

Antimicrobials in Furnishings in the Time of COVID-19

What do we know about their efficacy?

What do we need to know about their efficacy?

Webinar Date: June 2nd, 2020 at 12 noon PT/3pm ET

Speaker: Dr. Ted Schettler, MD, MPH

Science Director, Science and Environmental Health Network





Photo courtesy of Perkins+Will

A non-profit organization dedicated to protecting public health from exposures to toxic chemicals.

The Center for Environmental Health works with large purchasers to utilize their buying power to incentivize the production of environmentally preferable products

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MOVING THE MARKET TOWARDS HEALTHIER PRODUCTS



Antimicrobials in the Time of Coronavirus

Ted Schettler MD, MPH

Science and Environmental Health Network

June 2, 2020

Outline

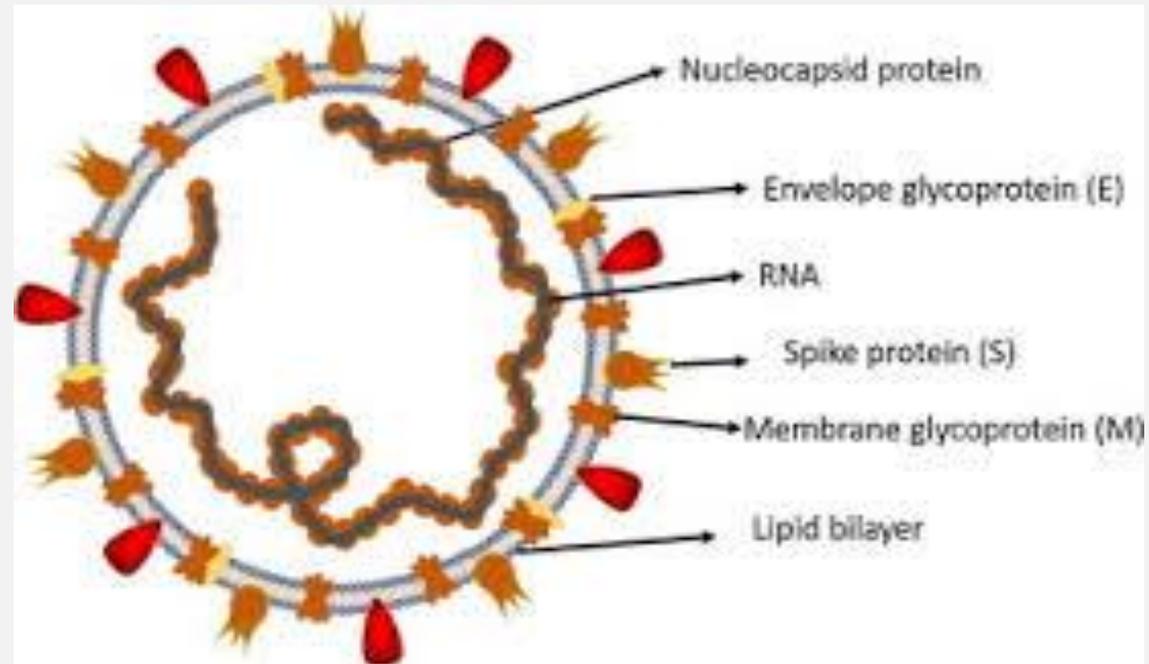
- Definitions
- The virus: SARS-CoV-2; the illness: Covid 19
- Strategies for prevention; hierarchy of controls
- Evaluating a potential role for antimicrobials in products and materials
- Looking ahead

