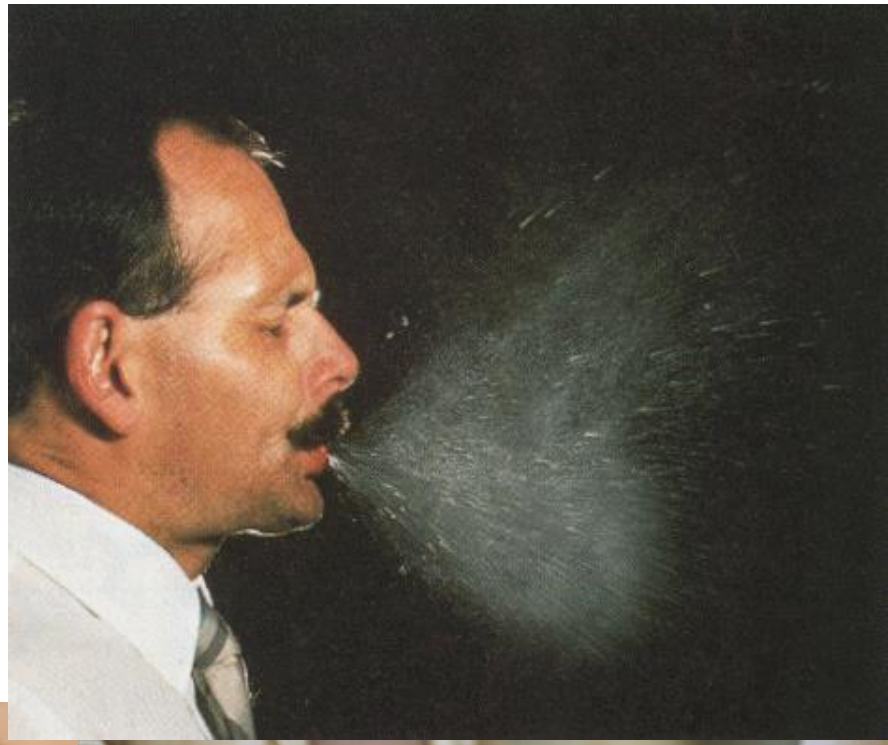
# SAFE CLEANING AND DISINFECTING OF INDOOR ENVIRONMENTS

Nancy P. Bernard, MPH, REHS

May 4, 2020

# Spreading Germs

- Foodborne
- Waterborne
- Person-to-Person
- Airborne
- Droplet transmission
- Contaminated surfaces



# Prevention – Everyone's Job!

- Wash your hands with plain soap and water – often!
- Cover your cough or sneeze.
- Avoid touching your eyes, nose, or mouth.
- Stay out of spit zones (**social distancing**).
- Get vaccinations.
- **Good ventilation.**
- Stay home when ill.
- Support Public Health.

# Soap

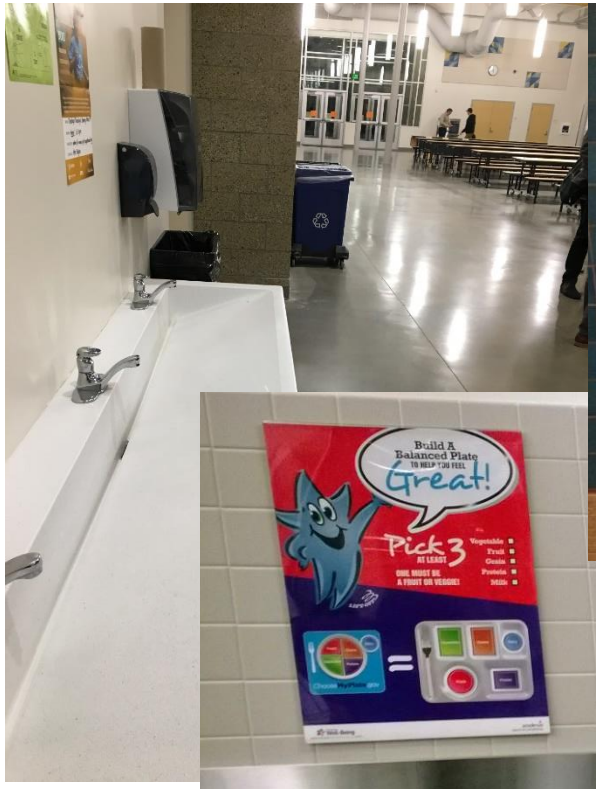
- Fragrance Free
- Dye Free
- Scrub for 20 seconds
- NO antibacterial soaps

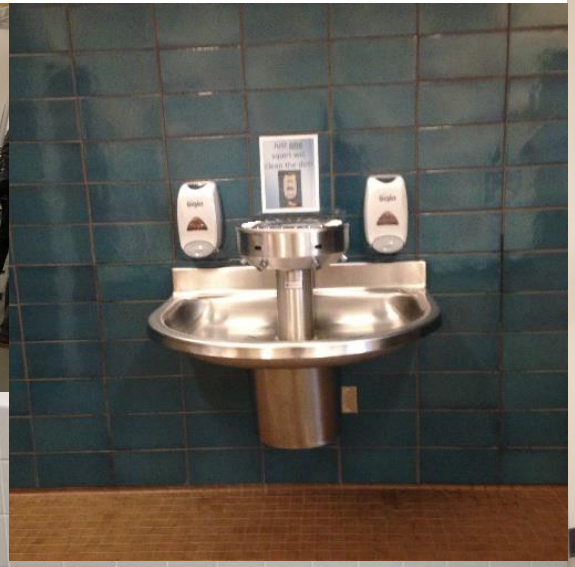
# Hand Sanitizer


- Not a substitute for hand washing
- Not effective on dirty hands
- At least 60% alcohol
- Hands should stay wet for 10-15 seconds
- Not considered effective on non-enveloped viruses or spores
- Flammable / poison
- Fragrance free
- Not recommended:
  - Benzalkonium chloride, “quat” based / non-alcohol / “natural”

