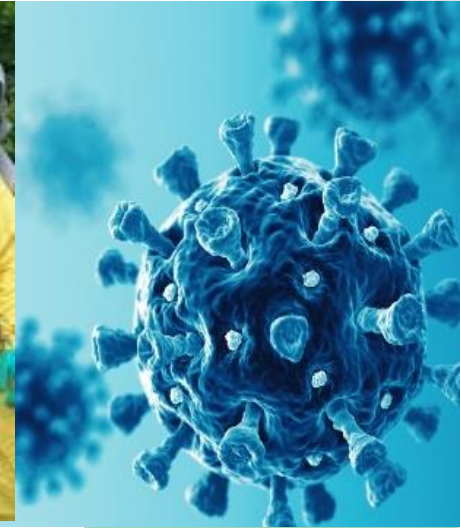


EPA Research to Support Reducing Environmental Transmission of COVID-19



**Shawn Ryan, Kristen Willis, Worth Calfee,
US Environmental Protection Agency
2021 Decon Conference**

Regulatory

- Pesticide Registration (FIFRA)
- FIFRA Enforcement
- Test Method Development

Response

- Cleanup Guidance
- Technical Support
- Preparedness/Mitigation

Research

- Surface Cleaning and Disinfection
- Residual Antimicrobial Coatings
- Pesticide Application and Devices
- Aerosol Treatment
- PPE Disinfection Methods



EPA SARS-CoV-2 Capabilities and Research

- EPA has capabilities to respond to environmental emergencies and address biological contamination
- The world continues to learn much about COVID-19 – EPA has the expertise to add to that knowledge, especially in the areas of exposure, wastewater, and cleaning and disinfection
- EPA researchers are building on an expansive body of world-class research and applying that knowledge to reduce the risk of exposure to SARS-CoV-2
- Aimed to help states & territories, tribes and local governments (e.g., public health agencies) guide the public, businesses and institutions to reduce risk of SARS-CoV-2
- Partnering with CDC, state and local agencies and others





Cleaning and Disinfection

GUIDANCE FOR CLEANING & DISINFECTING

PUBLIC SPACES, WORKPLACES, BUSINESSES, SCHOOLS, AND HOMES



SCAN HERE
FOR MORE
INFORMATION

1 DEVELOP YOUR PLAN

DETERMINE WHAT NEEDS TO BE CLEANED. Areas unoccupied for 7 or more days need only routine cleaning. Maintain existing cleaning practices for outdoor areas.

DETERMINE HOW AREAS WILL BE DISINFECTED. Consider the type of surface and how often the surface is touched. Prioritize disinfecting frequently touched surfaces.

CONSIDER THE RESOURCES AND EQUIPMENT NEEDED. Keep in mind the availability of cleaning products and personal protective equipment (PPE) appropriate for cleaners and disinfectants.

Follow guidance from state, tribal, local, and territorial authorities.

2 IMPLEMENT

CLEAN VISIBLY DIRTY SURFACES WITH SOAP AND WATER prior to disinfection.

USE THE APPROPRIATE CLEANING OR DISINFECTANT PRODUCT. Use an EPA-approved disinfectant against COVID-19, and read the label to make sure it meets your needs.

ALWAYS FOLLOW THE DIRECTIONS ON THE LABEL. The label will include safety information and application instructions. Keep disinfectants out of the reach of children.

3 MAINTAIN AND REVISE

CONTINUE ROUTINE CLEANING AND DISINFECTION. Continue or revise your plan based upon appropriate disinfectant and PPE availability. Dirty surfaces should be cleaned with soap and water prior to disinfection. Routinely disinfect frequently touched surfaces at least daily.

MAINTAIN SAFE PRACTICES such as frequent handwashing, using cloth face coverings, and staying home if you are sick.

CONTINUE PRACTICES THAT REDUCE THE POTENTIAL FOR EXPOSURE. Maintain social distancing, staying six feet away from others. Reduce sharing of common spaces and frequently touched objects.

For more information, please visit **CORONAVIRUS.GOV**





Develop/Implement Your Plan

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<https://www.epa.gov/pesticide-registration/list-n-disinfectants-use-against-sars-cov-2>

- **Cleaning with soap and water** removes germs, dirt and impurities from surfaces.
- **Disinfecting with an EPA-approved disinfectant against COVID-19 virus** kills germs on a surface.
- Follow the label directions
 - Safety
 - Clean
 - Disinfect
 - Appropriate application
 - Wetted contact time



Maintain and Revise Your Plan

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CONTINUE PRACTICES THAT REDUCE THE POTENTIAL FOR EXPOSURE. Maintain social distancing, staying six feet away from others. Reduce sharing of common spaces and frequently touched objects.

