

**Green Cleaning in Health Care Facilities**  
**Dr. Lynne Schulster, Center's for Disease Control**  
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**Green Cleaning in Health  
Care Facilities**

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Centers for Disease Control and Prevention

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**Green Cleaning in Health Care  
Facilities**

Disclaimer: The findings and conclusions in this presentation are those of the author and her information resources and do not necessarily represent any determination or policy of the Centers for Disease Control and Prevention (CDC).



Bluebonnets in Central Texas

**Objectives for Today's  
Presentation**

- Introduction to Green Cleaning and the Sustainable Environment
- Cleaning and disinfection issues
- Occupational and environmental safety
- Green Cleaning opportunities and resource management
- Information resources

**The Impact of Cleaning on the  
Environment**

- 5.0 Billion pounds of chemicals
- 4.5 Billion pounds of paper
- 0.5 Billions pounds of equipment
- 35.0 Billion plastic liners



**Definitions: Green Cleaning  
and Green Cleaning Products**

- Green Products: Products that reduce impacts on health and the environment when compared to similar products used for the same purpose. (E.O. 13101)
- Green Cleaning: Cleaning to protect health (patients/occupants, staff, administrators, and visitors) without harming the environment.

**Define Green Cleaning  
It's Not Just About Chemicals**

- Products
  - Disposable janitorial products (i.e. paper)
  - Equipment
  - Procedures
  - Source reduction and pollution prevention
  - Safe for patients
  - Safe for staff (especially product users)
  - Safe for environment (creates minimal amount of pollution, especially PBT's)
- Encourage sustainability

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**Disinfectants  
 are  
 Pesticides!!**

**U.S. EPA Regulations**

- ◆ Products for which a manufacturer is claiming antimicrobial activity are considered to be pesticides as per FIFRA, and must be registered by EPA before such products can be legally marketed
- ◆ Cleaners or detergents are not registered products
- ◆ AOAC testing; specific pathogen claims require pathogen-specific data

**Impact on Staff and Patients**

- **Staff:**
  - Irritant and allergic contact dermatitis on hands and forearms
  - Occupational asthma on the increase
  - 20% are eye and skin burns (chemical exposures)
  - Muscular/skeletal injuries (ergonomics)




- **Patients:**
  - Many exposed to chemicals 24/7
  - Chemical sensitivities

**Health Issues and Cleaning Chemicals**

- ◆ Annually institutional cleaning products acutely injure 6% of housekeeping workers.
- ◆ Respiratory system irritation and burns to eyes and skin can be caused by cleaning and disinfecting products in health care facilities.
- ◆ Patients and professional health care workers frequently complain about odors and respiratory problems associated with cleaning products and processes.
- ◆ Annually \$75 million are spent for medical expenses and lost time wages due to these cleaning product chemical injuries.

[www.wrppn.org](http://www.wrppn.org)



**Chemicals in Environmental Services**

|  |   |
|--|---|
| <p><b>HARD FLOOR CARE</b></p> <ul style="list-style-type: none"> <li>• Floor Cleaner</li> <li>• Floor Sealer and Finish</li> <li>• Wax Stripper</li> <li>• Baseboard Cleaner</li> <li>• Spray Buffing Compound</li> </ul> <p><b>CARPET CARE</b></p> <ul style="list-style-type: none"> <li>• Carpet Cleaner Conc.</li> <li>• Carpet Prespray</li> <li>• Spotters</li> <li>• Betadine® Remover</li> <li>• Defoamer</li> </ul> | <p><b>DISINFECTING &amp; SANITIZING</b></p> <ul style="list-style-type: none"> <li>• Disinfectant Cleaners</li> <li>• Chemical Sterilants</li> <li>• Bowl Cleaner-Disinfectants</li> <li>• Washroom Disinfectants</li> <li>• Chlorine Bleach Solutions</li> </ul> <p><b>GENERAL CLEANING PRODUCTS</b></p> <ul style="list-style-type: none"> <li>• General Purpose Cleaner</li> <li>• Glass Cleaner</li> <li>• Stainless Steel Cleaner/Polish</li> <li>• Furniture Polish</li> <li>• Graffiti Remover</li> <li>• Drain Maintainer</li> <li>• Odor Eliminator</li> </ul> |
|--|---|

**Cleaning and Chemicals**

Cleaning agents work by suspending dirt and grease. They do **not** kill microorganisms but they remove soils from a surface to allow the disinfectant to work more efficiently.