CDC: Show Me the Science:
http://www.cdc.gov/handwashing/show-me-the-science-hand-sanitizer.html

# Sinks, Sinks, and more Sinks





# Electric Hand Dryers

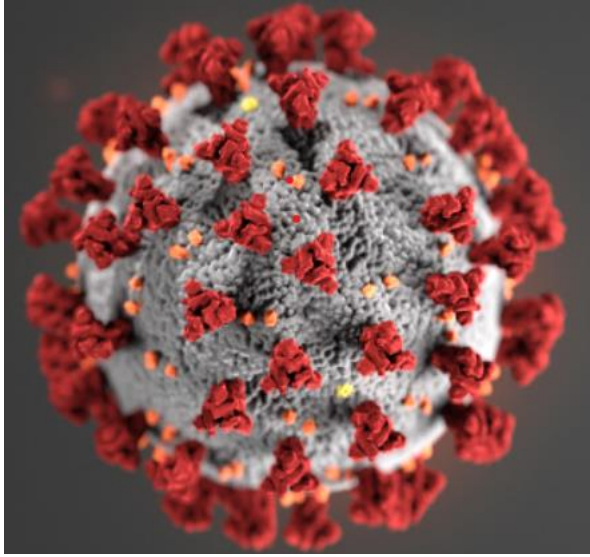
"Modern hand dryers are much worse than paper towels when it comes to spreading germs, according to new research. Airborne germ counts were 27 times higher around jet air dryers in comparison with the air around paper towel dispensers."

---

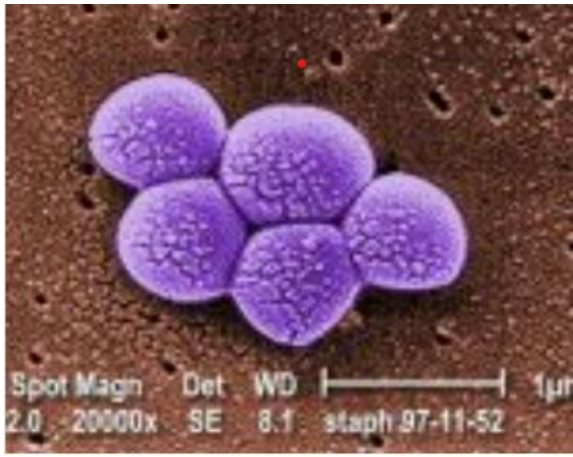
"jet-air" and warm air dyers studied

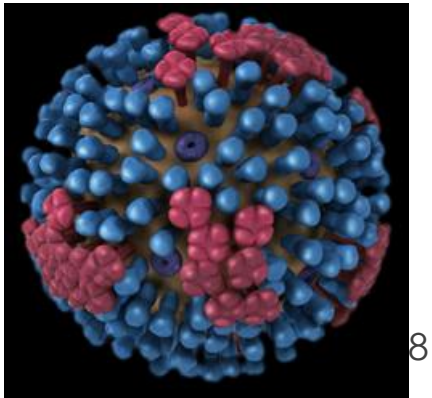
E.L. Best, P. Parnell, M.H. Wilcox. **Microbiological comparison of hand-drying methods: the potential for contamination of the environment, user, and bystander**. *Journal of Hospital Infection*, 2014.

# Microorganisms



- Influenza
- Measles
- *Pertussis* (Whooping Cough)
- COVID-19
- MRSA
  *Methicillin Resistant Staphylococcus aureus*
- Norovirus
- *Clostridium difficile* (C. diff)