Definitions

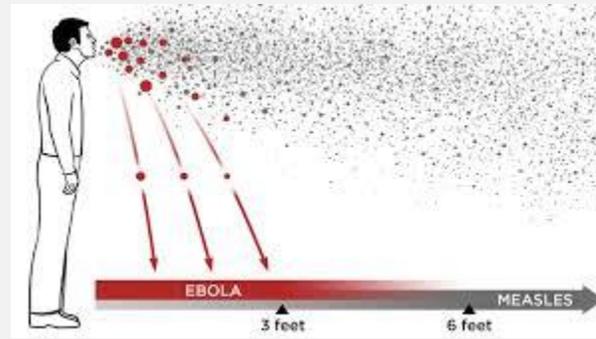
- ***Microorganism (microbe)*** – bacteria, viruses, fungi, some parasites
 - ***Antimicrobial*** - an agent that kills some microorganisms or stops their growth (many have a narrow spectrum of activity)
 - ***Cleaning*** - the removal of visible soil from objects and surfaces; normally is accomplished manually or mechanically using water with detergents or enzymatic products. (soap disrupts the lipid envelope of SARS-CoV-2)
- Disinfection*** - a process that eliminates many or all pathogenic microorganisms, except bacterial spores, on inanimate objects (chemical, UV light, heat, etc.)

SARS-CoV-2

- RNA, enveloped virus



SARS-CoV-2; Covid-19



- Predominately airborne transmission; large and small droplets (aerosol) > direct exposures
- Aerosols (< several microns) can remain suspended for several hrs. and travel farther
(Prather, Science, 27 May 2020); <https://science.sciencemag.org/content/sci/early/2020/05/27/science.abc6197.full.pdf>
- Contaminated surfaces > indirect exposures; may be more imp't in some settings than others
- Highly contagious; can be spread from an asymptomatic, infected person

