A17 New Information about Specifying and Cleaning Durable Coated Fabrics for Healthcare

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Monday, November 4, 2019

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#4. Explore widespread durable coated fabric failures in a health system, discover the sources of failures and chemical interactions between disinfectants, contaminates, and coated fabric; assess the impact to the hospital's business model; define new criteria and opportunities to enlarge the conversation and collaborate to rethink the basic building blocks of expectations.

Teri Lura Bennett
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Health System
Facilities
Architecture +
Planning

1. Learn about durable coated fabric construction, performance characteristics, potential new and innovative durable coated fabric technologies, and field reporting processes and procedures.

Show of Hands!

How many of you are experiencing the following?

SOILING & STAINING?

Show of Hands!

PUDDLING?

Show of Hands!

DELAMINATION?

How many of you have been told, as I was…
"…this is only happening at your hospital".

HCD HEALTHCARE DESIGN EXPO+CONFERENCE

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….Really?

We hear you.

We are right there with you.

It's embarrassing, time-consuming, and expensive to remedy these failures of our furnished environment.

We are here to talk about what we can do to fix this!

Survey of 150+ Healthcare designers;

When evaluating an upholstery material for your public and patient healthcare environments,

…what are your top issues?

Survey Results indicated these issues were all important:

- **Aesthetics**
- **Cleanability**
- **Cost**
- **Performance / Durability**
- **Sustainable (Green)**
- **Warranty**

..but which were MOST important, i.e. how did they RANK?

#1 Performance / Durability	***38%***
#2 Cleanability	***24%***
#3 Aesthetics	***18%***
#4 Warranty	***11%***
#5 Cost	***6%***
#6 Sustainable (Green)	***3%***

The Challenges….

Manufacturer testing, standards, and warranties based on cleaning/disinfecting paradigms …*that aren't happening!*

The result is premature upholstery fails, disgusted patients & visitors, and embarrassed staff who are managing furniture instead of patients!

…with the help of AAHID we are reaching out to better understand the magnitude of upholstery product failures within acute care, outpatient care, and long term care failures, by gathering information on how materials are being cleaned, and the current status of failures, associated costs, and potential solutions issues being discovered.

Cleaning and Disinfection Survey; to collect data on cleaning/disinfection products & procedures being used, from Environmental Services, Facility Management, and Designers **:**

https://www.surveymonkey.com/r/J6W3PDX.

Healthcare Durable Coated Fabrics Upholstery Failures Survey; to provide data regarding actual problems and failures of various types of durable coated fabrics used in healthcare across the U.S.

https://www.surveymonkey.com/r/HKBM67B

Recap of Basic Durable-Coated Fabrics information:

What are durable coated fabrics?

Coated Fabrics represent a family of fully coated textiles that can be considered "non-porous".

Coated Fabrics Are NOT a textile with a coating applied to the yarn.

Choices are:

PVC – Polyvinyl chloride (vinyl)

PU – Polyurethane (PU)

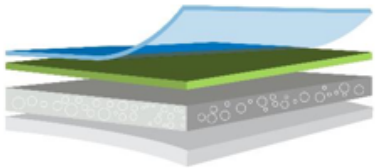
Silicone – relatively new to the Coated Fabrics market

Thermoplastic Elastomers – very new, used in roofing products for years

Recap of Basic Durable-Coated Fabrics information:

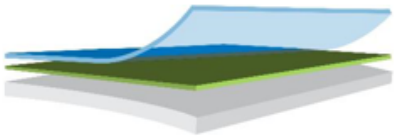
Construction Basics

PVC Cross Section



- Clear Protective top-finish critical to durability
- Skin-coat – 0.006" – 0.008"
- Foam Layer – 0.020" – 0.040"
- Textile Backing

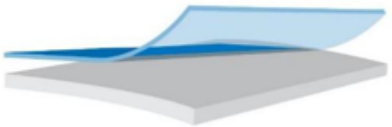
Polyurethane Cross-Section



- ~ .002" Skincoat* Critical to Durability
- Adhesive coating
- Textile/PU Base

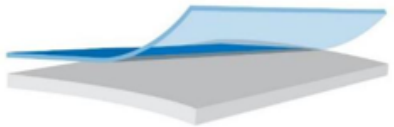
*Best: Polycarbonate – High resistance to hydrolysis
Good: Polyether – Good resistance to hydrolysis
Fair: Polyester – Low resistance to hydrolysis

Thermoplastic Elastomers



- .020" – 0.25" Single ply Coating
- Textile Backing

Silicone Coating



- .010" – 0.12" Single ply Coating
- Textile Backing

Shari Solomon, Industrial Hygienist & President, CleanHealth Environmental, LLC.

2. Discuss current cleaning/disinfecting paradigms, and explore the potential for innovation new cleaning technologies to help reduce HAI's, and improve performance.

Cleaning & Disinfection Challenges and Emerging Technologies

Presented by:
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CleanHealth Environmental
Risk Management Training Solutions

The Most Recent Statistics

(Published March 2014)

HAIs in U.S Acute Care Hospitals in 2011

- **722,000** HAIs; **75,000** deaths during their hospitalizations.
- **1 in 25** hospital patients on any given day has at least one HAI.
- More than half of all HAIs occurred outside of the intensive care unit.

-

- U.S. Centers for Disease Control and Prevention (CDC)

Surface Contamination

Over the past decade, substantial scientific evidence has accumulated indicating that contamination of environmental surfaces plays an important role in the transmission of several key healthcare-associated pathogens, including MRSA,*VRE, Clostridium difficile, Acinetobacter, and norovirus*

Understanding and Preventing Transmission of Healthcare-Associated Pathogens Due to the Contaminated Hospital Environment
- David J. Weber, MD, MPH (May 2013)

Soft Surface "Disinfection"
Durable-Coated Fabric Upholstery

- Soft surface claims are limited by the EPA, to "sanitizer" versus "disinfectant" claims.
- The EPA Performance Standard for non-food contact sanitizers requires a reduction of at least 99.9% (a 3-log reduction*).
- The disinfectant standard requires a higher level of reduction, 99.9999% reduction/kill (a 6-log reduction).

***3 log reduction means** the number of germs is 1000 times smaller. 4 **log reduction means** the number of germs is 10,000 times smaller.

Furniture Challenges

"Upholstered furniture in patient care areas should be covered with fabrics that are fluid-resistant, non-porous and can withstand cleaning with hospital-grade disinfectants; microorganisms have been shown to survive on porous fabrics such as cotton, cotton terry, nylon and polyester, and on plastics such as polyurethane and polypropylene."

- AHE – Association for the Healthcare Environment

Cost of Various HAIs

HAI Type	Cost in Dollars
MRSA Infection	$35,000-$60,000
C.diff Infection (CDI)	$18,000-$90,000
Surgical Site Infection (SSI) (Knee or Hip)	$30,000-$50,000
Central Line Associated Blood Stream Infection (CLABSI)	$16,000-$20,000
Catheter associated Urinary Tract Infection (CAUTI)	$5,000-$10,000
Ventilator associated pneumonia (VAP)	$15,000-$25,000

Infect Control Hosp Epidemiol 2010; 31:365-373
J Hosp Infect. 2010 Apr;74(4):309-18
Merollini et al. BMC Health Services Research 2013, 13:91

http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6008a4.htm
http://www.cdc.gov/hai/pdfs/hai/scott_costpaper.pdf

Organisms Outside Human Body

Microbe	Survival time outside human body
Clostridium difficile (spores)	5 months
Acinetobacter spp.	3 days to 5 months
Enterococcus spp. including VRE	5 days – 4 months
Pseudomonas aeruginosa	6 hours – 16 months
Klebsiella spp.	2 hours to > 30 months
Staphylococcus aureus, inc. MRSA	7 days – 7 months
Norovirus (and feline calicivirus)	8 hours to > 2 weeks[1]
SARS Coronavirus	72 hours to >28 days[2]
Influenza	Hours to several days[3]

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

1. Doultree *et al. J Hosp Infect* 1999;41:51-57.
2. Rabenau *et al. Med Microbial Immunol* 2005;194:1-6.
3. Bean *et al. J Infect Dis* 1982;146:47-51.

Germ Awareness is On The Rise

Used with permission from

Kimberly-Clark PROFESSIONAL

Resistance of pathogens to disinfectants

Pathogens	Example	Disinfectants		
		Low-level Disinfection	Intermediate-level Disinfection	High-level Disinfection
Prions	Mad Cow Disease			
Bacterial Spores	Clostridium difficile			Peracetic acid / hydrogen peroxide blends
Mycobacteria	Tuberculosis		Quat / alcohol	Bleach and Hydrogen peroxide
Nonlipid or small viruses	Norovirus			
Fungi	Athletes foot		Quat / alcohol blends	
Vegetative bacteria	MRSA, VRE	Quats		
Lipid or medium viruses	HIV			

Cleaning Agents/Disinfectants Typically Used for Healthcare Furniture

Bleach: sodium hypochlorite2 in a 5.25 - 6.25% dilution is an intermediate level disinfectant (use label recommendation for mixing bleach with water – typical is 10:1 water to bleach).