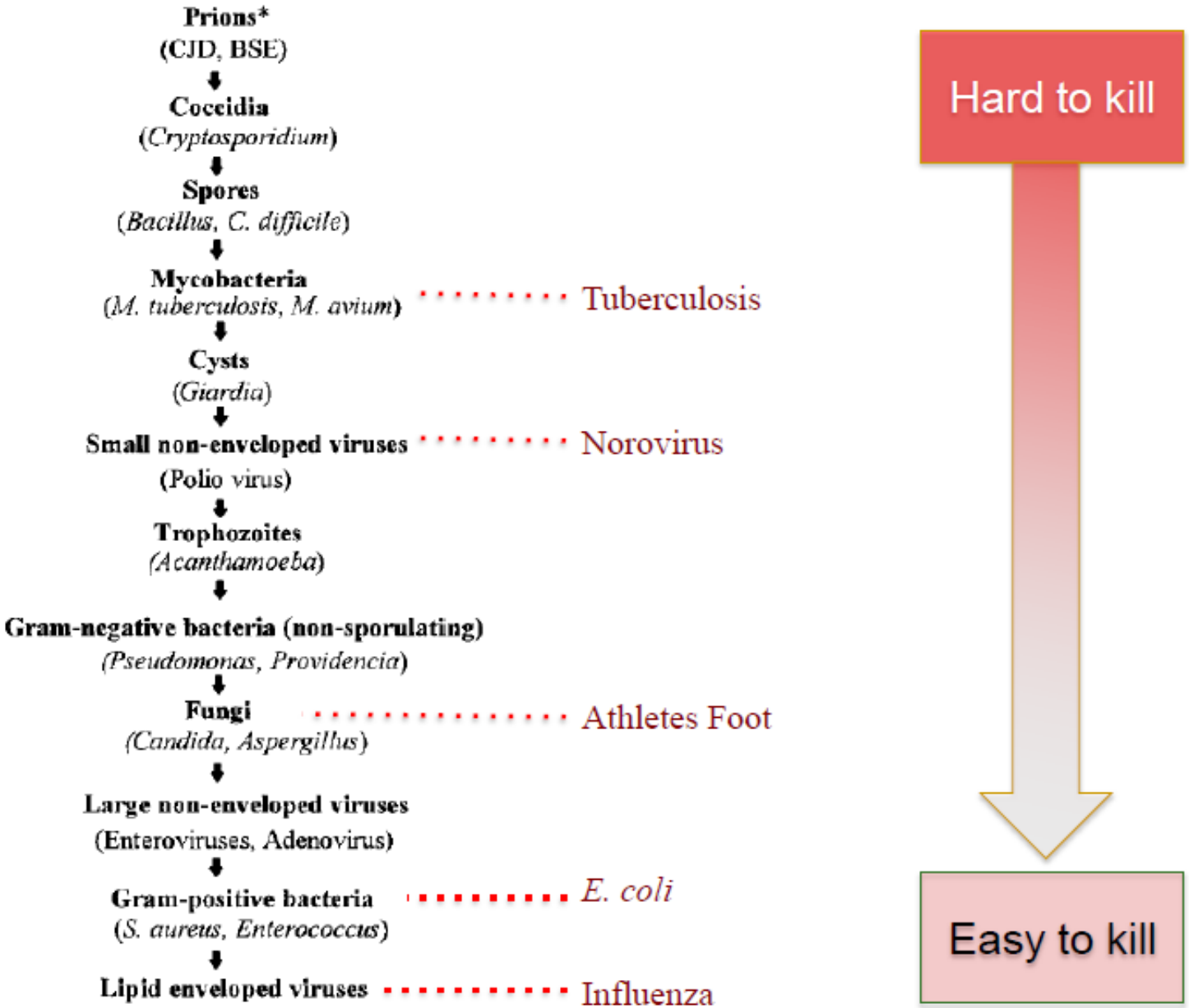



FIG. 1. Descending order of resistance to antiseptics and disinfectants. The asterisk indicates that the conclusions are not yet universally agreed upon.

Source: McDonnell & Russell, 1999

# SARS-CoV-2 Survivability

## Initial Study – more to learn

- SARS-CoV-2 – the virus that causes the disease COVID-19
  - (the novel human coronavirus)
- May float in the air about 3 hours
- May live on plastic and stainless steel up to 72 hours
- Copper – dead after 4 hours
- Cardboard – dead after 24 hours

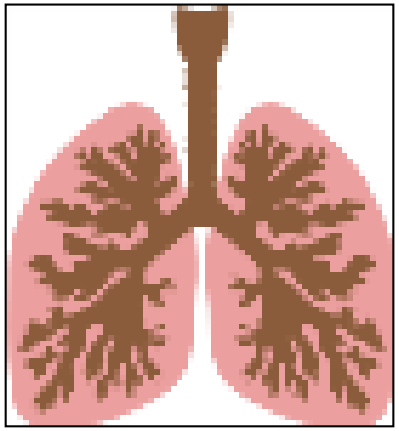
- https://www.nih.gov/news-events/news-releases/new-coronavirus-stable-hours-surfaces
- https://www.nejm.org/doi/full/10.1056/NEJMc2004973

# Clean – Sanitize – Disinfect?

- **Cleaners**, **Soaps**, **Detergents**
  - Remove dirt/organics.
- **Sanitizers**
  - Reduce germs from surfaces – 99.9%.
- **Disinfectants**
  - Destroy or inactivate germs and prevent them from growing.

# Health Hazards of Cleaning Products

- Causing asthma and making it worse
- Irritating skin, eyes, nose, throat, causing headaches
- Disrupting or acting like hormones
- Cancer risk



# Work -Related Asthma

New asthma from work

or

Asthma gets worse while at work

# Work Related Asthma

- Bleach
- Acid cleaners
- Disinfectants
- Carpet cleaner
- Floor stripper
- Ammonia
- Graffiti removers
- Mixing cleaning products, etc.