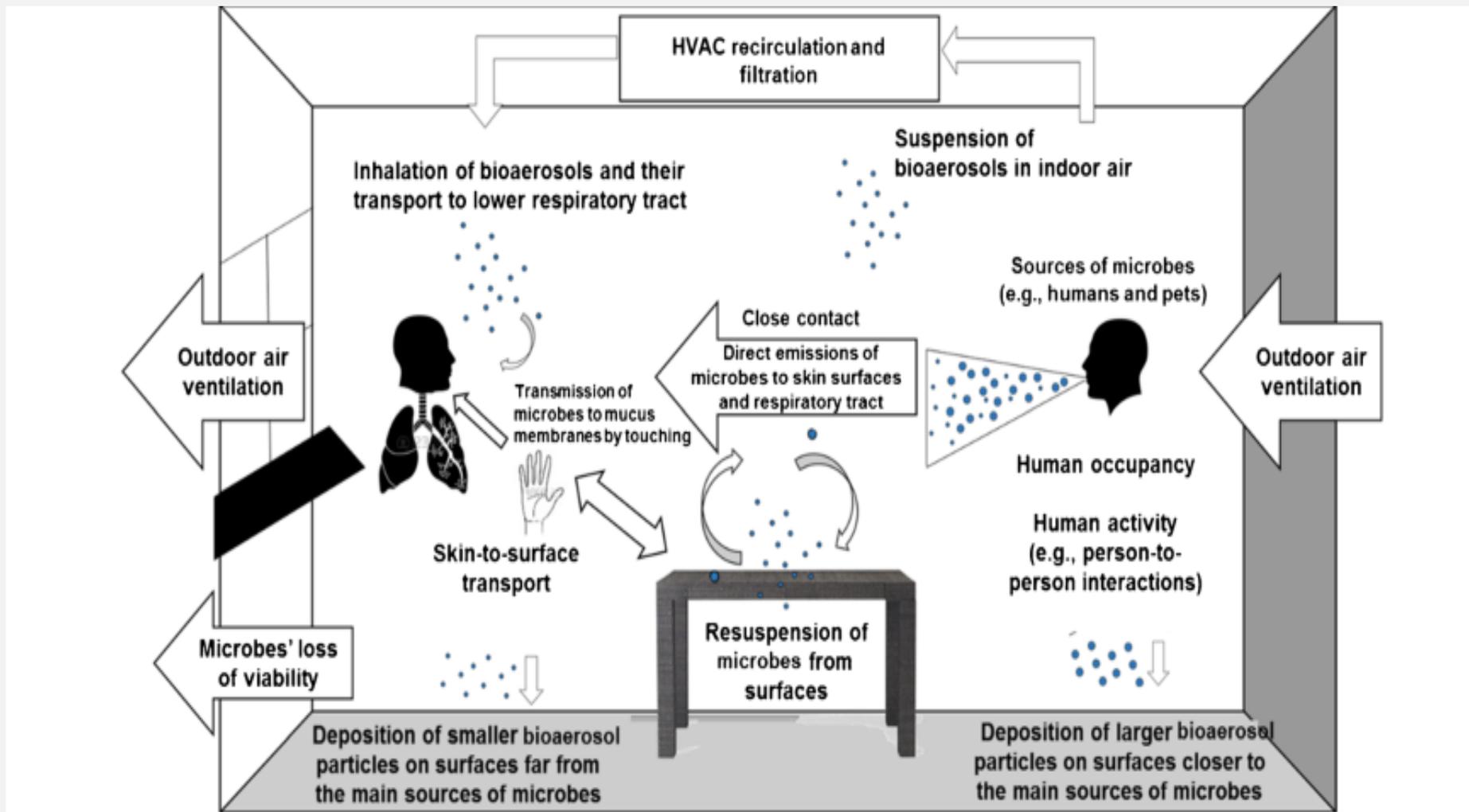


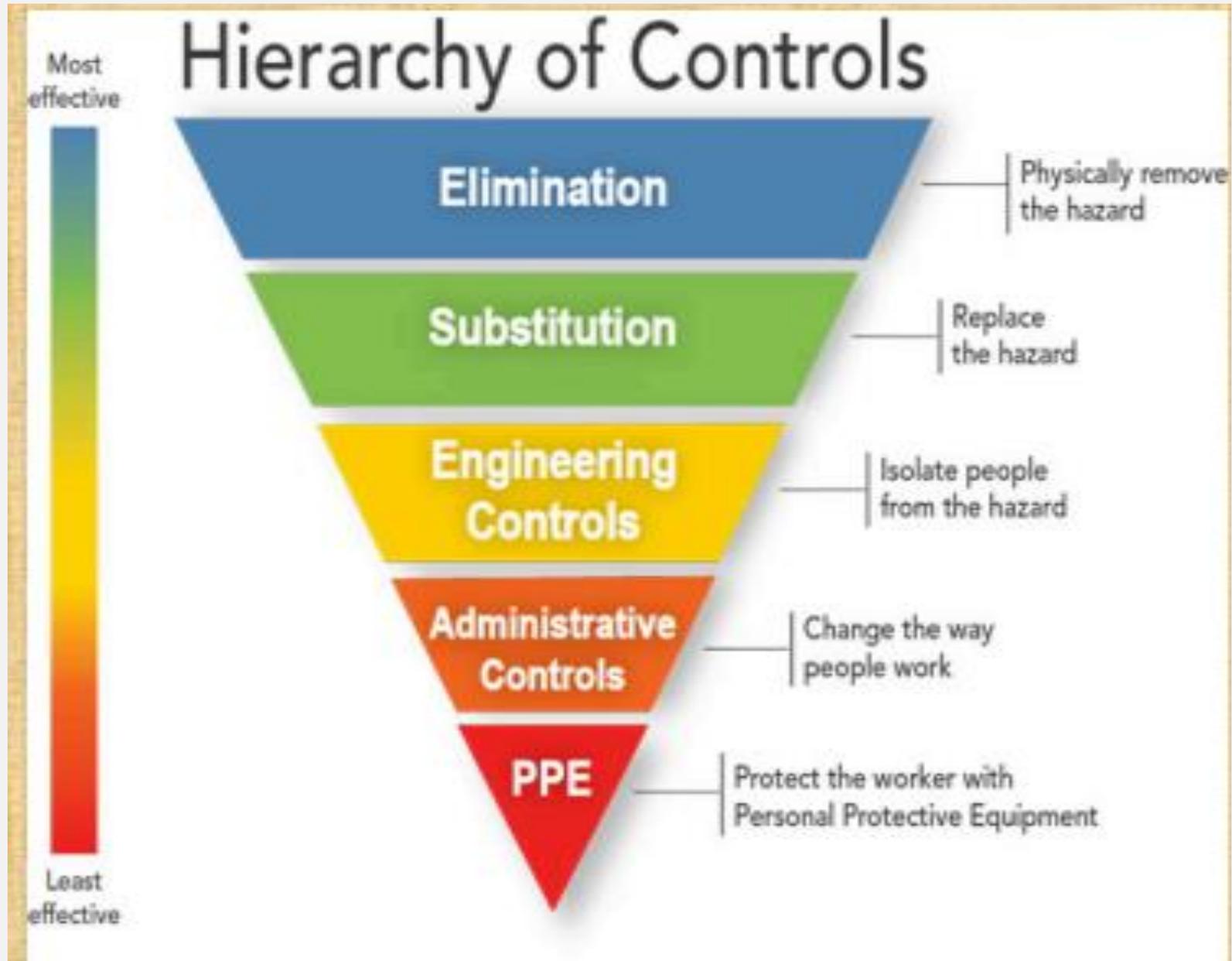
Fig. 1 Conceptual figure demonstrating various microbial transmission pathways between humans, air, and fomites in a typical indoor environment

