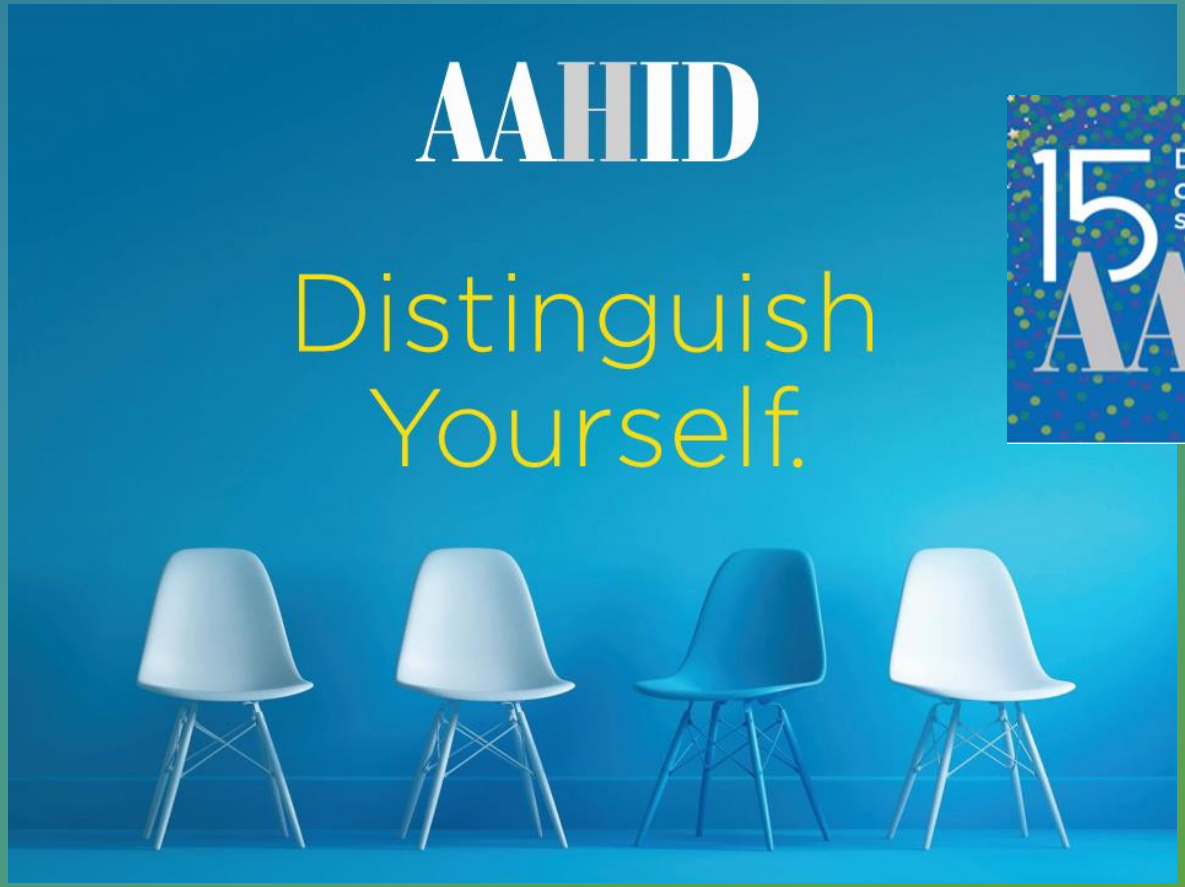
New Information about Specifying and Cleaning Durable Coated Fabrics for Healthcare

AAHID Education Session updated for

CHD Webinar July 16, 2020

THE CENTER FOR HEALTH DESIGN®



15 Designing the future of healthcare interiors since 2004 AAHID

AAHID

The **American Academy of Healthcare Interior Designers** is a nonprofit organization committed to the development and administration of the only certification program for **healthcare interior designers**.

AAHID

CHID Certified Healthcare Interior Designers® are the most qualified to ensure the health, safety, and welfare of patients, residents, and staff in hospitals, clinics, and residential care facilities.

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Facilities Architecture + Planning

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Director Design & Research, Adventist Healthcare

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

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

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

#3. Understand the challenges of conducting a real-world, 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.

#4. Explore widespread durable coated fabric failures in a health system, discover the sources of failures and chemical interactions between disinfectants, contaminants, 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
RN CHID CID IIDA EDAC
Interior Designer
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1. Learn about durable coated fabric construction, performance characteristics, potential new and innovative durable coated fabric technologies, and field reporting processes and procedures.

Are you experiencing the following?

DELAMINATION?

SOILING ?

STAINING?

CRACKS?

PUDDLING?

Do you have a room like this, and were you also told…
"This is only happening at your hospital"

Survey of 150+ Healthcare designers;

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

Survey Results indicated these issues were all important:

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

…MOST important to healthcare designers…

#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 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)

What are durable coated fabrics?

