Healthcare Textiles: Factors That Affect Cleanliness

Dr. Lynne Sehulster, Division for Healthcare Quality Promotion, CDC

A Webber Training Teleclass

Healthcare Textiles: Factors That Impact Cleanliness

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Topics for Today

- Healthcare laundry basics:
  - Some observations
  - Basic steps of the laundry process
  - Antimicrobial activity in the wash cycle
- Key observations from the report of the 2009 mucormycosis outbreak
- Assess the holding/transport/storage stage for contamination opportunities
- Fungi (and bacteria) as agents of textile biodegradation
- Strategies to minimize environmental contamination of hygienically clean healthcare textiles (HCTs)
- Antimicrobial treatment of textiles

Laundry and Infectious Diseases

- Textiles contaminated with body substances can contain large numbers of microorganisms (10^6 – 10^8 cfu/100 cm^2 fabric)
- Few reports in the literature link laundry to disease transmission when proper procedures are followed
- Annual estimates for volume of laundry processed in U.S. health care: several billion lbs. higher than the 5 billion lbs. in the late 1980s
- Continue current infection prevention practices

Observations from a Recent Study

- 135 personnel (45% physicians, 55% nurses) in surgical depts. (60%) and medical depts. (40%)
- Nonpathogenic skin organisms isolated from all attire tested
- Rate of contamination with pathogens higher in attire changed every 2 days compared to that for daily changes (p <.05)
- Isolated pathogenic bacteria:
  - *Acinetobacter* spp. 37% (89/238 cultures)
  - *Staphylococcus aureus* 13% (32/238 cultures)
  - Enterobacteriaceae 8% (18/238 cultures)
  - *Pseudomonas aeruginosa* 3% (8/238 cultures)
- Only skin bacteria isolated from 4 uniforms cultured immediately after receipt from the hospital laundry
  - Bacterial loads significantly lower than on uniforms being worn

Wiener-Well Y, et al. *Am J Infect Control* 2011; 39: 555-9

Current Healthcare Textiles Standard in the U.S.

- Standard for reusable textiles: Hygienically clean
  - Not quantified for microorganisms, but assume textiles are generally rendered free of vegetative pathogens
  - Through a combination of soil removal, pathogen removal, pathogen inactivation, contaminated laundry is rendered hygienically clean
  - Carries negligible risk to healthcare workers and patients, provided that the clean textiles are not inadvertently contaminated before use
  - Sensory attributes: visual, tactile, olfactory
- Reusable surgical textiles: Sterilized

CDC Guidelines for Environmental Infection Control in Health-Care Facilities, 2003:
http://www.cdc.gov/hicpac/pdf/guidelines/eic_in_HCF_03.pdf
ANSI/AAMI ST79:2010 and A1; ANSI/AAMI ST65:2008

AAMI: Hygienically Clean

- Definition: "Free of pathogens in sufficient numbers to cause human illness." (ANSI/ AAMI ST 65:2008)
- No one has ever defined what "sufficient numbers" means
  - Underlying medical conditions may increase risk of infection by opportunistic pathogens

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Main Steps of Healthcare Laundry Processing

- Collection of soiled textiles at point of use
- Transport to laundry
- Wash cycle:
  - Flush, main wash, bleaching, rinsing, souring
- Dried and pressed
- Packaged, loaded into carts
- Delivery back to the hospital

Conventional Laundering: Log Reductions in Bioburden

- In the wash, rinse cycles:
  - Agitation: ~3 log unit reductions
  - Addition of bleach: ~ 3 log unit reductions
- In the dry cycle:
  - ~ 1 – 2 log unit reductions
  - From: Blaser MJ, et al. 1984; *J Infect Dis* 149: 48-57.
- Post wash microbial burden ~10 – 100 CFU/cm^2
- Predominantly Gram-positive organisms

Alternatives to Hot-water Laundry

- In-house laundries consume an average of 50% - 70% of the facility's hot water (10% - 15% of the total energy used)
- Water temperature may be regulated locally
- Lower temperature (e.g., 22° – 50° C) wash cycles can be used with appropriate detergents and laundry additives
- New detergents and processes (e.g., oxidative products) are being evaluated in Europe
- Current problems associated with bleach use:
  - Not all fibers and fabrics are compatible with bleach
  - Chlorine + residual chlorhexidine gluconate (CHG) = brown stains