Microbial Exchange via Fomites and Implications for Human Health

Stephens et al. *Biology and Pollution*, 2019

<https://link.springer.com/content/pdf/10.1007/s40726-019-00123-6.pdf>

Prevention of Occupational Diseases: A systems approach





Prevention



- Hospital—PPE (masks, respirators, gloves, gowns, face shields); hand hygiene; cleaning and disinfection; testing and isolation; ventilation; rooms with infected patients have enough exhaust, with negative pressure relative to common areas, so any airborne virus is confined to limited areas.
- Community—spatial separation, masks, hand hygiene, cleaning and disinfection, testing and isolation
- Homes—hand hygiene, cleaning and disinfection; masks and isolation when someone in home is infected

Other workplaces

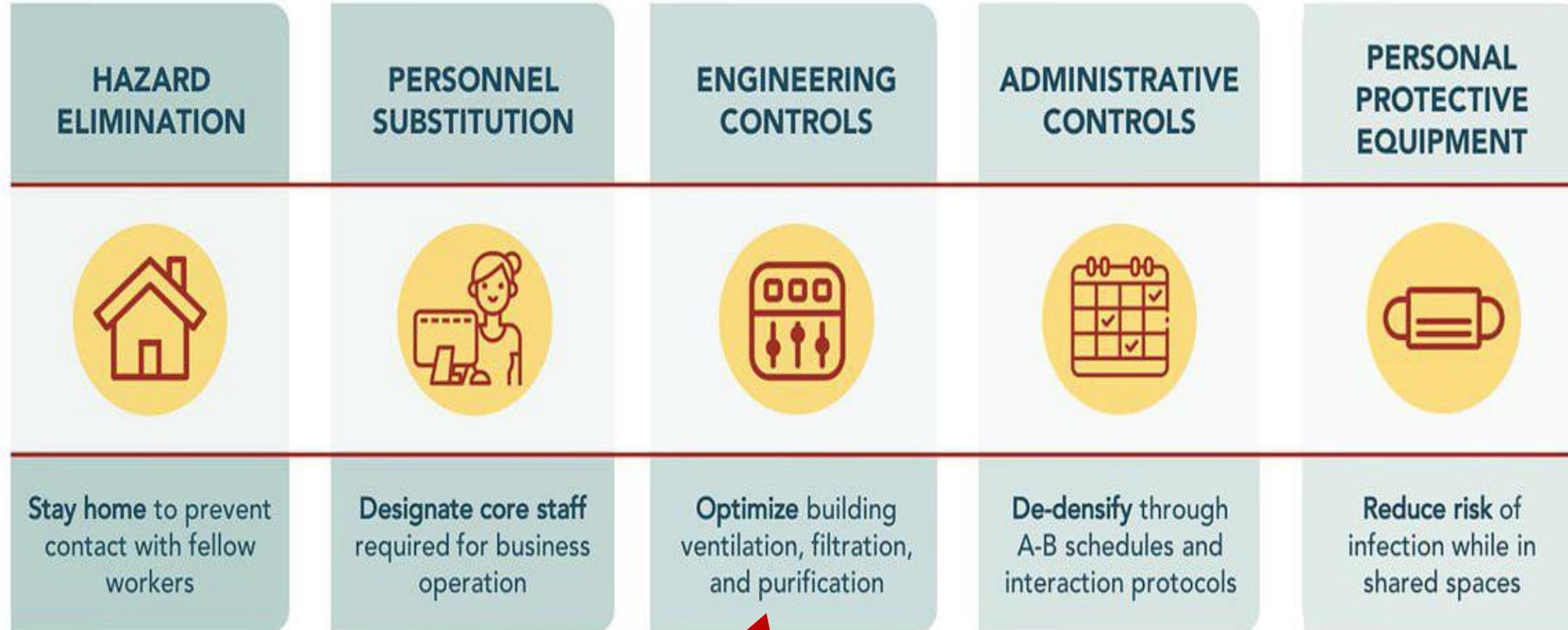
- Frequent illness checks; do not admit anyone with symptoms
- Deploy healthy building strategies, such as refreshing stale indoor air; opening windows; increasing the outdoor air ventilation rate in buildings with HVAC systems. (can have a dramatic effect on aerosols)
- Pass recirculated air through a high-efficiency filter
<https://tinyurl.com/y8w8nou3>
- Maintain physical distancing. Six feet is good, but 10 feet is better
- Cleaning and disinfection; Other antimicrobial technologies ?
- PPE where necessary