**Active Ingredients Used in Cleaning Products**

- **Surfactants**
- **Glycol Ethers**
- **Hydroxides**
- **Phosphates**

**Hazards:** Some nonionic surfactants (NPEs) are not readily biodegradable and can produce endocrine disruption; Glycol ethers are volatile organic compounds that can contribute to poor indoor air quality; Hydroxides are very corrosive to skin, eyes and respiratory system; Phosphates contribute to eutrophication

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### Disinfectants & Sanitizers

Risk Continuum

**Higher** ↑

- **Chlorine / Sodium Hypochlorite**
  - Very effective antimicrobial
  - Corrosive to eyes and skin
  - Damage floor finishes, carpets, clothing, etc.
  - Respiratory irritant
  - Environmental concerns from production, contaminants, byproducts
  - Mixing can create poisonous gas
- **Phenols**
  - Effective against TB – HBV assumed
  - Corrosive to eyes and skin
  - Damage floor finishes and other surfaces
  - Strong pungent odor – respiratory irritant
  - Environmental concerns. Possible estrogen mimic.
- **Quats**
  - Typically not proven effective against spores
  - Less toxic than Phenols – eye, skin and surface corrosivity
  - Toxic to aquatic life
- **Peroxide**
  - EPA Sanitizer. Long term stability concerns.
  - Superior health & environmental profile compared to phenols and quats

**Lower** ↓

### U.S. OSHA Bloodborne Pathogen Standard & Body fluids

- **Fluids covered by OSHA**
  - Blood, semen, cervical solutions, other
- **Excluded fluids include**
  - Urine, stool, saliva, sputum (unless visible blood)
- **Must be decontaminated with either a tuberculocidal or hepacidal disinfectant**

**29 CFR 1910.1030**

### Choosing a Disinfectant

- ◆ **Clean first!**
  - ◆ Cleaners don't disinfect, disinfectants don't clean
- ◆ **Nature and use of the item to be disinfected**
  - ◆ Disinfection level
- ◆ **Sufficient potency for disinfection**
  - ◆ Intrinsic resistance of microbes
  - ◆ Chemical class of disinfectant, use conditions
- ◆ **Materials compatibility**
- ◆ **Safety concerns: hazards with use?**
  - ◆ Aerosols, residuals, chemical sensitivities

### Activity of Selected Oxidative Germicides Against *C. difficile* Spores

- Strong oxidative disinfectants can inactivate high numbers of spores
- Contact time 10-15 mins.
- Occupational hazards with acidified bleach and 5000 mg/L FC bleach (chlorine gas)
- Can be used to manage an identified problem, but should not be used on a routine basis because of corrosiveness and hazards to workers and patients
- Clean to minimize organic soil amounts before disinfecting

From: Perez J, et al. *Am J Infect Control* 2005; 33: 320-5.

### Safety Assessment of Cleaning and Disinfectant Products

- ◆ How is the product diluted and how frequently is it being used?
- ◆ What is the product's intended use?
- ◆ What is the likelihood it will be misused?
- ◆ What is the experience level of users?
- ◆ What are the hazard ratings for the product?
- ◆ What does the MSDS say about the product safety?
- ◆ Does the product present an acceptable level of risk?
- ◆ What do others report about the product safety?

### Environmental Cleaning Study: VRE in RUMC MICU

- ◆ 4 periods of time over 9 months:
  - Period 1: baseline, current procedures
  - Period 2: enhanced environmental cleaning
    - ◆ Virac (cleaner / quat disinfectant)
      - 20 – 25 mins/room, 2X per day
      - "Bucket" method for the floors, 8 – 12 cloths for touched surfaces
  - Period 3: "washout" (no continued emphasis)
  - Period 4: hand hygiene campaign
- ◆ Rectal swabs for patients; environmental swabs; hand cultures for HCWs
- ◆ VRE acquisition rates:
  - Period 1: 33.47 cases per 1000 patient-days at risk
  - Period 2: 16.84
  - Period 3: 12.09
  - Period 4: 10.40
- ◆ Limitations to the study and unanswered questions:
  - No reported use of neutralizer for the disinfectant
  - Little or no details on the housekeeping procedures

Hayden MK, Bonten MJM, Blom DW, Lyle EA, van de Vijver DAMC, Weinstein RA. Reduction in acquisition of vancomycin-resistant *Enterococcus* after enforcement of routine environmental cleaning measures. *Clin Infect Dis* 2006; 42: 1552-60

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***The Inanimate Environment Can Facilitate Transmission***



~ Contaminated surfaces increase cross-transmission ~  
Abstract: The Risk of Hand and Glove Contamination after Contact with a VRE (+) Patient Environment. Hayden M, ICAAC, 2001, Chicago, IL.

