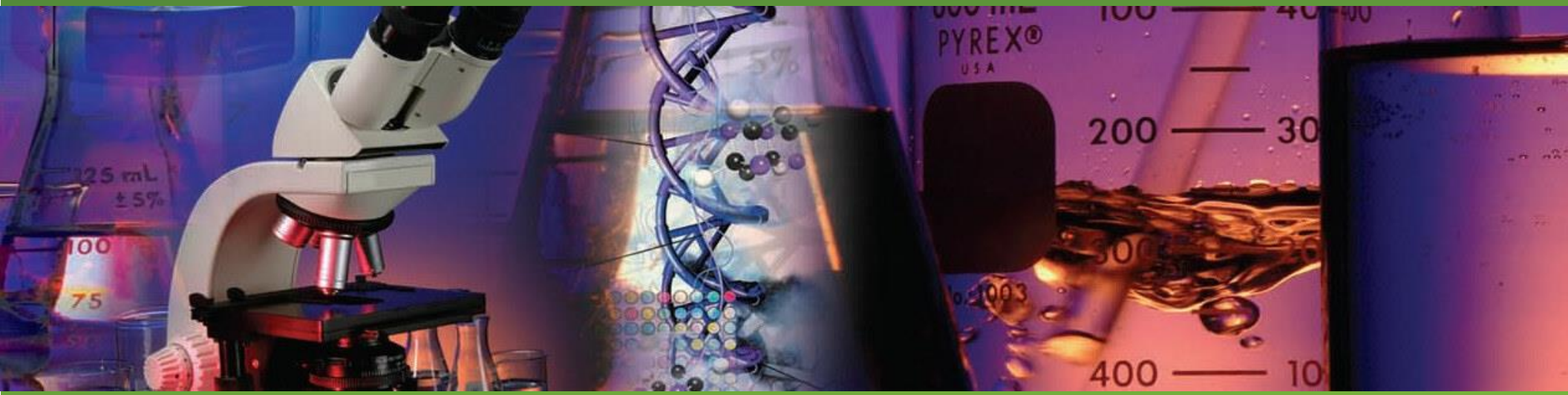
SAFELY DECONTAMINATING CORONAVIRUS



Gary Rosen, PhD FLA Lic Building Contractor;
FLA Lic Mold Assessor and Mold Remediator;
FLA Independent Insurance Adjuster.
BS Chemistry UF. PHD Biochemistry UCLA
gary@mold-free.org

WHO IS THE COURSE FOR?

- **Facility managers.**
- **Remediation contractors.**
- **Building contractors.**
- **Cleaning services.**
- **Attorneys.**
- **Not beginners.**

This training is for people that are already using Personal Protection Equipment and disinfectants for their current job … typically: Cleaning, Mold, Water Damage and/or Sewage.

Upon completion of the course you, will be able to disinfect properties for Coronavirus with complete assurance that the work is done 100% correctly and 100% safely for both occupants and crew <u>while reducing your liability</u>.

OUTLINE

- Part I: Biocides. Which ones work to kill Coronavirus. Which ones leave a dangerous toxic chemical residue (not Green, Chemical-Free). Is the cure worse than the cause? All pretty much sold out, expensive, and not available. No reason to use!
- Part II: Green-Chemical Free disinfectants that do not leave a toxic residue and are EPA/CDC approved to be 100% effective against Coronavirus… and some widely available and very low cost.
- Part III: What products are not CDC/EPA approved but may work 100% against Coronaviruses such as COVID-19.
- Part IV: Crew Safety. Outer wear & Respiratory protection. What works. What does not work.
- Part V: Post-Remediation testing. How do you prove that the premises are safe for re-entry. How do you prove that the Coronavirus is completely dead?
- Part VI: Discussion about Insurance Coverage.

Who Gets Deathly Ill?

SOUTH FLORIDA SunSentinel

- A South Florida Sun Sentinel analysis (4-10-20) … South Florida's **coronavirus deaths**.
- Of the 206 people who died in Miami-Dade and Broward counties as of Friday, only 13 did not suffer from preexisting chronic conditions.
- The 274 people who died from complications of COVID-19 … are most often between 70 and 79.

The main risk is not to young people but from young people that are carriers and not showing significant symptoms but infecting the elderly. This can be prevented by following the CDC recommendations on social distancing, disinfecting … for everyone.

PART I: BIOCIDES. WHICH WORK? WHICH LEAVE A TOXIC RESIDUE?

Cautions/ Warnings

- There is a massive shortage of appropriate disinfectants and application devices.
- As a result, cleaning services and remediation/ restoration contractors that are now experts in industrial hygiene are using anything and everything to fog office buildings, hotels and homes.
- The side effects of improper treatment could result in **severe illness, blindness, respiratory damage or even death**.
- Beyond the medical issues, the liability issues associated with illegal biocide use and/or application are a major concern.

EPA Product and Procedure Approvals

- Any employee that enters a building that has been "decontaminated" with either products or procedures that are contrary to EPA product label directions (this means in violation of Federal Law) can sue the employer for any and all either made up or real future illnesses.
- They just say that they are sick from disinfectants (EPA calls them Pesticides) that were applied in their work environment illegally … in violation of Federal Law.
- They don't have to actually prove causation.

Employers/Building Owners. Make sure that you pre-approve any and all disinfectant use.

EPA Product and Procedure Approvals

- Here's the key concerns.
  - In almost all cases due to either shortages or ignorance these disinfectant products will be used improperly and/or they are not legally allowed to be used in an office or home environment.
  - Check the following on the **EPA label directions on the back of the container.**
  - Marketing material, manufacturer web sites … sorry to say … all lie.
  - Only the product label is under EPA control.

CHECK LABEL DIRECTIONS FOR THE FOLLOWING

1. Is it approved for fogging? Approved for spraying is not in any way the same as approved for fogging. Spraying is defined by the EPA as a course spray, from a hand sprayer, not more than 6-8 inches from the surface. Spraying is NOT fogging.
2. Hard surfaces only. Or can it be applied to fabrics?
3. Approved for use in AC/ducting? If not explicitly approved for ducting, it is illegal to be applied to ducting. All fogging always enters ducting. #1 cause of illness in office workers…. Is chemical contaminants and/or microbial growth in ducting.
4. Are they using it at the appropriate dilution?
5. Is it safe for food surfaces and food?
6. EPA approved for residential/office use? For hospital use only?
7. Does the label say: "Caution may cause blindness."
8. Does product label say "Virucide?"

CHECK LABEL DIRECTIONS FOR THE FOLLOWING

9. Is the contact time/ dwell time appropriate for sanitizing Coronavirus? Fogging is almost always so light that there is no satisfactory coverage and evaporation is far quicker than the typical required 10 minute contact time.
10. Are they using an Electrostatic Sprayer or an ULV (ultra low volume) fogger? Keep in mind that they are very different. See definition below.

ULV (Ultra Low Volume) Foggers deliver product at droplet sizes, ranging from 10 microns to 120 microns.

The mist stays airborne to decontaminate the air and AC/ducts. **ULV Foggers** treat entire areas… unlike **Electrostatic sprayers** that are **directional and surface specific.**

One is not better than the other. They serve different purposes.

Biocides (Anti-Microbials)

- **Biocides:** Microban®, BotaniClean®, MediClean®, Fiberlock Shockwave® are examples of popular agents used for disinfecting microbial contamination that **leave a biocide chemical residue.**
- They are designed for and almost always used after <u>water damage and sewage mitigation</u> in order to keep down odor from bacterial growth.
- Some are proven to kill viruses. Some not.

Biocides (Anti-Microbials)

- **Biocides:** Microban®, BotaniClean®, MediClean®, Fiberlock Shockwave® and similar products:
  - Expensive.
  - Leave a toxic residue.
  - Hard to find during the Coronavirus pandemic.
  - Can only be applied to hard surfaces.
  - Cannot be fogged.
  - Optimized/ developed for water damage and sewage. Not at all optimum for Coronavirus … as we shall explain.
  - ALL termed “pesticides” by EPA.

DIRECTIONS FOR USE

It is a violation of Federal Law to use this product in a manner inconsistent with its labeling. That means if you use on anything except hard surfaces.

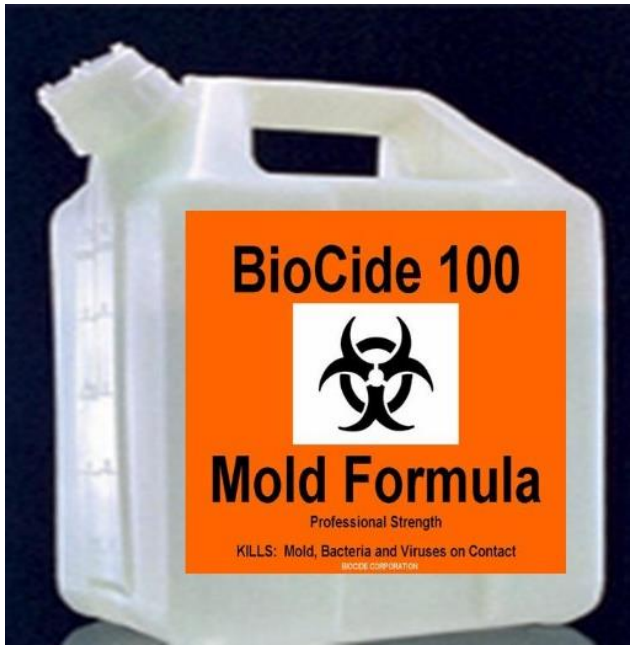
Residual Biocide Chemicals. Cause for Concern.

- When you use such strong Biocides (Pesticides) that are designed to be strong enough for disinfecting in one-step (no pre-cleaning) … there are severe EPA restrictions as to how they can be applied (fogged, sprayed, wiped or mopped); and where (what surfaces) they can be applied to.
  - If they are applied by fogging but the EPA label directions only approves wiping or mopping … use is a violation of Federal Law.
  - If the EPA label directions says only approved for hard surfaces, then applying to non-hard surfaces such as drywall or fabrics is a violation of Federal Law.

Residual Biocide Chemicals. Cause for Concern.

- If someone claims that they got cancer or their cancer got worse after you illegally sprayed the office or home with biocides/pesticides in a manner that is in violation of Federal law…
- How are you going to defend yourself?
- A jury is going to find against you. You could have simply used Green Chemical-Free products as recommended by the CDC/EPA but instead “you cut corners and used hazardous XYZ in ways that violated Federal law.” You will always lose!

Antimicrobial/Disinfectant … EPA Calls Them **Pesticides**



Antimicrobial/Disinfectan**t/** disinfectant - retards or stops microbial growth.

Terms for Biocide that seem more friendly. EPA calls them all Pesticides.

The EPA calls all biocides, disinfectants, sanitizers … **pesticides.** Certainly not a friendly sounding term. But that is what the plaintiff attorney will call them when suing you for illegal use of pesticides that they claim caused cancer, respiratory illness, ADHD in children …

Microban® Disinfectant Spray. Popular Product.

Microban/ Mediclean (Same Product)
Disinfect Spray Plus

Product <u>does not</u> say kills viruses. That means it is not EPA approved to kill viruses.

Microban BotaniClean. Says Virucide on Label. Hard Surface Only

DIRECTIONS FOR USE: It is a violation of Federal Law to use the product in a manner inconsistent with its labeling.

CLEANING AND DISINFECTING DIRECTIONS: Gross filth and heavy soil must be removed before applying cleaning solution. Apply to surfaces by cloth, sponge, brush, coarse spray or by immersing equipment using normal cleaning methods. All hard surfaces must be wet thoroughly, and remain wet for at least 10 minutes and allowed to air dry. Thoroughly rinse all wetted and cleaned food contact surfaces with potable water. As the solution becomes dirty discard and replace with fresh solution. This is a complete product. **DO NOT MIX WITH OTHER CHEMICALS.**

BotaniClean is an excellent one-step cleaner disinfectant for working surfaces, including stainless steel, chrome, glass and vinyl. Use BotaniClean for all disinfection of hard, non-porous surfaces (floors, walls, tables, etc.) in Healthcare Facilities including Operating Rooms, Intensive Care, Nurseries, Emergency Areas, Dental Operatories, Dental and Medical Offices, Oral Healthcare Facilities, Oral Surgery Centers, Dental Schools, Schools, Hospitals, Nursing Homes, Prisons, Dental Labs, by Police and EMS, **Residential, Restoration,**

While it says Virucidal on the label, on 3-26-20 we called Legends, the manufacturer, they said it <u>does not kill Coronavirus. Hard surfaces only.</u>

Both Thymol Based. Same Product.

Mediclean/Microban Concentrate: Strong. Virucide

Mediclean/Microban is EPA approved to kill Coronavirus.

Virucide. Called Mediclean/Microban "QGC".

One-Step Solution. No pre-cleaning required.