The Laundry Process: Log Reductions

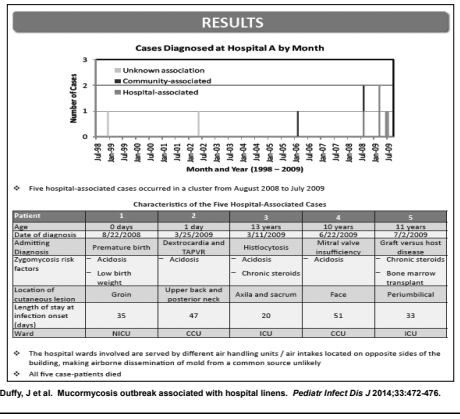
Process	Gram Positive LR*	Gram Negative LR*
Pre –wash at 35° C	0.73 – 2.47	0.70 – 1.16
Main wash at 45° C w/o pre-wash	0.97 – 2.58	1.11 – 2.66
Main wash at 60° C w/o pre-wash	1.34 - >5.56	3.71 - >5.6
E60 + 35: pre-wash at 35° C, main wash at 60° C	1.91 - >7.68	>5.6 - >7.76
Completed main wash at 75° C	>5.56 - >7.88	>5.6 - >7.76
Disinfecting only at 75° C	>5.56 - >7.88	>5.6 - >7.76
Complete 3-step cycle (with disinfection at 80° C)	>5.56 - >7.88	>5.6 - >7.76

- Detergent was mix of anionic and nonionic surfactants, phosphates
- Bleach: H_2O_2 agent; Disinfecting agent was peroxyacetic acid, H_2O_2, acetic acid
- Starting inocula: 10^6 – 10^7 CFU in 1 square cm
- The disinfecting step by itself could not remove stains
- *E. faecium* had the greatest survival; Gram positive > Gram negative
- * LR = log reduction

Fijan S, et al. *Diag Microbiol Infect Dis* 2007; 57: 251-257

U.S. EPA: Laundry Sanitizers and Disinfectants

- OCSPP 810.2400: Fabrics and Textiles – efficacy data recommendations
- Efficacy testing for antimicrobial pesticides intended to be used on fabrics and textiles, and which bear label claims as disinfectants or sanitizers
- Sanitizers used on fabrics: 3 $\log_{10}$ reduction
- Disinfectants used in laundry facility: $\geq$ 59 carriers out of 60 – no growth (carriers inoculated with $\geq 10^6$ microbes)



Duffy, J et al. Mucormycosis outbreak associated with hospital linens. *Pediatr Infect Dis J* 2014;33:472-476.

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HACCP: An Assessment Tool for Infection Prevention

- **HACCP**
  - **Hazard Analysis and Critical Control Points**
  - **Used extensively in the food service industry to help maintain product quality**
  - **Look critically at the laundry facility and the laundry process to identify possible points at which contamination could be introduced, diminishing textile hygienic quality**
  - **Helps to identify quality control strategies to prevent contamination of the product**

HACCP Analysis for Possible Opportunities for Environmental Contamination

- **Laundry Contractor A:**
  - **Facility was not climate controlled, ventilated with unfiltered outdoor air**
  - **Clean HCTs in uncovered bins, exposed to outdoor air before loading into trucks**
  - **Bins not lined with plastic that could be tied shut**
- **Hospital A:**
  - **Bins with clean HCTs held inside the loading dock receiving area for unspecified time**
  - **HCTs placed on shelves in Central storage area**
  - **Construction near the loading dock for the last 5 months of the epidemic period**

Duffy, J et al. Mucormycosis outbreak associated with hospital linens. *Pediatr Infect Dis J* 2014;33:472-476.