Slide courtesy of Ronnie Bell, Technical Manager/Omnova 2018

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)

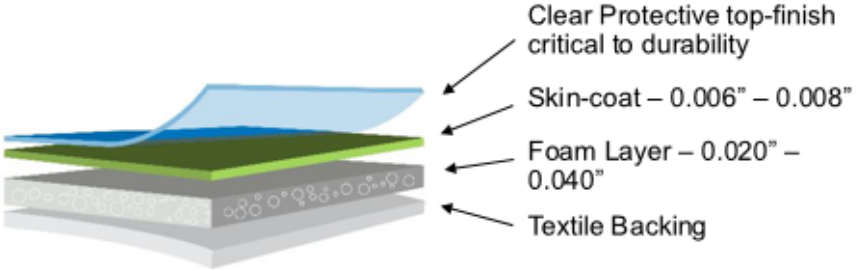
Silicone – relatively new to the Coated Fabrics market

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

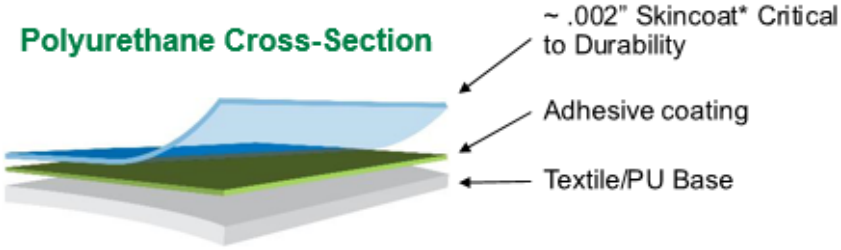
Construction Basics

Slide courtesy of Ronnie Bell, Technical Manager/Omnova 2018

PVC Cross Section

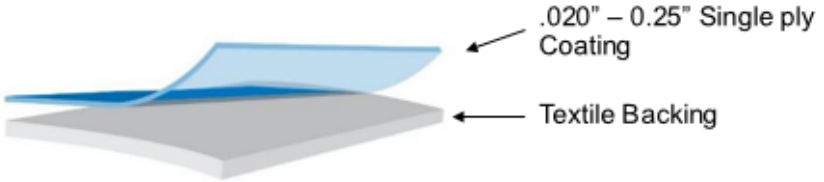


Polyurethane Cross-Section

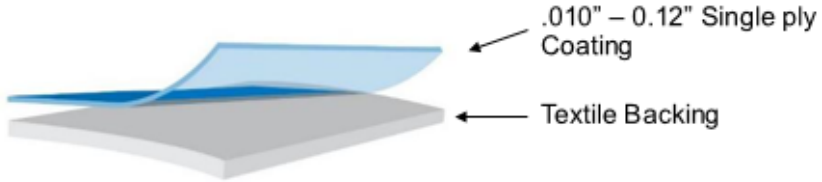


*Best: Polycarbonate – High resistance to hydrolysis
Good: Polyether – Good resistance to hydrolysis
Fair: Polyester – Low resistance to hydrolysis

Thermoplastic Elastomers



Silicone Coating



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

2. Discuss current cleaning/disinfecting paradigms, and explore the potential for innovative 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)

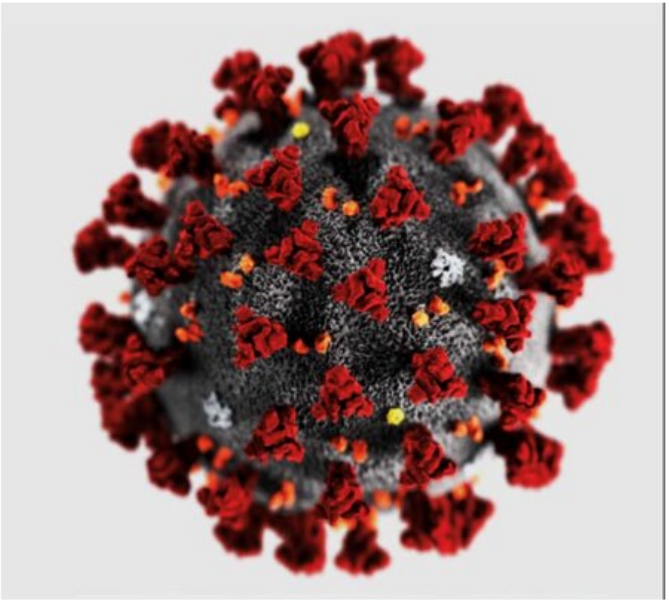
HAIs in U.S Acute Care Hospitals in 2011

- **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.