Peroxide: in a 3.0% solution, sometimes accelerated with acid, hydrogen peroxide can be either a low or intermediate level disinfectant

UV lights: The wavelength of UV radiation ranges from 210 to 328 nm (2100 to 3280 A) at 2-6 mw/cm2. 200-280 nm is typically considered to be the UVC range.

Alcohol: Isopropyl and ethyl alcohol at 55-70%, and usually used in combination with quaternary ammonium salts or as 70% isopropyl alcohol

AHE – Association for the Healthcare Environment

Cleaning Agents/Disinfectants Typically Used for Healthcare Furniture

Quaternary Ammonium (Quats): low level disinfectants that will kill most bacteria, viruses and fungi. Commonly used as the routine disinfectant product in healthcare applications.

Phenolic: intermediate level disinfectants that are effective against *Mycobacterium tuberculosis;* however, due to toxicity and environmental concerns they are being phased out of common use.

Steam: The vapor into which water is converted when heated. In healthcare, steam may be used to get rid of bed bugs and other infestations, and/or other infectious agents in upholstered furniture.

Chlorine Dioxide: intermediate level disinfectant in a 2.0 - 5.0% concentration. Although effective against C. diff., its use is not widespread in healthcare applications.

AHE – Association for the Healthcare Environment

In the Real World

Timeframes for Cleaning

- Occupied Rooms
  - AHE Best Practice – 15-20 minutes
  - Real World – 10-12 minutes
- Discharge Cleaning
  - AHE Best Practice – 45-60 minutes
  - Real World – 30-40 minutes

AHE – Association for the Healthcare Environment

What are dwell times?

Dwell Time

The amount of time that a disinfectant must remain wet on a surface to kill microorganisms.

Why does dwell time matter?

Knowing the dwell time impacts how much disinfectant to use and how long to leave it wet on the surface!

In the Real World

How a cleaning product is actually used is dependent on the cleaning protocols set up by the individual healthcare facility. Some of problems that exist with how these chemicals are used in healthcare facilities include:

1. The cleaning solution used is much more concentrated than stated in the directions.
2. The cleaning solution is allowed to remain on the surface for longer than the prescribed time.
3. The dwell time is not met and therefore must be reappllied multiple times.
4. The cleaning solution is not rinsed off with water.

It is still unclear what the long-term effect may be if the active ingredient of a disinfectant builds up on the fabric.

Health Care Furniture Design - Guidelines for Cleanability

- Intention: Provide direction to manufacturers, specifers, and users of healthcare furniture

- Purpose: Provide guidance to furniture manufacturers and healthcare professionals in understanding typical cleaners, disinfectants, cleaning methods, and performance of furniture when exposed to these cleaners and disinfectants.

Association for the Health Care Environment

Protocols Surrounding Furniture Selection

- Planning stage
  - Environmental Services (EVS) and Infection Prevention (IP) part of the decision-making process
  - Request cleaning and disinfection specifications from manufacturers.
  - Request studies regarding durability
  - Products should be designed for ease of cleanability. Where possible, parts (cushions, arm pads, etc.) should be easily removable and/or have removable covers to facilitate cleaning or replacement.

Selection of Furniture

- Cleanable
- Easy to maintain and repair
- Resistant to microbial growth
- Nonporous
- Seamless

PIDAC | Provincial Infectious Diseases Advisory Committee

Infection Prevention and Control

- PIDAC: Best Practices for Environmental Cleaning for Infection Prevention and Control | April 2018

Protocols Surrounding Furniture Cleaning, Disinfection and Maintenance

- Create and adhere to Facility Policies & Procedures
  - Training and education
  - Include manufacturers cleaning instructions geared to actual use provided for all product materials and finishes.
  - Include procedures for EVS if damage is identified during cleaning
  - Conduct regular audits
  - Wiping program may be considered

Emerging Technologies: *Antimicrobial Surfaces*

Replacing traditional materials (e.g., plastic, stainless steel) with materials with antimicrobial properties or treating surfaces with coatings is a potential solution to this problem.

Candidate antimicrobial surfaces and coatings supported by data from nonclinical settings include:

- Copper
- Silver
- Stainless steel coated with titanium dioxide
- Glass coated with xerogel, and
- Surfaces sprayed with surfacine or organosilane

Emerging Technologies: *Antimicrobial Surfaces*

"With the exception of copper, there is very limited evidence that any of these approaches persistently reduce microbial contamination in clinical settings and no evidence that they reduce the incidence of health care-associated infection" (PIDAC)

There is now evidence from multiple studies demonstrating that copper surfaces used in acute and long-term care settings reduce overall bacterial burden (e.g., total colony forming units per item or area). (PIDAC)

There is, therefore, insufficient evidence to recommend for or against the use of copper surfaces or copper impregnated linens in the health care setting, and facilities should weigh the cost, functionality, the limitation of copper (See Table 6) against its known antimicrobial properties, and low quality evidence suggesting it may impact infection rates when considering the use of copper surfaces or linens. (AHE)

"The use of antimicrobial inhibitors in materials and finishes is an emerging technology that is currently under investigation. No recommendation is given" (AHE)

Emerging Technologies: Surface Disinfection

Advantages and Disadvantages of HPV and UV Disinfection Systems Compared to Manual Cleaning and Disinfection Alone

Hydrogen Peroxide Vapor

- Advantage: Simultaneous disinfection of room surfaces, furniture, and complex equipment
- Disadvantage: Potential damage of some plastic and polymer surfaces

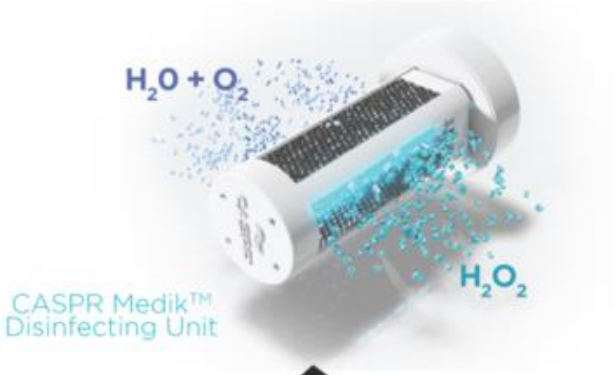
Ultraviolet light

- Advantage: No residue after use, Simultaneous disinfection of room surfaces, furniture, and equipment
- Disadvantage: Destructive effect over time on plastics and vinyls and fading of paints and fabrics

Continuous Disinfection Technologies

- Disinfecting Unit: Inserted into the ducts of an HVAC system, The system reacts with the H_2O molecules found in the air to continuously create highly effective oxidizing molecules, which are delivered at safe levels to all surfaces.

- High-intensity Narrow-spectrum (HINS) Light - composed of violet light from the visible spectrum with a wavelength of 405 nanometres (nm)



Role of Hospital Surfaces in Disease Transmission: Will Use of a Continuously Active Disinfectant Reduce Microbial Contamination?

William A. Rutala, Ph.D., M.P.H., C.I.C.

Director, Statewide Program for Infection Control and Epidemiology and Professor of Medicine, University of North Carolina at Chapel Hill, NC, USA

Former Director, Hospital Epidemiology, Occupational Health and Safety, UNC Health Care, Chapel Hill, NC (1979-2017)

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

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

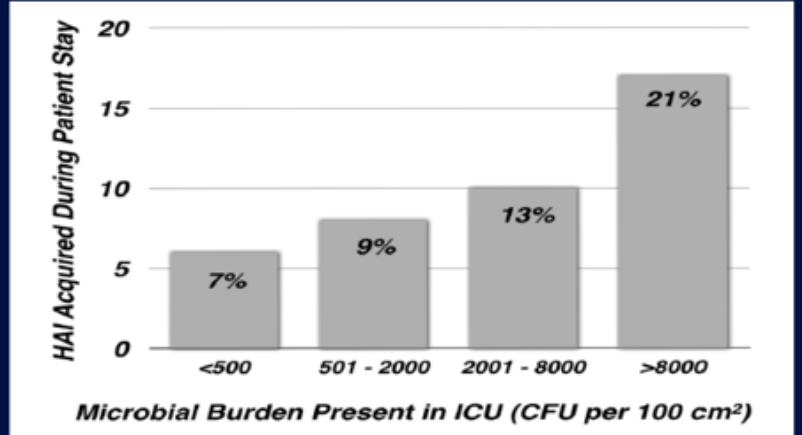


FIGURE 2. Quartile distribution of healthcare-acquired infections (HAIs) stratified by microbial burden measured in the intensive care unit (ICU) room during the patient's stay. There was a significant association between burden and HAI risk ($P = .038$), with 89% of HAIs occurring among patients cared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

Thank you!

