New Information about Specifying and Cleaning Durable Coated Fabrics

Highlights for Designers

CHD Webinar July 16, 2020
Learn about:

- Durable coated fabric performance characteristics, and real-world findings
- Current cleaning/disinfecting paradigms, and innovative new cleaning technologies to improve performance.
- Results from real-world, in-house, research field study of heavy-duty durable-coated fabrics.
- Widespread durable coated fabric failures
- Sources of failures and chemical interactions between disinfectants, contaminants, and coated fabric
- Impact to the business model
- New criteria for real-world testing to determine actual expected performance of durable coated fabrics
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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

Slide courtesy of Ronnie Bell, Technical Manager/Omnova 2018
Are you experiencing the following?

- **SOILING?**
- **STAINING?**
- **DELAMINATION?**
- **CRACKS?**
- **PUDDLING?**
Do you have a room like this, and were you also told...
“This is only happening at your hospital”
We hear you, we are right there with you. It is embarrassing, time consuming and expensive to remedy these failures.

Can we do anything to fix this?
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!
In conversation with other healthcare professionals, designers, industry association & manufacturers representatives, we discovered...

we were all having the same problems with premature comprehensive furniture upholstery failures.

It was an “Ah-Ha” moment!

We resolved to continue the conversation in collaboration with representatives across our industry including cleaning professionals in order to work toward a solution to benefit everyone...
The **Durable Coated Fabrics (DCF)** Group was born...

Comprised of:
- manufacturers/distributors,
- healthcare designers,
- trade association
- environmental services representatives.

Through conference calls and meetings we discuss issues of durability, poll the industry using **surveys** to obtain data on current practices, provide durability testing, and advance collegial dialogue within our industry.

In 2018 we began our affiliation with **AAHID** to support our work and help share information though updates posted on the AAHID website and LinkedIn page to continue the dialog.
In 2018 we surveyed 150+ Healthcare designers, asking:

When evaluating an upholstery material for your public and patient healthcare environments, what are your main issues?

...we found that MOST important to designers, was....

#1 Performance / Durability 38%
#2 Cleanability 24%
#3 Aesthetics 18%
#4 Warranty 11%
#5 Cost 6%
#6 Sustainable (Green) 3%
...with the help of AAHID we are gathering information to better understand the magnitude of product failures within acute care, outpatient care, and long term care failures, associated costs, and potential solutions.

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

Healthcare Furniture Failures Survey; to provide data regarding actual furniture problems and failures of various furniture items used in healthcare across the U.S.

(coming August 2020)
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.

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

- 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.
### SARS-CoV-2 (COVID-19) compared to SARS-CoV-1

<table>
<thead>
<tr>
<th>Media</th>
<th>SARS-CoV-1</th>
<th>SARS-CoV-2</th>
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<tbody>
<tr>
<td>Aerosols</td>
<td>3 hours</td>
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<td>Plastic</td>
<td>72 hours</td>
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<td>Stainless Steel</td>
<td>48 hours</td>
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<td>Cardboard</td>
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<td>Copper</td>
<td>8 hours</td>
<td>4 hours</td>
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# Resistance of pathogens to disinfectants

<table>
<thead>
<tr>
<th>Pathogens</th>
<th>Example</th>
<th>Low-level Disinfection</th>
<th>Intermediate-level Disinfection</th>
<th>High-level Disinfection</th>
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<tr>
<td>Prions</td>
<td>Mad Cow Disease</td>
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<td>Bacterial Spores</td>
<td><em>Clostridium difficile</em></td>
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<td>Mycobacteria</td>
<td>Tuberculosis</td>
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<td>Nonlipid or small viruses</td>
<td>Norovirus</td>
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<td>Fungi</td>
<td>Athletes foot</td>
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<td>Vegetative bacteria</td>
<td>MRSA, VRE</td>
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<td>Lipid or medium viruses</td>
<td>HIV SARS-CoV-2 (Covid-19)</td>
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- **Low-level Disinfection**: Quats, Quat / alcohol
- **Intermediate-level Disinfection**: Bleach and hydrogen peroxide, Quat / alcohol blends
- **High-level Disinfection**: Peroxide acid / hydrogen peroxide blends
Cleaning Agents/Disinfectants Typically Used for Healthcare Furniture

**Bleach:** sodium hypochlorite - intermediate level disinfectant

**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 Å) at 2-6 mw/cm².

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

**Quaternary Ammonium (Quats):** Low level disinfectants that will kill most bacteria, viruses and fungi.
How Disinfectants Work

To Work Properly, Disinfectants Need:

- Proper Concentration
- Dwell Time
- Kill Claims
- PROPER APPLICATION PROCESS!

[Image of bacterial cell with labels such as Cytoplasm, Nucleoid, Capsule, Cell Wall, Cytoplasmic Membrane, Ribosomes, Pilis, Flagella]
History of durable-coated fabric failures at Adventist Healthcare...