-

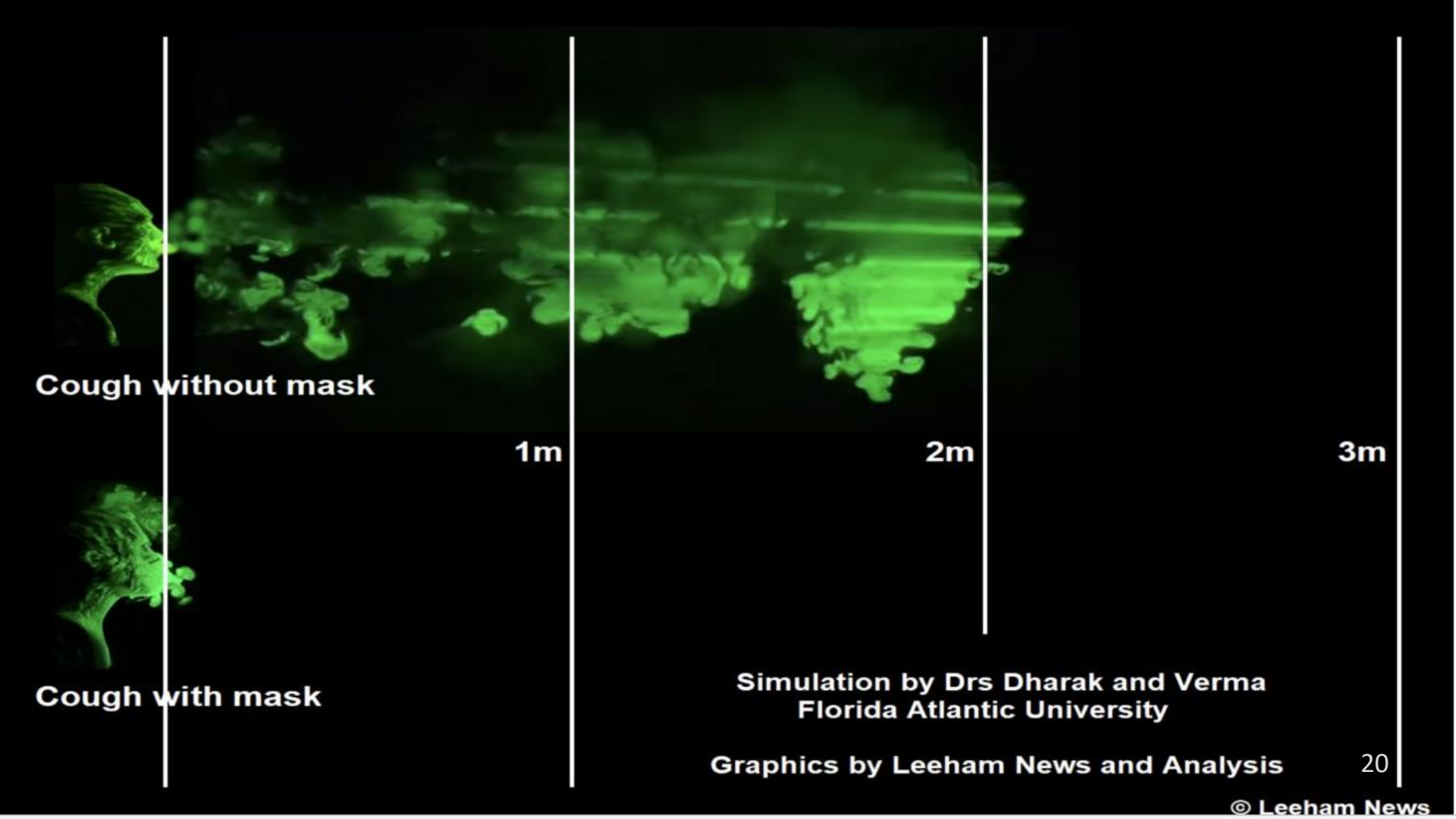
- U.S. Centers for Disease Control and Prevention (CDC)

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

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


Cough without mask
1m
2m
3m
Cough with mask
Simulation by Drs Dharak and Verma
Florida Atlantic University
Graphics by Leeham News and Analysis
© Leeham News

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.

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

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

Media	SARS-CoV-1	SARS-CoV-2
Aerosols	3 hours	3 hours
Plastic	72 hours	72 hours
Stainless Steel	48 hours	48 hours
Cardboard	8 hours	24 hours
Copper	8 hours	4 hours

Holbrook, M.G., Gamble, A., Williamson, B.N., et al. (2020) Aerosol and surface stability of SARS-CoV-2 as compared with SARS-CoV-1. New England Journal of Medicine, Correspondence nejm.org.

Used with permission from Kimberly-Clark PROFESSIONAL

Resistance of pathogens to disinfectants

Hard-to-Kill

Easy-to-Kill

Pathogens	Example	Disinfectants
Prions	Mad Cow Disease	Low-level Disinfection: Quats
Bacterial Spores	Clostridium difficile	Intermediate-level Disinfection: Quat / alcohol; Quat / alcohol blends
Mycobacteria	Tuberculosis	High-level Disinfection: Bleach and Hydrogen peroxide; Peracetic acid / hydrogen peroxide blends
Nonlipid or small viruses	Norovirus	
Fungi	Athletes foot	
Vegetative bacteria	MRSA, VRE	
Lipid or medium viruses	HIV, SARS-CoV-2	

Cleaning Agents/Disinfectants Typically Used for Healthcare Furniture

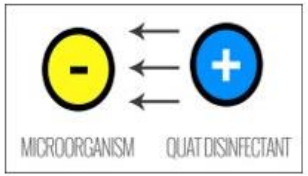
Bleach: sodium hypochlorite - intermediate level disinfectant

Hydrogen Peroxide: Can be either a low or intermediate level disinfectant

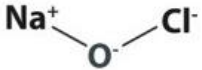
UV lights: The wavelength of UV radiation ranges from 210 to 328 nm (2100 to 3280 A) at 2-6 mw/cm2.