Leaves a toxic residue. Hard surfaces. Only.

DIRECTIONS FOR USE

It is a violation of Federal Law to use this product in a manner inconsistent with its labeling. That means if you use on anything except hard surfaces.

EPA Approvals.

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

EPA Approvals.

EPA Registration Number	Active Ingredient/s	Product Name	Company	Follow the disinfection directions and preparation for the following virus	Contact Time (in minutes)	Formulation Type	Emerging Viral Pathogen Claim?	Date Added to List N
70271-13	Sodium Hypochlorite	Pure Bright Germicidal Ultra Bleach	KIK International LLC	Human Coronavirus	5	Dilutable	No	03/13/2020
70385-6	Quaternary Ammonium	QGC	Prorestore Products	Human Coronavirus	10	Dilutable	No	03/13/2020
70590-2	Sodium Hypochlorite	Bleach-rite Disinfecting Spray With Bleach	Current Technologies Inc	Human Coronavirus	1	RTU	No	03/13/2020

- As of 03/13/20, Microban/Mediclean QGC is now specifically EPA approved for Coronavirus.
  - Quat (Quaternary Ammonium) based.
  - One-step solution. No pre-cleaning required.
  - 10 minute contact time.
  - 2 ounces per gallon water.
  - Hard surfaces only.

Leaves a toxic residue. Federal law prohibits use on anything but hard surfaces.

Microban® QGC Product Info from Jon Don Web Site

Microban® Germicidal Cleaner Concentrate is a **one-step**, quat-based disinfectant that is effective against a broad spectrum of bacteria, **viruses**, mold, and mildew.

Microban® Germicidal Cleaner Concentrate can safely treat **both hard nonporous surfaces and carpets.**

It leaves behind a delightful mint scent.

Compare above product description written by Jon Don sales/marketing on the Jon Don web site to what is on the back label of the Microban® container which is the ONLY EPA approved description of the product.

Microban® EPA Label Compare to Jon Don Marketing

Microban Germicidal Cleaner Concentrate is for use on the following **hard non-porous** surfaces … countertops countertop laminates, stovetops, sinks. Appliances. refrigerators, microwave ovens (exterior), tables, picnic tables, outdoor furniture, chairs, desks, telephones, highchairs, bed frames, washable walls, cabinets, doorknobs, telephones, shower stalls, tubs and glazed ceramic tiles, whirlpool bath tubs, glazed porcelain tiling, garbage cans, exhaust fans, refrigerated storage and display equipment, coils and drains pans of air conditioning and refrigeration equipment and heat pumps, stainless steel, enameled surface, finished woodwork, Formica, laminated surfaces, vinyl and plastic upholstery, ultrasonic baths, bathtubs, shower stalls, sinks and bathroom fixtures, walls, kennel runs, cages, floors conductive flooring and other hard non-porous surface (such as metal, stainless steel, glazed porcelain, glazed ceramic, fiberglass and plastic).

Fiberlock Shockwave. Another Quat Based Disinfectant

DISINFECTION/FUNGICIDAL/*VIRUCIDAL* DIRECTIONS:
Apply use solution to hard inanimate, non-porous surfaces thoroughly wetting surfaces with a cloth, mop, sponge or sprayer. For heavily soiled areas, a preliminary cleaning is required.

DIRECTIONS FOR USE
It is a violation of Federal Law to use this product in a manner inconsistent with its labeling.

DANGER LABEL FIBERLOCK SHOCKWAVE

PRECAUTIONARY STATEMENTS HAZARDS TO HUMANS AND DOMESTIC ANIMALS. DANGER. Corrosive. Causes irreversible eye damage and skin burns. Do not get in eyes, on skin, or on clothing. Harmful if swallowed. Wear protective eyewear (goggles, face shield or safety glasses). Wear protective clothing and rubber gloves. Avoid contamination of food. Wash thoroughly with soap and water after handling and before eating, drinking, chewing gum, using tobacco or using the toilet. Remove contaminated clothing and wash clothing before reuse.

- Do not fog/mist/aerosolize.
- **Avoid liability. Use these strong one-step biocides per label directions only.**
- **Or avoid their use. Go Green, Chemical-Free as recommended by the CDC/EPA.**

Chlorine Dioxide Liquid. 20% CD. Compare to CD Gas!

PX10 RESTORATION & REMEDIATION SOLUTIONS

BIOTAB7

{Alternate Brand Names: Meditab5, Dtab8, Advanced Biocide X, ABX, ABX3}

[Biocide, Disinfectant, Cleaner and Deodorant]

[Biotab7 meets efficacy standards for hospital grade disinfectant on hard non-porous surfaces using the AOAC Use-Dilution Test Methods with 500 ppm Biotab7 in 400 ppm hard water and supplemented with 5% soil load.]

[Disinfectant, Deodorant, Slimicide, Fungicide, Algaestat, Mildewstat, Cleaner]
[All-In-One, Multi-Surface, One-Step, Bactericidal, Odor Counteractant, Odor Neutralizer]
[Commercial, Medical, Residential, Industrial, Institutional]
[Hospital [-Grade] Disinfectant, Cleaner, Multi-Surface Disinfectant Cleaner, Cleans All Hard, Non-Porous Water Washable Surfaces]
[[Kills [99.9%] Germs] [Ordinary Cleaners [don't][can't]] [For [Use in] Organic Production]

Active Ingredient:
Sodium chlorite:.....20%
Other Ingredients:.....80%
Total.....100%

DIRECTIONS FOR USE

It is a violation of Federal Law to use this product in a manner inconsistent with its labeling.

Chlorine Dioxide Liquid. Not Approved for Fogging.

TO CLEAN, DISINFECT AND DEODORIZE HARD, NON-POROUS SURFACES

For all applications, directly apply by mop, sponge, spraying apparatus, ensuring visible application for time specified or apply through immersion or clean-in-place application. [This is not approved for fogging.]

For visibly soiled including heavily soiled surfaces: Remove gross filth and other debris by mechanical means. Thoroughly brush and clean using prepared solution or other cleaning solution then rinse with potable water.

Tablets and liquid solution must be handled with care and all procedures must be followed according to the product label and the SDS (Safety Data Sheet).

General Safety Guidelines:

Read Advanced Biocide SDS first. Always be aware of product fumes during mixing. Do not inhale above open containers. Close container quick and tightly and store in cool, dark, well ventilated room. [Ask your supplier before opening package for dosage.]

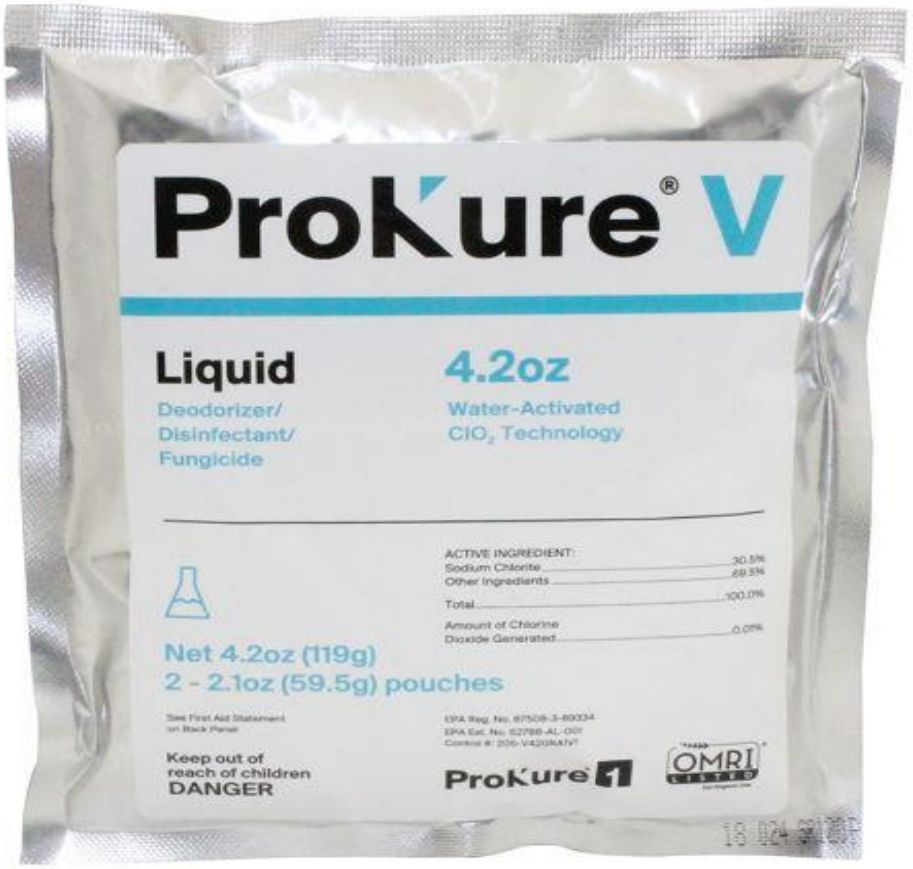
1. Fill an opaque spray bottle or appropriate container with specified amount of tap water
2. Slowly add correct number of Tablets to Water. Do Not add water to tablets. Tablet => Water
3. Wait 3 minutes, stir gently
4. Discard unused product after 8 hours [or as specified in Use Application Directions]

Chlorine Dioxide Liquid. Not Approved for Fogging

PRECAUTIONARY STATEMENTS

Hazards to Humans and Domestic Animals: DANGER: Corrosive. Causes irreversible eye damage and skin burns. May be fatal if inhaled. Do not get in eyes, on skin, or on clothing. Wear face shield or goggles and rubber gloves when handling. Wear coveralls worn over long-sleeved shirt and long pants.

ProKure V Chlorine Dioxide Liquid (Compare to CD Gas)
30% Chlorine Dioxide. EPA: 87508-3-89334



- **How is this product or PX-10 that are liquid Chlorine Dioxide any better, or safer than (liquid) chlorine bleach that costs a fraction of the price? Zip. Zero.**

What about SteraMist?
March 13, 2020 R&R Roundtable interview

- **Dr. Shane (Pres. SteraMist): "**With the coronavirus able to remain on surfaces for up to nine days, our product's application via **mist or fog** is perfectly suited to the task."

But from the EPA label.

PRECAUTIONARY STATEMENTS
Hazards to Humans and Domestic Animals
DANGER: Liquid causes irreversible eye damage. Harmful if absorbed through skin. Do not get in eyes, or on clothing. Avoid contact with skin. Wear appropriate protective eyewear such as goggles, face shield, or safety glasses. Wash thoroughly with soap and water after handling and before eating, drinking, chewing gum, using tobacco or using the toilet. Remove and wash contaminated clothing before reuse.

WHAT ABOUT STERAMIST?
FROM EPA LABEL

Active Ingredient:	
Hydrogen peroxide	7.8%
Inert Ingredients	92.2%
total	100.0%

Normal hydrogen peroxide is 3%. 7.8% is very corrosive and dangerous. Not for household use.

Directions for Use

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

Shade from radiant heat and direct sunlight. Stow away from powdered metals and permanganates. This product is for use in SteraMist™ application equipment only, including SteraMist Environment System or SteraMist™ Surface Unit , and by personnel trained by TOMI Environmental Solutions, Inc. Read and follow the Binary Ionization Technology® (BIT™) Solution (package insert) (label) for complete directions on pre-cleaning, sealing and

What about SteraMist?
From EPA Label

SteraMist™ Environment System Room Fogging/Misting Directions:

Use the SteraMist™ Environment System exclusively with Binary Ionization Technology® (BIT™) Solution. For use in pre-cleaned enclosures and on pre-cleaned equipment. Remove any visible gross filth from surfaces and equipment before application. The product must be used as packaged and not diluted in any way. To be used only on hard, non-porous surfaces.

For use in sealed rooms in industrial, commercial, and institutional settings (see label for list of specific Healthcare Use Sites and Other Use Sites lists). The use rate to achieve a minimum

What about SteraMist?
From EPA Label

PERSONAL PROTECTIVE EQUIPMENT (PPE):
For applicators and handlers of the SteraMist™ Surface Unit Hand Held equipment and for early re-entry for the SteraMist™ Environment System, the following PPE must be worn:

- Protective eyewear such as goggles or face shield, or safety glasses
- R95 or N95 Respirator (depending on environment) with Activated Charcoal Filter, Powered Air Purifying Respirator with organic vapor filter, or equivalent
- Gloves, long sleeves, and long pants.

- Not for use in homes
- Hard surfaces only
- Highly corrosive
- Irreversible eye damage
- Requires PPE with Activated Charcoal Filter
- Requires special proprietary applicator
- Spray no more than 24 inches from surfaces
- **Don't believe the marketing hype. This is of no use outside of the hospital environment.**

Section Summary: Many Different Kinds of Disinfectants

- **If a product such as Microban QGC, Shockwave or SteraMist can only be used for disinfecting hard floor surfaces … why not simply use soap and water to clean/disinfect the floor?**
- **Will be 100% effective. Soap/water doesn't leave a toxic residue; is low cost, and in abundant supply.**

CHANGE THE WAY YOU THINK!!!!