- Frequency of cleaning and disinfection
 - Consider use of surface/object
 - Follow specific guidance, as appropriate
- Safe practices
 - Hand washing
 - Cloth face coverings
 - Staying home if sick
- Consider other adjustments
 - Social distancing
 - Reducing shared spaces and objects
 - Reducing soft and porous materials, if appropriate

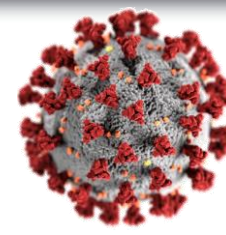
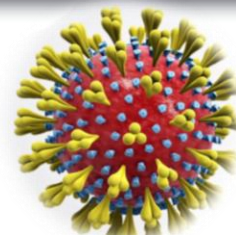
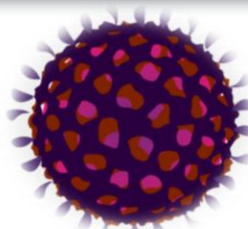
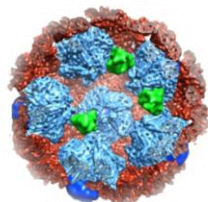
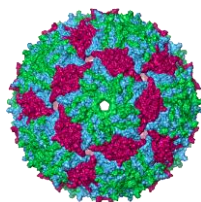


Research topics were selected because they can result in a critical and rapid impact on the current CoV-2 response:

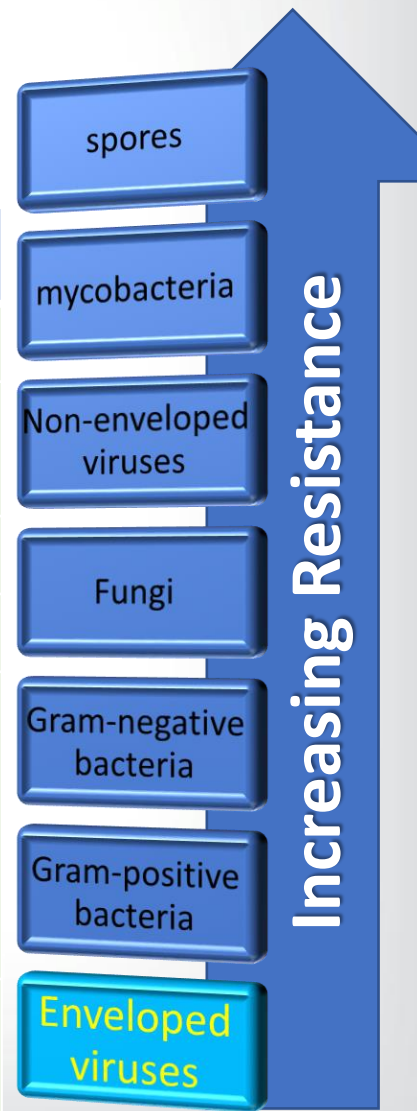
- How can real-world surfaces be cleaned and/or disinfected most effectively?
- Are there ways to disinfect high-touch, public spaces that remain effective for long periods of time?
- What are effective ways to apply disinfectants?
- How effective are alternative disinfection devices, such as UVC?
- How effective are aerosol treatment technologies and what are appropriate methods to determine effectiveness?
- How can PPE be readily and effectively disinfected and reused?



Virus Testing: Comparison



	MS2	Phi6	MHV	229E	SARS-CoV-2
Enveloped?	No	Yes	Yes	Yes	Yes
Host	Bacteria (<i>E. coli</i>)	Bacteria (<i>P. syringae</i>)	Mice	Humans	Humans
Genus	Levivirus	Cystovirus	Betacoronavirus	Alphacoronavirus	Betacoronavirus
BSL	1	1	2	2	3
Advantage	High resistance & persistence, fast and easy analysis	Moderate resistance & persistence, fast and easy analysis	Same genus as SARS-CoV-2, non-human pathogen	Same Family as SARS-CoV-2	Actual agent of COVID-19
Surrogate?	Comparison in progress			Regulatory surrogate	



Cleaning and Disinfection Results

- Testing against beta coronavirus, MHV-A59
- Preliminary results show high effectiveness (disinfection level) for CDC bleach recipe on stainless steel when
 - Sprayed and wait for 10 minutes
 - Spray and wipe immediately
- Wiping with detergent/water wetted wipe demonstrated
 - Some effectiveness (not quite consistent disinfection level) on hard non-porous materials
 - Less effectiveness on porous material (bus/train seat cover material)



- Outcomes

- ✓ Evaluated antiviral efficacy of ~25 antimicrobial coating products
- ✓ Assisted mass-transit agencies with selection of appropriately-vetted and registered products for risk reduction measures
- ✓ Inform stakeholders on realistic expectations of product performance
- ✓ Developed relationship with numerous transit agencies and antimicrobial product companies