Hospital A Pre-Intervention Environmental Cultures

Linen Related Areas and Items Cultured		
Category	*Rhizopus* Positive	Samples Tested
Linen storage room	6	8
Clean linen delivery bins	10	22
Clean linen in bins	1	3
Linen delivery truck (inside)	1	1
Linen bin holding area	1	1
Ward A linen closet	2	4
Ward B linen closet	3	4
Ward C linens	0	9
OR linen closet	2	10
Linen rewashed in hospital	0	3
Total	26 (40%)	65

Non-linen Related Areas and Items Cultured		
Category	*Rhizopus* Positive	Samples Tested
Skin adhesives	0	9
Wound cleaner	0	1
Ward C	0	8
Pharmacy	0	2
Respiratory equipment room	1	2
Air handling unit	0	1
Service entrance	0	1
Total	1 (4%)	24

Intervention: Initial Control Measures

- Based on the results of the initial investigation, Hospital A implemented the following interventions seven days after the case triggering the investigation was diagnosed
  - changed to a different linen supply company
  - started using a different entrance for linen deliveries and a different linen bin holding area
  - removed all linen in use at the time
  - disinfected the linen storage room

Duffy, J et al. Mucormycosis outbreak associated with hospital linens. *Pediatr Infect Dis J* 2014;33:472-476.

Conclusions From the Outbreak Investigation

- **HCTs were the most likely vehicle to have brought *Rhizopus* in contact with the patients**
- **Genetic subtyping of fungal isolates supported this epidemiologic hypothesis**
- **Contamination of clean HCTs with *Rhizopus* happened repeatedly, but might have been intermittent**
- **HCTs should be laundered, shipped, and stored in a manner that minimizes exposure to environmental contaminants**

Duffy, J et al. Mucormycosis outbreak associated with hospital linens. *Pediatr Infect Dis J* 2014;33:472-476.

Chain of Infection (COI)

- **Virulent pathogen:**
  - **Bacteria, fungi, viruses, parasites, prions**
- **Sufficient number of pathogen:**
  - **Infectious dose**
- **Mode of transmission:**
  - **Contact, droplet, airborne**
- **Portal of entry:**
  - **Broken skin, mucous membrane, respiratory tract, ingestion**
- **Susceptible host:**
  - **Age, immunity, medical conditions**

Other possible links include reservoir, portal of exit

Questions Raised

- **Customers are beginning to question the standard**
  - **Is hygienically clean good enough? Should we be doing something different?**
  - **Should we be incorporating more antimicrobials into the laundry process on a routine basis?**
- **Reports of customers asking laundry operators to do ATP sampling of laundry facility surfaces, cleaned textiles**
  - **What does this mean?**
  - **Should microbial sampling of clean textiles be implemented?**
  - **Use of ATP monitoring of hard surfaces in a HACCP approach**

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Outbreaks Attributed to Laundered Healthcare Textiles (HCTs)

- 12 outbreaks in 43 years worldwide attributed to laundered, clean HCTs
  - U.S. – 3, U.K. – 5, Japan – 3, Singapore – 1
  - > 353 patients affected
  - Pathogens identified:
    - *Aspergillus flavus*
    - *Bacillus cereus* (7/12, 58% of the outbreaks)
    - MRSA
    - *Streptococcus pyogenes*
    - *Rhizopus delemare*
    - *Clostridium difficile*
  - Root causes included environmental contamination during transport, dust, improper storage conditions, washing machine malfunctions, inadequate drying, construction dust, recycled water in wash and rinse

Outbreaks Attributed to Soiled Healthcare Textiles (HCTs)

- 5 outbreaks of occupationally-acquired infections or exposure to hazardous pharmaceuticals in 43 years
  - 148 – 248 workers affected
  - Pathogens/chemicals identified:
    - Scabies
    - *Microsporis canis*
    - *Salmonella hadar*
    - Hepatitis A virus
    - Antineoplastic pharmaceuticals
- Breach of infection prevention practices identified
  - Improper handling created aerosols
  - Failure to use appropriate PPE
  - Exposures to fecal and other body substance contamination

Four Key Observations: Infections and HCTs

- Patient-to-patient transmission of infection has not as yet been reported in association with hygienically-clean HCTs
  - Laundry processes carried out in accordance with recommended industry operational specifications for water quality, cycle parameters, proper laundry chemical selection and use, and proper equipment maintenance
- Outbreaks involve environmental contamination and failure to maintain HCT cleanliness after washing and drying
  - Root causes identified and corrected
  - Problems with storage are most frequently identified
- Occupational infection or chemical exposure involve failure to use PPE and follow standard infection prevention procedures when handling soiled HCTs
- Rare events, but is underreporting at work here?