**Cleaning and Disinfecting of Medical Equipment**

- ◆ FOLLOW THE MANUFACTURER'S INSTRUCTIONS!!!
- ◆ In the absence of instructions, clean and follow with low- intermediate-level disinfection depending on the degree of contamination
- ◆ Consider covering those surfaces that are frequently touched during delivery of care

Do NOT use high-level disinfectants/chemical sterilants (e.g., glutaraldehyde, formaldehyde) to disinfect medical equipment surfaces or housekeeping surfaces!!

**Cleaning and Disinfecting of the Housekeeping Surfaces**

- ◆ Clean on a regular basis to remove soil and dust
- ◆ Physical removal of microorganisms and organic soil is as important as the antimicrobial effect of the disinfecting agent
- ◆ Surfaces not touched frequently by hand (i.e., floors) in general care areas are cleaned and disinfected
- ◆ ***This is controversial – routine disinfection of floors is not supported by epidemiology; lack of consensus among infection control staff and hospital epidemiologists***

**Cleaning and Disinfecting of the Housekeeping Surfaces**

- ◆ Follow manufacturer's instructions if using proprietary cleaners or disinfectants
  - Use conditions (e.g., concentration, contact time)
- ◆ Clean and disinfect surfaces that are touched by hand on a frequent and regular basis
  - Door knobs, light switches, bed rails
  - Surfaces around the toilet



**Cleaning Plans Matter**

- Evaluate how facility is defined for cleaning purposes
- All one level?
- Different standards for different areas?  
– [www.astm.org](http://www.astm.org)

(ASTM E1971-89 Standard Guide for Stewardship for Cleaning Commercial and Institutional Buildings)

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## Process for Change Recognize Differing Agendas

- Infection Control - cleaning, disinfection
  - Environmental Services – cost containment, ease of use, efficiencies
  - Purchasing – group contracts, cost containment
  - Risk Management – optimize environment, reduce risks, protect patients
  - Employee Health – protect healthcare workers
  - Administration – overall performance, community relations
- Recognize the competition for resources.

## Divide Facility By “Risk”

- High ↑  
Risk Continuum  
↓  
Low
- Critical (high risk)
    - Emergency
    - Labor and Delivery
    - Morgue
    - Surgery
  - Semi-critical (medium risk)
    - Restrooms (public)
    - Nursery
    - Clinics, outpatients, diabetes, respiratory
    - Rehabilitation, physical therapy, cardiac rehab
  - Non-critical (low risk)
    - Exterior maintenance
    - Administration Areas, accounting, records, HR, etc.
    - Patient registration and waiting areas
    - Shops, carpentry, mail, printing, materials management
    - Hallways

## Green Cleaning Products

- Chemicals:
  - Cleaners: Green Seal GS-37
  - Others: Low VOC
  - Concentrates with dilution controls
  - Floor Finish: Sustainable, metal-free
  - Hand Soaps: Non-antimicrobial (except where required)
- Paper & Liners:
  - Comprehensive Procurement Guidelines
  - Green Seal
  - Chlorine-Free Paper Association
- Equipment
  - Vacuums: CRI Green Label Program
  - Floor Machines: Vacuum attachments
  - Microfiber cloths, mops
  - High-efficiency carpet extractors
  - Water-conserving equipment
  - Vapor machines
  - Entry mats



## Alternative Chemical Ingredients Used in Green or Sustainable Cleaning Products

- ◆ Polyglucosides and Alcohol Ethoxylates Surfactants replace NPEs and APEs
- ◆ Hydrogen Peroxide replaces Harsh Acids and Alkali Builders
- ◆ Corn Based Esters replace petroleum distillates
- ◆ Vegetable Derived Surfactants replace petroleum derived surfactants
- ◆ Fruit Derived Solvents and Acids replace hazardous petroleum solvents and harsh acids

## How to Know if a Product is “Green”



**U.S. Environmental Protection Agency**  
[www.epa.gov/dfe](http://www.epa.gov/dfe)



**Green Seal**  
[www.greenseal.org](http://www.greenseal.org)



**Environmental Choice Canada**  
[www.environmentalchoice.com/](http://www.environmentalchoice.com/)

## How to Determine if Cleaning Products Are Hazardous or Contain Hazardous Substances

Review ingredients on material safety data sheet (MSDS). You can check products or ingredients against the following databases or lists.