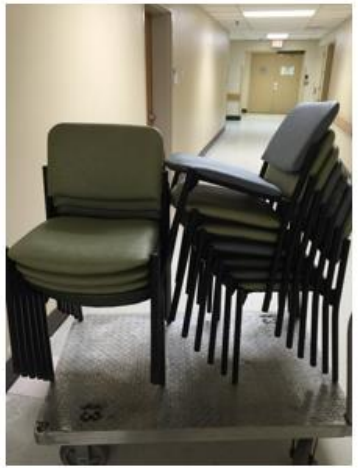
"Let me guess...it's contagious!"

3. Understand the challenges of conducting a real-word, in-house, research field study of heavy/duty healthcare recommended, durable-coated fabrics and hear generic findings along with cleaning and disinfecting results from the same study.

Barbara Dellinger, MA, FIIDA, CHID, CID, EDAC, NCIDQ
Director Design & Research, Adventist Healthcare

History of failures of durable-coated fabrics at AHC and "Ah Ha" moments…

- Prep Joint Commission visits in 2014 and 2017 - requests by Depts for new furniture!



More and more failures...

The “Ah –Ha!” moment that started it all!

- Shuttle bus conversation with other HC designers (in-house and consultants) from airport to Design Connections November 2017
- We expressed frustration with coated fabric failures… we all began sharing stories and photos.
- Continued the discussion at Design Connectior with other AAHID members. *Ah –Ha!…*

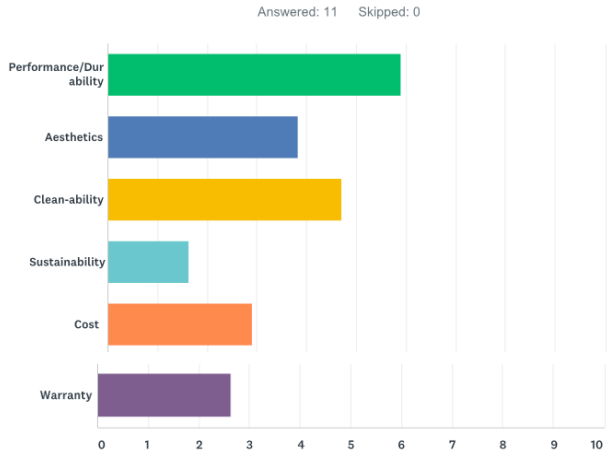
We were ALL having the same problems!

The Durable-Coated Fabrics Task Group was born…
comprised of manufacturers, distributors, healthcare designers, trade association and environmental services representatives.

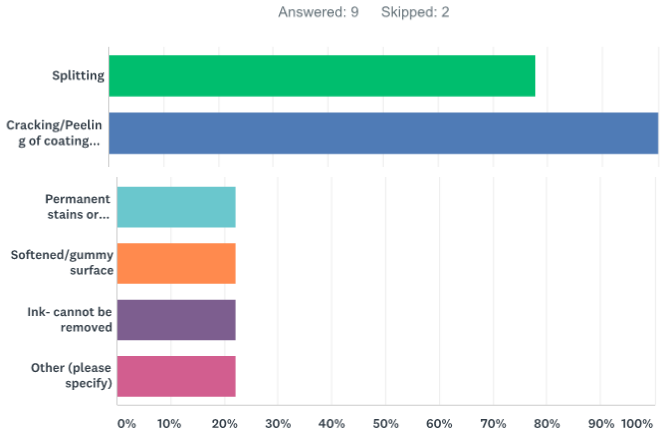
Through conference calls and meetings we discuss issues of durability, including polling the industry for information on current practices, upholstery specification checklists, durability testing, and industry advancements. Our findings are posted on the AAHID LinkedIn page to help continue the dialog.

Confirmed: the problem exists across the U.S., Canada, and possibly world-wide….

Q1 When selecting any upholstery fabric for a Healthcare project, please rank the following in order of importance, with 1 being most important, and 6 (or 7) being least important.



Q11 If you answered ‘yes’ to a fabric failure, please describe the type of failure(s). (If a photo is available that reflects failure, please upload in question 12/14). If no to a fabric failure, please skip.



Further case studies being developed…

Example: AHC – Case Study – SGMC Unit 2D

Within 3 months of directive from new nurse manager to use Bleach wipes on ALL chairs every day, this damage occurred.
Chairs had been in use (with no damage) for over 4 years. Other chairs are still use with no damage.

Cost for new chairs:
$370 X 17 = $6,290

Eager to do your own research?

Goals for SGMC Field Study

- Reupholster all chairs in ***most durable*** DCFs so that they can be consistently cleaned ***every*** day for at least 4 months in order to see which are most durable.
  - Convince EVS to clean them thoroughly every day
  - Confirm that EVS is cleaning them every day
- Swab for bioburden (myself) cleanliness once per week
- Original outcome goals:
  1. Determine which DCF's were most durable (withstood being cleaned everyday)
  2. Determine which DCF's were easiest to clean and/or stayed cleanest

BUT new issues led to new goals

- What is definition of "Heavy Duty/24/7? Development of Risk Assessment
- Field Study – too many issues to determine #2. Preliminary results only.

Evergreen Lounge Field Study

- Chairs in ICU/CVIR Waiting area (Evergreen Lounge) were metal framed in excellent condition, upholstered in woven textile fabric. (c.2012)

- Reupholster seating units, 2-seater and 3–seater in the following durable-coated fabrics:
  - Silicone
  - Polyurethane/Polycarbonate
  - Vinyl
  - TPE

- Manufacturers donated durable-coated fabrics. Spec Furniture donated labor to reupholster. AHC paid for new cushions.

Making the case for the importance of Evidence-Based Design and evaluating return on investments (ROI)

Research objective: to determine results for

- HAI's related to fabric
- ROI's for failures

Low cost for reupholstery

Each type of unit, single/double/triple had same seat-back upholstery, but different cushions

Silicone (x3) TPE (x4) Vinyl (x5) PU/PC (x6)

Careful coordination of 18 different upholstery materials to achieve aesthetic congruence, and avoid "crazy quilt" appearance.

Field Study Set up Process…

…educate, select, coordinate, order, install, educate, plead, track, swab, and continue to plead…

Swabbing – to verify effectiveness of cleaning

- SureTrend – Maryland Health Connections measure for bioburden (ATP)

Scoring: 25 – 50 = Passing

11 = Excellent

2725 = FAIL

Preliminary Results of SGMC Evergreen Lounge Durable Coated Fabrics Field Study Results 10.11.2019

	DCF type	Splitting	Cracking/ Peeling of coating from backing	Crocking	Softened or Gummy	Stretching	Ink Transfer	Comments
1.	Silicone 1							
2.	Silicone 2							
3.	Silicone 3							
4.	Thermoplastic Elastomer 1 (a)							Single seat
5.	Thermoplastic Elastomer 1 (b)							Triple seat
6.	Thermoplastic Elastomer 2							
7.	Thermoplastic Elastomer 3							
8.	Vinyl 1							
9.	Vinyl 2							
10.	Vinyl 3							
11.	Vinyl 4							
12.	Vinyl 5							
13.	Polyurethane/Polycarbonate1							
14.	Polyurethane/Polycarbonate 2 (a)							
15.	Polyurethane/Polycarbonate 2 (b)							
16.	Polyurethane/Polycarbonate 3							Double seats
17.	Polyurethane/Polycarbonate 4							
18.	Polyurethane/Polycarbonate 5							

Seats, backs and sides cleaned with Echolab A- 456 II, from Jan 10 – Oct 10, 2019. Although cleaning was supposed to be every day (7 days per week), in reality it was sporadic – approx. 3 – 5 times per week, not every day.

4 – Excellent	3 – Good	2- Poor	1 -Severe

A new tool to evaluate each durable-coated fabric is needed!

- Inconsistent definitions of "HC Heavy Duty – approved for 24/7 use"
- Inconsistent vocabulary between disciplines
- Too often the desire for "sustainable" supersedes durability & performance
- Difficult for designers to get the info (if they even know what to ask!)
  - Many tests exist, some we don't know about, how do they relate to our field conditions, are the results "smoke and mirrors", or just too much scientific jargon?
  - Reps don't know – Tech depts. feel it's too much info
  - Not enough dialogue with other disciplines
  - Memo Tags very inconsistent
- Healthcare Furnishings Upholstery Risk Zones needed to be identified

Find your project's Risk Zone…

…Reduce Risks for upholstery failures!