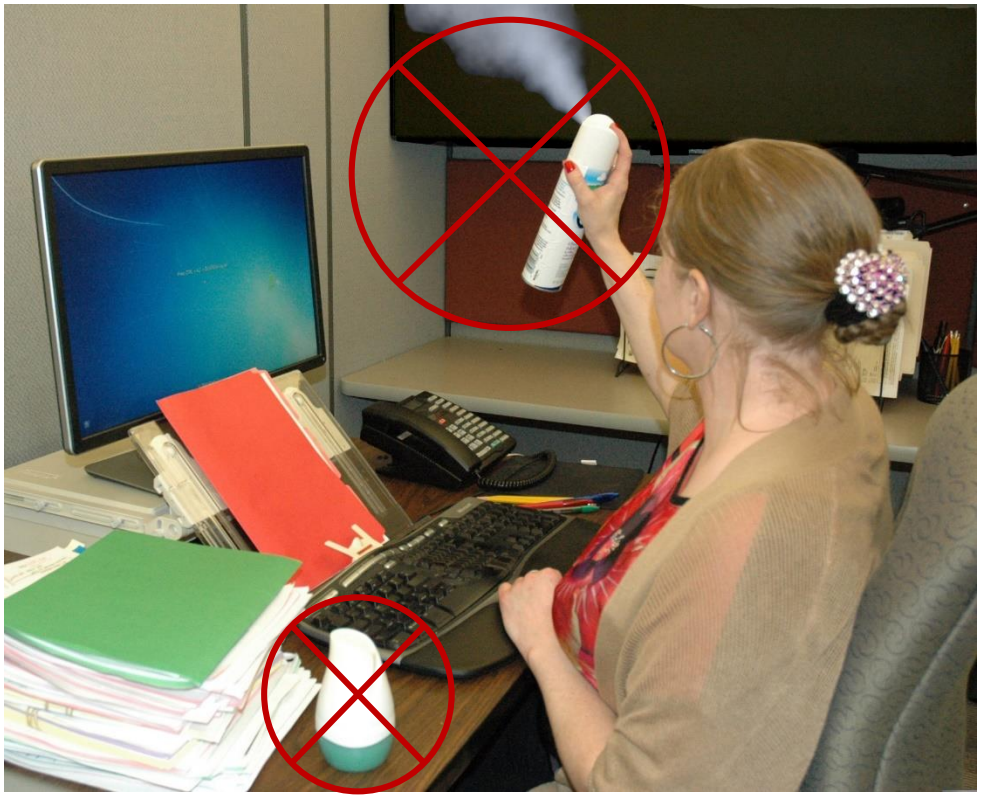
# New Asthma

People may get asthma as adults from exposures at work

Asthmagens: Ingredients that may cause asthma

Small amounts
⟶ lifetime impact

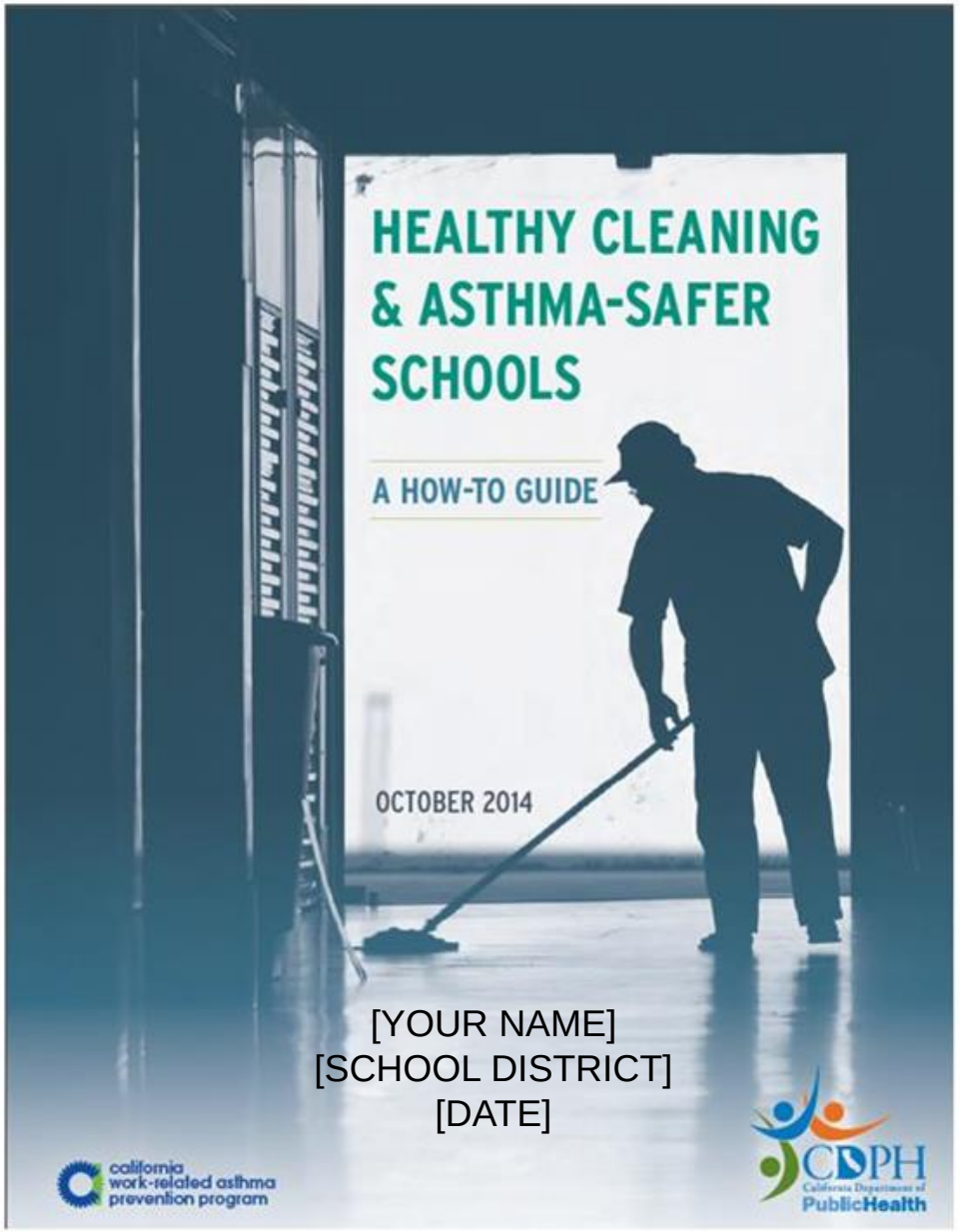
Asthma triggers: cause asthma attacks – which cause permanent damage