- Prep for Joint Commission visits in 2014 and 2017 – throwing out hundreds of thousands of dollars worth of furniture due to failed upholstery
- In 2020 expanded cleaning for Covid-19
More and more failures...

Seat cushions replaced
70 x $100 = $7,000

Backs and seats are damaged.
150 x $2,400 = $360,000
Further case studies being developed...

Example: AHC – Case Study – SGMC Unit 2D

New directive to use Bleach wipes on ALL chairs every day

< In 12 weeks months this damage occurred

Elsewhere these same chairs had been in use for more than 4 years with no damage.

Cost for New Chairs
17 x $370 = $6,290
Shady Grove Medical Center
Field Study

New issues led to new goals and frustrations:

• Definition of “Heavy Duty/24/7” coated fabric was obscure
  • Manufacturers used the term but there was no definition
  • Sales reps use trendy terms unrelated to the science
  • Memo Tag/Sample tickets inconsistent; no uniformity between manufacturers or requirement to state testing results

• Sustainable/green requirements override durability and performance
• Limited dialogue with other disciplines (EVS, Inf Control)
• Testing requirements:
  • None specifically required for Healthcare, or any market
  • All tests are optional; manufacturers pay by the test;
  • Many tests have several names (ACT, CFFA, ASTM)
  • Minimums for “commercial” not valid for healthcare
  • Manufacturers use phrases for tests/results that may be easier to understand than technical language, but ultimately confusing because of inconsistent understanding of terms (e.g. crocking)

• A new Specifiers Tool was clearly needed
The Durable Coated Fabric Selection Process and Programming Guide

• To be rolled out at HCD November 2020
• Part 1 - Programming guide with questions to be asked/answered by:
  • Designer/Specifie
  • Durable Coated Fabric Manufacturer/Distributor
  • End Users
  • Furniture manufacturers/Suppliers
• Part 2 – CFFA Healthcare-201 Standard Testing
  • Lists tests that a Healthcare Durable Coated Fabric must pass
  • Probable Certification
  • Possible change to sample ticket/memo tag

• *STAY TUNED ...*
DCF Selection Guide – CFFA April 2020 update

• CFFA has finalized the minimum performance standard for contract upholstery (indoor) for healthcare applications, and it is now posted to the website. It can be found here: https://www.cffaperformanceproducts.org/cffa-includes/pdfs/HealthcareStandardIndoorUpholstery.pdf.

• In addition, CFFA has developed a healthcare stain test, CFFA-142 (in the standard), which can be found in CFFA's STM: https://www.cffaperformanceproducts.org/cffa-includes/pdfs/STMPamphlet.pdf.
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  + additional failures in administrative and research buildings

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.
• Hospital Acquired Infections, (HAI) risks associated with the exposed sub-surfaces, cushion cores, soft backings, and raw wood:
  • SARS-CoV-2
  • 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?

• Discover the sources of failures - 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 expand the conversation - engage Facilities, EVS, EPI, Safety, Compliance, Supply Chain, Center for Innovation, Hospital Leadership
  
  • SARS-CoV-2 = ALL spaces have the same high risk of failure
  • Reduce cost – first and life-cycle considerations, plan for accelerated failures in non-clinical and administrative buildings
  • Increased durability to resist cleaning methods and environmental contaminates
  • Create new tests & performance criteria for upholstery and finishes specifications
  • Create safer environments for all users
Case Study: Third Party Lab Material Testing

Goal – Create tests 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 - Results**

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

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**4 Excellent  3 Good  2 Poor  1 Severe Effect**

Not many 4s, Polyurethane failed

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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 & performance treatments/base cloth combinations matter** – polycarbonate vs. silicone with the same branded performance treatment/top coat 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 contaminants in healthcare and public areas tested:

Patient Transferrable Stains
1. Super Lustrous Lipstick- Love That Red (already on standard test)
2. Baby Oil (already on standard test)
3. Daily Moisture Dry Skin Moisturizer
4. Acetone Nail Polish Remover
5. Non-Acetone Polish Remover
6. Broad-Spectrum Sunscreen SPF 50 (Oxybenzone 5%, Avobenzone 3%, Octocrylene 4%, Homosalate 10%, Octisalate 5%)
7. Skin Sunscreen Lotion with Broad Spectrum SPF 60+(Zinc oxide 4.7%, Titanium dioxide 4.9%)
8. Jamaican black castor oil strengthen restore leave-in conditioner

Synthetic Body Fluids and Clinical Reagents
1. Stomach Acid – Carolina Biological Supply Company: Gastric Juice, Artificial, Laboratory Grade
2. Human Sweat – Pickering AATCC TM15 Sweat pH 4.3
3. Urine – Carolina Biological Supply Company: Simulated Urine, Normal (already on standard test)
4. Viscot Mini Surgical Fine Tip Marker
Case Study: New Stain Resistance Test – Cleaning Chemicals