GETTING BACK TO WORK



Harvard Healthy Buildings Program

A LAYERED DEFENSE APPROACH



Content by Joseph G. Allen (@j_g_allen), assistant professor of exposure and assessment science and director of the Healthy Buildings Program at Harvard University's T.H. Chan School of Public Health (@HarvardChanSPH). Design by Josh Lasky (@JoshLasky).



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Is there a role for antimicrobial surfaces on fomites?

How long does SARS-CoV-2 remain infectious on various surface materials?

Material	Non-infectious in cell culture lab tests after:
Plastic	3 - <7* days
Stainless steel	2 - <7* days
Glass	4* days
Wood or cloth	2* days
Copper	4 hrs.
Paper	3* hrs.
Cardboard	1 day
Paper money	up to 4* days
Aerosols	> 3 hrs.

Infectious titers begin to fall off fairly quickly

(at 21 to 23°C and 40% relative humidity)

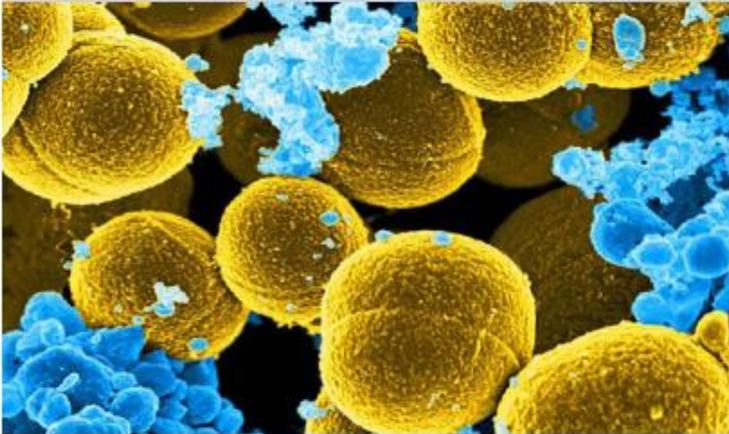
NEJM, Apr 16, 2020 <https://www.nejm.org/doi/full/10.1056/NEJMc2004973>

*Lancet, Apr 2, 2020 <https://tinyurl.com/upk9k6g> (also discusses enviro conditions)