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.



SODIUM HYPOCHLORITE FORMULA STRUCTURE



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

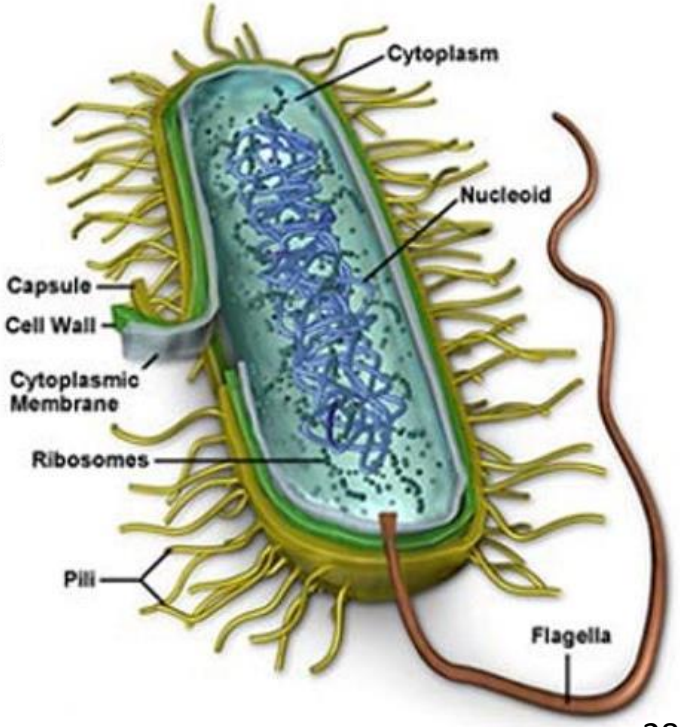
Covid-19 Update

AHE – Association for the Healthcare Environment

How Disinfectants Work

To Work Properly, Disinfectants Need:

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



Health Care Furniture Design - Guidelines for Cleanability

- Intention: Provide direction to manufacturers, specifiers, 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

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

Cleaning & Disinfection: Policy & Procedures

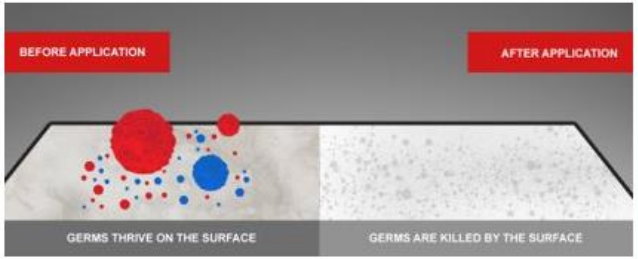
- Increased frequency of cleaning and disinfection in high density and high-touch areas
- Staff training
- Staff roles and responsibilities
- Cleaning frequencies
- Cleaning and disinfection protocols
- Selection of tools, supplies, equipment and chemicals
- Validation of cleanliness

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.

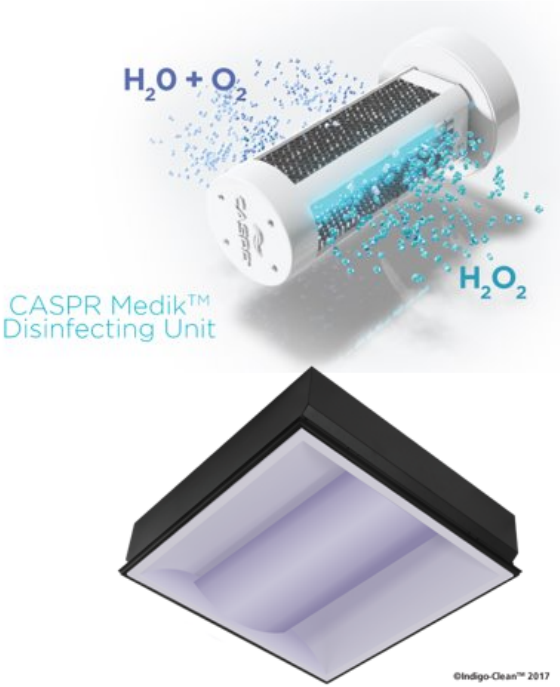
Candidate antimicrobial surfaces and coatings supported by data from nonclinical settings include:

- Copper
- Silver
- Surfaces sprayed with surfacine or organosilane



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 nanometers (nm)



Thank you!