Section Summary: Residual Killing Power

- You might say that products such as Microban or Shockwave are better than soap and water on hard surfaces because they leave a protective killing residue.
- **But there is absolutely no science that these products when dried protect against viruses.**
- **Nor do their EPA approved labels make such a claim.**
- **The claim is that they provide residual protection but only against mold and mildew. Why? Because if the dried biocide gets wet, it again becomes active and protects against mold/mildew that grow only on wet surfaces.**
- **When it has dried, the biocide residue does not provide any residual disinfecting power against Viruses.**

Section Summary: Limited Application Methods

- Regarding **application** methods for: Microban QGC, & Fiberlock Shockwave and many other similar products.
- Typical EPA language about spraying :
  - "For sprayer applications use a **coarse spray device.** Spray 6-8 inches from surface and rub with brush, sponge or cloth. Do not breathe spray."
- **None of these biocides can be fogged or aerosolized. It is illegal to do so. And highly dangerous. But often done! Resulting in sick/toxic homes and AC ducting.**

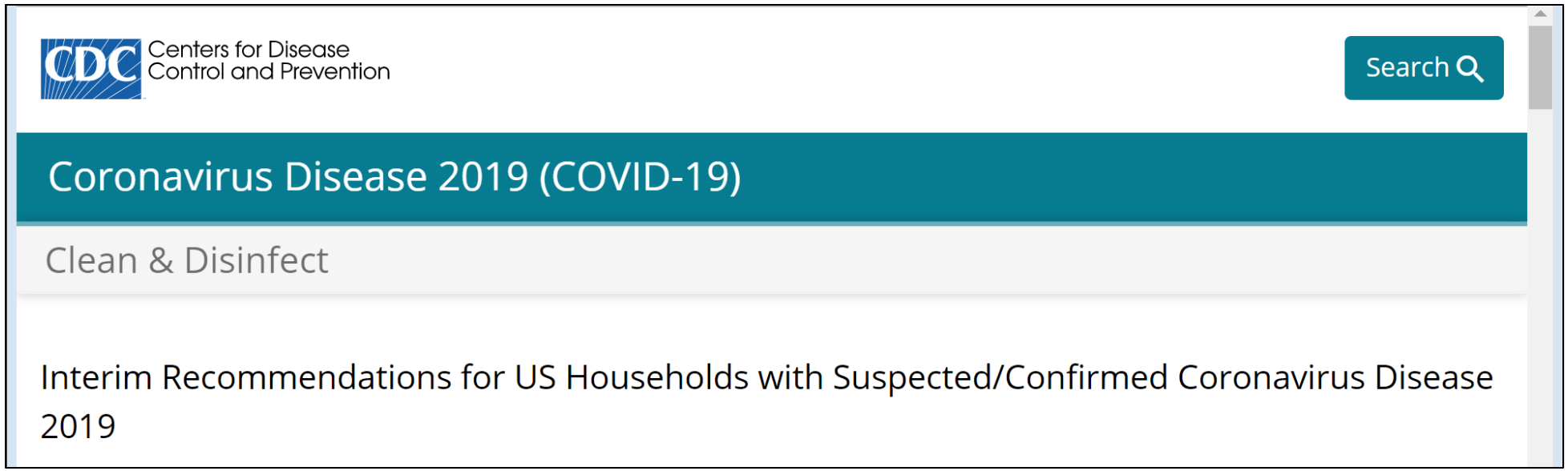
ULV Fogger.

Better, Cheaper and Available Options.

- There are Green Chemical-Free (no toxic residue) alternatives to products such as Microban®, Botaniclean®, MediClean®, Fiberlock Shockwave®, SteraMist that are:
  - Readily available
  - Far cheaper
  - EPA/CDC approved for disinfecting Coronavirus.
  - No legal restrictions on how or where applied.
  - Let's look at them next.

PART II: EPA APPROVED GREEN CHEMICAL-FREE DISINFECTANTS

Cleaning and Disinfecting Defined by CDC



- **Cleaning** refers to the removal of germs, dirt, and impurities from surfaces. Cleaning does not kill germs, but by removing them, it lowers their numbers and the risk of spreading infection.
- **Disinfecting** refers to using chemicals to kill germs on surfaces. This process does not necessarily clean dirty surfaces or remove germs, but by killing germs on a surface *after* cleaning, it can further lower the risk of spreading infection.

Homeowners Today Want Green Chemical-Free

- **Chlorine Dioxide, Bleach, Lysol, Ozone, Alcohol.**
- None of these agents leave a toxic residue.
- They all are EPA approved to kill viruses including Coronavirus.
- Considered Green, Chemical-Free.
- Can be used on food prep areas.
- Requires pre-cleaning. Not one-step solution as with Mediclean QGC, Microban QGC, Shockwave.

- But is the extra work needed for pre-cleaning worth it?
- Is green, chemical free the right choice during the Coronavirus pandemic?
- Absolutely… as we will learn today.

Chlorine Dioxide GAS. Two-Step Solution. Requires Pre-Cleaning

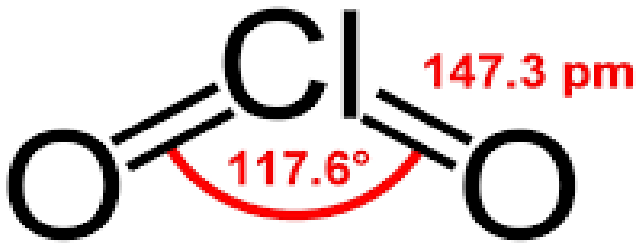
- ClO_2 **gas** technology offers many **BENEFITS**:
  - Environmentally Friendly
  - EPA/RMP & OSHA PSM Compliance
  - Safe. Is used to treat food.

Untreated and stored for 6 weeks at 4°C

Treated with 10 mg/l Chlorine dioxide gas for 10 min and stored for 6 weeks at 4°C

Properties of Chlorine Dioxide Gas

- An effective and environmentally safe treatment used worldwide for disinfecting water supplies, buildings, cars and yachts.
- Not to be confused with Chlorine bleach (liquid) or Chlorine Dioxide liquid which are very reactive and will bleach carpeting and fabrics. Chlorine dioxide gas is different.
- ClO_2 gas is far less reactive and does not bleach carpet or fabrics. But it is excellent at killing viruses.
- Proven by Federal Government to kill viruses. Used by Federal Government (2001) to kill Anthrax spores.
- <u>Pre-cleaning required.</u>

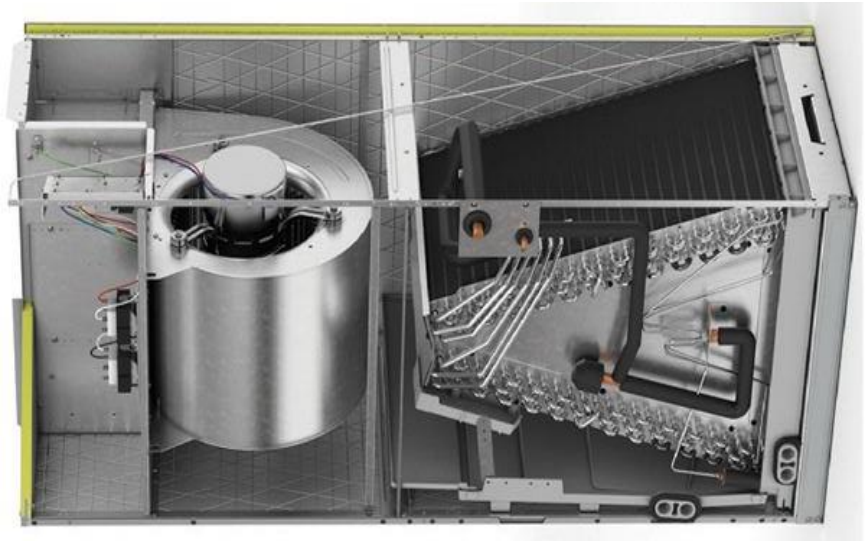


Chlorine Dioxide: Eco-Friendly & Effective

- Chlorine dioxide (CD) gas breaks down to sodium chloride (table salt).
- No toxic residue.
- And residual odor dissipates rapidly (compared to ozone which can linger for weeks).
- Example: Sold by Pureline. Product is called Purevista.
- We've been using CD for over 5 years. Very effective against the much harder to kill mold spores.

Pureline Purevista chlorine dioxide launcher

Chlorine Dioxide Gas: Eco-Friendly & Effective



- We put the CD gas dispenser under the air handler coils or under the return air.
- As the gas bubbles up, the gas is pulled through the air handler and ducting and distributed/blown throughout the indoor space disinfecting air and pre-cleaned surfaces.
- This is performed overnight in an unoccupied space.

Chlorine Dioxide: For Large Scale Production

- Pureline and Sabre have the capacity to provide large scale viral decontamination with CLO2.

PureVista Product For Decontaminating Masks

PureLine™

DOPKE™ DECON SYSTEM

The Dopke™ Decon System is a bench top sealed chlorine dioxide treatment system for decontaminating PPE like N95 masks, gowns, glasses, shields etc. The system produces and maintains ~1000ppm ClO_2 gas (not a mist, but a "true gas" that obeys ideal gas laws) within the decontamination chamber for just over an hour to provide 6-Log reduction (sterilization) of all surfaces and fibers (includes layered fabrics and filter mask material) inside and out. The system utilizes PureLine's patented PureVista™ (PV) chlorine dioxide production canisters to safely and easily produce ClO_2 gas as needed for each decontamination cycle.

BASE DOPKE™ DECON SYSTEM – Gasketed Transparent Box with PV launching Tray, Sensor Port installed.

- Contact them for more information. www.Pureline.com

PureVista Product Pricing.

PureLineSolutions™

purevista.info

The $ClO_2GO^{™}$

847 963 8465
info@pureline.com
1241 N. Ellis Street
Bensenville, IL 60106

Size	Part Number	Price
PureVista™ [1]		
PV100	100100	$84.99
PV50	100050	$49.99
PV25	100025	$29.99
PV12.5	100012	$24.99
PV2 (includes launcher)	100020	$5.99

- For information purposes only. We are not affiliated with Pureline in any way.

Chlorine Dioxide: Excellent Against Coronavirus

ejpmr, 2017,4(8), 678-685

EUROPEAN JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.ejpmr.com

SJIF Impact Factor 4.161

Review Article

ISSN 2394-3211

EJPMR

CHLORINE DIOXIDE GAS FOR THE PREVENTION OF INFECTIOUS DISEASES

Norio Ogata*

R and D Center, Taiko Pharmaceutical Co., Ltd., Seikacho, Kyoto, Japan.

***Corresponding Author: Dr. Norio Ogata**

R and D Center, Taiko Pharmaceutical Co., Ltd., Seikacho, Kyoto, Japan.

Chlorine Dioxide: Works at Low Levels

against infectious microbes, such as bacteria and viruses. Disinfection using such low-concentration ClO_2 gas does not require evacuation of people, and could be used to disinfect room air in the simultaneous presence of people. The use of ClO_2 gas at very low concentrations may open new avenue of disinfection systems of room air without requiring evacuation of people. This review presents the details of the disinfection system of ClO_2 gas.

- Very low doses of CLO2 gas are effective against virus. Levels 1000 to 10,000 times less than those required to kill anthrax and mold spores.
- https://www.ncbi.nlm.nih.gov/pmc/articles/PMC12146060/

Lysol: Special Case of Quat

- **Lysol (in a can) or generic.** A special case. Alcohol based powerful disinfectant/virucide with the same chemical biocide component as Shockwave or Microban QGC. (Quat based disinfectants.)
- **But with only a small amount of biocide/ disinfectant because it is alcohol based and not water based such as Shockwave/ Microban and the alcohol does most of the disinfecting .**
- Lysol leaves a relatively small amount of biocide when the alcohol evaporates, it is EPA approved for all surfaces including kitchens and food prep surfaces. Pre-cleaning required.
- **Can be sprayed on fabric furniture. Books etc.**

Assuring 10 min Contact Time

The heaviness of the mist must be adjusted to make sure contact time is 10 minutes.

You check for drying time using a FLIR infrared camera.

When the disinfectant is still drying/ evaporating, the sprayed material will be blue (cold) in the FLIR screen.

FLIR infrared imager for detecting contact time.

BLEACH

- Green Chemical-Free. Does not leave a toxic residue.
- Bleach is an oxidizing agent and actually remove viruses (mold and bacteria) by disintegration (oxidation.)
- Can be used in food prep areas and any surfaces.
- Kills Coronavirus. Apply after pre-cleaning.
- Strong bleach of course can damage fabrics.
- But according to the CDC only 1% bleach solution needed to kill Coronavirus.
- That is very dilute bleach. Check before you use, but that bleach concentration can be used on almost any surface.