Biodegradation of Textiles

- Textiles, especially those containing natural fibers, are readily attacked by microbes
  - Some processing and finishing agents (e.g., dyes) are also vulnerable
  - Over time ⇨ loss of strength, discoloration, change of appearance, odor
- Fungi are the most important microbial class associated with biodegradation
- Three things necessary for fungal growth:
  - Food source (e.g., cellulose)
  - Moisture
  - Favorable environmental conditions (e.g., temperature, humidity)

Szostak-Kotowa J. Biodeterioration of textiles. *Int Biodeterioration Biodegradation* 2004; 53: 165-170.

Biodegradation of Textiles

- There are two main ways to control and/or prevent biodegradation of HCTs:
- Control of environmental and physical conditions of clean HCTs, or
- Use antimicrobial treatments

Szostak-Kotowa J. Biodeterioration of textiles. *Int Biodeterioration Biodegradation* 2004; 53: 165-170.

Laundry Holding/Transport / Storage

- Controlling the environmental conditions is considered to be the best means of protecting textiles
- Clean HCTs touch clean surfaces
  - That includes clean hands and worker uniforms
- HCTs should be as dry as practical prior to bundling or packaging
- Unwrapped HCTs should be stored and transported using strategies to prevent inadvertent contamination by soil or body substances
  - Covered containment, either bins, carts, or shelves

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Laundry Transport / Storage

- Separate clean textiles from contaminated textiles when transporting in a vehicle
- Physical barriers and/or space separation
- Clean, unwrapped textiles can be stored in a clean location for short periods of time
- Unwrapped textiles should be stored so to prevent inadvertent contamination by soil or body substances
- **This is the part of the overall process that is most vulnerable to outside contamination**

Climate Control via Ventilation: Key Engineering Specifications

Why this is important:

- **Fungi grow rapidly at RH > 80%**
- **Keeping the ventilation parameters consistent helps to minimize microbial growth**
  - **Trapped excess moisture due to packaging may create opportunities for growth when RH fluctuates**
  - **May cause pockets of high humidity within the HCT bundle that may be RH >80%**
  - **This increase can be as much as 20% over ambient humidity**
- **Higher temperatures encourage fungal growth**

- **Clean HCT Storage:**
  - **Temperature: 72 - 78° F**
  - **Relative humidity (RH): NR***
  - **Air changes/hour (ACH): 2**
  - **Airflow direction: Positive**
- **Surgical Pack Room Storage:**
  - **Temperature: < 78° F**
  - **Relative humidity: < 70%**
  - **Air changes/hour (ACH): 2**
  - **Airflow direction: Positive**
- **Hold/Staging at the Laundry:**
  - **?**

FGI. Guidelines for Design & Construction of Hospitals & Outpatient Facilities. 2014 Ed. FGI, Dallas, TX
ANSI/ASHRAE/ASHE Standard 170-2013. Ventilation of Health Care Facilities. 2013. ASHRAE, Atlanta, GA
HLAC Accreditation Standards for Processing Reusable Textiles for Use in Healthcare Facilities, 2011. Plainfield, IL
ANSI/AAMI ST65:2008 (R2013). Processing of Reusable Surgical Textiles for Use in Healthcare Facilities, 2009. Arlington, VA
Montegut D, Indictor N, Koestler RJ. Fungal deterioration of cellulosic textiles: a review. *Int Biodeterioration* 1991; 28:209-226