Antimicrobial Coatings

The Problem:

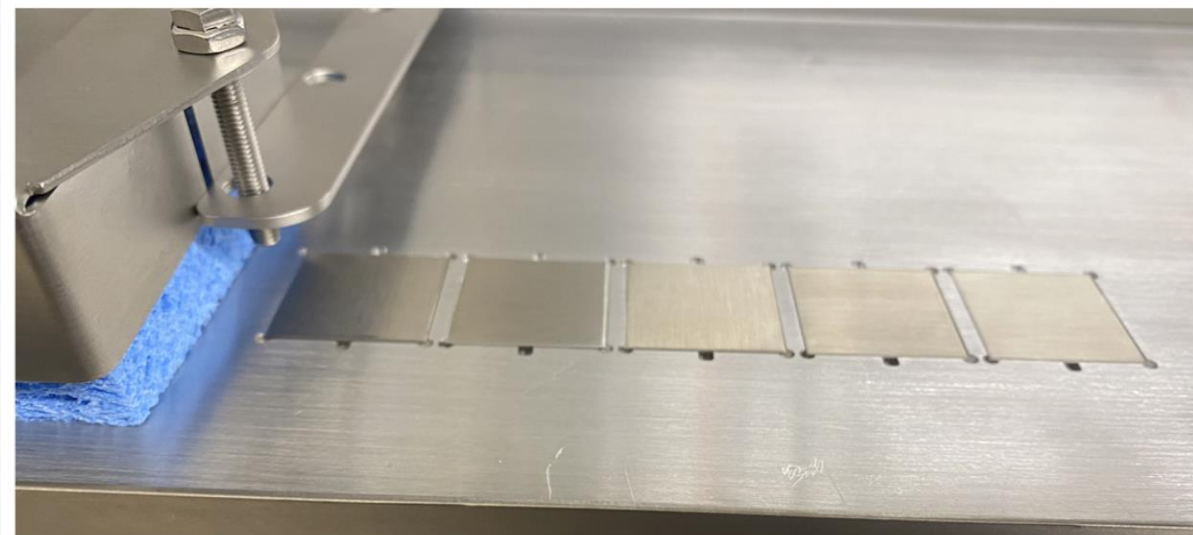
- What are effective ways to reduce exposure in high-traffic environments such as mass-transit?
- Surfaces are likely not the major risk contributor, but should not be neglected
- Unable to clean/disinfect on an interval that is meaningful

And...

- Transit Agencies (and others) inundated by companies advocating for their product or device
- How to choose effective options to reduce risk?



- Antimicrobial Coatings – Questions:
 - Are they effective at killing viruses?
 - How long do they maintain their activity?
 - How durable are they?