Highly Diluted Beach Kill Coronavirus per CDC

CDC Centers for Disease Control and Prevention

Search

Coronavirus Disease 2019 (COVID-19)

Clean & Disinfect

Interim Recommendations for US Households with Suspected/Confirmed Coronavirus Disease 2019

- Diluted household bleach solutions can be used if appropriate for the surface. Follow manufacturer's instructions for application and proper ventilation. Check to ensure the product is not past its expiration date. Never mix household bleach with ammonia or any other cleanser. Unexpired household bleach will be effective against coronaviruses when properly diluted.
  - Prepare a bleach solution by mixing:
    - 5 tablespoons (1/3rd cup) bleach per gallon of water or
    - 4 teaspoons bleach per quart of water

Bleach is Approved for All Surfaces

DEODORIZING			
Garbage Cans	2/3 Cup	1 Gallon	After washing and rinsing, brush inside with bleach solution. Let drain.
Drains	1 Cup (8 oz)	—	Flush drains. Pour into drain. Flush with hot water.
& STAIN REMOVAL			
All Surfaces	2/3 Cup	1 Gallon	Add bleach to powdered detergent solution. Apply, let stand for at least 2 minutes. Wipe and rinse.

DILUTION TABLE: PPM (Parts Per Million Available Chlorine).
Check chlorine concentration with standard test strip.

- Of course strong bleach will damage fabrics.
- Here the label directions say add powdered detergent to bleach to remove mold.
- Coronavirus is more easily killed/removed than is mold … without needing to add detergent.

US CDC 1/100 Dilution. German Research 1/50

Journal of Hospital Infection 104 (2020) 246–251

Available online at www.sciencedirect.com

Journal of Hospital Infection

journal homepage: www.elsevier.com/locate/jhin

Review

Persistence of coronaviruses on inanimate surfaces and their inactivation with biocidal agents

G. Kampf [a,*], D. Todt [b], S. Pfaender [b], E. Steinmann [b]

[a] University Medicine Greifswald, Institute for Hygiene and Environmental Medicine, Ferdinand-Sauerbruch-Straße, 17475 Greifswald, Germany
[b] Department of Molecular and Medical Virology, Ruhr University Bochum, Universitätsstrasse 50, 44801 Bochum, Germany

SUMMARY

Currently, the emergence of a novel human coronavirus, SARS-CoV-2, has become a global health concern causing severe respiratory tract infections in humans. Human-to-human transmissions have been described with incubation times between 2-10 days, facilitating its spread via droplets, contaminated hands or surfaces. We therefore reviewed the literature on all available information about the persistence of human and veterinary coronaviruses on inanimate surfaces as well as inactivation strategies with biocidal agents used for chemical disinfection, e.g. in healthcare facilities. The analysis of 22 studies reveals that human coronaviruses such as Severe Acute Respiratory Syndrome (SARS) coronavirus, Middle East Respiratory Syndrome (MERS) coronavirus or endemic human coronaviruses (HCoV) can persist on inanimate surfaces like metal, glass or plastic for up to 9 days, but can be efficiently inactivated by surface disinfection procedures with 62–71% ethanol, 0.5% hydrogen peroxide or 0.1% sodium hypochlorite within 1 minute. Other biocidal agents such as 0.05–0.2% benzalkonium chloride or 0.02% chlorhexidine digluconate are less effective. As no specific therapies are available for SARS-CoV-2, early containment and prevention of further spread will be crucial to stop the ongoing outbreak and to control this novel infectious thread.

- 1/50 dilution of bleach recommended. (Not 1/100 as per CDC.) Kills Coronavirus in 1 minute. 0.5% hydrogen peroxide works similarly.

Alcohol Recommended by CDC To Kill Coronavirus

- For disinfection, diluted household bleach solutions, alcohol solutions with at least 70% alcohol, and most common EPA-registered household disinfectants should be effective.

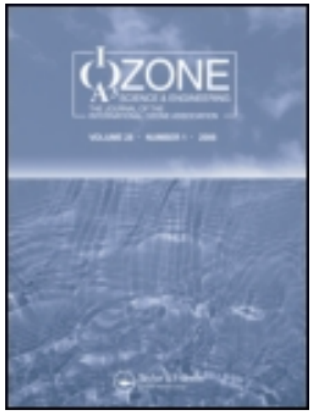
Hydrogen Peroxide. No Reference by CDC

SUMMARY

Currently, the emergence of a novel human coronavirus, SARS-CoV-2, has become a global health concern causing severe respiratory tract infections in humans. Human-to-human transmissions have been described with incubation times between 2-10 days, facilitating its spread via droplets, contaminated hands or surfaces. We therefore reviewed the literature on all available information about the persistence of human and veterinary coronaviruses on inanimate surfaces as well as inactivation strategies with biocidal agents used for chemical disinfection, e.g. in healthcare facilities. The analysis of 22 studies reveals that human coronaviruses such as Severe Acute Respiratory Syndrome (SARS) coronavirus, Middle East Respiratory Syndrome (MERS) coronavirus or endemic human coronaviruses (HCoV) can persist on inanimate surfaces like metal, glass or plastic for up to 9 days, but can be efficiently inactivated by surface disinfection procedures with 62—71% ethanol, 0.5% hydrogen peroxide or 0.1% sodium hypochlorite within 1 minute. Other biocidal agents such as 0.05—0.2% benzalkonium chloride or 0.02% chlorhexidine digluconate are less effective. As no specific therapies are available for SARS-CoV-2, early containment and prevention of further spread will be crucial to stop the ongoing outbreak and to control this novel infectious thread.

- CDC does not reference what percent hydrogen peroxide works to kill Coronavirus and what the contact time.
- Recent German research shows 0.5% hydrogen peroxide kills Coronavirus in 1 minute.

Ozone Very Effective Against Viruses



Taylor & Francis
Taylor & Francis Group

Ozone: Science & Engineering

ISSN: 0191-9512 (Print) 1547-6545 (Online) Journal homepage: https://www.tandfonline.com/loi/bose20

Development of a Practical Method for Using Ozone Gas as a Virus Decontaminating Agent

James B. Hudson , Manju Sharma & Selvarani Vimalanathan

To cite this article: James B. Hudson , Manju Sharma & Selvarani Vimalanathan (2009) Development of a Practical Method for Using Ozone Gas as a Virus Decontaminating Agent, Ozone: Science & Engineering, 31:3, 216-223, DOI: 10.1080/01919510902747969

To link to this article: https://doi.org/10.1080/01919510902747969

Ozone Very Effective Against Viruses

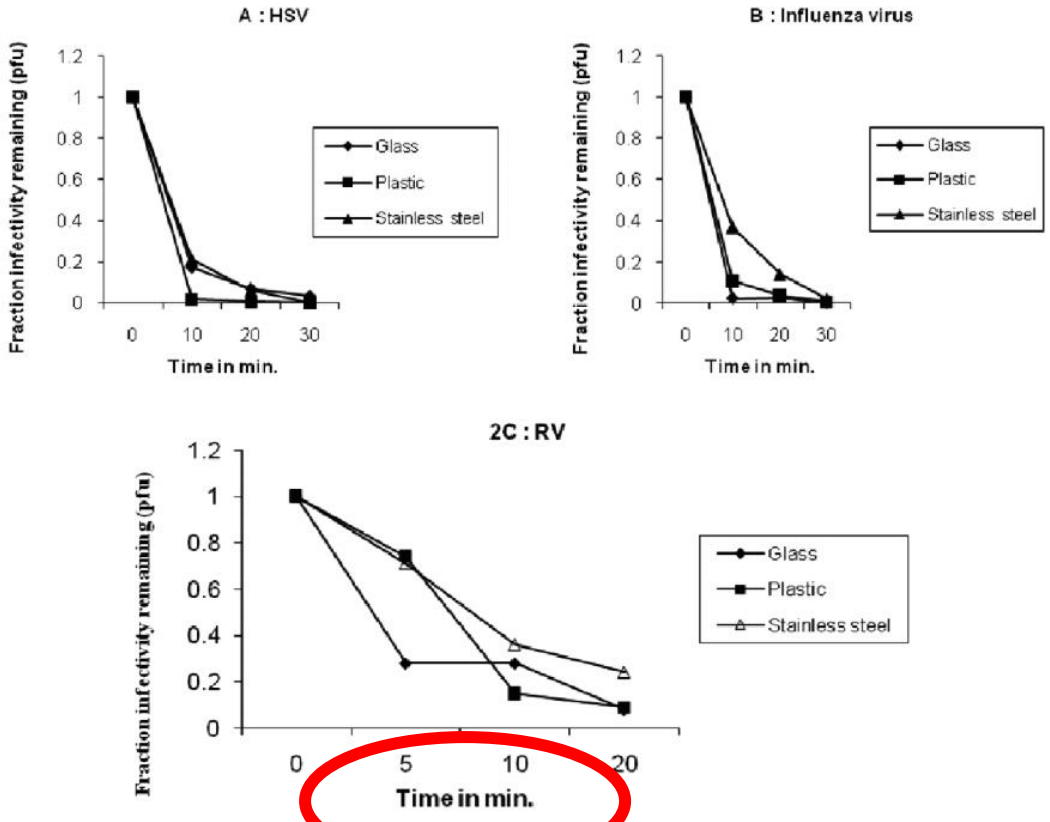


FIGURE 2. Kinetics of inactivation of viruses on different surfaces. Multiple aliquots of each virus, in separate experiments in the laboratory, were dried onto the different surfaces, and exposed to ozone gas (10 ppm) at ambient humidity (45% RH). Periodically duplicate samples were removed for reconstitution and freezing. They were subsequently thawed and assayed by plaque formation on the appropriate cell lines.

Section Summary: Green, Chemical Free

- **Chlorine Dioxide Gas, Dilute Bleach, Lysol, Ozone, Alcohol.**
- Green, chemical free. Disinfectants that do not leave a toxic residue. No restrictions on application methods, no restrictions on what surfaces can be used on.
- As recommended by CDC … pre-clean before disinfecting .
- These are not one-step disinfectants such as Microban, Mediclean, Shockwave. So you need to pre-clean before disinfecting … but only if surfaces are dirty/dusty.
- Dilute bleach, in particular, is deactivated by organic matter. (Dirt/dust.)

Section Summary: Green, Chemical Free

- **Chlorine Dioxide, Dilute Bleach, Lysol, Ozone, Alcohol.**
- These products provide no residual disinfection (and that is good … no residual biocides) but neither do Microban QGC, Mediclean QGC or Shockwave except for mold and mildew.
- A common concern: Chlorine bleach is corrosive. So why use it if it can damage fabrics, metal, wood etc.
- But the CDC says a 1% (approximately) solution of bleach will kill Coronavirus. That is very dilute. What is the problem with corrosion?
- A major question remains … how much disinfection of surfaces is actually needed after cleaning?

WHAT ABOUT HYDROXYL GENERATORS?
MARCH 13, 2020 R&R ROUNDTABLE

- **Sheppard (Odorox Pres.):**
- "Based on the results with MS2 … **we believe** that Odorox is effective against the coronavirus."

- "<u>Odorox is focused on the aerosolized viruses</u> while spraying and wiping is best for surfaces."

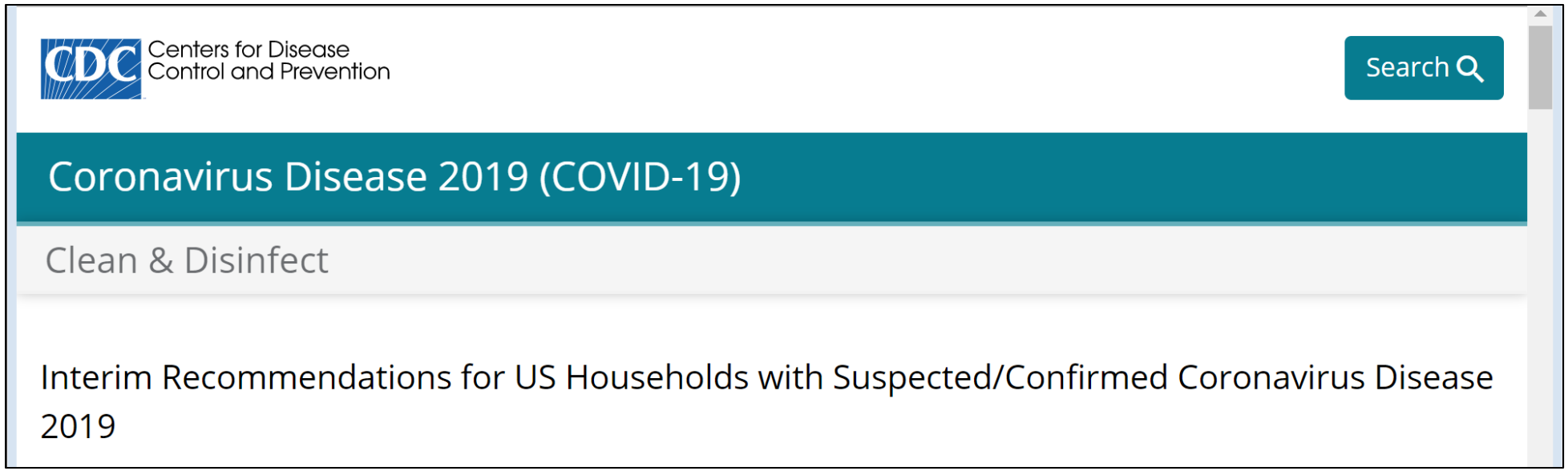
The XL3 has a vacuum switch and requires a separate "snail air mover" to activate the optics.