Application of staining agent with *extended dwell time of 48 hours*

Cleaning of staining/contaminate agents *with hospital disinfectants in lieu of soap & water*:

- Oxivir TB wipes Hydrogen Peroxide (0.5%)
- Clorox Bleach Germicidal Wipes
- Virex II 256
## Case Study: Material Testing – Sunscreen

<table>
<thead>
<tr>
<th>Stain</th>
<th>Replicate (Cleaning Agent)</th>
<th>Fabric 1 Vinyl w/Brand A Topcoat</th>
<th>Fabric 2 Vinyl with UV &amp; Acrylic Topcoat</th>
<th>Fabric 3 Thermoplastic Elastomer</th>
<th>Fabric 4 Silicone, no topcoat</th>
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<td>1</td>
<td>Oxivir</td>
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<td>S: +</td>
<td>S: +</td>
<td>S: +</td>
<td>S: +</td>
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**S**: Stain Present  
**Evaluating using**: + (present) or – (not present)

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<th>Poor</th>
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<th>Severe Effect</th>
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**NO 4s, all stained**

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# Case Study: Material Testing – Leave-in Hair Conditioner

<table>
<thead>
<tr>
<th>Stain</th>
<th>Replicate (Cleaning Agent)</th>
<th>Fabric 1 Vinyl w/Brand A Topcoat</th>
<th>Fabric 2 Vinyl with UV &amp; Acrylic Topcoat</th>
<th>Fabric 3 Thermoplastic Elastomer</th>
<th>Fabric 4 Silicone, no topcoat</th>
<th>Fabric 5 Polyurethane</th>
<th>Fabric 6 Treated Leather</th>
<th>Fabric 7 Vinyl w/Brand B Topcoat</th>
<th>Fabric 8 100% Nylon Matrix</th>
<th>Fabric 9 Polycarbonate w/Brand C Topcoat</th>
<th>Fabric 10 Silicone w/Brand C Topcoat</th>
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<tr>
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</table>

S = Stain Present

Evaluated using: + (present) or - (not present)

---

4 Excellent  3 Good  2 Poor  1 Severe Effect

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## Case Study: Material Testing – New Staining Agents Test Takeaways

<table>
<thead>
<tr>
<th>Patient Transferrable Stains</th>
<th>Scores:</th>
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</thead>
<tbody>
<tr>
<td>Super Lustrous Lipstick- Love That Red</td>
<td>100% fabrics stains present – no 4s</td>
</tr>
<tr>
<td>Baby Oil</td>
<td>75% of fabrics stains present, all at 2 or 3, few 4s</td>
</tr>
<tr>
<td>Daily Moisture Dry Skin Moisturizer</td>
<td>60% of fabrics stains present; all at 2 or 3, few 4s</td>
</tr>
<tr>
<td>Acetone Nail Polish Remover</td>
<td>30% fabrics types stains present; 3 or 4</td>
</tr>
<tr>
<td>Non-Acetone Polish Remover</td>
<td>30% fabric types stains present; 2, 3, 4</td>
</tr>
<tr>
<td>Broad-Spectrum Sunscreen SPF 50 (Oxybenzone 5%, Avobenzone 3%, Octocrylene 4%, Homosalate 10%, Octisalate 5%)</td>
<td>100% fabrics stains present – no 4s; all fabric types scored 1-2, very few 3s</td>
</tr>
<tr>
<td>Skin Sunscreen Lotion with Broad Spectrum SPF 60+(Zinc oxide 4.7%, Titanium dioxide 4.9%)</td>
<td>100% fabrics stains present – no 4s; 1 fabric type scored 1, most scored 2</td>
</tr>
<tr>
<td>Jamaican black castor oil strengthen restore leave-in conditioner</td>
<td>100% fabrics stains present – no 4s</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Synthetic Body Fluids and Clinical Reagents</th>
<th>Scores:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stomach Acid</td>
<td>40% fabrics stains present, all at 3 &amp; 4</td>
</tr>
<tr>
<td>Human Sweat</td>
<td>0% fabric stains present, though 50% scored 3 on degradation &amp; appearance</td>
</tr>
<tr>
<td>Urine</td>
<td>0% fabric stains present, though 50% scored 3 on degradation &amp; appearance</td>
</tr>
<tr>
<td>Viscot Mini Surgical Fine Tip Marker</td>
<td>100% fabrics stains present; no 4s, many 1,2s</td>
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</table>
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
• COVID-19 response = ONE LEVEL OF RISK for selection of materials
• 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
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

Healthcare Durable Coated Fabrics Furniture Failures Survey
*(coming August 2020)*
Contact Information

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Shari Solomon: Solomon@cleanhealthenv.com

Teri Lura Bennett: terlur@me.com
Thank you!