society Guideline for Reprocessing Flexible Gastrointestinal Endoscopes, 2011

- Relatively new technologies for HLD
  - EvoTech
  - OER-Pro
- Endoscope durability and longevity
  - No published data regarding materials durability and potential for reduced function or reduced ability to attain HLD

Multi-Society Guideline for Reprocessing Flexible Gastrointestinal Endoscopes, 2011

- EVOTECH w/Cleaning Claim
  - Product Definition:
    - Integrated double-bay AER
    - Eliminates manual cleaning
    - Uses New High-Level Disinfectant (HLD) with IP protection
    - Single-shot HLD
    - Automated testing of endoscope channels and minimum effective concentration of HLD
    - Incorporates additional features (LAN, LCD display)
    - Eliminates soil and microbes equivalent to optimal manual cleaning, BMC ID 2010; 10:200
Automatic Endoscope Reprocessors

- EvoTech-integrates cleaning (FDA-cleared claim) and high-level disinfection. Automated cleaning comparable to manual cleaning. All residual data for cleaning of the internal channels as well as external insertion tube surfaces were below the limit of <6.4 ug/cm² of protein and <1.8 ug/cm² of hemoglobin. Data demonstrate that the soil and microbial removal effected by EvoTech cleaning phase was equivalent to that achieved by manual cleaning. BMC Infect Dis 2010;10:200

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