Questions About Odorox?
March 13, 2020 R&R Roundtable

- No actual Peer Reviewed published studies that it works for Viruses.
- What humidity is needed? Special humidifiers needed or required?
- How long to disinfect for Viruses? If it can take up to 3-4 days to eliminate odor what duration is proven for Viruses?
- The need for a blower causes the viruses in dust/dirt to spread through the AC system.
- Recommended to run without filters.
  But then the bulbs get dirty and don't work.
- How to clean bulbs? And how often?
  When to replace bulbs? They do not say on their web site or technical docs.
- For odors easy to tell when not working.
  For Viruses … impossible.

PART III: OTHER OPTIONS FOR CLEANING/ DISINFECTING

Cleaning and disinfecting Defined by CDC



Centers for Disease Control and Prevention

Search

Coronavirus Disease 2019 (COVID-19)

Clean & Disinfect

Interim Recommendations for US Households with Suspected/Confirmed Coronavirus Disease 2019

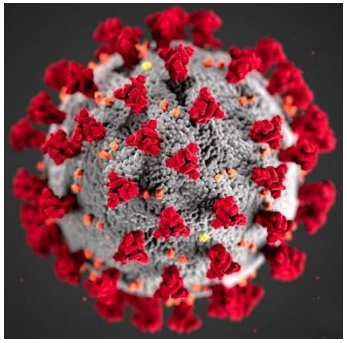
- **Cleaning** refers to the removal of germs, dirt, and impurities from surfaces. Cleaning does not kill germs, but by removing them, it lowers their numbers and the risk of spreading infection.
- **Disinfecting** refers to using chemicals to kill germs on surfaces. This process does not necessarily clean dirty surfaces or remove germs, but by killing germs on a surface *after* cleaning, it can further lower the risk of spreading infection.

Cleaning Does Not Kill Germs

- First off, the CDC says that cleaning does not kill germs (viruses, bacteria etc.)
- But that is an incorrect statement.
- Depends on what you use to clean and what "germs" are being cleaned.
- Cleaning with detergents will not only **clean** Coronavirus but will also **kill** Coronavirus.
- **For Coronavirus … deep cleaning with detergent cleaners will kill Coronavirus.**
- Is that because Coronavirus is special and easily killed with detergent cleaners. The answer is yes!

Cleaning Does Not Kill Germs. Not Necessarily Correct.

- Enveloped viruses like COVID-19 — which rely on a protective lipid (fatty/oily) coating (shell/envelope) — are the easiest type of viruses to deactivate/kill.
- In contrast with many gastrointestinal viruses like norovirus which have a tough protein shell called a capsid, viruses with this fatty wrapping are relatively vulnerable.



- "It's much more sensitive. It's sort of a wimpy protective shell," says virologist Seema Lakdawala of the University of Pittsburgh.

CDC: Cleaning Does Not Kill Germs. Wrong

- "There are a few ways to burst this flimsy lipid-based shell."
- "Alcohol-based products disintegrate the protective lipids."
- "Quaternary ammonium disinfectants (Quats), attack protein and lipid structures, thwarting the pathogen's typical mode of infection."
- "Bleach and other potent oxidizers swiftly break down a virus's essential components."
- And so do detergent cleaners. Detergents clean by dissolving oils and greases (lipids) and are especially effective against lipid enveloped viruses such as Coronavirus.

CDC Says: Cleaning Does Not Kill Germs. Wrong!

Effectiveness of Common Household Cleaning Agents in Reducing the Viability of Human Influenza A/H1N1

Jane S. Greatorex[1], Rosanna F. Page[2], Martin D. Curran[1], Paul Digard[2], Joanne E. Enstone[3], Tim Wreghitt[1], Penny P. Powell[4], Darren W. Sexton[4], Roberto Vivancos[4,5], Jonathan S. Nguyen-Van-Tam[3,6]*

1 Health Protection Agency, Addenbrookes Hospital, Cambridge, United Kingdom, **2** Department of Pathology, University of Cambridge, Cambridge, United Kingdom, **3** Public Health and Epidemiology, University of Nottingham, Nottingham, United Kingdom, **4** Biomedical Research Centre, University of East Anglia, Norwich, United Kingdom, **5** Health Protection Agency, Cheshire and Merseyside Health Protection Unit, Cheshire, United Kingdom, **6** Health Protection Agency, East Midlands, Nottingham, United Kingdom

Abstract

Background: In the event of an influenza pandemic, the majority of people infected will be nursed at home. It is therefore important to determine simple methods for limiting the spread of the virus within the home. The purpose of this work was to test a representative range of common household cleaning agents for their effectiveness at killing or reducing the viability of influenza A virus.

- Study on what household cleaners kill flu virus? A lipid enveloped virus same as Coronavirus.

CDC Says: Cleaning Does Not Kill Germs. Wrong!

Conclusions/Significance: Active ingredients in a number of the cleaning agents, wipes, and tissues tested were able to rapidly render influenza virus nonviable, as determined by plaque assay. Commercially available wipes with a claimed antiviral or antibacterial effect killed or reduced virus infectivity, while nonmicrobiocidal wipes and those containing only low concentrations (<5%) of surfactants showed lower anti-influenza activity. Importantly, however, our findings indicate that it is possible to use common, low-technology agents such as 1% bleach, 10% malt vinegar, or 0.01% washing-up liquid to rapidly and completely inactivate influenza virus. Thus, in the context of the ongoing pandemic, and especially in low-resource settings, the public does not need to source specialized cleaning products, but can rapidly disinfect potentially contaminated surfaces with agents readily available in most homes.

- 1% (very dilute) Bleach, 10% vinegar, and **0.01% (very dilute)** detergent "rapidly and completely inactivates influenza virus."
- Influenza virus, as is Coronaviruses, is a lipid enveloped virus and very susceptible to detergents compared to the many other non-lipid enveloped viruses.
- These cleaning agents at these concentrations will kill Coronaviruses such as COVID-19.

Bleach (again) and Detergent

AVIAN DISEASES 52:118–123, 2008

Inactivation of Avian Influenza Virus Using Common Detergents and Chemicals

M. E. Lombardi,[A] B. S. Ladman,[B] R. L. Alphin,[C] and E. R. Benson[D]

[A]Department of Bioresources Engineering, University of Delaware, 264 Townsend Hall, Newark, DE 19716
[B]Department of Animal and Food Sciences, University of Delaware, 315 Worrilow Hall, Newark, DE 19716
[C]Department of Animal and Food Sciences, University of Delaware, 107 C. C. Allen Biotechnology Laboratory, Newark, DE 19716

Received 21 July 2007; Accepted and published ahead of print 26 November 2007

SUMMARY. Six disinfectant chemicals were tested individually for effectiveness against low pathogenic avian influenza virus (LPAIV) A/H7N2/Chick/MinhMa/04. The tested agents included acetic acid ($C_2H_4O_2$), citric acid ($C_6H_8O_7$), calcium hypochlorite ($Ca(ClO)_2$), sodium hypochlorite (NaOCl), a powdered laundry detergent with peroxygen (bleach), and a commercially available iodine/acid disinfectant. Four of the six chemicals, including acetic acid (5%), citric acid (1% and 3%), calcium hypochlorite (750 ppm), and sodium hypochlorite (750 ppm) effectively inactivated LPAIV on hard and nonporous surfaces. The conventional laundry detergent was tested at multiple concentrations and found to be suitable for inactivating LPAIV on hard and nonporous surfaces at 6 g/L. Only citric acid and commercially available iodine/acid disinfectant were found to be effective at inactivating LPAIV on both porous and nonporous surfaces.

- Bleach and conventional laundry detergent (all at low concentration) are effective disinfectants against viruses.

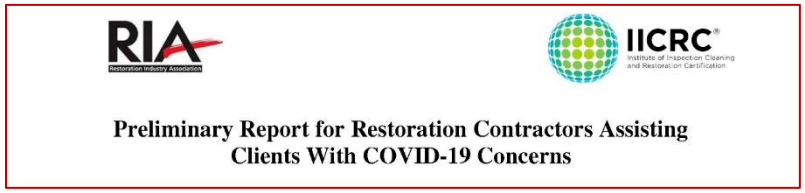
Section Summary. Detergents

- Coronavirus with its lipid envelope can not only be cleaned with dilute detergents but will also be killed by **dilute detergents** because the detergents destroy the lipid shell just as it destroys grease stains on shirts that are laundered.
  - Works on all surfaces of course.

PART IV:
CREW SAFETY

Crew Safety Outer Wear

According to RIA/IICRC Report. Some Excellent Advice.



- "The minimum personal protective equipment (PPE) recommended by the CDC for individuals potentially exposed to COVID-19 includes **gloves, gowns, eye protection, and respirators.**
- "However, if a shortage of disposable suits occurs… (make due). Such outerwear can be worn as a replacement for street clothes **if a controlled changing area is available** and oversized clothing is purchased and worn on top of street clothes."
- **"In such cases proper provisions for the collection, handling, and cleaning of clothes are necessary."**

Disposable Suits vs. Street Clothes Followed by Full Body disinfecting

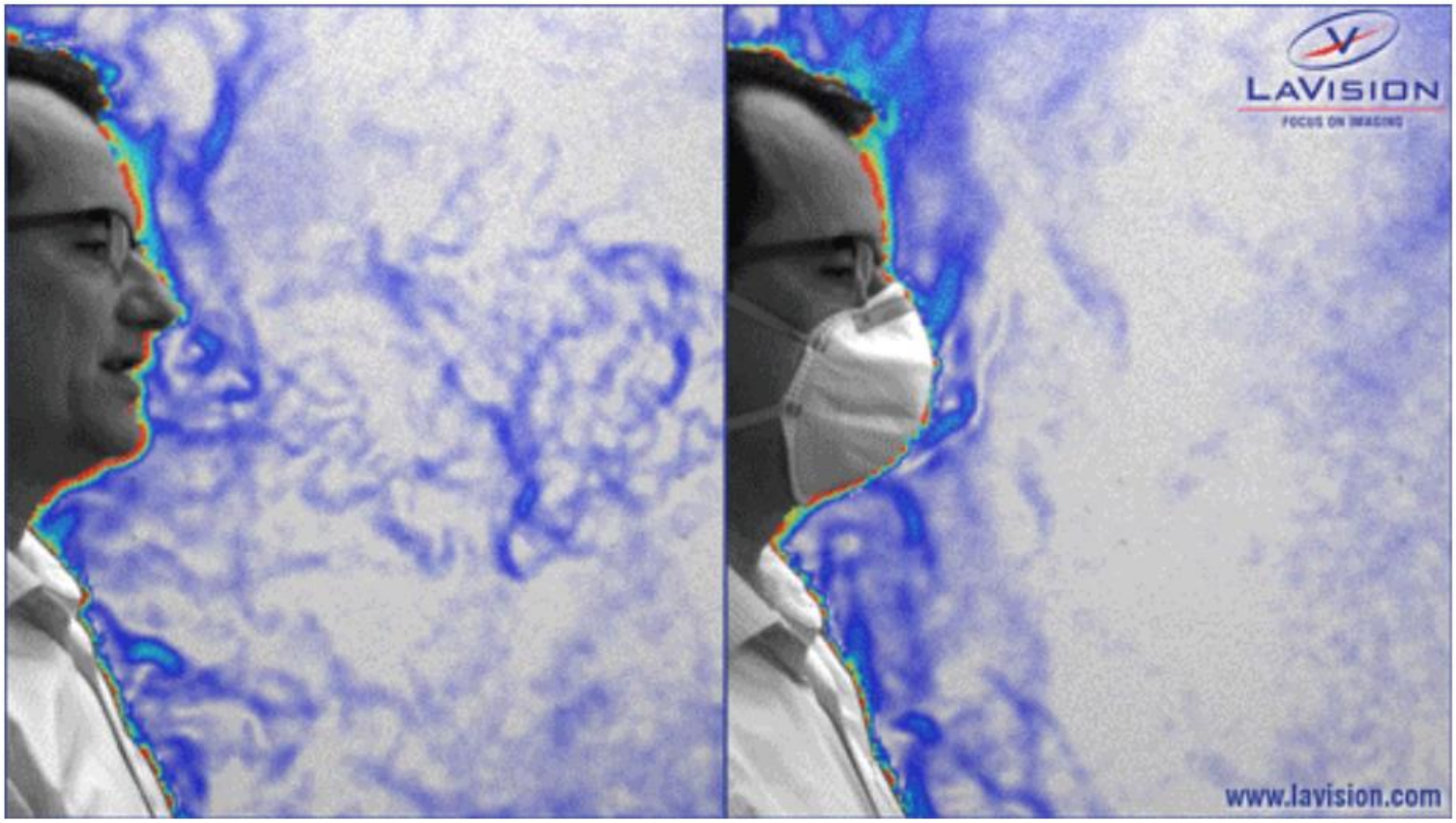
- RIA/IICRC: … cleaning of clothes are necessary.”
  - Not sure about this advice…
  - Are you going to take your virus contaminated clothes home to wash/disinfect?
  - The answer is … NO. Heck NO.