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

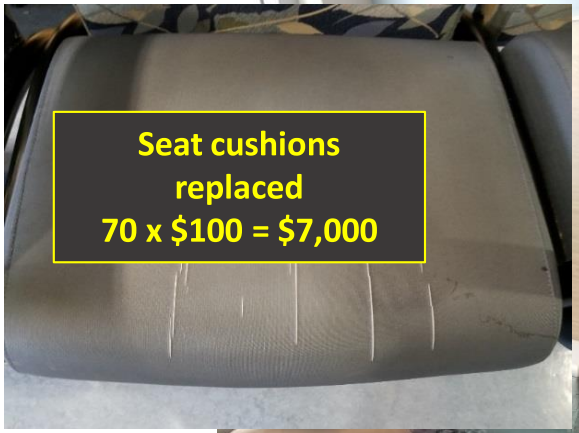
3. Understand the challenges of conducting a real-world, in-house, research field study of heavy/duty healthcare recommended, durable-coated fabrics and hear generic findings along with cleaning and disinfecting results from the same study.

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

History of durable-coated fabric failures at AHC and “Ah Ha” moments…

- 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

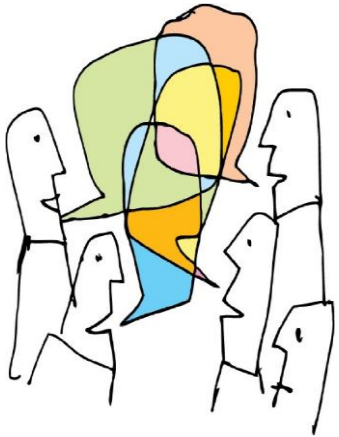
More and more failures…



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

Backs and seats are damaged.
150 x $2,400 = $360,000

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



In the airport shuttle to Design Connections, February 2017, several healthcare designers, both in-house and consultants, expressed frustration with coated fabric failures.

We began sharing stories and photos.

We continued the discussion at Design Connections with industry partners and AAHID members. *Ah –Ha!…*

We were ALL having the same problems, something had to be done!

The Durable Coated Fabrics (DCF) Group was born…

Comprised of;

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

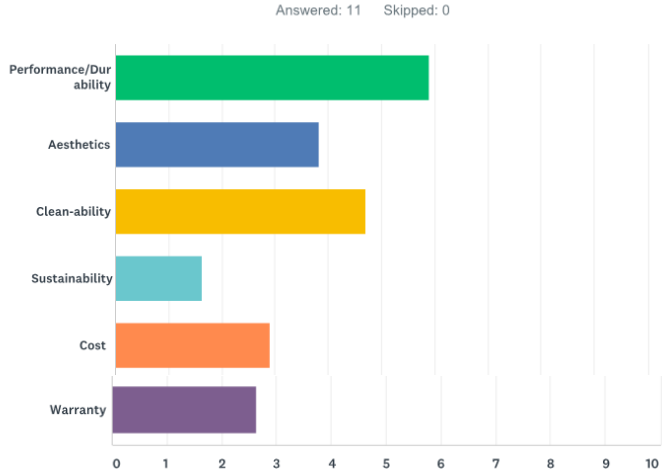
Through conference calls and meetings we discuss issues of durability, poll the industry for information on current practices, create upholstery specification checklists, provide durability testing, and advance collegial dialogue within our industry.

Updates posted on the AAHID LinkedIn page to continue the dialog.

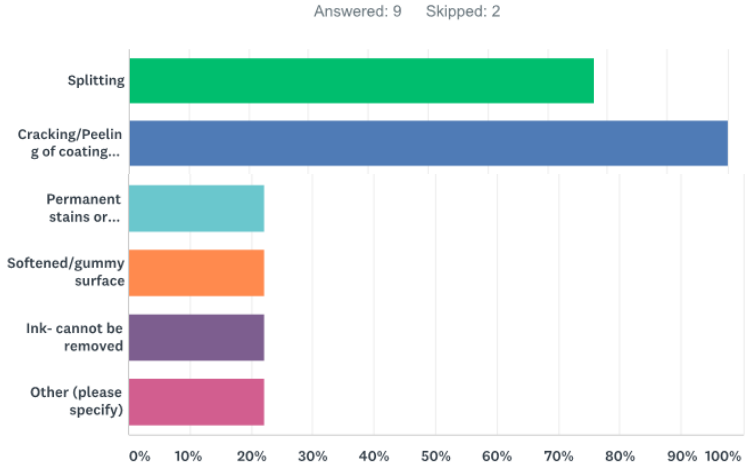
Confirmed:
The problem exists across the U.S., Canada, and possibly world-wide….

Survey: The State of Durable Coated Fabrics in Healthcare

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.