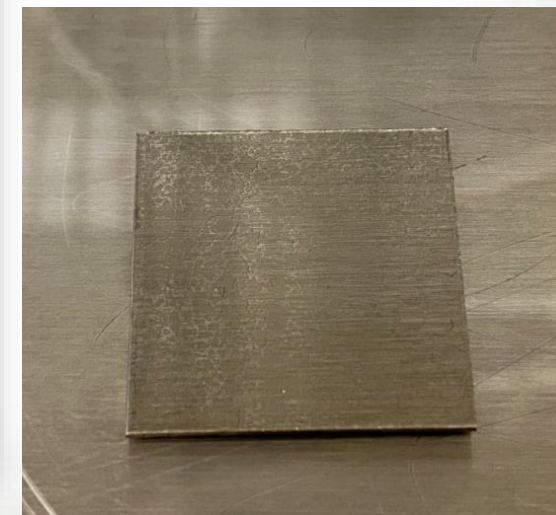
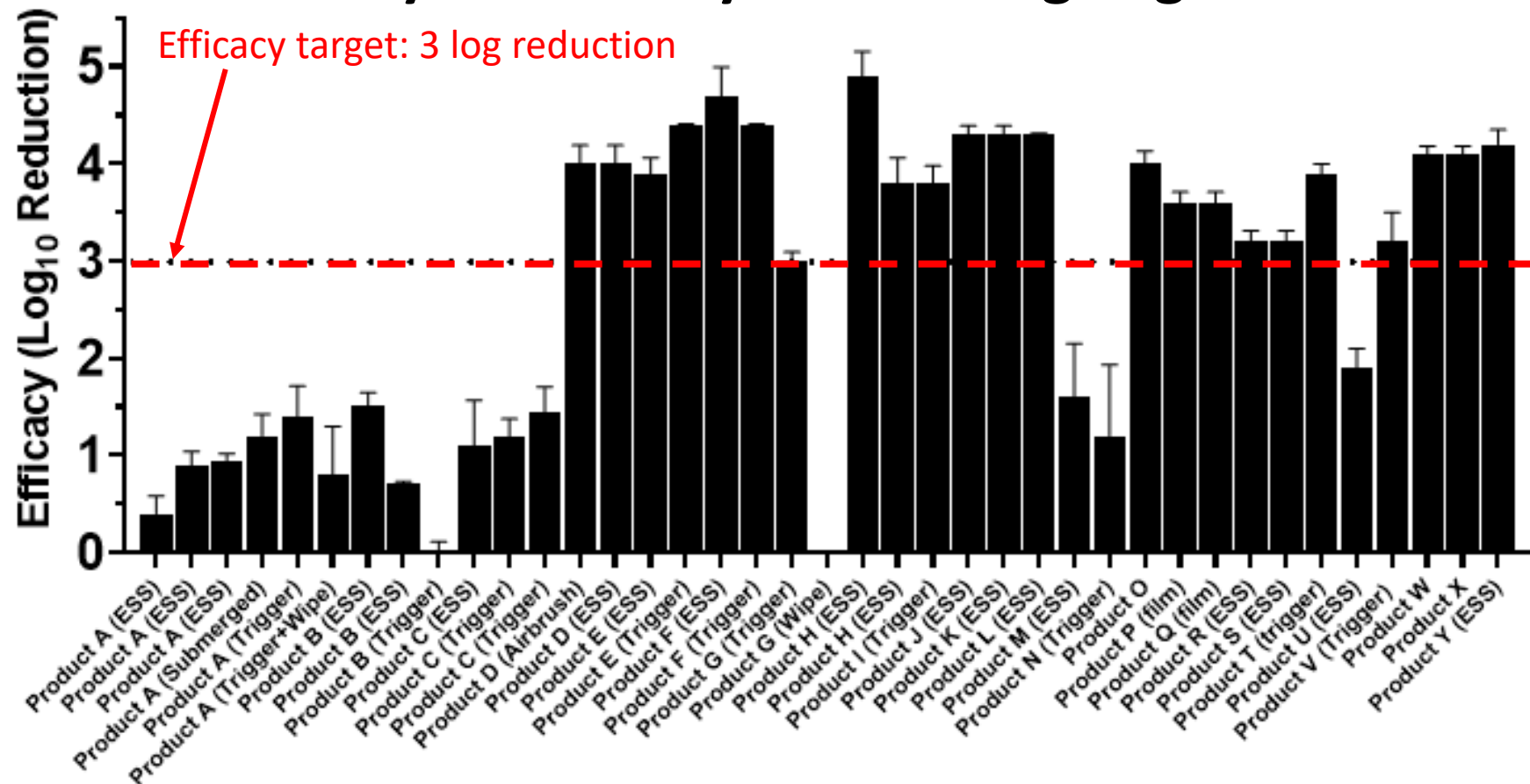


Antimicrobial Coatings

- Approach
 - Collaboration with NYC MTA, LA Metro and other stakeholders to gather input
 - 20+ technology transfer agreements
 - Collaboration with EPA OCSP to develop an interim method for product registration
 - Laboratory evaluation of products with BSL1 viruses to determine efficacy and durability
 - Subset of products evaluated against SARS-CoV-2