Healthcare Durable Coated Fabric Risk Assessment to Inform Selection and Specification

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Jane Rohde, AIA, FIIDA, ASID, CHID, ACHA, LEED AP BD+C, GGA-EB
Timothy O'Keefe
Thank You to DCF Task Group Peer Reviewers

AAHID American Academy of Healthcare Interior Designers
DCF TASK GROUP

Healthcare locations with upholstered seating can be categorized into one of four Risk Zones/Areas

Use this guide to evaluate each durable coated fabric being considered, based on its location (area/zone)

- Highest Risk Zone/Class 4: Patient areas
- High Risk Zone/Class 3: Nursing Unit Support
- Medium Risk Zone/Class 2: Dining, Lobbies, Outpatient
- Low Risk Zone/Class 1: Offices

Table 1: Highest Risk / Class 4 and High Risk / Class 3 Performance Characteristics

Test	ACT Voluntary Performance Guidelines for Coated Fabrics minimum[1] or if (*) not included within ACT Voluntary Performance Guidelines	HC HD 24/7 recommendations for Highest Risk / Class 4 and High Risk / Class 3	Comments	Your DCF #____ (complete for each DCF)
Abrasion Resistance: CFFA 1: Determines relative abrasion resistance under service conditions. • Method a, ASTM D 4157 – 2013: Wyzenbeek Method: A square woven cotton fabric is rubbed against a sample under controlled conditions to determine wear properties[2]. ○ Standard Test Method for Abrasion Resistance of Textile Fabrics (Oscillatory Cylinder Method)	50,000 double rubs	100,000 double rubs		
• Method b, ASTM D 3389 – 2016: Taber Abraser Method: A specimen clamped to a rotary platform is rotated under two rubber-based grinding wheels. Usually used for determining print wear. ○ Standard Test Method for Coated Fabrics Abrasion Resistance (Rotary Platform Abrader)	ACT has a visual guideline and Grade 3 is the minimum using the H-18 grinding wheel.	Manufacturers generally use a CS 17 rubber-based abrading wheel to determine print wear.	It is recommended for designer to discuss with manufacturer / distributor of durable coated fabric the method and results used based upon the printed durable coated fabric being evaluated for specification.	

4. Explore widespread durable coated fabric failures in a health system, discover the sources of failures and chemical interactions between disinfectants, contaminates, and coated fabric; assess the impact to the hospital's business model; define new criteria and opportunities to enlarge the conversation and collaborate to rethink the basic building blocks of expectations.

Linda Gabel, CHID IIDA Senior Interior Design Planner, The Ohio State University Wexner Medical Center

Case Study – University Health System

New 1.2 million SF state-of-the-art Cancer Hospital opened in 2014

Project Goals for Furniture and Finishes:

- Create a safe environment for patients, guests and staff
- Sophisticated esthetic
- LEED Gold / reduce use of PVC – based products

  Design Consultant chose to replace 90% of PVC with Polyurethane coated fabrics and finishes.
- Reduce first cost
- Increased durability
- Ease of housekeeping and maintenance

Case Study – Unintended Consequences

Rapid degradation of polyurethane (PU) coated fabrics and finishes:

- At 8 months in Emergency Department waiting and exam rooms
- Within 2 years:
  - Surgery waiting areas, infusion rooms
  - all 24/7 patient care areas, including task chairs/stools
- Within 3 years:
  - all areas, Gummy texture and peeling of task chair/stools
  - all clinic waiting areas, and PU top coat failure on printed vinyl, revealing white base coating
  - peeling of PU wood finishes
  - peeling and degradation of PU arm caps

Case Study: Public and Patient Area Failures

Issues:

- Cleaning & Chemicals
- “no rinse” protocol
- UV light treatment
- Heat
- Oils
- Sweat
- 24/7 use
- Rubbing/abrasion
- Polyurethane-based materials





Case Study: Clinical and Office Support Areas Failures

Issues:

- Heat
- Oils
- Sweat
- 24/7 use
- Rubbing/abrasion points
- Polyurethane-based materials

These surfaces are not scheduled to be cleaned by EVS

Case Study – Unintended Consequences

Quantity of Failures from the Cancer Hospital, (Original items):

1,053 Inpatient sleep settees, overnight sleep chairs, & patient recliners
540 Large scale lounge seating units
923 Infusion Recliners & exam /infusion room guest seating
130 (ED only) modular & exam room seating
1,623 Upholstered Task chairs & stools
4,269

*Note that we have ordered large quantities of furniture with **these same polyurethane fabrics and finishes since 2013** to replace public and patient care furniture in waiting areas throughout the university hospital campus and all off-campus buildings and clinics.*

Case Study – Why is this important?

1. Epidemiology (EPI) Concerns

- EVS staff is unable to properly clean and disinfectant the surfaces due to damage & vulnerable subsurface of material exposed.
- EPI has defined the following Hospital Acquired Infections, (HAI) risks associated with the exposed sub-surfaces, cushion cores, soft backings, and raw wood:

  - **Multidrug resistant organisms (e.g. MRSA, VRE)**
  - **Clostridium difficile**
  - **Acinetobacter**
  - **Pseudomonas**
  - **Klebsiella**

2. Contaminated Furniture has to be pulled out of service - sent to hard trash

3. Financial impact - unforeseen cost of replacement furniture

– capital & operational budget diversions est. $9 Million over 5+ years

Case Study: What's the plan moving forward?

Strategies:

- **Discover the sources of failures** - chemical interactions between disinfectants, UV, contaminates, and interior materials – *collaborate with Chemical Engineering Department to understand chemical formula and construction of materials, generate hypothesis for lab tests*

- **Assess the impact** to the hospital's business model – *operational vs. capital $*

- **Define new criteria and opportunities** to enlarge the conversation - *engage Facilities, EVS, EPI, Safety, Compliance, Supply Chain, Center for Innovation, Hospital Leadership*
    - Reduce cost – first and life-cycle considerations
    - Increased durability to resist cleaning methods and environmental contaminates
    - Create new tests & performance criteria for upholstery and finishes specifications
    - Safer environment for all users

- **Continually Collaborate** to reframe expectations of Hospital Leadership

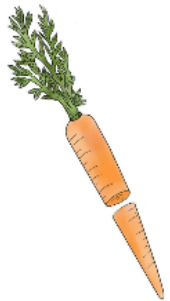
Case Study: Third Party Lab Material Testing

Hypothesis – Utilize a Third Party Lab for Material Testing methods that reflect the current state of disinfecting chemicals/methods, and environmental contaminates within the acute care hospital setting to more accurately predict material performance:

- Disinfectant & Accelerated UV Exposure Tests, Combined Together
- Stain Resistance Test – New Staining Agents and Cleaning Chemicals

Ten upholstery fabrics types currently marketed for "healthcare" tested:

- **Vinyl with Brand A topcoat**
- **Vinyl with UV and acrylic topcoat**
- **Vinyl with Brand B topcoat**
- **Polyurethane**
- **Thermoplastic Elastomer**
- **Polycarbonate with Brand C topcoat**
- **Silicone, no top coat**
- **Silicone with Brand C topcoat**
- **100% nylon matrix**
- **Treated Leather**



Case Study: Disinfectant & Accelerated UV Exposure Tests

Disinfectants and Cleaners *–after saturation and drying, chemicals are left on samples going in to Xenon-Arc chamber to test for light-fastness and degradation*

- **10% bleach solution**
- **Oxivir TB: Hydrogen Peroxide (0.5%)**
- **Oxycide: Hydrogen Peroxide + Peroxyacetic Acid**
- **Quaternary - Virex II 256**
- **JF2 Glance: Non-ammoniated**
- **JF3 Stride Citrus Neutral cleaner**
- **Hand Sanitizer - 70% Isopropanol**

Case Study: Disinfectant & Accelerated UV Exposure Tests

Rating for fabrics after Disinfectant and Xenon Arc Exposure:

4 **Excellent:** No effect to the integrity or appearance of the material

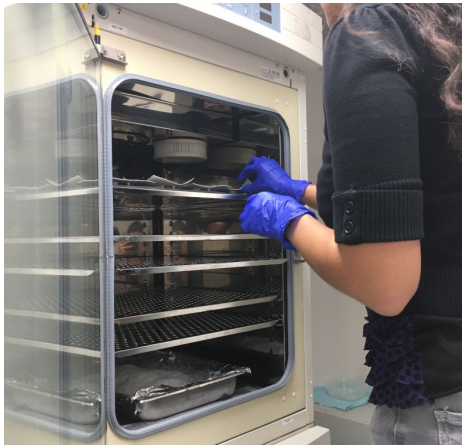
3 **Good:** Slight discoloration. Damage determined to not affect the material performance and aesthetically mildly objectionable.

2 **Poor:** Moderate effect. Softening, Stiffening and/or swelling are present and permanent.

1 **Severe effect**: Discoloration, cracking and/or delamination clearly visible or objectionable aesthetics.