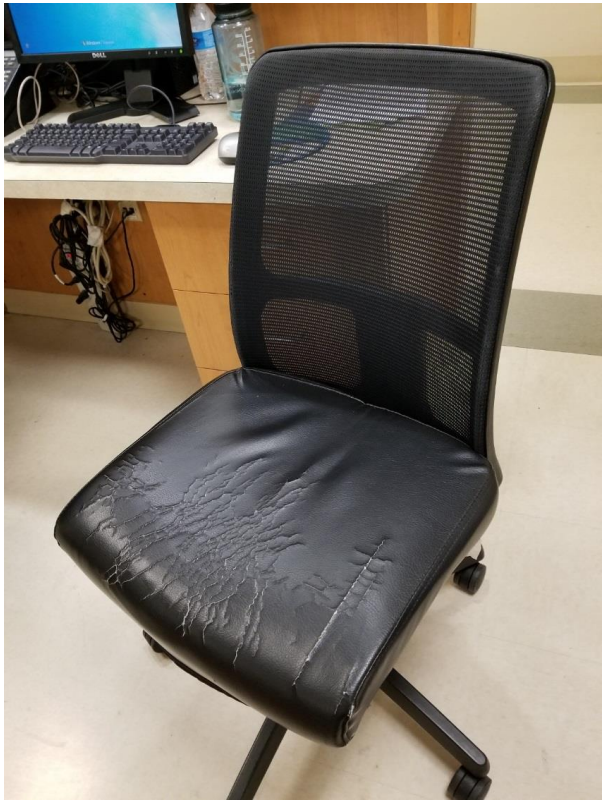
Q11 If you answered 'yes' to a fabric failure, please describe the type of failure(s). (If a photo is available that reflects failure, please upload in question 12/14). If no to a fabric failure, please skip.



New Survey underway for Furniture manufacturers to document their issues...

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

Evidence-Based Design Field Study

Goals for our field study at the
Evergreen Lounge at Shady Grove Medical Center

1. Reupholster approx. 40 chairs in heavy duty coated fabrics to determine the most durable after being used 24/7 in a busy ICU/CVIR waiting area and cleaned everyday for 4 – 6 months.
2. Determine which DCF's were easiest to clean, as determined by swabbing for bioburden once a week.
3. Careful coordination of 18 different upholstery materials to achieve aesthetic congruence, and avoid "crazy quilt" appearance.
4. Use a variety of heavy duty DCF's; Silicone (x3), TPE (x4), Vinyl (x5), and PU/PC (x6).

Evergreen Lounge – "Before" pictures

SGMC Field Study

BUT 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

Evergreen Lounge – “after” chairs were reupholstered

Swabbing – to verify effectiveness of cleaning

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

Scoring: 25 – 50 = Passing

Now 1 – 50 = passing

11 = Excellent; Very clean

2725 = FAIL

Problem: EVS team was not consistent with cleaning; results varied too much to continue

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

What is a Risk Assessment?*

- Proactive - Is an assessment that examines a process in detail, including sequencing of events, actual or potential risks, and failures or points of vulnerability and that prioritizes, through a logical process, areas for improvement based upon an actual or potential impact of care, treatment or services provided*

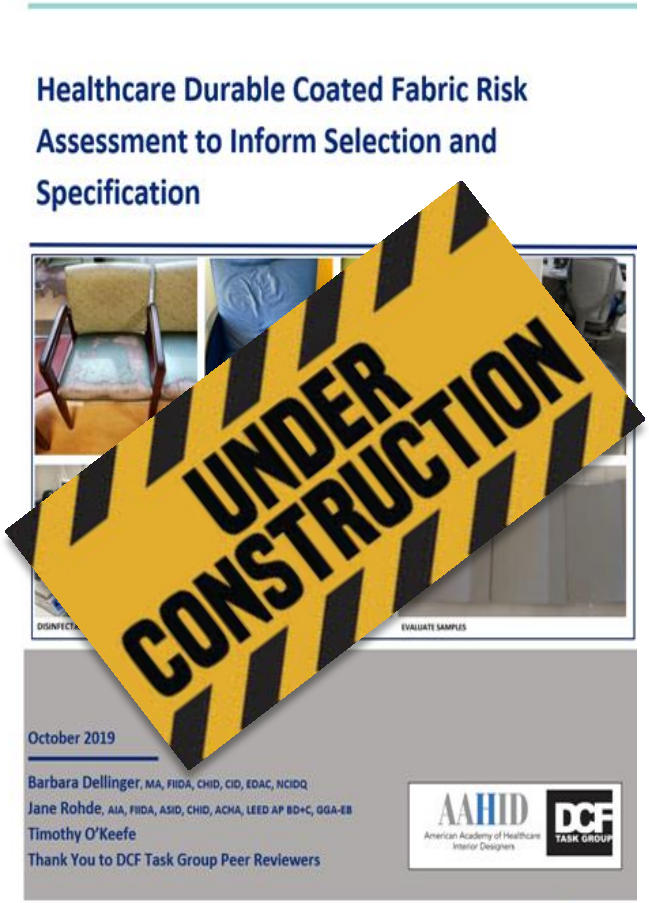
- Reactive – In response to identified safety events or risks
  - Creates awareness of hazards and risks
  - Identifies who may be at risk (patients, staff, families)
  - Used to prevent injuries or illness (or failures) especially when done at the design or planning stage

- Generally, Risk Assessments are done for improvement, after problems are identified

* The Joint Commission definition

How a Risk Assessment is done:

- Review all available information about manufacturer's literature, authoritative sources, results of testing, workplace inspection reports or incidents or failures, including the type and frequency of occurrence.
- Identify actions to eliminate the hazard, or control the risk
- Evaluate to confirm if the hazard has been eliminated or is risk is appropriately controlled
- Monitor to make sure the result continues to be effective
- Document the process for future planning or issues.