Laundry Holding/Transport / Storage: Area Cleanliness and Dust Control

- **Evaluate HCT storage area in the hospital for ways to minimize dust intrusion**
  - **Self-closing doors help to maintain positive pressurization**
  - **Location of HCT storage room relative to the loading dock and other services**
  - **Amount of traffic through the room**
- **Establish hospital policy for regular cleaning and disinfection of the room's storage surfaces**
- **Where are clean HCTs unloaded in the hospital?**
- **Visual inspection of outermost bundle surfaces**

Antimicrobial Chemical Treatments

- **Different approaches to adding chemical treatments:**
  - **Impregnation of the fiber (e.g., copper)**
  - **Treatment of the fabric before final garment/item construction**
  - **Treatment of the garment/item (e.g., add/recharge an antimicrobial residual)**
- **Function of the antimicrobial treatment**
  - **Protection of the fabric/garment to maintain textile function**
  - **Hygienic treatment**
- **Antimicrobial treatments for hygienic purposes:**
  - **Low toxicity to humans, minimize skin irritation**
  - **Should not leach from the fabric (e.g., when moistened by sweat)**
  - **Should not interfere with proper function of the textile**
  - **Low cost, withstand repeated washings**

Szostak-Kotowa J. Bioterioration of textiles. *Int Biodeterioration Biodegradation.* 2004; 53:165-170.

A Short List of Antimicrobial Chemicals for Textiles

- **Quaternary ammonium compounds plus acrylic copolymer fluid repellent**
- **Chitosans and chitooligosaccharides**
- **Quaternary ammonium compounds plus organosilane (forming a silicon-nitrogen carbon polymer)**
- **Hydrophobic N-alkyl plus benzophenone containing polyethylenimine**
- **Silver (Ag) nanoparticles**
- **Copper (Cu) nanoparticles**
- **Gold (Au) nanoparticles**
- **Siloxane sulfipropylbetaine (SSPB)**
- **Titanium dioxide (TiO_2)**
- **Ag nanocomposite with TiO_2 and citric acid as a crosslinker**
- **Triclosan**

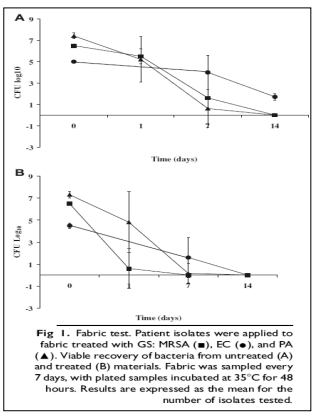

Fig 1. Fabric test. Patient isolates were applied to fabric treated with GS: MRSA (■), EC (●), and PA (▲). Viable recovery of bacteria from untreated (A) and treated (B) materials. Fabric was sampled every 7 days, with plated samples incubated at 35°C for 48 hours. Results are expressed as the mean for the number of isolates tested.

Treatment of Fabric with Quaternary Ammonium/Organo-silane During the Wash Process

From: Baxa D, et al. *Am J Infect Control* 2011; 39: 483-7

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Log Reductions on Untreated Fabric (Control) and Silver Treated Fabric

Table 1 Average inhibition[a] of clinical and reference strains of ten bacterial species on bioactive and control fabrics depending on the contact time

	No. of strains	CS (cfu/ml)	3 h		24 h		48 h		72 h	
			CF	BTF	CF	BTF	CF	BTF	CF	BTF
A. baumannii	3	3.5×10^6	0	0	0	2.6	0	4.1	0.8	5
E. aerogenes	3	5.8×10^6	0	1.5	0	3.4	2.2	4.3	4	5
E. coli	4[b]	5.5×10^6	0	0	0	4	2	5	4.5	5
E. faecalis	3	3.8×10^6	0	0	1.8	3.1	2	4	4	4.8
K. pneumoniae	3	4.0×10^6	0	0.6	0	5	4	5	4	5
M. morganii	4[b]	4.5×10^6	0	0	0	4	4	5	5	5
P. aeruginosa	4[b]	4.2×10^6	0	0.3	0	4	2	4	5	5
P. aeruginosa mucous	3	3.5×10^6	0	3.8	4.2	5	4.5	5	5	5
P. mirabilis	3	3.5×10^6	0	1.1	0	4	3	4.6	4	5
S. aureus	4[b]	2.8×10^6	0	1.3	1.5	4.2	3	5	3	5
S. epidermidis	3	3.2×10^6	0	0	1.6	4	3	5	3.2	5