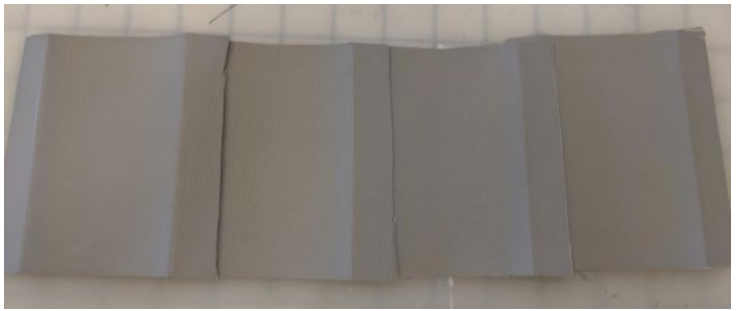
Case Study: Disinfectant & Accelerated UV Exposure Tests - Process

DISINFECTANT APPLICATION



80 DEGREE DRYING CABINET

XENON ARC CABINET



EVALUATE SAMPLES

Case Study: Disinfectant & Accelerated UV Exposure Tests - Results

Disinfectant	Fabric 1 Vinyl w/Brand A Topcoat	Fabric 2 Vinyl w/UV & Acrylic Topcoat	Fabric 3 Thermoplastic Elastomer	Fabric 4 Silcone, no topcoat	Fabric 5 Polyurethane	Fabric 6 Treated Leather	Fabric 7 Vinyl w/Brand B Topcoat	Fabric 8 100% Nylon Matrix	Fabric 9 Polycarbonate w/Brand C Topcoat	Fabric 10 Silcone w/Brand C Topcoat
A In-house Bleach	Rating: 3.0	Rating: 3.0	Rating: 1.7	Rating: 3.3	Rating: 1.0	Rating: 2.0	Rating: 1.3	Rating: 1.0	Rating: 2.0	Rating: 4.0
B Oxivir TB: Hydrogen Peroxide (0.5%)	Rating: 2.0	Rating: 3.0	Rating: 2.0	Rating: 3.0	Rating: 1.0	Rating: 2.7	Rating: 3.0	Rating: 1.3	Rating: 2.0	Rating: 3.0
C Oxycide: Hydrogen Peroxide + Peroxyacetic Acid	Rating: 2.0	Rating: 3.0	Rating: 2.0	Rating: 3.0	Rating: 1.3	Rating: 2.3	Rating: 2.3	Rating: 2.3	Rating: 2.0	Rating: 3.0
D Quaternary- Virex II 256	Rating: 4.0	Rating: 4.0	Rating: 2.0	Rating: 4.0	Rating: 1.3	Rating: 3.0	Rating: 4.0	Rating: 1.3	Rating: 1.7	Rating: 4.0
E JF2 Glance: Non-ammoniated	Rating: 4.0	Rating: 4.0	Rating: 2.0	Rating: 2.7	Rating: 1.0	Rating: 3.7	Rating: 4.0	Rating: 1.0	Rating: 2.3	Rating: 3.0
F JF3 Stride Citrus Neutral Cleaner	Rating: 3.3	Rating: 4.0	Rating: 2.0	Rating: 2.7	Rating: 1.0	Rating: 4.0	Rating: 4.0	Rating: 3.3	Rating: 2.7	Rating: 2.3
G Hand Sanitizer- 70% Isopropanol	Rating: 4.0	Rating: 3.3	Rating: 2.0	Rating: 2.0	Rating: 1.0	Rating: 3.7	Rating: 4.0	Rating: 1.3	Rating: 3.0	Rating: 3.0

4 Excellent 3 Good 2 Poor 1 Severe Effect

Case Study: Disinfectant & Accelerated UV Exposure Tests

Takeaways:

- **Prolonged exposure to UV light matters with ALL disinfectant residue**
- **UV additive** appears to be very helpful in preventing damage
- **Topcoats/base cloth combinations matter** – polycarbonate vs. silicone with the same topcoat had different results
- **50% of fabrics** rated for healthcare appear vulnerable to alcohol-based hand sanitizer and “non-oxidizing” cleaning chemicals
- **Acrylic topcoat**, not usually considered for healthcare, appears to perform very well with disinfecting chemicals, even alcohol-based hand sanitizers

Case Study: Stain Resistance Test – New Staining Agents

Commonly used environmental contaminates in healthcare and public areas tested:

Patient Transferrable Stains

- **Super Lustrous Lipstick- Love That Red** (already on standard test)
- **Baby Oil** (already on standard test)
- **Daily Moisture Dry Skin Moisturizer**
- **Acetone Nail Polish Remover**
- **Non-Acetone Polish Remover**
- **Broad-Spectrum Sunscreen SPF 50 (Oxybenzone 5%, Avobenzone 3%, Octocrylene 4%, Homosalate10%, Octisalate 5%)**
- **Skin Sunscreen Lotion with Broad Spectrum SPF 60+(Zinc oxide 4.7%, Titanium dioxide 4.9%)**
- **Jamaican black castor oil strengthen restore leave-in conditioner**

Synthetic Body Fluids and Clinical Reagents

- **Stomach Acid – Carolina Biological Supply Company: Gastric Juice, Artificial, Laboratory Grade**
- **Human Sweat – Pickering AATCC TM15 Sweat pH 4.3**
- **Urine – Carolina Biological Supply Company: Simulated Urine, Normal** (already on standard test)
- **Viscot Mini Surgical Fine Tip Marker**

Case Study: Stain Resistance Test – Cleaning Chemicals

Disinfectant chemicals/products used to clean the stained samples *in lieu of soap and water*:

- Oxivir TB wipes Hydrogen Peroxide (0.5%)
- Clorox Bleach Germicidal Wipes
- Virex II 256

Case Study: Stain Resistance Test - Ratings

Ratings for Fabrics after application, *extended dwell time,* **and cleaning of staining/contaminate agents** *with hospital disinfectants* ***in lieu of soap & water*****:**

4 **Excellent cleanability**: No stain mark in the material or migration through to backing material

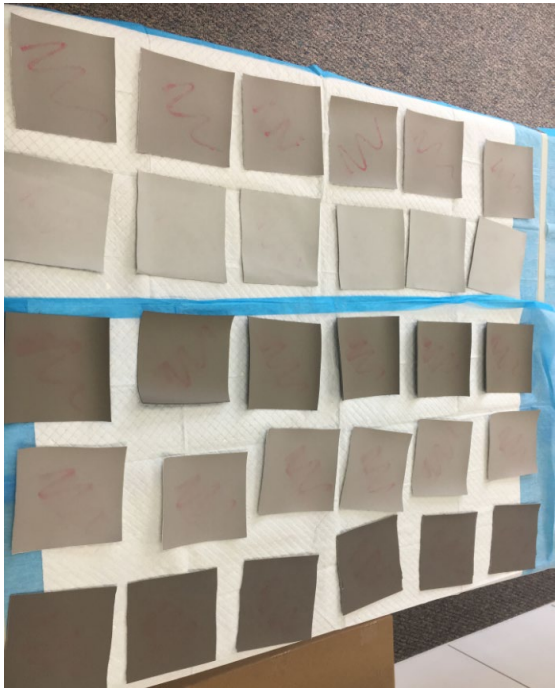
3 **Good cleanability**: Damage determined to not affect the material performance and aesthetically acceptable

2 **Poor cleanability:** Stain almost intact, softening, stiffening and/or swelling is present and appears permanent

1 **Severe effect:** Non-cleanable, no stain removed, stain migrated through to backing material, cracking, and/or delamination clearly visible.

Case Study: Stain Resistance Test – Process

APPLICATION OF STAIN, 48 HR DWELL TIME



AFTER CLEANING, EVALUATE

Case Study: Material Testing – New Staining Agents Results

Stain	Replicate (Cleaning Agent)	Fabric 1 Vinyl w/Brand A Topcoat	Fabric 2 Vinyl with UV & Acrylic Topcoat	Fabric 3 Thermoplastic Elastomer	Fabric 4 Silcone, no topcoat	Fabric 5 Polyurethane	Fabric 6 Treated Leather	Fabric 7 Vinyl w/Brand B Topcoat	Fabric 8 100% Nylon Matrix	Fabric 9 Polycarbonate w/Brand C Topcoat	Fabric 10 Silcone w/Brand C Topcoat
H Revlon Super Lustrous Lipstick- Love That Red	1 (Oxivir)	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +
		Rating: 2.7	Rating: 3.0	Rating: 2.3	Rating: 3.0	Rating: 3.0	Rating: 2.7	Rating: 2.0	Rating: 1.7	Rating: 2.7	Rating: 2.0
	2 (Bleach)	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +
		Rating: 2.0	Rating: 2.7	Rating: 2.7	Rating: 1.7	Rating: 3.3	Rating: 3.0	Rating: 2.3	Rating: 2.0	Rating: 3.0	Rating: 1.7
	3 (Virex)	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +
		Rating: 3.0	Rating: 2.0	Rating: 3.0	Rating: 3.0	Rating: 3.0	Rating: 2.7	Rating: 2.3	Rating: 2.0	Rating: 3.0	Rating: 1.7
	4 (Oxivir)	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +
		Rating: 3.0	Rating: 3.0	Rating: 2.3	Rating: 2.7	Rating: 3.0	Rating: 2.3	Rating: 2.0	Rating: 2.0	Rating: 3.0	Rating: 1.0
	5 (Bleach)	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +
		Rating: 2.7	Rating: 3.0	Rating: 2.7	Rating: 3.0	Rating: 3.0	Rating: 3.0	Rating: 2.7	Rating: 2.3	Rating: 3.0	Rating: 1.7
	6 (Virex)	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +
		Rating: 2.3	Rating: 2.3	Rating: 2.3	Rating: 2.3	Rating: 3.3	Rating: 3.0	Rating: 3.0	Rating: 2.0	Rating: 3.0	Rating: 2.0
	S= Stain Present										
	Evaluated using:	+ (present)	or - (not present)								