Cleaning and disinfection

- Clean first; soap and water
- EPA list <https://www.epa.gov/coronavirus>
- N list products; variable toxicity and dwell time;
effective within one to several minutes
- Some are respiratory irritants and/or sensitizers: can cause or trigger asthma –e.g. quaternary ammonium cmp'ds; sodium hypochlorite (bleach)
- Less toxic examples: hydrogen peroxide, ethyl alcohol, isopropyl alcohol, citric acid, L-lactic acid
- BUT compatibility with surface to be disinfected is important to consider; follow directions

**Antimicrobials in
Hospital Furnishings:**
Do They Help Reduce
Healthcare-Associated Infections?



Ted Schettler MD, MPH

March 2016



Antimicrobials in Hospital Furnishings 1

HAI causes & interventions are multifactorial

Role of contaminated surfaces

Importance of cleaning and disinfection is undeniable

Summaries of antimicrobial coatings and surface technologies; their efficacy

Summaries of laboratory test methods to evaluate bacterial loads on surfaces; some have been modified to evaluate impacts on viral loads and infectivity

<https://tinyurl.com/zjl3fha>

Antimicrobial technologies in products and materials

- Chemicals
- Metals: Copper-, silver-, zinc-containing formulations
- Antimicrobial polymers (some include “quats”)
- In health care settings, their efficacy in reducing healthcare-acquired infections is not yet shown
- Covid19 has increased pressure on manufacturers to expand their more general use (e.g. furnishings)
- Will this be driven by data (efficacy, safety, durability) or by hope and assumptions?



Communication

Can Nanotechnology and Materials Science Help the Fight against SARS-CoV-2?

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<https://www.mdpi.com/2079-4991/10/4/802>

What is being promoted now?

- Cuprous oxide nanoparticles, nanosized copper iodide particles, silver nanoparticles, zinc oxide nanoparticles; sometimes in zeolites (nanoporous alumina silicates)
- Multiple mechanisms of action are involved: inhibit nucleic acid replication; denature enzymes; damage envelope; oxidative stress

Are they effective?

- Goals?: Reduce infective microbial burden? Reduce transmission? Reduce infections? Increase a sense of safety?
 - Efficacy:
 - How was the product evaluated? How does that compare to conditions of use?
 - How generalizable to a range of microbes? To coronaviruses?
 - How long does the effect last under conditions of use?
- (appendix C <https://tinyurl.com/zjl3fha> for summary of test methods)

Efficacy of antimicrobial technologies

- Considerable data on antibacterial properties of various products; not generalizable to all bacterial pathogens
- Some data on impacts on infectivity of viruses; (e.g., influenza, HIV, hepatitis C, HSV, adenoviruses)
- Few data on impacts on coronaviruses specifically

JIS Z 2801 / ISO 22196 (Modification),

Japanese Industrial Standard test for determining antiviral activity of solid materials

- Virus cultured in a cell culture
- Samples of the material treated with test antimicrobial substances and untreated control samples are inoculated with the test virus. (SARS-CoV-2 or a surrogate coronavirus)
- The test virus is held in place under a coverslip and samples are held for a prescribed time and temperature.
- Samples are then assayed for viral infectivity in a cell culture appropriate for the test virus. The percent and log reduction in viral infectivity are calculated and compared to control.

JIS L 1922 : Cell culture assay is similar and can be used to evaluate antiviral textiles

Where are we?

- As of now, there is no evidence that adding antimicrobial properties to the surfaces of products adds value to the array of current recommendations for reducing transmission of SARS-CoV-2 or Covid 19. That could change.

For purchasers

If you are considering purchasing furnishings with antimicrobial properties hoping that they may:

- further reduce the SARS-CoV-2 viral load as one element of a systems response to the pandemic
- reduce viral transmission
- reduce infections and illness, and/or
- help reduce concern and add a sense of security

Look for evidence of efficacy and consider downsides before making a decision.

Evidence to look for:

- Studies of efficacy in destroying coronavirus infectivity; were validated methods for evaluating efficacy used?
- What were the experimental conditions? How do they compare to real-world conditions of use?
- How long do the viricidal properties in this product last under conditions of use?
- What are the implications for proven cleaning and disinfection protocols? False sense of security?
- Are there potential adverse health or environmental impacts of adding this antimicrobial to this product?