Efficacy of One Day-old Coatings Against Phi6





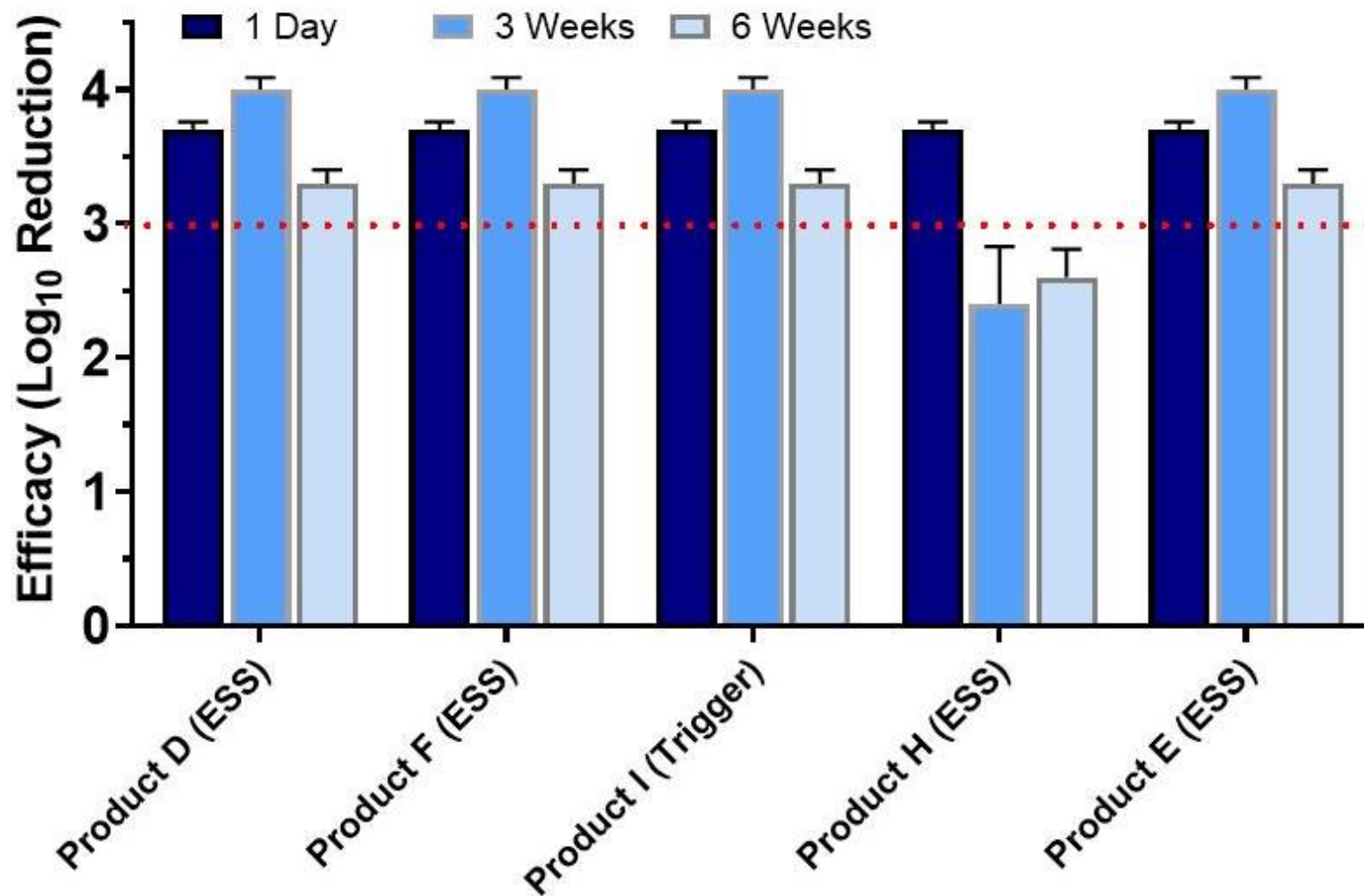
Antimicrobial Coatings: Stability

How Long Do Coatings Maintain Activity?

Test Specifics:

- Coatings on stainless steel coupons
- Applied by ESS or trigger-pull sprayer
- Coupons stored at ambient indoor conditions for 1 day, 3 weeks, or 6 weeks
- Test Challenge: 1×10^6 Phi6 PFU, in PBS + 5% Fetal Bovine Serum, in a 10ul droplet (spread)
- 2-hour contact time