4	Excellent	3	Good	2	Poor	1	Severe Effect

Case Study: Material Testing – New Staining Agents Results

Stain	Replicate (Cleaning Agent)	Fabric 1 Vinyl w/Brand A Topcoat	Fabric 2 Vinyl with UV & Acrylic Topcoat	Fabric 3 Thermoplastic Elastomer	Fabric 4 Silcone, no topcoat	Fabric 5 Polyurethane	Fabric 6 Treated Leather	Fabric 7 Vinyl w/Brand B Topcoat	Fabric 8 100% Nylon Matrix	Fabric 9 Polycarbonate w/Brand C Topcoat	Fabric 10 Silcone w/Brand C Topcoat
I Johnson's Baby Oil	1 (Oxivir)	S: +	S: +	S: -	S: +	S: +	S: +	S: +	S: +	S: -	S: -
		Rating: 3.3	Rating: 3.7	Rating: 4.0	Rating: 3.0	Rating: 3.3	Rating: 2.7	Rating: 3.7	Rating: 3.0	Rating: 4.0	Rating: 3.3
	2 (Bleach)	S: +	S: +	S: +	S: +	S: +	S: +	S: -	S: +	S: +	S: -
		Rating: 3.0	Rating: 3.0	Rating: 3.0	Rating: 2.7	Rating: 3.3	Rating: 3.0	Rating: 3.7	Rating: 2.7	Rating: 3.0	Rating: 3.0
	3 (Virex)	S: +	S: +	S: +	S: +	S: +	S: +	S: -	S: +	S: -	S: -
		Rating: 3.7	Rating: 2.7	Rating: 3.3	Rating: 3.0	Rating: 3.3	Rating: 2.3	Rating: 4.0	Rating: 2.3	Rating: 4.0	Rating: 3.0
	4 (Oxivir)	S: +	S: +	S: +	S: +	S: +	S: +	S: -	S: +	S: -	S: -
		Rating: 3.0	Rating: 3.3	Rating: 3.0	Rating: 3.0	Rating: 3.0	Rating: 2.3	Rating: 4.0	Rating: 3.0	Rating: 4.0	Rating: 3.0
	5 (Bleach)	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: -
		Rating: 3.3	Rating: 2.3	Rating: 3.3	Rating: 3.7	Rating: 3.0	Rating: 3.0	Rating: 3.3	Rating: 2.7	Rating: 3.3	Rating: 3.7
	6 (Virex)	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: -	S: -
		Rating: 3.3	Rating: 2.7	Rating: 3.3	Rating: 3.0	Rating: 3.0	Rating: 2.3	Rating: 3.3	Rating: 2.3	Rating: 4.0	Rating: 3.0
	S= Stain Present										
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4 Excellent 3 Good 2 Poor 1 Severe Effect

Case Study: Material Testing – New Staining Agents Results

Stain	Replicate (Cleaning Agent)	Fabric 1 Vinyl w/Brand A Topcoat	Fabric 2 Vinyl with UV & Acrylic Topcoat	Fabric 3 Thermoplastic Elastomer	Fabric 4 Silcone, no topcoat	Fabric 5 Polyurethane	Fabric 6 Treated Leather	Fabric 7 Vinyl w/Brand B Topcoat	Fabric 8 100% Nylon Matrix	Fabric 9 Polycarbonate w/Brand C Topcoat	Fabric 10 Silcone w/Brand C Topcoat
J Jergen's Daily Mosture Dry Skin Moisturizer	1 (Oxivir)	S: +	S: -	S: +	S: +	S: +	S: -	S: +	S: -	S: -	S: -
		Rating: 3.0	Rating: 4.0	Rating: 3.0	Rating: 3.0	Rating: 3.0	Rating: 4.0	Rating: 3.0	Rating: 3.3	Rating: 4.0	Rating: 4.0
	2 (Bleach)	S: +	S: -	S: +	S: +	S: +	S: +	S: +	S: +	S: -	S: +
		Rating: 2.0	Rating: 3.7	Rating: 3.0	Rating: 2.7	Rating: 3.0	Rating: 2.7	Rating: 2.7	Rating: 2.0	Rating: 3.7	Rating: 3.0
	3 (Virex)	S: +	S: -	S: +	S: +	S: -	S: +	S: +	S: +	S: -	S: -
		Rating: 2.0	Rating: 4.0	Rating: 3.0	Rating: 3.0	Rating: 3.7	Rating: 3.3	Rating: 3.0	Rating: 2.3	Rating: 4.0	Rating: 4.0
	4 (Oxivir)	S: -	S: -	S: +	S: +	S: +	S: +	S: +	S: +	S: -	S: +
		Rating: 3.3	Rating: 3.7	Rating: 3.3	Rating: 2.7	Rating: 3.0	Rating: 2.7	Rating: 3.0	Rating: 2.7	Rating: 3.3	Rating: 2.7
	5 (Bleach)	S: +	S: -	S: -	S: +	S: +	S: +	S: +	S: +	S: -	S: +
		Rating: 2.0	Rating: 3.3	Rating: 4.0	Rating: 2.7	Rating: 2.7	Rating: 3.0	Rating: 2.0	Rating: 2.0	Rating: 3.0	Rating: 2.7
	6 (Virex)	S: +	S: -	S: +	S: +	S: -	S: -	S: +	S: +	S: +	S: +
		Rating: 2.7	Rating: 3.7	Rating: 3.0	Rating: 3.0	Rating: 4.0	Rating: 3.7	Rating: 2.7	Rating: 3.0	Rating: 3.0	Rating: 2.7
	S= Stain Present										
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K Cutex Acute Nail Polish Remover	1 (Oxivir)	S: -	S: -	S: -	S: -	S: +	S: +	S: -	S: +	S: -	S: -
		Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 3.0	Rating: 3.0	Rating: 4.0	Rating: 3.0	Rating: 3.0	Rating: 3.7
	2 (Bleach)	S: -	S: -	S: -	S: -	S: +	S: +	S: -	S: +	S: -	S: -
		Rating: 4.0	Rating: 3.7	Rating: 4.0	Rating: 3.7	Rating: 3.3	Rating: 3.3	Rating: 3.3	Rating: 3.0	Rating: 4.0	Rating: 3.3
	3 (Virex)	S: -	S: -	S: -	S: -	S: +	S: +	S: -	S: +	S: -	S: -
		Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 2.7	Rating: 3.3	Rating: 4.0	Rating: 3.0	Rating: 4.0	Rating: 3.7
	4 (Oxivir)	S: -	S: +	S: -	S: -	S: +	S: +	S: -	S: +	S: -	S: -
		Rating: 4.0	Rating: 3.7	Rating: 4.0	Rating: 4.0	Rating: 3.3	Rating: 3.0	Rating: 4.0	Rating: 3.0	Rating: 4.0	Rating: 4.0
	5 (Bleach)	S: -	S: -	S: -	S: -	S: +	S: +	S: -	S: +	S: -	S: -
		Rating: 4.0	Rating: 3.7	Rating: 4.0	Rating: 3.7	Rating: 3.0	Rating: 3.0	Rating: 3.7	Rating: 3.0	Rating: 3.0	Rating: 3.0
	6 (Virex)	S: +	S: -	S: -	S: -	S: +	S: +	S: -	S: +	S: -	S: -
		Rating: 3.7	Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 3.0	Rating: 3.0	Rating: 4.0	Rating: 3.0	Rating: 3.3	Rating: 4.0
	S= Stain Present										
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Case Study: Material Testing – New Staining Agents Results

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L Cutex Polish Remover, Non-Acetone	1 (Oxivir)	S: -	S: +	S: -	S: -	S: -	S: -	S: -	S: +	S: -	S: -
		Rating: 3.7	Rating: 3.0	Rating: 4.0	Rating: 4.0	Rating: 3.3	Rating: 4.0	Rating: 4.0	Rating: 3.0	Rating: 4.0	Rating: 4.0
	2 (Bleach)	S: -	S: +	S: +	S: -	S: -	S: +	S: -	S: +	S: +	S: -
		Rating: 4.0	Rating: 3.0	Rating: 3.3	Rating: 3.7	Rating: 4.0	Rating: 3.0	Rating: 3.7	Rating: 2.7	Rating: 3.7	Rating: 4.0
	3 (Virex)	S: -	S: +	S: +	S: -	S: -	S: +	S: -	S: +	S: -	S: -
		Rating: 4.0	Rating: 3.0	Rating: 3.3	Rating: 4.0	Rating: 4.0	Rating: 3.0	Rating: 4.0	Rating: 3.0	Rating: 4.0	Rating: 4.0
	4 (Oxivir)	S: -	S: +	S: -	S: -	S: -	S: +	S: -	S: +	S: -	S: -
		Rating: 4.0	Rating: 3.3	Rating: 3.7	Rating: 4.0	Rating: 4.0	Rating: 3.7	Rating: 4.0	Rating: 2.7	Rating: 4.0	Rating: 4.0
	5 (Bleach)	S: -	S: +	S: +	S: -	S: -	S: +	S: -	S: +	S: -	S: -
		Rating: 4.0	Rating: 3.3	Rating: 3.0	Rating: 3.7	Rating: 4.0	Rating: 3.0	Rating: 4.0	Rating: 2.3	Rating: 4.0	Rating: 4.0
	6 (Virex)	S: -	S: +	S: +	S: -	S: -	S: +	S: -	S: +	S: -	S: -
		Rating: 4.0	Rating: 3.0	Rating: 3.0	Rating: 4.0	Rating: 3.7	Rating: 3.0	Rating: 4.0	Rating: 3.0	Rating: 4.0	Rating: 4.0
	S= Stain Present										
	Evaluated using:	+ (present)	or - (not present)								