For furnishings manufacturers

- Without more data, avoid making added antimicrobials the standard option for any products, with the exception of antimicrobials that are used solely for product protection. Antimicrobials should be a “must select” option to make the decision clear, as well as to track the demand for products containing antimicrobials.
- If antiviral properties are added to high touch surfaces on request because of Covid 19, use technologies that are proven effective in reducing the infectivity of coronaviruses under conditions of use.

For furnishings manufacturers

- Take the lead or collaborate in the design or execution of a research agenda intended to fill data gaps related to efficacy and risks associated with adding antimicrobials to furnishings.
- Require full toxicity testing, studies of potential leaching, and evaluations of potential human or environmental exposure to any antimicrobials used in products.

Thank you

Ted Schettler

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HOW CEH CAN HELP

- Webinars
- Purchaser/ Specifier Resources, e.g.
 - Technical Specifications
 - Lists of Healthier Products
- Product Testing
- Customized Consulting and Technical Assistance



ANSI/BIFMA e3-2019

A New Tool

Credit 7.4.4:

Targeted Chemical Elimination

New criterion restricts the “**Hazardous Handful**”:

- Flame retardants
- PFASs
- Antimicrobials
- PVC
- Formaldehyde

Can apply to level 1, 2, or 3 products

BIFMA



Specify Products That Meet 7.4.4



Thursday, June 4: 1-2:30 pm PT/4-5:30 pm ET

- Safer cleaning and disinfecting practices returning to the workplace
- Procurement of safer disinfectants: what to ask your supplier/put in your contract/look for when purchasing
- Best practices for safer cleaning and disinfecting at home
- Q&A

https://theic2.org/ic2_webinar_safer_cleaning_disinfecting

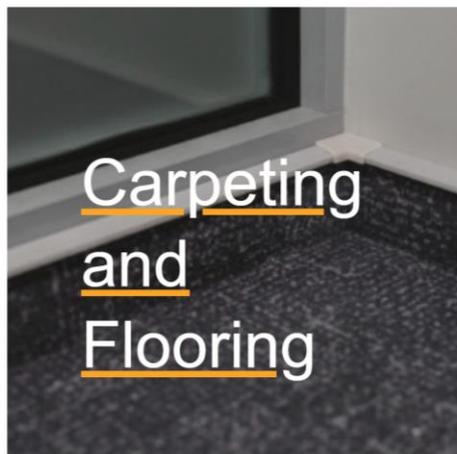




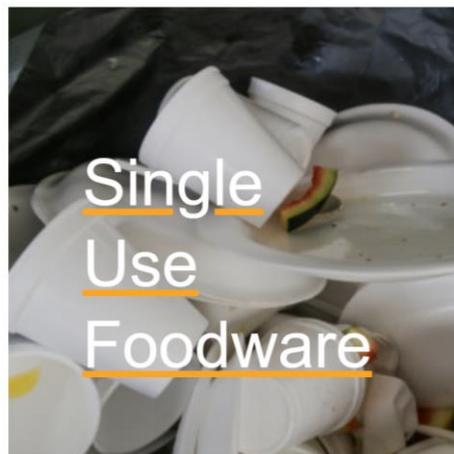
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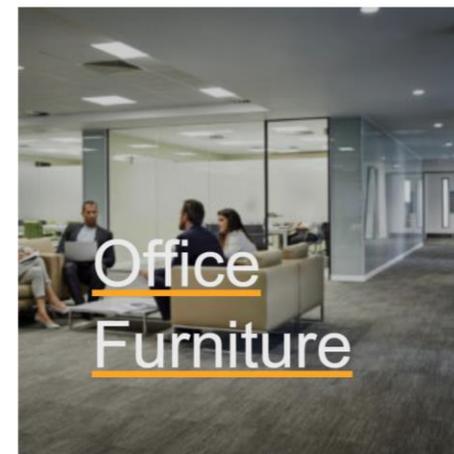
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Thank you!