Disposable Suits vs. Street Clothes Followed by Full Body disinfecting

- Consider on-the-spot disinfecting the crew with 70% alcohol applied by spray/fog.
- Kills viruses. Not hazardous to people.
- Sanitizes people, clothing and Tyveks for reuse.
- Fogging uses very little alcohol.
- Do not fog near flames. Alcohol is a fire hazard.

Crew Safety
Respiratory Protection

Focus On Respiratory Protection



Cough w/o mask.

Cough with mask.

Focus On Respiratory Protection

Am J Infect Control. 2006 Mar;34(2):51-7.

Do N95 respirators provide 95% protection level against airborne viruses, and how adequate are surgical masks?

Bałazy A[1], Toivola M, Adhikari A, Sivasubramani SK, Reponen T, Grinshpun SA.

Author information

- **N95 respirators not designed to be 95% effective against small viruses.**
- **Surgical masks not effective at all against viruses.**

Full Face Mask. 100% Effective Down to 0.3 Micron

3M Full Facepiece Respirator, 6800. Protects eyes. Even this will not be perfect for viruses. **Consider disinfecting after use with Ozone or Chlorine Dioxide.**

N100. 100% Effective Down to 0.3 Micron

3M 8233 N100
Respirator. Not considered reusable. But must be reused.
Consider disinfecting after use with Ozone or Chlorine Dioxide.

Respiratory Protection. N100 vs P100

N100 vs P100?

The difference between the two pertains to their resistance to oil-based particles. Both good for our needs.

N95 Respirators. 95% Effective Down to 0.3 Micron

3M 8210 or 8511 N95 Respirators. Not considered reusable. But must be reused. 8511 has exhalation valve that helps reduce heat and moisture build-up inside the respirator

Consider disinfecting after use in Ozone or Chlorine Dioxide.

N100 Filters. 100% Effective Down to 0.3 Micron

The difference between the 3M 2091 respirator filter and the 3M 2097 respirator filter is that the 3M 2097 filters out nuisance levels of organic vapor. (Organic vapors are carbon based vapors, like oils). Both good for our needs.

Consider disinfecting after use with Ozone or Chlorine Dioxide.

Half Face Respirator. With P100 Cartridge. But No Eye Protection

3M 7500 Series Reusable Respirator. Must add eye protection. **Coronavirus infection can occur through the eyes.**

Eye Protection for Half Face Respirators

3M Safety Glasses, Removable Foam Gasket, Clear Anti-Fog Lenses. Protects eyes but not perfect.

Best Eye Protection for Half Face Respirators

3M GoggleGear. Indirect venting. (Yellow Arrow.)
Anti-scratch and Scotchgard Anti-fog coating
Clear polycarbonate lens
OSHA D3 (droplet and splash) and D4 (dust) rated.
Protects eyes but not perfect.

According to the CDC. N95.

- "An N95 respirator will filter out at least 95% of very small (0.3 micron) particles."

- At least 95% down to 0.3 micron.
- But Coronavirus is 0.1 to 0.125 micron!
- Do not rely on N95% respirators to protect you against Coronavirus.
- Keep in mind that even N100 respirators are not 100% effective against viruses

OUR RECOMMENDATIONS

- **We recommend:** Full face or half face respirator (with quality goggles) and P100 cartridges.
  - Cartridges are reusable. Can be sanitized with chlorine dioxide or ozone.
- This gives far better protection against viruses vs N95.
- But how much better? Perfect? Not at all.
- Let us assume that neither N95 or even N/P100 work perfectly for virus size particles.
- Should this concern you when decontaminating a potentially infected area?
- It does concern me!

STUDENTS HAVE ASKED

- Students have asked … “How long do disposable respirators or cartridges last”.
- There is no simple or accepted answer.

- For mold remediation, the masks/ filters get dirty from the aerosolized demolition dusts no matter how clean the work space is kept. They frequently need changing.
- But if you are using a mask/filter in a clean (essentially virus free) environment they should be able to be used for ever. Until they fall apart.
- **If you are using a mask/filter in a potentially virus infected area, at the end of the job … disinfect. Or it has been recommended simply put it aside for 5-7 days before reuse.**

OUR RECOMMENDATIONS

- When crews are working decontaminating a potentially infected area, all client personnel **SHOULD** be gone to reduce exposure risk.
- For offices, work at night.
- If you must decontaminate facilities such as nursing homes where people must be present, use only young workers … no older at risk people.

How Long Do Viruses Stay Airborne?

Airborne Transmission

- **Airborne transmission**
  1. Via airborne droplet spread from cough/sneeze.
  2. Via airborne spread of droplet residue: Viruses attached to airborne skin flakes, fungal spores and/or dusts.
  3. Through the AC and ducting.

Sneeze/Cough Droplets Relatively Large vs Naked Viruses

- Small droplets from cough/sneeze of the order of **1.0 micron** evaporate within a few milliseconds, even under the conditions of high RH.
- Droplets of the order of **10 micron** exist for up to a few tenths of a second.
- While very large droplets, **100 micron** in diameter, survive for up to almost a minute.
- **With this information we can conclude that N95 masks that are tested to work down to 0.3 micron will be very effective at filtering out such sneeze/cough droplets but what happens to the viruses when the droplets evaporate?**

Take No Chances. Do not Rely on PPE!

Indoor Air 2006; 16: 335–347
www.blackwellpublishing.com/ina

INDOOR AIR
doi:10.1111/j.1600-0668.2006.00432.x

Droplet fate in indoor environments, or can we prevent the spread of infection?

- According to the article: “If the droplets contain infectious bioaerosols, such as viruses, the viruses too would remain in the air after the liquid content evaporated”.
- **0.1 micron airborne viruses, free of their water drops (coughs/ sneezes) … there is no proof that they would be in any way effectively filtered by either N95 or N100 masks neither of which are rated below 0.3 micron.**

Take No Chances. Ventilate to Clean Air of Viruses

- An effective method to reduce the level of any airborne viruses is to ventilate (as we do to make mold remediation safe). Replace the indoor air with outdoor air.
- This procedure is simple. Place high speed axial fan ventilators in the indoor environment connected to the outdoors using lay flat ducting.
- Example: Max Force is 4000 cfm. Will exchange the air in a room or home or office quickly (may need a few of them.)

Max Force.

SPECIFICATIONS FOR MAX FORCE

VOLTAGE	110/120V
FREQUENCY	60 HZ
MOTOR	1 HP
CURRENT	8.6 AMPS
RPM	3450
CFM	4000
HEIGHT	22”
WIDTH	21”
LENGTH	15 ½”
WEIGHT	39 lbs*

Take No Chances. Ventilate

- But make sure that you are not exhausting the virus-contaminated air into someone else's home or office.
- No you are not destroying the environment by exhausting viruses outdoors.

Photochem Photobiol. 2007 Sep-Oct;83(5):1278-82.

Inactivation of influenza virus by solar radiation.

Sagripanti JL[1], Lytle CD.

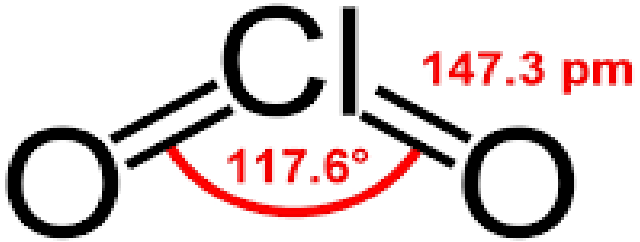
Author information

Abstract

Influenza virus is readily transmitted by aerosols and its inactivation in the environment could play a role in limiting the spread of influenza epidemics. Ultraviolet radiation in sunlight is the primary virucidal agent in the environment but the time that influenza virus remains infectious outside its infected host remains to be established. In this study, we calculated the expected inactivation of influenza A virus by solar ultraviolet radiation in several cities of the world during different times of the year. The inactivation rates reported here indicate that influenza A virions should remain infectious after release from the host for several days during the winter "flu season" in many temperate-zone cities, with continued risk for reoccupation and human infection. The correlation between low and high solar virucidal radiation and high and low

Take No Chances. Or Instead of Ventilating …

- Consider: Gassing the job site the evening or morning before with either **Chlorine Dioxide or Ozone.**
- Gas thru the AC system.
- This will eliminate ALL airborne viruses while at the same time decontaminating the AC/ducting
- Make sure that the building is safe for re-entry. See next section.



Measuring Ozone/ CLO2

Measuring Levels of CLO2 and Ozone

- We measure the level of disinfectant gas for two purposes:
  1. To make sure the levels administered are sufficient to kill the virus.
  2. To make sure the levels before re-entry are safe.
- There are gas monitors available to perform such measurements.

Ozone

- We use the Aeroqual ozone monitor from Ozone Solutions to measure Ozone levels.
- Programmable danger level alarm.

Ozone Monitor

CLO2

- We use the MSA monitor for measuring CLO2 levels.
- Pre-programmed alarm.
- Alarm goes off if monitor detects levels of CLO2 above OSHA permitted levels.

MSA Multi Gas Monitor

Employee Temperature Log

Employee Temperature Log. Temp ≥ 100.4?

Employee Temperature Log

Name _____

Date fever watch initiated _____ Date fever watch ends _____

Instructions:

- Each person must have a log form.
- Temperature must be taken twice a day, preferably around the same time in the morning and in the evening.
- Temperature must be taken by a medical professional (R.N., M.A., etc.) with a **DIGITAL** thermometer.
- If you are taking aspirin, Tylenol® (acetaminophen), ibuprofen, or any medicine that can reduce a fever, take your temperature before taking your next dose and note medication taken, dose, and time of last dose in comments column.
- If temperature is ≥100.4° F (38° C) immediately notify _____.

Date	Time	Temperature	Route	Comments
	a.m./p.m.	F/C	Digital Forehead	
	a.m./p.m.	F/C	Digital Forehead	
	a.m./p.m.	F/C	Digital Forehead	
	a.m./p.m.	F/C	Digital Forehead	
	a.m./p.m.	F/C	Digital Forehead	
	a.m./p.m.	F/C	Digital Forehead	
	a.m./p.m.	F/C	Digital Forehead	
	a.m./p.m.	F/C	Digital Forehead	
	a.m./p.m.	F/C	Digital Forehead	
	a.m./p.m.	F/C	Digital Forehead	
	a.m./p.m.	F/C	Digital Forehead	
	a.m./p.m.	F/C	Digital Forehead	
	a.m./p.m.	F/C	Digital Forehead	
	a.m./p.m.	F/C	Digital Forehead	
	a.m./p.m.	F/C	Digital Forehead	
	a.m./p.m.	F/C	Digital Forehead	
	a.m./p.m.	F/C	Digital Forehead	
	a.m./p.m.	F/C	Digital Forehead	

Updated 03/18/2020

Employee Temperature Log

- On March 17, 2020, the U.S. Equal Employment Opportunity Commission (EEOC) issued an update to its guidance that now expressly acknowledges that **employers may implement temperature screening measures in response to the current COVID-19 pandemic.**

Digital Thermometer

Employee Temperature Log

- However, the EEOC cautions employers to “be aware that some people with COVID-19 do not have a fever.”
- Checking temperature does not detect all people that have been recently infected.

Make Sure You Have Disposable Plastic Covers

Employee Forehead Temperature Using FLIR

- Several of our students have had success (more success than with cheap thermometers) using a FLIR Thermal Imager to measure crew body temperature (forehead) before starting jobs.
- Use the top temperature range in the upper right-hand side of the FLIR.
- See picture on right.
- This is our preferred method of checking body temperature of crew. Fast and accurate.