# Asthma-Safer Cleaning

- Update and maintain equipment
- Ventilate adequately – bring in outside air
- Regularly change air filters
- Air fresheners are not asthma-safer
- Clean has no scent
- Safe Product Selection

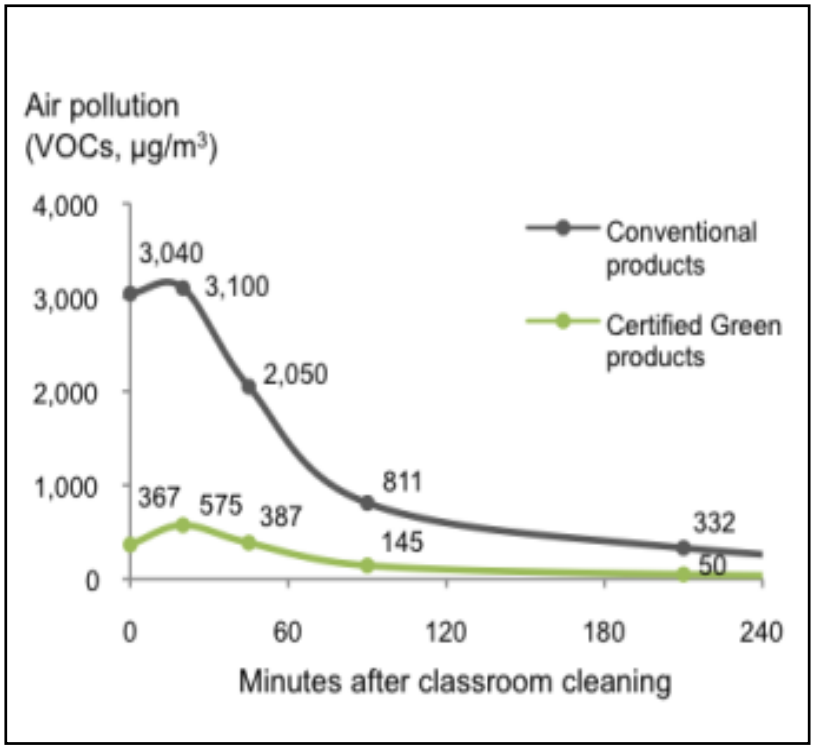
Staff and students deserve to work and learn in a safe and healthy school environment, and they can, since safer cleaning products and methods exist.



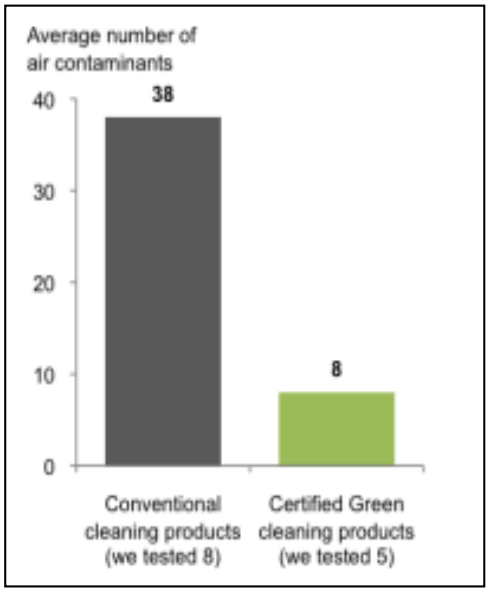
# Green Cleaning
# (Always Clean Before You Disinfect)

Definition: Products and services that reduce health and environmental impact compared to other products and services used for the same purpose.

# Greener School Cleaning Supplies = Fresh Air + Healthier Schools




Green cleaning releases less air pollution




Green general purpose cleaners had fewer air contaminants

# Greenwashing

- Selling you a “green” product that isn’t actually green.

- Third-party certified groups make sure products meet criteria to reduce risks to health and the environment.

Advertising and labels not always reliable

# Greenwashing


Company's self-declared green products may not be safer or healthier

# Certification Programs

Green Seal Industrial and Institutional Cleaners Standard (GS-37)

UL ECOLOGO Hard Surface Cleaners Standard (UL 2759)

EPA (Fragrance-Free) Safer Choice

# Cleaning and Disinfecting Procedures

- *Cleaning* refers to the removal of dirt and impurities, including germs, from surfaces. Cleaning alone does not kill germs. But by removing the germs, it decreases their number and therefore any risk of spreading infection.

- *Disinfecting* works by using chemicals to kill germs on surfaces. This process does not necessarily clean dirty surfaces or remove germs. But killing germs remaining on a surface after cleaning further reduces any risk of spreading infection.

- Third party certified (Green Seal, EPA Fragrance-free Safer Choice) "green" cleaners

- Disinfecting with an Environmental Protection Agency (EPA) disinfectant registered for use against the novel coronavirus - see List N: Disinfectants for Use Against SARS-CoV-2.

- EPA's Design for the Environment antimicrobial pesticide (safer disinfectants) program such as those based on hydrogen peroxide or alcohol.

# Disinfection

- Use the proper concentration of disinfectant.
- Allow the required wet contact time.
- Follow the product label hazard warnings and instructions for personal protective equipment (PPE) such as gloves, eye protection, and adequate ventilation.
- Use disinfectants in a well ventilated space and not around children.
- Obtain the Safety Data Sheet (SDS).
- Parents, teachers and staff should not supply disinfectants and sanitizers.
- Keyboards and other sensitive electronics: Use alcohol wipes. Wash hands before and after use and do not touch your face while using. Do not assume they are sterile.