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Case Study: Material Testing – New Staining Agents Results

Stain	Replicate (Cleaning Agent)	Fabric 1 Vinyl w/Brand A Topcoat	Fabric 2 Vinyl with UV & Acrylic Topcoat	Fabric 3 Thermoplastic Elastomer	Fabric 4 Silcone, no topcoat	Fabric 5 Polyurethane	Fabric 6 Treated Leather	Fabric 7 Vinyl w/Brand B Topcoat	Fabric 8 100% Nylon Matrix	Fabric 9 Polycarbonate w/Brand C Topcoat	Fabric 10 Silcone w/Brand C Topcoat
M Coppertone Ultraguard Sunscreen Continous Spray SPF 50	1 (Oxivir)	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +
		Rating: 2.7	Rating: 2.3	Rating: 3.0	Rating: 3.0	Rating: 2.3	Rating: 3.0	Rating: 2.7	Rating: 2.0	Rating: 1.7	Rating: 3.0
	2 (Bleach)	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +
		Rating: 2.0	Rating: 2.7	Rating: 2.0	Rating: 2.0	Rating: 1.0	Rating: 2.7	Rating: 2.0	Rating: 1.3	Rating: 1.7	Rating: 1.0
	3 (Virex)	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +
		Rating: 2.3	Rating: 2.0	Rating: 1.7	Rating: 1.7	Rating: 2.0	Rating: 2.7	Rating: 2.3	Rating: 1.3	Rating: 1.3	Rating: 1.0
	4 (Oxivir)	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +
		Rating: 2.0	Rating: 2.7	Rating: 2.7	Rating: 3.0	Rating: 2.3	Rating: 3.0	Rating: 3.0	Rating: 1.7	Rating: 2.0	Rating: 2.3
	5 (Bleach)	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +
		Rating: 3.0	Rating: 2.0	Rating: 2.0	Rating: 1.0	Rating: 1.3	Rating: 2.3	Rating: 2.3	Rating: 2.3	Rating: 1.0	Rating: 1.0
	6 (Virex)	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +
		Rating: 2.3	Rating: 2.0	Rating: 1.7	Rating: 1.0	Rating: 1.3	Rating: 3.0	Rating: 3.0	Rating: 1.0	Rating: 1.7	Rating: 1.0
	S= Stain Present										
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HCD HEALTHCARE DESIGN EXPO+CONFERENCE

#HCDcon

Case Study: Material Testing – New Staining Agents Results

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N Neutrogena Sensitive Skin Sunscreen Lotion SPF 60+	1 (Oxivir)	S: +	S: -	S: +	S: -	S: +	S: +	S: +	S: +	S: +	S: +
		Rating: 3.0	Rating: 3.0	Rating: 3.0	Rating: 4.0	Rating: 2.0	Rating: 2.7	Rating: 3.0	Rating: 2.7	Rating: 1.7	Rating: 2.7
	2 (Bleach)	S: +	S: -	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +
		Rating: 3.0	Rating: 3.7	Rating: 3.0	Rating: 2.3	Rating: 2.3	Rating: 3.3	Rating: 3.0	Rating: 3.0	Rating: 1.7	Rating: 3.0
	3 (Virex)	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +
		Rating: 2.0	Rating: 3.0	Rating: 2.0	Rating: 3.0	Rating: 2.0	Rating: 2.3	Rating: 2.7	Rating: 2.3	Rating: 2.0	Rating: 3.0
	4 (Oxivir)	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +
		Rating: 3.0	Rating: 3.0	Rating: 3.0	Rating: 4.0	Rating: 2.7	Rating: 3.0	Rating: 3.0	Rating: 3.0	Rating: 1.7	Rating: 2.7
	5 (Bleach)	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +
		Rating: 2.7	Rating: 3.0	Rating: 3.0	Rating: 3.0	Rating: 2.7	Rating: 3.0	Rating: 3.0	Rating: 2.7	Rating: 1.7	Rating: 3.0
	6 (Virex)	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +
		Rating: 2.3	Rating: 3.3	Rating: 2.3	Rating: 3.0	Rating: 2.3	Rating: 2.0	Rating: 2.0	Rating: 2.0	Rating: 1.7	Rating: 2.7
	S= Stain Present										
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O Shea Moisture Jamaican Black Castor Oil Leave-in Conditioner	1 (Oxivir)	S: +	S: -	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +
		Rating: 3.0	Rating: 4.0	Rating: 3.0	Rating: 3.0	Rating: 3.0	Rating: 3.0	Rating: 3.0	Rating: 3.0	Rating: 3.0	Rating: 3.0
	2 (Bleach)	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +
		Rating: 2.3	Rating: 3.0	Rating: 3.0	Rating: 3.0	Rating: 3.0	Rating: 3.0	Rating: 2.3	Rating: 3.0	Rating: 3.0	Rating: 3.0
	3 (Virex)	S: +	S: -	S: -	S: +	S: +	S: +	S: +	S: +	S: +	S: +
		Rating: 3.0	Rating: 4.0	Rating: 4.0	Rating: 3.3	Rating: 3.0	Rating: 3.0	Rating: 3.0	Rating: 3.0	Rating: 3.0	Rating: 3.0
	4 (Oxivir)	S: +	S: -	S: -	S: +	S: +	S: +	S: +	S: +	S: +	S: +
		Rating: 3.0	Rating: 4.0	Rating: 4.0	Rating: 3.0	Rating: 3.3	Rating: 3.0	Rating: 3.0	Rating: 3.0	Rating: 3.0	Rating: 3.0
	5 (Bleach)	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +
		Rating: 3.0	Rating: 2.7	Rating: 3.0	Rating: 3.0	Rating: 3.0	Rating: 3.0	Rating: 3.0	Rating: 3.0	Rating: 3.3	Rating: 3.0
	6 (Virex)	S: +	S: +	S: -	S: +	S: +	S: +	S: +	S: +	S: +	S: +
		Rating: 3.0	Rating: 3.0	Rating: 4.0	Rating: 3.7	Rating: 3.0	Rating: 3.0	Rating: 3.7	Rating: 3.0	Rating: 3.7	Rating: 3.0
	S= Stain Present										
	Evaluated using:	+ (present)	or - (not present)								

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Stain	Replicate (Cleaning Agent)	Fabric 1 Vinyl w/Brand A Topcoat	Fabric 2 Vinyl with UV & Acrylic Topcoat	Fabric 3 Thermoplastic Elastomer	Fabric 4 Silcone, no topcoat	Fabric 5 Polyurethane	Fabric 6 Treated Leather	Fabric 7 Vinyl w/Brand B Topcoat	Fabric 8 100% Nylon Matrix	Fabric 9 Polycarbonate w/Brand C Topcoat	Fabric 10 Silcone w/Brand C Topcoat
P Stomach Acid-Carolina Biological Supply	1 (Oxivir)	S: -	S: -	S: -	S: +	S: -	S: -	S: -	S: -	S: -	S: -
		Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 3.0	Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 3.7
	2 (Bleach)	S: -	S: -	S: -	S: +	S: -	S: -	S: +	S: -	S: +	S: +
		Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 3.0	Rating: 4.0	Rating: 3.7	Rating: 3.0	Rating: 4.0	Rating: 3.0	Rating: 3.0
	3 (Virex)	S: -	S: -	S: -	S: +	S: -	S: -	S: -	S: +	S: -	S: -
		Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 3.0	Rating: 4.0	Rating: 4.0	Rating: 3.7	Rating: 3.0	Rating: 4.0	Rating: 3.3
	4 (Oxivir)	S: -	S: -	S: -	S: +	S: -	S: -	S: -	S: -	S: -	S: -
		Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 3.0	Rating: 4.0	Rating: 4.0	Rating: 3.7	Rating: 3.7	Rating: 3.3	Rating: 4.0
	5 (Bleach)	S: -	S: -	S: -	S: +	S: -	S: -	S: +	S: +	S: +	S: +
		Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 3.0	Rating: 4.0	Rating: 4.0	Rating: 3.0	Rating: 3.0	Rating: 3.0	Rating: 3.3
	6 (Virex)	S: -	S: -	S: -	S: +	S: -	S: -	S: -	S: +	S: -	S: -
		Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 3.3	Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 3.0	Rating: 4.0	Rating: 4.0
	S= Stain Present										
	Evaluated using:	+ (present)	or - (not present)								