FLIR Thermal Image of Forehead

Cleaning Fabric Furniture/ Carpet

Cleaning With Fabric Cleaners

- Cleaning with soap/detergent and water, or steam cleaning, extraction is effective against Coronavirus.
- Such cleaning procedures are removal.
- Do not vacuum, it aerosolizes viruses. Does not remove.
- But such cleaning is expensive and time consuming.

Carpet Cleaning

- Either cover carpet with plastic or steam clean and then spray with Scotchgard.
- Again … vacuum cleaners take the viruses on the carpet and aerosolize them … blow them into the air.

DANGER.

SHAMPOO. DRY. SEAL.

Cleaning Fabric Furniture After Scotchgard

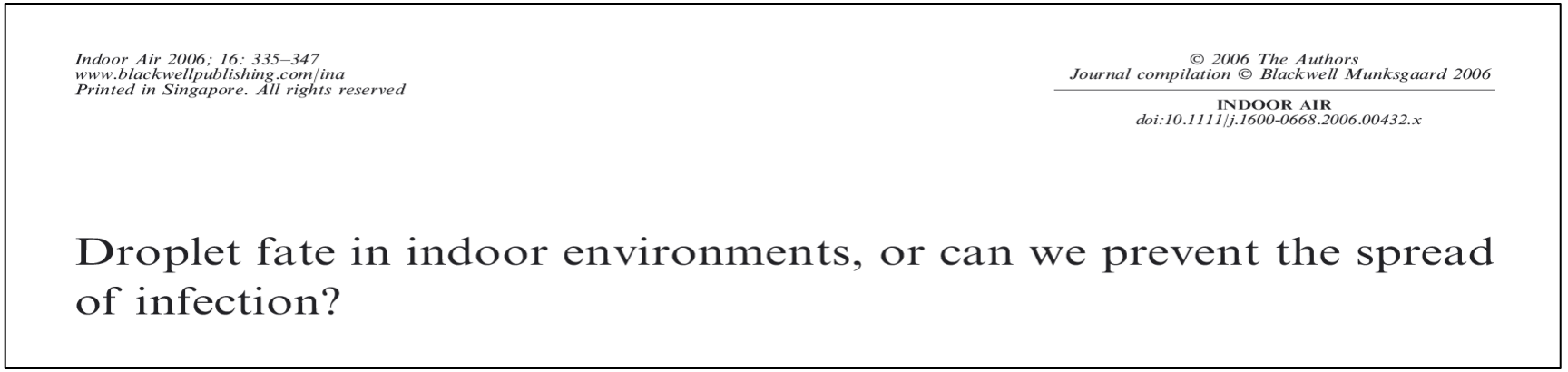
- Sealing fabric furniture and carpet with Scotchgard improves the ability of fabrics to be cleaned and disinfected.
- <u>Makes them similar to a hard surface.</u>
- This is not a commercial for Scotchgard but it is very inexpensive by the gallon and makes cleaning/ disinfecting fabric furniture/carpet easier and with less disinfectant.
- Shag carpet. Discard.

Scotchgard

Air Filtration

Air Filtration

- People use face masks to filter out sneeze or cough micro-particles.
- But they forget about high quality air filters in their air handlers.
- Turn the AC FAN=ON. Use MERV 13 air filters.
- Effective to capture most submicron aerosolized particles. Which is most sneeze or cough airborne droplets.



Indoor Air 2006; 16: 335–347
www.blackwellpublishing.com/ina

INDOOR AIR
doi:10.1111/j.1600-0668.2006.00432.x

Droplet fate in indoor environments, or can we prevent the spread of infection?

Air Filtration

- The influenza virus survives in dust (including submicron dust particles) for a number of days depending upon the surface on which it is deposited (Derrick, 1941).
- The virus can then be spread either by:
  - Direct contact (for example touching of the surface by hands) or by,
  - Aerial transfer of dried virus on dust particles.
- **Why not filter out virus contaminated dust in the air with good quality air filters?**
- **Why not reduce air transport as a mechanism for virus spread?**
- **No one talks about this. No one thinks about this.**

Min Merv 13 Air Filters for Filtering Small Particles.

MERV Rating	0.3- 1.0 Milcrons	1.0 = 3.0 Milcrons	3.0 -10.0 Milcrons
MERV-1	-	-	<20%
MERV-2	-	-	<20%
MERV-3	-	-	<20%
MERV-4	-	-	<20%
MERV-5	-	-	20% - 34%
MERV-6	-	-	35% - 49%
MERV-7	-	-	50% - 69%
MERV-8	-	-	70% - 85%
MERV-9	-	<50%	>85%
MERV-10	-	50% - 64%	>85%
MERV-11	-	65% - 79%	>85%
MERV-12	-	80% - 89%	>85%
MERV-13	<75%	>90%	>85%
MERV-14	75% - 84%	>90%	>85%
MERV-15	85% - 94%	>90%	>85%

Filters less than MERV 13/APR2200 will not remove highly toxic sub-micron mold fragments.

Don’t Aerosolize Dusts

- Do not bring in air scrubbers or blowers. Do not vacuum.
- They will aerosolize the virus contaminated surface dust.

Do! Change Out Client AC Filters to Merv 13 the Night Before

- Do. Change out the client's AC filters the night before you enter.
- Turn the FAN=ON instead of Auto.
- This will filter the air 24x7.
- **ALL dusts even submicron dusts (or mold spores) that may have viruses attached will be completely filtered out**.

Pre-Cleaning & Disinfecting Touchpoints

Pre-Cleaning Touch Points

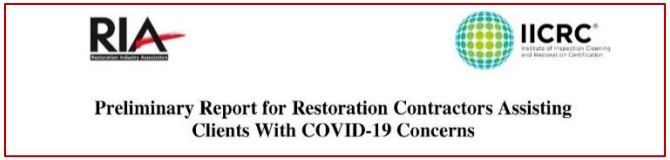
- Delivering the cleaning agent as a foam may have advantages over a sprayer or fogger for cleaning touchpoints.
- A foam application allows the worker to see what has been covered, allows the product to stay on the surface longer without drying, and may use significantly less of the cleaning product.
- **Keep in mind that often touchpoints do not need pre-cleaning but only disinfecting.**

Foam-It brand foamer.

Cover Return Air Ducting

- Return air vents should be covered to prevent migration of fogged or sprayed biocides (not recommended but we know people are doing it) into the equipment or to other areas.
- While air duct cleaning can be incorporated into COVID-19 response procedures, the EPA has strict rules regarding which products can be used in HVAC systems.
- No biocides that leave a killing residue can be fogged/sprayed into ducting.

According to RIA/IICRC Report. HVAC Is Not a Concern



- "It is also at this time **not clear** that the HVAC or air conveyance system plays a role in the spread of SARS-CoV-2 virus, and the inclusion of HVAC cleaning and decontamination **therefore may not be necessary."**
- I would disagree with that position. Don't worry about the HVAC/ducting because at this time it is "not clear" that it plays a roll in spreading Coronavirus.
- Are you going to bet your life that the HVAC system cannot play a part in virus dispersal? NO. Heck no!
- In fact the HVAC is the optimal mechanism for dispersing gaseous disinfectants such as Ozone or Chlorine Dioxide gas.
- And at the same time … the AC and ducting get sanitized.

Clean / Disinfect Equipment Between Jobs

- It is important to note that equipment must be scrupulously cleaned between each project. Cleaning for viruses is not cleaning for mold!
- Contractors should validate their equipment cleaning procedures to ensure that no microbiological contaminants will be transferred from one location to another.
- We recommend disinfecting equipment using a disinfectant applied as a foam. A low concentration bleach/detergent mix works well.

Clean / Disinfect Equipment Between Jobs

- To produce a suitable bleach-based disinfecting foam be sure to use a high PH, high foam detergent.
- If you use a low PH detergent it will neutralize the bleach which is high PH.
- The Zep brand high foam, high PH equipment cleaner applied with a Foam-It brand applicator/foamer works well. (It's what we use.)

PART V: POST-REMEDIATION TESTING & WRAP UP

Post Remediation Testing

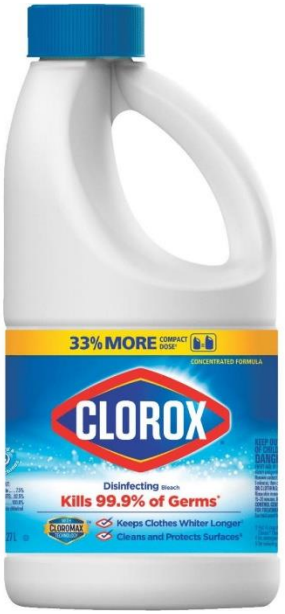
ATP Testing

- A widely used process in the food industry that provides on-site instant results is a swab collection of surface samples using an adenosine triphosphate (ATP) meter. ATP meters do not identify viral contaminants since those organisms do not produce ATP.
- However, the overall reduction in biological contaminants is an excellent surrogate measure of cleanliness since selective cleaning of specific contaminants is impossible (e.g., it is not possible to clean bacteria and leave behind just the virus).

Our firm uses the Kikkoman Lumitester PD-30.

ATP Testing

- ATP test equipment varies. No set standard.
- For us, ATP post remediation testing is not generally reliable because it is so sensitive. But can be made reliable.
- ATP testing works for us when surfaces are pre-cleaned and then cleaned again/ sanitized with 1 to 10 (strong) bleach solution which eliminates all trace of organic matter.
- Then results come back Non Detect. Zero.
- That is a number everyone can agree on for Post Remediation Verification.



Culture Testing

- Culture testing for mold and bacteria is a CDC/EPA approved procedure for Post Remediation testing for Coronavirus. Why?
- Mold spores are much more durable than Coronavirus.
- If most or all mold spores have been killed, viruses are all dead.
- Highly reliable for air.
- For surfaces because one only tests a small area of surfaces, reliable only if entire surface is bleached with 10% bleach as with ATP testing.

Culture Testing

Pre-Remediation Testing

Post-Remediation Testing

CONCLUSIONS

WHICH PROCEDURES/PRODUCTS MAKE THE MOST SENSE?

There is no answer to that. Depends on what you are disinfecting among other things. General thoughts …

- **Lysol** (Quat plus Alcohol.) Excellent for decontaminating workers. Safe. Kills Coronavirus. Requires pre-cleaning if rooms heavily soiled.
- **Chlorine Dioxide (GAS only).** Excellent in very low dosage to disinfect pre-cleaned dirty/dusty rooms. Expensive/ limited supply because there is a large volume of air to disinfect versus disinfecting surfaces. Disinfects ducting.
- **Ozone.** Kills viruses at recommended concentrations. As long as there is electricity there will be ozone. Not limited to containers of disinfectants or alcohol on hand. Requires pre-cleaning if rooms heavily soiled.

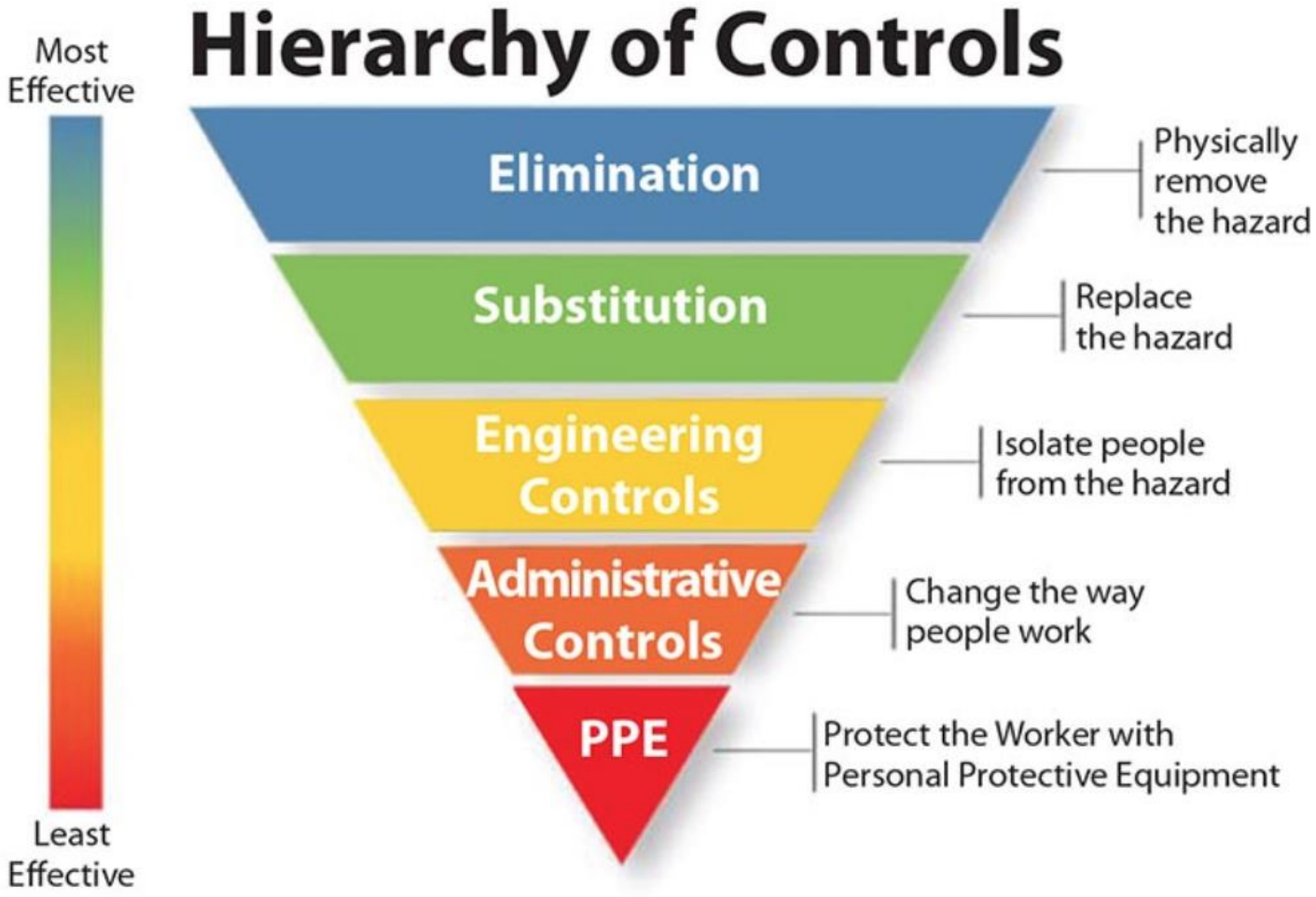
WHICH PROCEDURES/PRODUCTS MAKES THE MOST SENSE?