# Disinfectants

Considered pesticides by Environmental Protection Agency (EPA)

Cannot be third-party certified by Green Seal or UL ECOLOGO

EPA's Design for the Environment has a safer disinfectants program

# Characteristics of Selected Disinfectants

For More Information, see the 'Disinfection 101' document at www.cfsph.iastate.edu

| Disinfectant Category | Alcohols | Aldehydes | Biguanides | Halogens: Hypochlorites | Halogens: Iodine Compounds | Oxidizing Agents | Phenols | Quaternary Ammonium Compounds (QAC) |
|---|---|---|---|---|---|---|---|---|
| **Sample Trade Names** | Ethyl alcohol<br>Isopropyl alcohol | Formaldehyde<br>Glutaraldehyde | Chlorhexidine<br>Nolvasan®<br>Virosan® | Bleach | Betadyne®<br>Providone® | Hydrogen peroxide<br>Peracetic acid<br>Virkon S®<br>Oxy-Sept 333® | One-Stroke Environ®<br>Pheno-Tek II®<br>Tek-Trol® | Roccal®<br>DiQuat®<br>D-256® |
| **Mechanism of Action** | •Precipitates proteins<br>•Denatures lipids | •Denatures proteins<br>•Alkylates nucleic acids | •Alters membrane permeability | •Denatures proteins | •Denatures proteins | •Denature proteins and lipids | • Denatures proteins<br>• Alters cell wall permeability | • Denatures proteins<br>• Binds phospholipids of cell membrane |
| **Advantages** | •Fast acting<br>•Leaves no residue | •Broad spectrum | •Broad spectrum | •Broad spectrum<br>•Short contact time<br>•Inexpensive | •Stable in storage<br>•Relatively safe | •Broad spectrum | • Good efficacy with organic material<br>• Non-corrosive<br>• Stable in storage | • Stable in storage<br>• Non-irritating to skin<br>• Effective at high temperatures and high pH (9-10) |
| **Disadvantages** | •Rapid evaporation<br>•Flammable | •Carcinogenic<br>•Mucous membranes and tissue irritation<br>•Only use in well ventilated areas | •Only functions in limited pH range (5–7)<br>•Toxic to fish (environmental concern) | •Inactivated by sunlight<br>•Requires frequent application<br>•Corrodes metals<br>•Mucous membrane and tissue irritation | •Inactivated by QACs<br>•Requires frequent application<br>•Corrosive<br>•Stains clothes and treated surfaces | •Damaging to some metals | • Can cause skin and eye irritation | |
| **Precautions** | Flammable | Carcinogenic | | Never mix with acids; toxic chlorine gas will be released | | | May be toxic to animals, especially cats and pigs | |
| **Vegetative Bacteria** | Effective | Effective | Effective | Effective | Effective | Effective | Effective | YES—Gram Positive<br>Limited—Gram Negative |
| **Mycobacteria** | Effective | Effective | Variable | Effective | Limited | Effective | Variable | Variable |
| **Enveloped Viruses** | Effective | Effective | Limited | Effective | Effective | Effective | Effective | Variable |
| **Non-enveloped Viruses** | Variable | Effective | Limited | Effective | Limited | Effective | Variable | Not Effective |
| **Spores** | Not Effective | Effective | Not Effective | Variable | Limited | Variable | Not Effective | Not Effective |
| **Fungi** | Effective | Effective | Limited | Effective | Effective | Variable | Variable | Variable |
| **Efficacy with Organic Matter** | Reduced | Reduced | ? | Rapidly reduced | Rapidly reduced | Variable | Effective | Inactivated |
| **Efficacy with Hard Water** | ? | Reduced | ? | Effective | ? | ? | Effective | Inactivated |
| **Efficacy with Soap/ Detergents** | ? | Reduced | Inactivated | Inactivated | Effective | ? | Effective | Inactivated |

? Information not found

*Disclaimer: The use of trade names does not in any way signify endorsement of a particular product. For additional product names, please consult the most recent Compendium of Veterinary Products.*

References: Linton AH, Hugo WB, Russel AD. Disinfection in Veterinary and Farm Practice. 1987. Blackwell Scientific Publications; Oxford, England; Quinn PJ, Markey BK. Disinfection and Disease Prevention in Veterinary Medicine, In: Block SS, ed., Disinfection, Sterilization and Preservation. 5th edition. 2001. Lippincott, Williams and Wilkins: Philadelphia.



the Center for Food Security & Public Health
Iowa State University
www.cfsph.iastate.edu

# Safer Products and Practices for Disinfecting and Sanitizing Surfaces

## San Francisco Department of the Environment 2014

**Table 1. Summary of Health and Environmental Attributes of 11 Active Ingredients Commonly Found in Surface Disinfectants and Non-food Contact Sanitizers**

| ACTIVE INGREDIENT | CANCER | REPRODUCTIVE TOXICITY | ASTHMA | SKIN SENSITI-ZATION | AQUATIC TOXICITY | PERSISTENCE |
|---|---|---|---|---|---|---|
| Caprylic Acid | No | No | No | No | Med acute | Low |
| Citric Acid | No | No | No | No | None | Low |
| Hydrogen Peroxide | No[1] | No | No | No | High acute | Low |
| Lactic Acid | No | No | No | No | None | Low |
| Ortho-Phenylphenol (OPP) | Known | Suspected | No | No | Very high acute | Low |
| Peroxyacetic Acid (PAA) | No | No | Yes | No | Very high acute | Low |
| Pine Oil | No[2] | No | No[3] | Yes | None | Low |
| Quaternary Ammonium Chloride Compounds (Quats) | No | Suspected | Yes | One compound[4] | High acute, med | Very High |
| Silver | No | No | No | No | High acute | Very High |
| Sodium Hypochlorite (Chlorine Bleach) | No | No | Yes | No | Very high acute | Low |
| Thymol | No | No[5] | No | Yes | High acute | Low |