CS, cell suspensions of inoculums as an average of cfu/ml;CF, control fabric;BTF, Bioactive® -treatad fabric

[a]Inhibition expressed as average $\log_{10}$ reductions (LR) in relation to the inoculum size ($5\log_{10}$ cfu)

[b]Three clinical strains and a reference strain are included

Mariscal A, et al. ***Eur J Clin Microbiol Infect Dis*** **2011; 30: 227-32**

Dermatophyte Susceptibility to Selected Antimicrobial Textiles

Table 1. Results of Testing the Refined Textiles for Antifungal Activity

	Negative Control	DDAC	PHMB	AgCl Low	AgCl High	Cu
Trichophyton rubrum (n = 4)	5	0	3	4	1	5
Trichophyton mentagrophytes (n =4)	5	5	5	2	1	5
Candida albicans (n = 3)	-	4.47 (0)	3.09 (1.11)	4.97 (0)	3.04 (1.39)	1.14 (0.90)

Growth inhibition of the *Trichophyton* species assessed as follows:

0 = no growth visible to the naked eye
1 = no growth visible to the naked eye, but visible under the microscope
2 = 25% growth compared to the negative control
3 = 50% growth compared to the negative control
4 = > 50% growth compared to the negative control
5 = growth comparable to the negative control

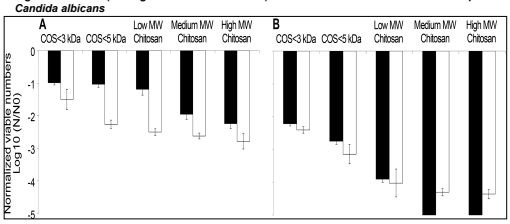
Inhibition of *Candida albicans* shown as $\log_{10}$ reductions. Standard deviation shown in parentheses.

Key: DDAC = didecyldimethylammonium chloride
PHMB = poly-hexamethylenbiguanide
AgCl = silver chloride
Cu = copper

From: Hammer TR, et al. Dermatophyte susceptibility varies toward antimicrobial textiles. ***Mycoses*** **2012; 55: 344-351.**

Chitosans and Chitooligosaccharides Antimicrobial Activity - *Candida albicans*

Figure 3. Effects (Average ± Standard Deviation) of Different MW Chitosans and COS Upon *Candida albicans*



Panel A: 1 hour exposure Panel B: 4 hour exposure
Black bars: incubated in Müller-Hinton broth White bars: incubated in cotton fabric

From: Fernandes JC et al. ***J Microbiol Biotechnol*** **2010; 20: 311-318.**

Effect of Artificial Sweat on Silver Leaching from Treated Fabrics

Table 3: Initial silver content and total silver release in standard formulas of artificial sweat for 24 h

Sample	Initial silver content (mg/kg)	Silver released in artificial sweat (mg/kg)			
		AATCC Ph 4.3	ISO Ph 5.5	ISO Ph 8.0	EN Ph 6.5
A0	n.d.	n.d.	n.d.	n.d.	n.d.
A1	36.12 ± 22.42	21.01 ± 4.13	15.53 ± 3.62	34.27 ± 2.88	35.83 ± 19.68
A2	56.57 ± 34.28	33.39 ± 15.80	28.81 ± 10.34	66.54 ± 46.29	77.96 ± 23.80
A3	95.12 ± 33.12	70.15 ± 37.29	72.69 ± 11.99	82.22 ± 26.99	152.20 ± 36.54
A4	425.21 ± 93.73	217.61 ± 81.32	177.13 ± 57.13	268.31 ± 131.15	322.21 ± 87.00
B	n.d.	n.d.	n.d.	n.d.	n.d.
C	n.d.	n.d.	n.d.	n.d.	n.d.
D	n.d.	n.d.	n.d.	n.d.	n.d.
E	15.16 ± 9.90	0.08 ± 0.05	0.01 ± 0.01	0.50 ± 0.30	0.36 ± 0.10
F	1.22 ± 0.87	n.d.	n.d.	n.d.	0.05 ± 0.00
G	0.99 ± 1.53	n.d.	n.d.	n.d.	n.d.