Initial tool was a DCF Risk Assessment:

Healthcare locations with upholstered seating could be categorized into one of four Risk Zones/Areas ***(Covid-19 has made all zones high risk!)***

In 2019, this guide was intended to evaluate each durable coated fabric by:

- Identifying the Zone/Area
- Analyzing testing data
- Selecting the appropriate DCF

..after discussions between many disciplines, new sharing of information, we are "re-writing" the original Risk Assessment to become....

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/Specifier
  - 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.

CFFA-HEALTHCARE-201
APRIL 2020

Recommended Minimum Performance Standards for
VINYL-COATED AND OTHER CHEMICAL COATED UPHOLSTERY FABRICS - HEALTHCARE

Next Steps…

Healthcare Designers: Ask for the new "Healthcare Label" (once available) Until then, have DCF rep fill out the CFFA Healthcare-201, Ask that fabric sample ticket/memo tags provide testing results.

Industry Partners: Share technical information with designers, educate reps in greater depth.

Fabric manufacturers/distributors: Help designers get the *information* needed to select the best upholstery fabric for their environments. Educate your teams, and coordinate with manufacturers of cleaning products.

Furniture manufacturers: Create healthcare furniture products that are *component-based construction*, so that failing, contaminated surface components *can be easily replaced* to avoid sending the entire product into landfills.

Cleaning product manufacturers: consider *real-world challenges,* create new products that can *safely clean & disinfect* durable-coated fabrics without rinsing.

All: Understand that Covid-19 cleaning and disinfecting protocols will be used throughout the built environment meaning that all products will need to be more durable.

4. Explore widespread durable coated fabric failures in a health system, discover the sources of failures and chemical interactions between disinfectants, contaminants, 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 + 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.
- EPI has defined the following 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?

Strategies:

- **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**

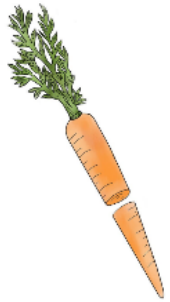
Case Study: Third Party Lab Material Testing

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.

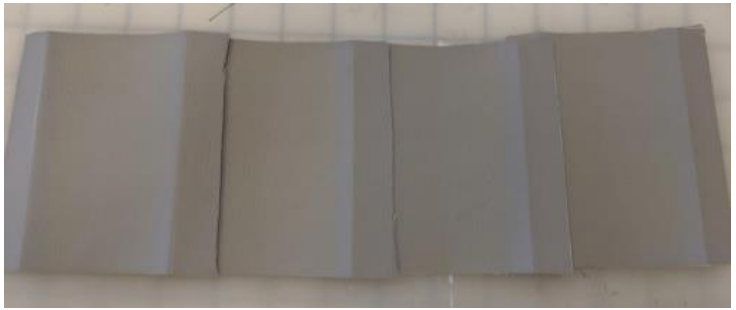
1 **Severe effect**: Discoloration, cracking and/or delamination clearly visible or objectionable aesthetics.

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

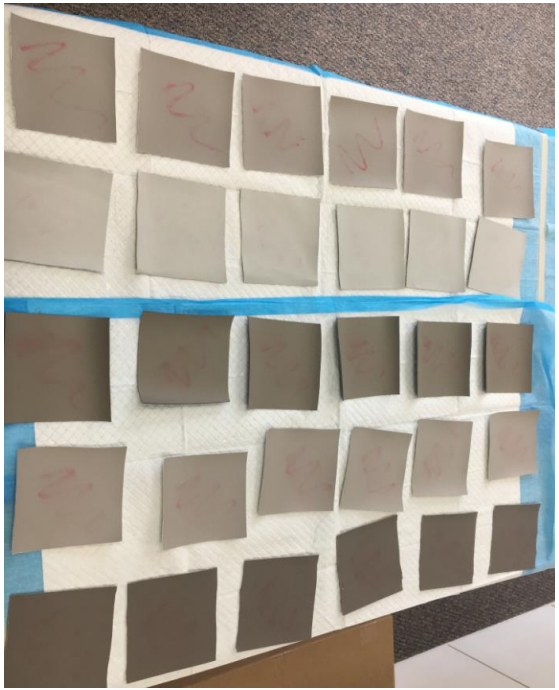
3 **Good cleanability**: Damage determined to not affect the material performance and aesthetically acceptable

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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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
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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
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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
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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										
	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
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
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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
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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										
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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
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
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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
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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

(Covid-19 has made all zones high risk!)