# EPA's Design for the Environment

- Antimicrobial Pesticide Pilot Project
- The DfE logo on an EPA-authorized antimicrobial pesticide label means that the product:
  - Is in the least-hazardous classes (III & IV) of EPA's acute toxicity)
  - Is unlikely to have carcinogenic or endocrine disruptor properties
  - Is unlikely to cause developmental, reproductive, mutagenic, or neurotoxicity issues
  - All ingredients reviewed
  - Does not require the use of agency mandated PPE
  - Has no unresolved efficacy failures
  - Has no unresolved compliance/enforcement action

# Disinfectants

| Asthma-Safer Ingredients | Ingredients that may Cause Asthma |
| --- | --- |
| • Hydrogen Peroxide<br>• Lactic Acid<br>• Citric Acid<br>• Alcohol-ethyl alcohol, isopropyl alcohol | • Quaternary ammonium compounds include alkyl dimethyl benzyl ammonium chloride, benzalkonium chloride, lauryl dimethyl benzyl ammonium chloride, didecyl dimethyl ammonium chloride<br>• Bleach (sodium hypochlorite)<br>• Acetic acid (found in vinegar)<br>• Thymol (skin sensitizer, suspected asthmagen)<br>• Glutaraldehyde<br>• Peracetic acid (peroxyacetic acid) |

# Resources - Safer Disinfectants

## Safer Cleaning, Sanitizing and Disinfecting Strategies to Reduce and Prevent COVID-19 Transmission

Proper cleaning and disinfecting are important for reducing the spread of COVID-19. This fact sheet provides best practices for cleaning, sanitizing and disinfecting surfaces to prevent the spread of disease while minimizing harmful chemical exposures. These practices focus on the workplace, however they can be applied in any setting. Consult the U.S. Centers for Disease Control and Prevention and the U.S. National Institute for Occupational Health and Safety for the most current information.

Remember, when possible for handwashing and cleaning surfaces, soap and water is always the best option.

### Why are we talking about safer practices?

**Hazardous chemicals are common in cleaning, sanitizing and disinfecting products.**

People using these products, and people in the spaces where they are used, can get sick or develop illnesses, including asthma. Others harm reproductive health or may cause cancer if too much exposure occurs. Some damage skin or other body systems. For example, custodians using cleaning products and disinfectants are most likely to get work-related asthma. Four out of five workers with job-related asthma in the U.S. were in areas during, or right after, cleaning was done.[1]

**Safer options are available**

Look for Safer Choice, Green Seal®, Ecologo® and Design for the Environment (DfE) labels on products.

These labels are on environmentally preferable cleaning products and disinfectants that have a lesser or reduced effect on human health and the environment. These labels have strict requirements and can help you avoid chemicals that have negative impacts.

### Key Terms

**Cleaner**

Removes germs, dirt, and impurities from surfaces or objects. Works by using soap/detergent, water and friction to physically remove dirt and germs from surfaces. Cleaning before disinfecting reduces spreading infection more than disinfecting alone.

**Sanitizer**

Reduces germs on surfaces to levels considered safe for public health (usually 99.99%). Products must be EPA registered.

**Disinfectant**

Destroys almost all infectious germs, when used as the label directs on a surface. No effect on dirt, soil, or dust. Should be used where required by law, in high-risk and high-touch areas, or in case of infectious disease. Products must be EPA registered.

DEPARTMENT OF ENVIRONMENTAL & OCCUPATIONAL HEALTH SCIENCES | UNIVERSITY of WASHINGTON | SCHOOL OF PUBLIC HEALTH deohs.washington.edu

**https://osha.washington.edu/sites/default/files/documents/FactSheet_Cleaning_Final_UWDEOHS_0.pdf**

## SAFER DISINFECTANTS ON EPA'S LIST OF RECOMMENDED ANTIMICROBIAL PRODUCTS FOR USE AGAINST NOVEL HUMAN CORONA VIRUS

**Responsible Purchasing Network**

**March 2020**

Because there is an urgent need for clear and consistent information about cleaning, disinfecting and sanitizing practices that are most likely to remove and kill COVID-19, it is critically important for all of us to follow the guidance issued by the US Environmental Protection Agency (EPA) and CDC.

The US Environmental Protection Agency (EPA) has published – and *List N: EPA's Registered Antimicrobial Products for Use Against Novel Coronavirus SARS-CoV-2, the Cause of COVID-19.* List N includes over 350 EPA-registered disinfecting products that, according to EPA "have qualified under [its] emerging viral pathogen program for use against SARS-CoV-2, a coronavirus that causes COVID-19. Coronaviruses are enveloped viruses, meaning they are one of the easiest types of viruses to kill with the appropriate disinfectant product."