Efficacy of 'Aged' Coatings Against Phi6





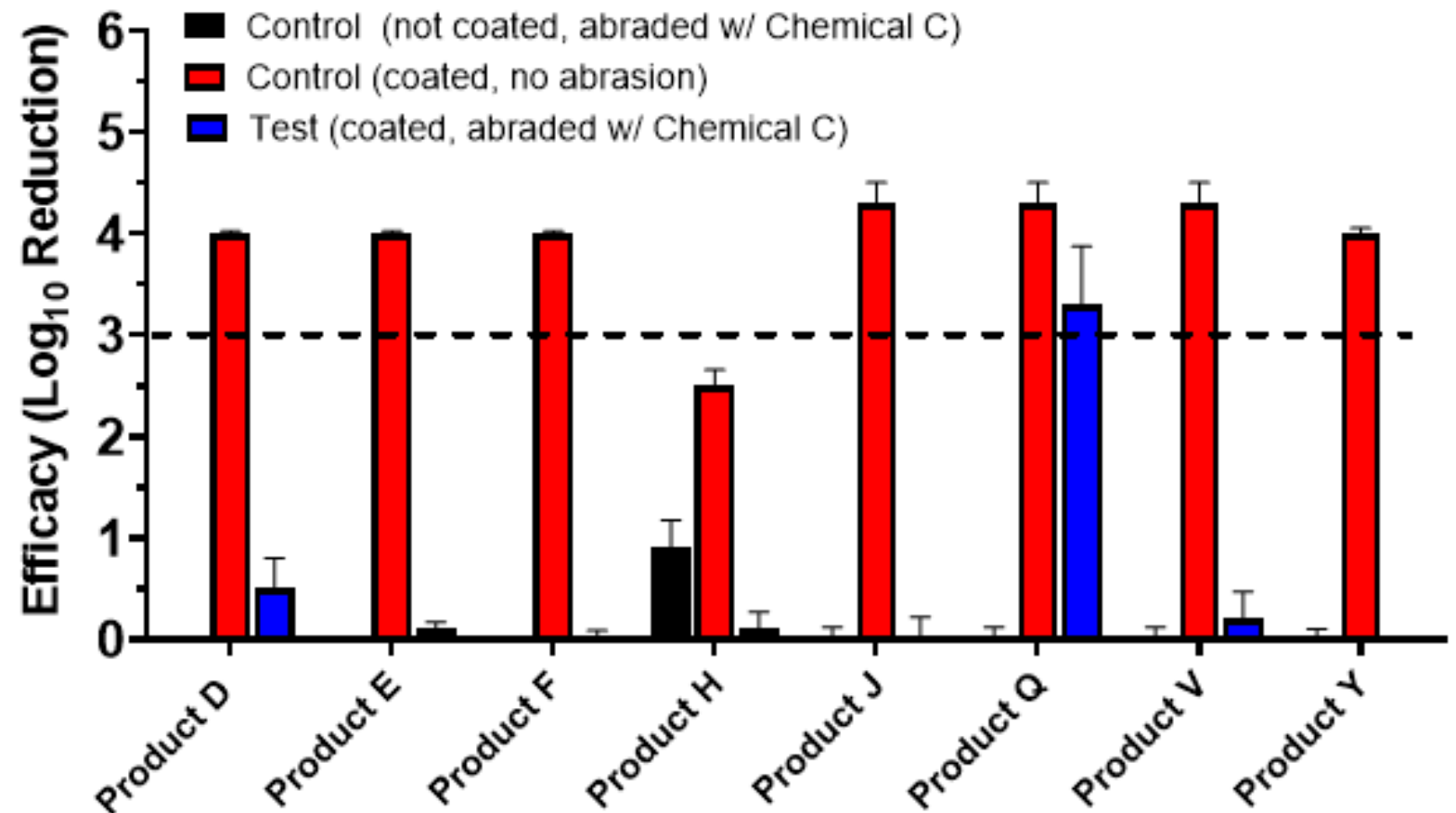
Antimicrobial Coatings: Durability

How Durable are Coatings?

Test Specifics:

- Coatings on stainless steel coupons
- Applied by ESS
- Coatings abraded w/ EPA interim method – Treatment C
- Test Challenge: 1×10^6 Phi6 PFU, in PBS + 5% Fetal Bovine Serum, in a 10ul droplet (spread)
- 2-hour contact time