- ~~**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…

Healthcare Designers: Ask for the new "Healthcare Label" (once available) Until then, have DCF rep fill out the CFFA Healthcare-201, Ask that fabric sample ticket/memo tags provide testing results.

Industry Partners: Share technical information with designers, educate reps in greater depth.

Fabric manufacturers/distributors: Help designers get the *information* needed to select the best upholstery fabric for their environments. Educate your teams, and coordinate with manufacturers of cleaning products.

Furniture manufacturers: Create healthcare furniture products that are *component-based construction*, so that failing, contaminated surface components *can be easily replaced* to avoid sending the entire product into landfills.

Cleaning product manufacturers: consider *real-world challenges,* create new products that can *safely clean & disinfect* durable-coated fabrics without rinsing.

All: Understand that Covid-19 cleaning and disinfecting protocols will be used throughout the built environment meaning that all products will need to be more durable.


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

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

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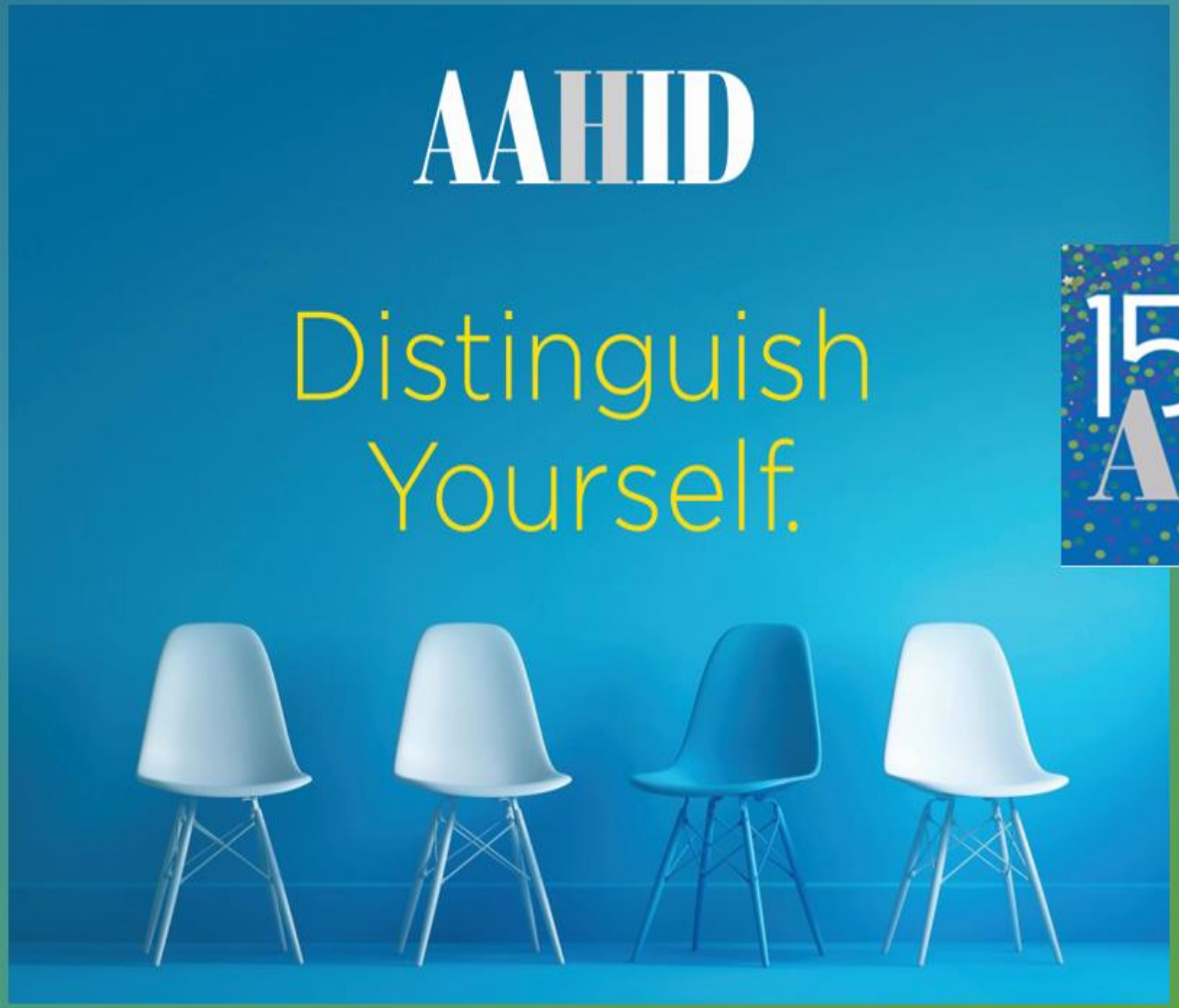
Thank you!

…Questions?

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



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