- IARC – International Agency for Research on Cancer: [www.iarc.fr](http://www.iarc.fr)
- NTP – National Toxicology Program: <http://ntp-server.niehs.nih.gov>
- OSHA – Occupational Safety and Health Administration: [www.osha.gov](http://www.osha.gov)
- IRIS – EPA Integrated Risk Information System: [www.epa.gov/iris](http://www.epa.gov/iris)
- NIOSH – National Institute of Occupational Health and Safety: [www.cdc.gov/niosh](http://www.cdc.gov/niosh)
- ACGIH – American Conference of Governmental Industrial Hygienists: [www.acgih.org](http://www.acgih.org)
- CleanGredients Database – Green Blue Institute: [www.greenblue.org](http://www.greenblue.org)
- Green Seal: [www.greenseal.org](http://www.greenseal.org)
- EPA DfE – EPA Design for the Environment: [www.epa.gov/dfe/pubs/projects/formulat/index.htm](http://www.epa.gov/dfe/pubs/projects/formulat/index.htm)
- IRCHS – Indiana Relative Chemical Hazard Score: [www.ecn.purdue.edu/CMTI/IRCHS/](http://www.ecn.purdue.edu/CMTI/IRCHS/)
- TURI – Toxic Use Reduction Institute: [www.cleansolutions.org](http://www.cleansolutions.org)

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## A Housekeeping Process in Transition...

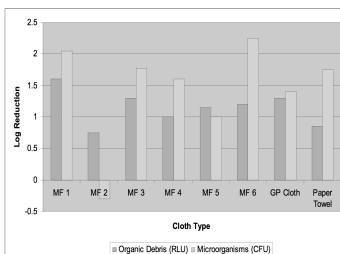
- ◆ Mopping procedures:
  - Frequency of replacing cleaning solutions during use, rinse procedures, mop head switch-out, disposable vs. reusable
- ◆ New! Microfiber cleaning materials
  - UC Davis MC study: ergonomic, economical [www.epa.gov/Region9/waste/p2/projects/mops.pdf](http://www.epa.gov/Region9/waste/p2/projects/mops.pdf)
  - Resource savings: 95% less chemicals, 95% less water, overall cost savings 5-10%, microfiber mop heads lasted 5-10 times longer
  - Not effective on grease or body substance spills

## Microfiber Pilot Test Results Swedish Hospital – Seattle Washington

- ◆ Water/chemical usage before microfiber: 36 gallons per day and 18 oz. of cleaning chemical
- ◆ Water/chemical usage post microfiber: 9 gallons per day and 4.5 oz. cleaning chemical
- ◆ Staff satisfaction: cleaner floors, no mop wringers, reduction of shoulder and arm strain injuries

Source: Mike Smith, Swedish Hospital, Seattle Washington

## Reductions in Soil and Microorganisms with Microfiber



- Dry surfaces wiped with a wet cloth
- No use of cleaners or disinfectants during the tests
- Variable results in cleaning efficiency
- Texture was important
- Damp cloth worked best

Source: Moore G, Griffith C. A laboratory evaluation of the decontamination properties of microfiber cloth. *J Hosp Infection* 2006; 64: 379-85.

## New Technology and Cleaning Equipment

- ◆ “Selling” the new equipment and processes to infection control (IC)!
  - ◆ IC: does the new item produce aerosols and/or stir up dust?
  - ◆ How do the new and old technology compare on performance?
  - ◆ What chemicals are used?
  - ◆ Do patients need to be relocated?

## Entryway Systems and Maintenance

- Intended to capture contaminants, soil at entry
- Design all entrances with permanent entry systems or mats
- Can be used inside and out
- Should be appropriate for climate
- Class 1 Fire Retardency
- Size approximately 12 feet in length
- Develop a plan to track cleaning

## Cleaning and Janitorial Maintenance Products

- Use Green Seal Certified products
  - [www.greenseal.org](http://www.greenseal.org)
- Use low VOC products for other categories
- MSDS – full disclosure
- Use concentrates with dispensing equipment
- Increase the “life” of finishes
- Use metal-free floor finishes
- Maintain a log of all cleaning activities
- Train cleaning personnel re: chemical storage, dispensing, use
- Provide adequate janitorial space and utilities for proper mixing and preparation of solutions

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**Janitorial Equipment**

- Vacuums meet CRI's Green Label Program
  - [www.carpet-rug.com](http://www.carpet-rug.com)
- Extraction equipment remove sufficient moisture to dry carpet in 24 hours
- Buffers & burnishers with vacuum attachments
- Propane equipment have high-efficiency, low emission engines
- Auto scrubbers equipped with variable-speed pumps
- Battery-powered equipment environmentally preferable batteries (gel batteries)
- Ergonomic equipment
- Maintain an equipment log