The Responsible Purchasing Network has identified and is promoting products on EPA's List N that are the safest from the perspective of protecting human health and the environment from toxic risks because they contain only antimicrobial ingredients (such as hydrogen peroxide, ethanol, or citric acid) that are not known to cause occupational asthma or cancer. These surface disinfectants can often replace chlorine bleach or quaternary ammonium chloride compounds, which have been linked to these adverse human health effects.


EPA's List N includes several of the safer hydrogen peroxide-based "safer" surface disinfectants that are recommended in San Francisco's *Safer Products and Practices for Disinfecting and Sanitizing Surfaces* report, which RPN helped to develop. These include, but are not limited to:

- Clorox Commercial Solutions® Hydrogen Peroxide Disinfecting Cleaner and **Clorox Healthcare Hydrogen Peroxide Cleaner Disinfectant** (EPA Registration No. 67619-24) a ready-to-use liquid with efficacy against a wide array of bacteria and viruses (including Human Coronavirus) with a 1-minute contact time.
- Clorox Commercial Solutions® Hydrogen Peroxide Cleaner Disinfectant Wipes and **Clorox Healthcare Hydrogen Peroxide Cleaner Disinfectant Wipes** (EPA Registration No. 67619-25), which have efficacy against a wide array of bacteria and viruses (including Human Coronavirus) with a 1-minute contact time.

RPN Responsible Purchasing Network

**https://osha.washington.edu/sites/default/files/documents/Updated%20Safer%20Disinfectants%20List_March%2026%2C%202020.pdf**

# Bleach


- Disinfectant, NOT a cleaner
- Make a fresh solution daily
- **Never mix with ammonia or acid products**
- Use gloves, ventilation, eye protection
- Emergency Eye Wash
  - DOSH Directive 13.0 July 15, 2011

http://www.lni.wa.gov/Safety/Rules/Policies/PDFs/DD1300.pdf

# Cleaning and/or Disinfecting ?

- High-risk areas
  - Athletics
  - Bathrooms – daily
    - Warm water for hand washing (~90-100°F)
  - Health rooms
  - Cafeterias/Kitchens
  - High touch surfaces
    - Door handles
    - Faucets
    - Keyboards
    - Railings
    - Phones
    - Drinking Fountains
- Floors—not usually
- Where someone is ill – vomit/blood/feces/urine

# Special Concerns

- Cake toilet deodorizers
  - paradicholorobenzene
- Citrus & Terpene Solvents
  - D-Limonene
- Nano Technology
  - nano-silver
- “Air Fresheners”
- Ozone generators
- Fragrances
- Anti-microbial soaps
  - Triclosan / Triclocarban
  - Quaternary Ammonia compounds

# Perfumed, Fragranced, & Scented

- **Added fragrances can trigger asthma attacks, allergies, sensitization.**
  - People on the autism spectrum particularly impacted.
- **Eye, skin, and respiratory irritation.**
- **"Fragrance" – a thousand components.**
  - Limonene, pinenes, acetone, ethanol, camphor, benzyl alcohol, ethyl acetate, limonene, **benzene**, **formaldehyde**, 1,4-dioxane, methylene chloride, acetaldehyde, synthetic musks, **phthalates**, etc.
- **A primary source of IA and OA pollutants.**
- **Look for "fragrance-free," not "unscented".**

- **New Fragrance-Free Toolkit from UCLA**
  https://csw.ucla.edu/about/fragrance-free/

# Microfiber

Important cleaning tools

- Little to no cleaning chemicals
- Less effort, absorbent, durable
- Prevent injuries, illnesses
- Avoid cross-contamination
- Simple to clean

# No Spraying/Fogging Chemicals Into the Air


# Resources

- Why Soap Works
  https://www.nytimes.com/2020/03/13/health/soap-coronavirus-handwashing-germs.html
- Safer Cleaning, Sanitizing and Disinfecting Strategies to Reduce and Prevent COVID-19 Transmission, UWDEOHS
  https://osha.washington.edu/sites/default/files/documents/FactSheet_Cleaning_Final_UWDEOHS_0.pdf
- Safer Disinfectants on EPA's List of Recommended Antimicrobial Products for use against Novel Human Corona Virus, Responsible Purchasing Network
  https://osha.washington.edu/sites/default/files/documents/Updated%20Safer%20Disinfectants%20List_March%2026%2C%202020.pdf
- Cleaning for Asthma-Safe Schools (CLASS), *CDPH*
  https://www.cdph.ca.gov/Programs/CCDPHP/DEODC/OHB/WRAPP/Pages/CLASS.aspx
- *Cleaning for Healthier Schools – Infection Control Handbook 2010*
  https://portal.ct.gov/-/media/Departments-and-Agencies/DPH/dph/environmental_health/eoha/pdf/CleaningforHealthierSchoolsFINAL2411pdf.pdf?la=en
- Informed Green Solutions
  http://www.informedgreensolutions.org/
- Characteristics of Selected Disinfectants
  http://www.cfsph.iastate.edu/Disinfection/Assets/CharacteristicsSelectedDisinfectants.pdf
- *Safer Products and Practices for Disinfecting*, 2014, SFDE, RPN
  http://www.sfenvironment.org/sites/default/files/fliers/files/sfe_th_safer_products_and_practices_for_disinfecting.pdf


# THANK YOU!

Nancy P Bernard, MPH, REHS, CPSI
Nancy.Bernard@doh.wa.gov
360-236-3072

**Resources available:**

**www.doh.wa.gov/schoolenvironment**

**Join my list serve for timely information!**


Washington State Department of
Health