Efficacy of 'Abraded' Coatings Against Phi6





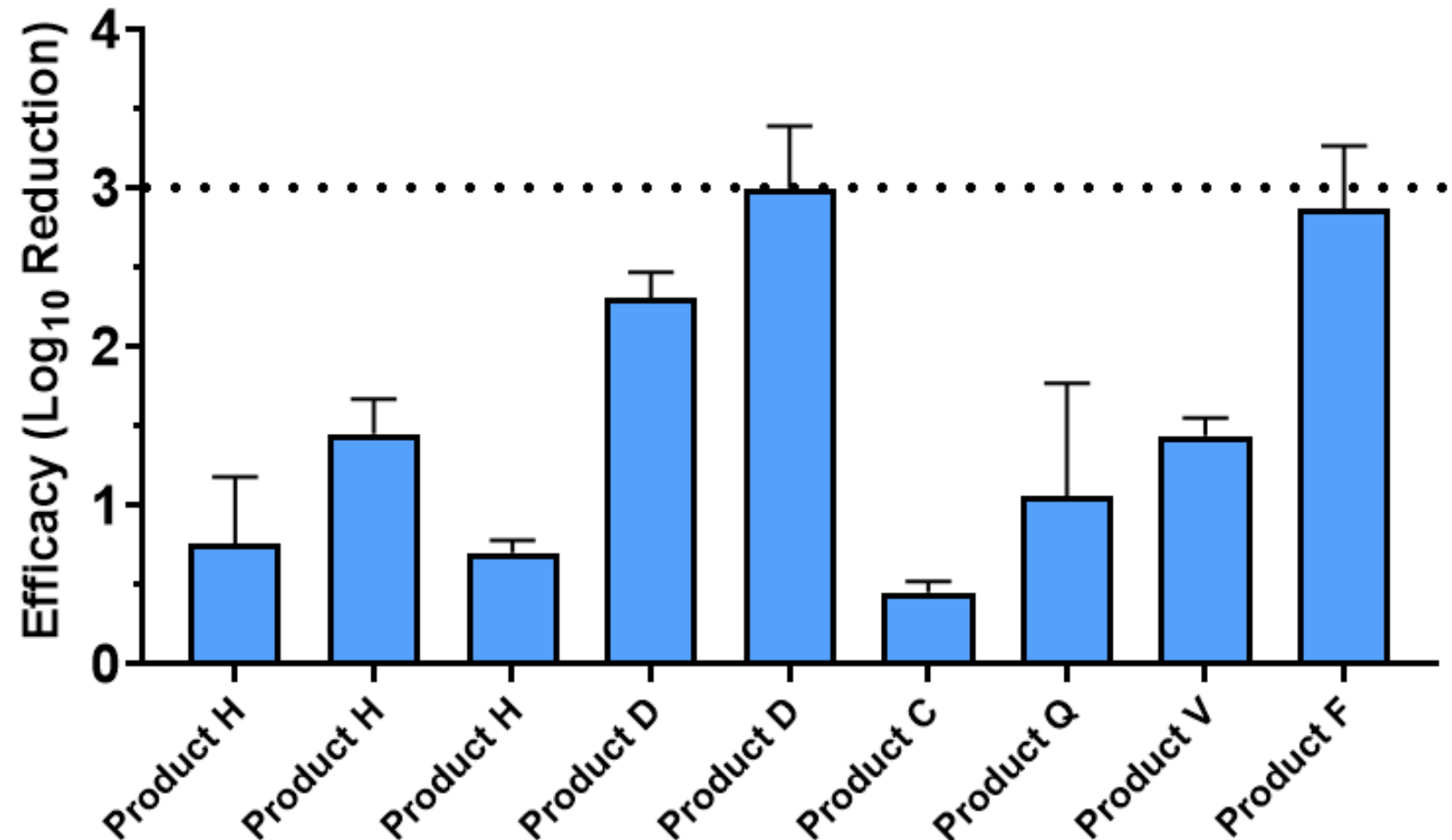
Antimicrobial Coatings: SARS-CoV-2

Do Coatings have Activity against SARS-CoV-2?

Test Specifics:

- Coatings on stainless steel coupons
- Applied by ESS or airbrush
- Test Challenge: 1×10^6 SARS-CoV-2 TCID₅₀, in TC media w/ 5% serum, in a 200ul droplet (spread)
- 2-hour contact time

Efficacy of Antimicrobial Coatings Against SARS-CoV-2



- Summary

- Evaluated antiviral efficacy of ~25 antimicrobial coating products
- Product efficacy against Phi6 ranged from very good to very little
- Product stability was good, when not abraded
- Products have low resistance to wetting and abrasion
- Efficacy against SARS-CoV-2 ranged from 1LR (90%) to 3LR (99.9%)
- Able to inform transit agencies, on expectation of performance from antimicrobial products, and current EPA-registration status

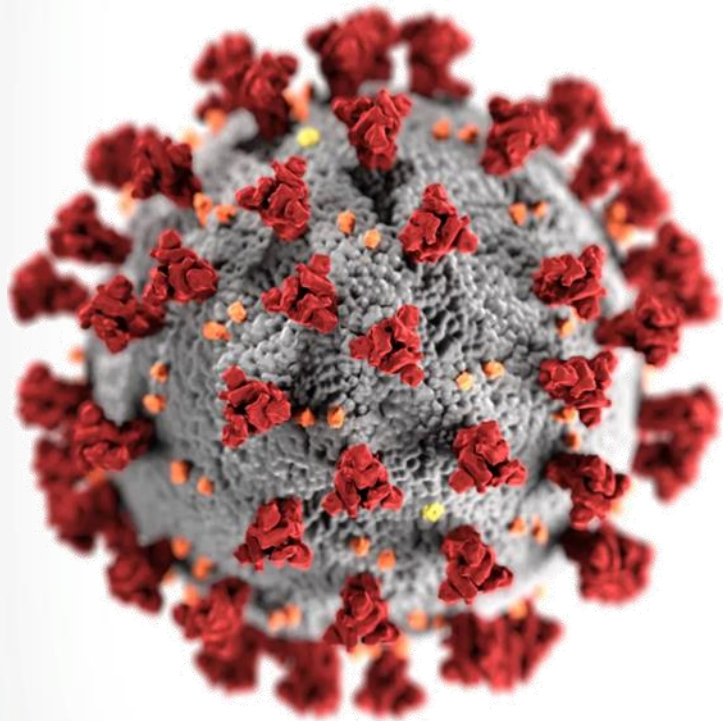




FIFRA- Regulatory Background

- Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) – Authorizes EPA to regulate any pesticide product that is sold and distributed in the U.S.
 - Antimicrobial pesticides destroy or suppress microorganisms in the inanimate environment
- Before any antimicrobial pesticide product can be lawfully sold or distributed, EPA performs a comprehensive scientific assessment of the product.
 - Section 3 registration- Approved products have an EPA Registration number (e.g. XXXX-YYYYY) and accompanying master label that can be viewed on the Pesticide Product Label System Website:
 - <https://www.epa.gov/pesticide-labels/pesticide-product-label-system-ppls-more-information>
- The Agency evaluates the active ingredients, other ingredients in the product and the proposed use pattern to ensure that, when the product is used according to label directions, no unreasonable adverse effects on human health or the environment will occur.