**Janitorial Paper and Other Disposable Products**

- Comprehensive Procurement Guidelines
  - [www.epa.gov/cpg/products.htm](http://www.epa.gov/cpg/products.htm)
  - Toilet tissue: 20% minimum PC content
  - Paper hand towels: 40% minimum PC content
  - Industrial wipes: 40% minimum PC content
  - Facial tissues: 10% minimum PC content
  - Plastic trash liners: 10% minimum PC content
- Processed chlorine free
- Large rolls
- Hands-free dispensers that limit paper
- Micro-fiber cloths, mops and bonnets
- Recycled containers, buckets, carts, mats, etc.

**Integrated Pest Management**

- Landscape to eliminate "safe havens"
- Prevent pests from entering the building
- Eliminate food and moisture
- Monitor for pests before they become a problem
- Eliminate clutter
- Use the least toxic pesticide possible
- Universal notification

**Encourage Recycling**

- Establish a waste reduction and recycling program that addresses the separation, collection and storage of materials for recycling including (at a minimum) paper, glass, plastics, and metals
- Encourage a high level of recycling by building occupants

The success of recycling programs is dependant upon ongoing educations

**Steps to Developing a "Greener" Cleaning/Disinfecting Strategy I**

- ◆ Meet with IC: understand how surfaces are or are not involved in microbial transmission
- ◆ Know your limitations: regulations and standards that must be implemented
- ◆ Support IC: encourage handwashing, hand hygiene
- ◆ Purposeful and frequent cleaning
- ◆ Develop cleaning / disinfection strategies for surfaces touched frequently by hand

**Steps to Developing a "Greener" Cleaning/Disinfecting Strategy II**

- ◆ Choose chemical application methods that minimize aerosol production
- ◆ Ensure sufficient potency appropriate for the job and materials compatibility
- ◆ Evaluate whether or not a chemical residual is necessary or desirable
- ◆ Incorporate barrier coverings whenever practical for items that are difficult to clean

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**Steps to Developing a “Greener”  
Cleaning/Disinfecting Strategy III**

- ◆ Follow manufacturer / label instructions for use of disinfectants and proper equipment or surface management
- ◆ Review MSDS carefully and consider chemical sensitivities of patients, workers
- ◆ Evaluate new products carefully: look for EPA registrations, independent studies if available

**Goals of Green Cleaning:  
“Good – Not Less Bad!”**

- ◆ Minimize human and environmental hazards
- ◆ Improve indoor air quality
- ◆ Eliminate hazardous waste treatment and disposal
- ◆ Reduce environmental pollutants
- ◆ Lower the aquatic, plant and animal toxicity
- ◆ Reduce VOC emissions inside and outside buildings
- ◆ Reduce the regulatory burden
- ◆ Protect the cleaning worker
- ◆ Help earn points toward U.S. Green Building Council LEED Certification for existing structures

**Moving Forward!**

- ◆ For Green Cleaning to go mainstream:
  - ◆ Emphasize the benefits of frequent cleaning, resource management
  - ◆ Maintain potency; strive for reductions in toxicity, targeted and appropriate use of disinfectants
  - ◆ EPA registration, following label instructions
- ◆ The most important piece of advice:  
Evidence-based: publish results of lab- and in-use studies in peer-viewed journals

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Source: U.S. Dept. of the Interior, National Park Service: Grand Teton National Park

**Thank You!**

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“Protect patients, protect health-care  
personnel, and promote safety, quality, and  
value in the health-care delivery system”

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**The Next Few Teleclasses**

|                    |   |
|--------------------|---|
| <b>October 10</b>  | <b><i>Infection Prevention Among Refugees</i></b><br>... with Dr. Mark Birch  |
| <b>October 18</b>  | <b><i>Hot Issues in Hand Hygiene Improvement</i></b><br>... with Julie Storr, World Health Organisation<br>Sponsored by Deb Canada <a href="http://www.deb.ca">www.deb.ca</a> |
| <b>November 6</b>  | <b><i>Commissioning Infection Control Strategies</i></b><br>... with Yvonne Sawbridge, National Health Service (UK)   |
| <b>November 8</b>  | <b><i>Hazard Vulnerability Analysis for Infection Control</i></b><br>... with Andrew Streifel, University of Minnesota  |
| <b>November 15</b> | <b><i>An Approach to Outbreak Management - Using Biostats to Clobber Bugs</i></b><br>... with Dr. Dick Zoutman, Queen's University  |

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