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Case Study: Material Testing – New Staining Agents Results

Stain	Replicate (Cleaning Agent)	Fabric 1 Vinyl w/Brand A Topcoat	Fabric 2 Vinyl with UV & Acrylic Topcoat	Fabric 3 Thermoplastic Elastomer	Fabric 4 Silcone, no topcoat	Fabric 5 Polyurethane	Fabric 6 Treated Leather	Fabric 7 Vinyl w/Brand B Topcoat	Fabric 8 100% Nylon Matrix	Fabric 9 Polycarbonate w/Brand C Topcoat	Fabric 10 Silcone w/Brand C Topcoat
Q Human Sweat-Pickering AATCC TM15 pH 4.3	1 (Oxivir)	S: -	S: -	S: -	S: -	S: -	S: -	S: -	S: -	S: -	S: -
		Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 3.0	Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 4.0
	2 (Bleach)	S: -	S: -	S: -	S: -	S: -	S: -	S: -	S: -	S: -	S: -
		Rating: 3.7	Rating: 4.0	Rating: 4.0	Rating: 3.0	Rating: 4.0	Rating: 4.0	Rating: 3.0	Rating: 3.7	Rating: 3.3	Rating: 3.7
	3 (Virex)	S: -	S: -	S: -	S: -	S: -	S: -	S: -	S: -	S: -	S: -
		Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 4.0
	4 (Oxivir)	S: -	S: -	S: -	S: -	S: -	S: -	S: -	S: -	S: -	S: -
		Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 3.7	Rating: 4.0	Rating: 4.0	Rating: 4.0
	5 (Bleach)	S: -	S: -	S: -	S: -	S: -	S: -	S: -	S: -	S: -	S: -
		Rating: 4.0	Rating: 3.7	Rating: 3.7	Rating: 3.3	Rating: 2.7	Rating: 3.3	Rating: 3.0	Rating: 3.0	Rating: 3.0	Rating: 3.3
	6 (Virex)	S: -	S: -	S: -	S: -	S: -	S: -	S: -	S: -	S: -	S: -
		Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 4.0
	S= Stain Present										
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R Simulated Urine-Carolina Biological Supply, Normal	1 (Oxivir)	S: -	S: -	S: -	S: -	S: -	S: -	S: -	S: -	S: -	S: -
		Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 3.7	Rating: 4.0	Rating: 4.0	Rating: 4.0
	2 (Bleach)	S: -	S: -	S: -	S: -	S: -	S: -	S: -	S: -	S: -	S: -
		Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 3.0	Rating: 3.7	Rating: 4.0	Rating: 3.0	Rating: 3.7	Rating: 3.0	Rating: 3.0
	3 (Virex)	S: -	S: -	S: -	S: -	S: -	S: -	S: -	S: -	S: -	S: -
		Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 3.7
	4 (Oxivir)	S: -	S: -	S: -	S: -	S: -	S: -	S: -	S: -	S: -	S: -
		Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 3.7	Rating: 3.0	Rating: 4.0	Rating: 4.0	Rating: 3.7
	5 (Bleach)	S: -	S: -	S: -	S: -	S: -	S: -	S: -	S: -	S: -	S: -
		Rating: 3.0	Rating: 3.3	Rating: 4.0	Rating: 3.3	Rating: 3.3	Rating: 3.7	Rating: 3.0	Rating: 3.7	Rating: 3.7	Rating: 3.3
	6 (Virex)	S: -	S: -	S: -	S: -	S: -	S: -	S: -	S: -	S: -	S: -
		Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 4.0	Rating: 4.0
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S Viscot Mini Surgical Fine Tip Marker	1 (Oxivir)	S: +	S: +	S: +	S: -	S: +	S: +	S: +	S: +	S: +	S: +
		Rating: 1.0	Rating: 1.0	Rating: 1.0	Rating: 4.0	Rating: 1.0	Rating: 1.0	Rating: 1.0	Rating: 1.0	Rating: 2.0	Rating: 3.0
	2 (Bleach)	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +
		Rating: 2.7	Rating: 3.0	Rating: 2.7	Rating: 3.0	Rating: 2.7	Rating: 2.3	Rating: 3.0	Rating: 2.0	Rating: 3.0	Rating: 2.0
	3 (Virex)	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +
		Rating: 1.3	Rating: 1.3	Rating: 1.0	Rating: 3.0	Rating: 1.0	Rating: 1.0	Rating: 1.7	Rating: 1.0	Rating: 3.0	Rating: 2.7
	4 (Oxivir)	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +
		Rating: 1.0	Rating: 1.0	Rating: 1.0	Rating: 3.7	Rating: 1.0	Rating: 1.0	Rating: 1.0	Rating: 1.0	Rating: 1.3	Rating: 3.0
	5 (Bleach)	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +
		Rating: 2.7	Rating: 2.7	Rating: 2.0	Rating: 3.0	Rating: 2.0	Rating: 2.3	Rating: 3.0	Rating: 3.0	Rating: 3.0	Rating: 2.7
	6 (Virex)	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +	S: +
		Rating: 1.3	Rating: 1.3	Rating: 1.0	Rating: 3.0	Rating: 1.3	Rating: 1.0	Rating: 2.0	Rating: 1.0	Rating: 2.7	Rating: 2.3
	S= Stain Present										
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Case Study: Material Testing – New Staining Agents Test Takeaways

Patient Transferrable Stains	Scores:
Super Lustrous Lipstick- Love That Red	100% fabrics stains present – no 4s
Baby Oil	75% of fabrics stains present, all at 2 or 3, few 4s
Daily Moisture Dry Skin Moisturizer	60% of fabrics stains present; all at 2 or 3, few 4s
Acetone Nail Polish Remover	30% fabrics types stains present; 3 or 4
Non-Acetone Polish Remover	30% fabric types stains present; 2, 3, 4
Broad-Spectrum Sunscreen SPF 50 (Oxybenzone 5%, Avobenzone 3%, Octocrylene 4%, Homosalate10%, Octisalate 5%)	100% fabrics stains present – no 4s; all fabric types scored 1-2, very few 3s
Skin Sunscreen Lotion with Broad Spectrum SPF 60+(Zinc oxide 4.7%, Titanium dioxide 4.9%)	100% fabrics stains present – no 4s; 1 fabric type scored 1, most scored 2
Jamaican black castor oil strengthen restore leave-in conditioner	100% fabrics stains present – no 4s
Synthetic Body Fluids and Clinical Reagents	**Scores:**
Stomach Acid	40% fabrics stains present, all at 3 & 4
Human Sweat	0% fabric stains present, though 50% scored 3 on degradation & appearance
Urine	0% fabric stains present, though 50% scored 3 on degradation & appearance
Viscot Mini Surgical Fine Tip Marker	100% fabrics stains present; no 4s, many 1,2s

Case Study: Moving Forward

- **There is no "silver bullet" fabric for healthcare – yet!**
- **Modify Industry standardized tests** to update expectations of performance – adjust to changes in disinfectants and CDC requirements
- **Establish level of risk** before selection of material
- Consider **component-based furniture** over unitized to easily replace items that are forecasted to degrade over time
- Adjust **life-cycle replacement** expectations with Owners
- Manufacturers have **opportunity for innovative & collaborative product development** to create durable fabrics and finishes

Next Steps:

- Everyone: We need your help to get more data! *Fill out the survey!*
- Healthcare Designers: Use the Healthcare Fabric Risk Assessment tool – *Do a field study!*
- Industry Organizations: Help designers, *Share technical information*
- Manufacturers of cleaning products: consider the *real-world challenges* we face and create products that can *safely clean* durable-coated fabrics!
- Fabric manufacturers & distributors: Help designers get the *information* they need to complete their Healthcare Fabric Risk Assessments – Educate your teams – Coordinate with manufacturers of cleaning products

GOALS

- Sample Ticket/Memo Tag in the same format by 2022??

  Work collaboratively to create an industry standard format

- **Consider using the term: "Heavy Duty – 24/7" - an evidence term, understood by all**


AAHID will post info on their website and
LinkedIn page as it becomes available.
Encourage all Interior designers
to discuss this with your peers, clients, etc.
We don't have all the answers yet,
but we do have partners to help find the solutions!

Help us to Collect Data!

Cleaning and Disinfection Survey
https://www.surveymonkey.com/r/J6W3PDX

Healthcare Durable Coated Fabrics Upholstery Failures Survey
https://www.surveymonkey.com/r/HKBM67B

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thank you!

…questions?

Do the best you can until you know better. Then when you know, do better.
- Maya Angelou


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your potential!
15
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of healthcare interiors
since 2004
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