Public health antimicrobial claims



- EPA reviews data to support claims for all public health microorganisms (e.g. SARS-CoV-2, MRSA, C. difficile)
 - Most common claims are sanitizers, disinfectants and sterilants
- The 810 Product Performance Test Guidelines provide methods and performance standards to support most public health claims:
 - <https://www.epa.gov/test-guidelines-pesticides-and-toxic-substances/series-810-product-performance-test-guidelines>
- Data to support non-public health claims (e.g. microbiostat, odor causing bacteria) are not reviewed by EPA
 - Registrant must have data available on request



EPA Disinfectant List N

- EPA's List N site has been viewed over **23 million times** and has been updated weekly since March 2020
- To date, **this list includes over 540** wipes, sprays and products that are effective against SARS-CoV-2 because they meet the following criteria:
 - demonstrated efficacy against the coronavirus SARS-CoV-2 (COVID-19);
 - demonstrated efficacy against a pathogen that is harder to kill than SARS-CoV-2; or
 - demonstrated efficacy against a different human coronavirus similar to SARS-CoV-2.
- Currently over **120 List N products** tested specifically against **SARS-CoV-2**.
- Also features companion FAQs for disinfectants and COVID-19



Collaborative Efforts between OCSPP and ORD



- In **July 2020**, EPA posted guidance and announced expedited review for applications to add directions for use with electrostatic sprayers to products intended to kill SARS-CoV-2.
- In **October 2020**, EPA provided [interim guidance and methods](#) and announced expedited review for products making residual (long-lasting) efficacy claims.
- **Current 2021**, assessment of products to treat air.
- **Devices:** Unlike chemical pesticides, EPA does not routinely review the safety or efficacy of pesticidal devices.

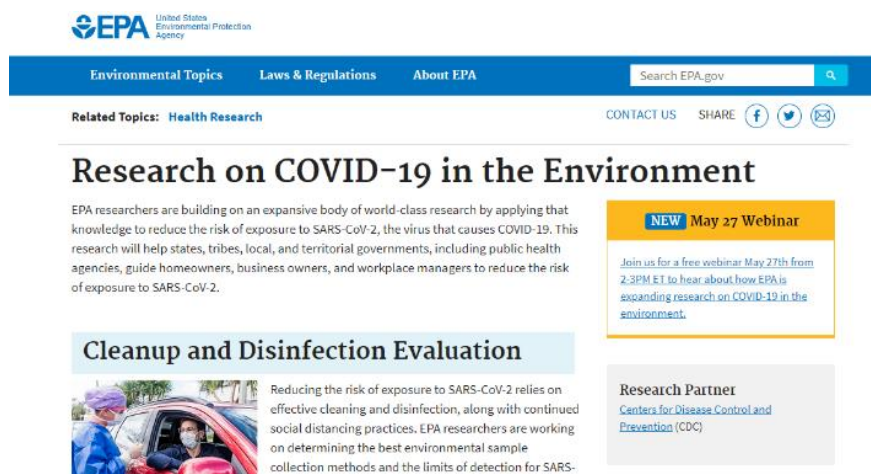
- Cleaning and Disinfection
 - Disinfectants, when applied appropriately, are highly effective on hard, non-porous surfaces
 - Cleaning alone can reduce viral load on hard, non-porous surfaces
- Antimicrobial coatings
 - Demonstrate promise from initial effectiveness and stability
 - Challenge with durability as supplemental coating products



EPA COVID-19 Research Website

More information is available at EPA's CoV-2 Research website:

<https://www.epa.gov/healthresearch/research-covid-19-environment>



Additional research questions can be submitted to CESER@epa.gov

DISCLAIMER: The United States Environmental Protection Agency (EPA), through its Office of Research and Development, funded and managed the research described. This presentation was peer and administratively reviewed and has been approved for presentation as an Environmental Protection Agency document. It does not necessarily reflect the views of the Environmental Protection Agency. No official endorsement should be inferred. This presentation includes photographs of commercially-available products. The photographs are included for purposes of illustration only and are not intended to imply that EPA approves or endorses the product or its manufacturer. EPA does not endorse the purchase or sale of any commercial products or services. Data presented herein did not undergo a formal quality assurance review as outlined in "U.S. EPA Office of Research and Development's Quality Management Plan for Scientific Research". If these data are included in future EPA reports or other publications, they will be subjected to this review.