Data are mean ± SD of three independent experiments.
n.d. = not detected

From: Kulthong K, et al. ***Part Fib Toxicol*** **2010; 7: 8-16**

EPA: Treated Article Exemption

- **According to FIFRA, "treated articles" refer to articles or products that are treated with an antimicrobial pesticide to protect the article or product themselves.**
- **Treated Articles Exemption:**
  - **An article or substance treated with or containing a pesticide to protect the article or substance, if the pesticide is registered for such use**
  - **The Treated Articles Exemption is available only for the protection of the product and not for public health uses**
    - **Odor control, prevention of deterioration**
- **Products bearing a public health claim must be registered in addition to the registration of the antimicrobial pesticide**

http://www.epa.gov/pesticides/factsheets/treatart.htm

Quality Issues for Consideration

- **Conduct risk-benefit analysis**
- **Potential toxicologic and allergic side effects**
  - **Does exposure alter the microbial ecology of the skin, skin integrity?**
- **Potential selection for resistant microorganisms with long-term use**
- **Potential environmental issues**
  - **Biodegradability, toxicity to plants, marine life**
- **Persistence of the antimicrobial effect**
  - **Is recharge needed, or is another treatment necessary?**
- **Can consistent adherence to existing infection prevention practices achieve similar results?**
- **Need to document an impact on healthcare-associated infection (HAI) rates while using antimicrobial treatment of textiles**

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Resources for More Information

- CDC:
  - Guidelines for Environmental Infection Control in Health-Care Facilities: http://www.cdc.gov/hicpac/pdf/guidelines/eic_in_HCF_03.pdf
  - Guidelines for Disinfection and Sterilization in Healthcare Facilities: http://www.cdc.gov/hicpac/pdf/guidelines/Disinfection_Nov_2008.pdf
  - HAI Prevention Tool Kit: http://www.cdc.gov/HAI/prevent/prevention_tools.html
    - Options for Evaluating Environmental Cleaning
    - Appendices to the Conceptual Program Model for Environmental Evaluation
    - CDC Environmental Checklist for Monitoring Terminal Cleaning
    - CDC Environmental Checklist
    - Environmental Cleaning Evaluation Worksheet (Excel format)
    - CDI Prevention Tool Kit
- EPA:
  - Selected EPA-Registered Disinfectants: http://www.epa.gov/oppad001/chemregindex.htm
  - Pesticide Product Label System: http://www.epa.gov/pesticides/pestlabels/index.htm

Thank You!

"Protect patients, protect healthcare personnel, and promote safety, quality, and value in the healthcare delivery system."

CDC 24/7

For more information please contact Centers for Disease Control and Prevention
1600 Clifton Road NE, Atlanta, GA 30333
Telephone, 1-800-CDC-INFO (232-4636)/TTY: 1-888-232-6348
E-mail: cdcinfo@cdc.gov Web: www.cdc.gov

National Center for Emerging and Zoonotic Infectious Diseases

October 23 **INFECTION PREVENTION IN OUTPATIENT ONCOLOGY SETTINGS**
Dr. Alice Guh, Division of Healthcare Quality Promotion, Centers for Disease Control and Prevention

November 5 (Free WHO Teleclass – Europe)
PUBLIC REPORTING AND DISCLOSURE OF HAI RATES: POSITIVE IMPACT OR CONFUSION?
Dr. Michael Borg, St. Luke's Hospital, Malta
Sponsored by the World Health Organization

November 6 (Free Teleclass)
CBIC IS MAKING THE CERTIFICATION PROCESS WORK FOR ALL !
Craig H Gilliam and Lita Jo Henman, Certification Board of Infection Control

November 13 **EMERGING RESPIRATORY VIRUSES: ARE HEALTHCARE WORKERS PROTECTED?**
Dr. Virginia Roth, The Ottawa Hospital

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Clean Care is Safer Care
www.who.int/gpsc/en

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