- **70% Alcohol.** Works great if you can find it.
- **Dilute Bleach.** Optimal low cost solution for disinfecting any surfaces. Surfaces need to be pre-cleaned or relatively clean because dilute bleach is deactivated by organic materials (dust/dirt.) 1/100 recommended by CDC. 1/50 recommended by latest German Research.
- **Hydrogen Peroxide:** Consumer products not EPA/CDC recommended. But studies show 0.5 percent works well.
- **Microban QGC/Mediclean QGC /Fiberlock Shockwave**. Kills Coronavirus. Hard to find. Limited to hard surfaces. No fogging. Not recommended. No benefit vs dilute bleach or soap/detergents and water. **Liability issues.**

WHICH PROCEDURES/PRODUCTS MAKES THE MOST SENSE?

- **Detergents for Cleaning.** Part of recommended 2-Step solution. Clean and then Disinfect. (But pre-cleaning prior to disinfecting is not needed if surfaces are generally clean.)
- There is no set concentration of detergent that is EPA/CDC approved to kill viruses. Research studies indicate 0.01 percent detergent is all you need to kill Coronavirus. But is that enough to clean. No. Dilute per label directions.

OSHA WORKER PROTECTION



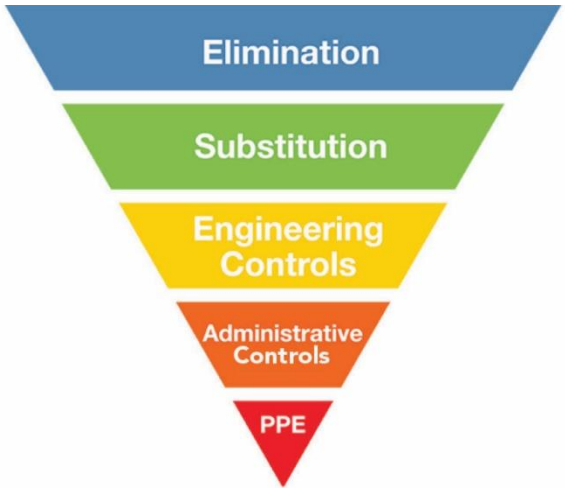
OSHA. "Do not overly rely on PPE".
Relying on PPE is the least effective protection method.

OSHA WORKER PROTECTION

Do not rely on personal protective equipment (**PPE**) devices alone to provide protection against hazards. ... The following **OSHA** standards apply when selecting proper eye and face protection for the workplace: 29 CFR 1910.132, General requirements.

www.osha.gov › SLTC › etools › eyeandface ▼

- OSHA. “Do not overly rely on PPE”. Very good advice!
- The key to safety is to keep the work environment as safe as possible.
- **For Coronavirus, first and foremost do not work in any buildings that have people inside that may be infected and spreading the virus. If you must then use young people only.**



WORKER PROTECTION: FOCUS ON ELIMINATING THE DANGER

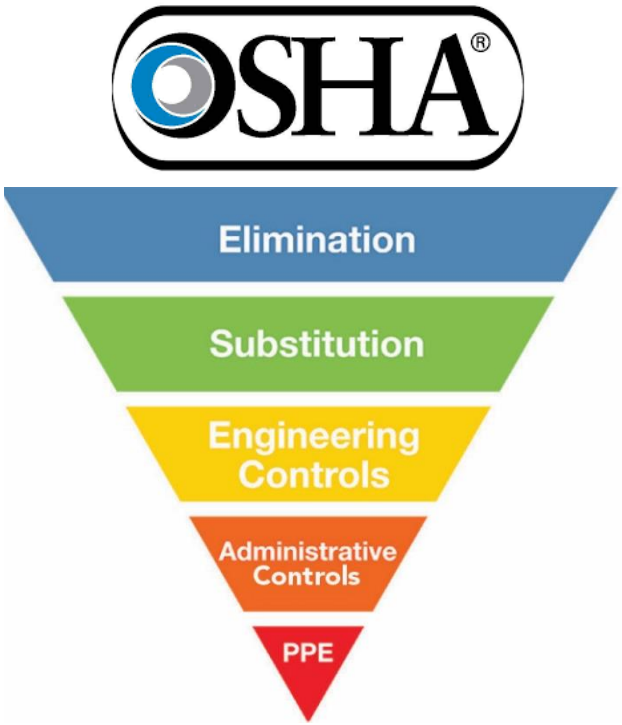
- Rely on N95s or even N100s? No. Viruses pass through an N95 in studies as we have seen. “Do not overly rely on PPE”.
- Best to make sure there are no live airborne viruses while your crews are cleaning/ decontaminating. Pre-clean air with:
  - Chlorine dioxide gas or ozone thru the AC a few hours before your crew enters.
  - Use CD or Ozone monitors to make sure it safe to re-enter.
  - Or air the place out with powerful fans before entering.
  - And/or replace AC filters with min Merv 13 and turn FAN=ON.
  - Make sure you have eye protection.

DO NOT EXPOSE ELDERLY OR SUSCEPTIBLE WORKERS

- **Do Not Expose Elderly or Susceptible Workers**
- Substitute a young person for an older person for Coronavirus work.
- **This is huge!**

SCREEN YOUR CREW

- Do not work with crew members that have elevated temperatures.
- Measure temperatures with a FLIR. If elevated, send home.



PRV: POST REMEDIATION VERIFICATION

- ATP monitoring floors that have been cleaned and then bleached. No organic matter detected. Viruses all gone.
- But visual testing of cleanliness works well. Re-Swiffer a floor and if the bottom of the Swiffer is quite clean, then virus and anything else are all gone.
- After Chlorine Dioxide gas or Ozone treatment, test for live airborne Penicillium/ Aspergillus with culture testing. Mold spores dead = All viruses dead.

Titan Hydroxyl Generator Experiments

Titan Hydroxyl Generators Experiments

- Titan Hydroxyl generators … claimed to kill viruses but no science to back that up.
  - What concentration?
  - What humidity?
  - What duration?
- Will you bet your life on marketing claims that these kill Coronavirus?
- Studies/testing underway.

Test room in my garage.

Hydroxyl Generators Preliminary Test Results

- The theory is that if the Hydroxyl generator can kill mold spores then it can kill Coronavirus which is much more fragile.
- 30 min in 8x8x8 room. 30 minute pretreat air with Titan 4000.
  - 30 minute exposure of PDA filled petri dish.
  - Compare to outside.
  - Incubate at 93 degrees for 4 days.
- Results with Titan 4000 that had dust on the bulbs. No observable difference.

Hydroxyl Generators Preliminary Test Results

- Keep in mind that the Titan has a metal “air” filter that does absolutely no good in filtering out dusts.
- Best to throw this filter away and replace with Merv 13 rated filter.
- The MERV 13 only reduces air flow by 25% (as measured) while keeping the bulbs clean.
- Cleaning the bulbs requires disassembly.

Hydroxyl Generators With Humidity Boost.

- Results with Titan plus Maximizer (small humidifier.) Lab analysis. Doesn’t work. See next two pages.

Our Test Room

Hydroxyl. Treated vs Outside Control. Very Little Difference.

ANALYSIS METHOD	6120 Air Culturable	6120 Air Culturable	6120 Air Culturable	6120 Air Culturable
LOCATION	301	301	301	OUT
COC / LINE #	1323387 - 1	1323387 - 2	1323387 - 3	1323387 - 4
SAMPLE TYPE & VOLUME	SETTLING	SETTLING	SETTLING	SETTLING
SERIAL NUMBER	A	B	C	D
COLLECTION DATE	Not provided	Not provided	Not provided	Not provided
ANALYSIS DATE	Mar 30, 2020	Mar 30, 2020	Mar 30, 2020	Mar 30, 2020
CONCLUSION	NOT ELEVATED	NOT ELEVATED	NOT ELEVATED	NOT ELEVATED

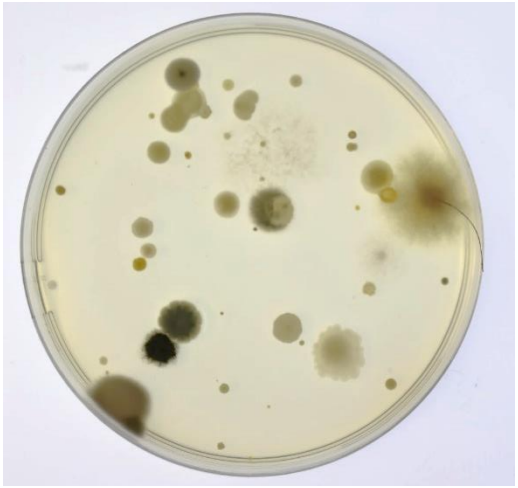
IDENTIFICATION		Colonies	Percent of Total		Colonies	Percent of Total		Colonies	Percent of Total		Colonies	Percent of Total
Cladosporium												
Non-sporulating fungi		2	29		2	100					2	40
Penicillium		5	71					2	50		3	60
Yeast								2	50			
TOTAL SPORES		7	100		2	100		4	100		5	100
MINIMUM DETECTION LIMIT*		1			1			1			1	

ANALYSIS METHOD	6120 Air Culturable	INTENTIONALLY BLANK	INTENTIONALLY BLANK	INTENTIONALLY BLANK
LOCATION	OUT			
COC / LINE #	1323387 - 5			
SAMPLE TYPE & VOLUME	SETTLING			
SERIAL NUMBER	E			
COLLECTION DATE	Not provided			
ANALYSIS DATE	Mar 30, 2020			
CONCLUSION	NOT ELEVATED			

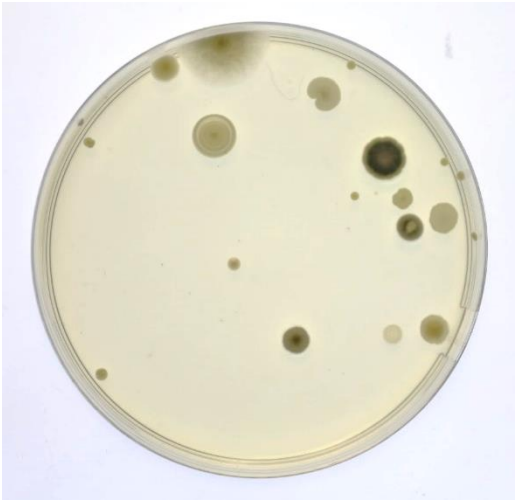
IDENTIFICATION		Colonies	Percent of Total	Raw Count	Spores per m^3	Percent of Total	Raw Count	Spores per m^3	Percent of Total	Raw Count	Spores per m^3	Percent of Total
Cladosporium		2	40									
Non-sporulating fungi		3	60									
Penicillium												
Yeast												
TOTAL SPORES		5	100									
MINIMUM DETECTION LIMIT*		1										

Hydroxyl. What Do You Think?

- Test results show that the room with the hydroxyl generator was much worse than the control. How is this possible.
- The Titan fan (or Odorox snail blower) stirs / aerosolizes dust and **greatly increases spores (or Coronaviruses) in the air.**



Hydroxyl treated indoor air.



Control

Hydroxyl Generators. With Vornado Humidifier

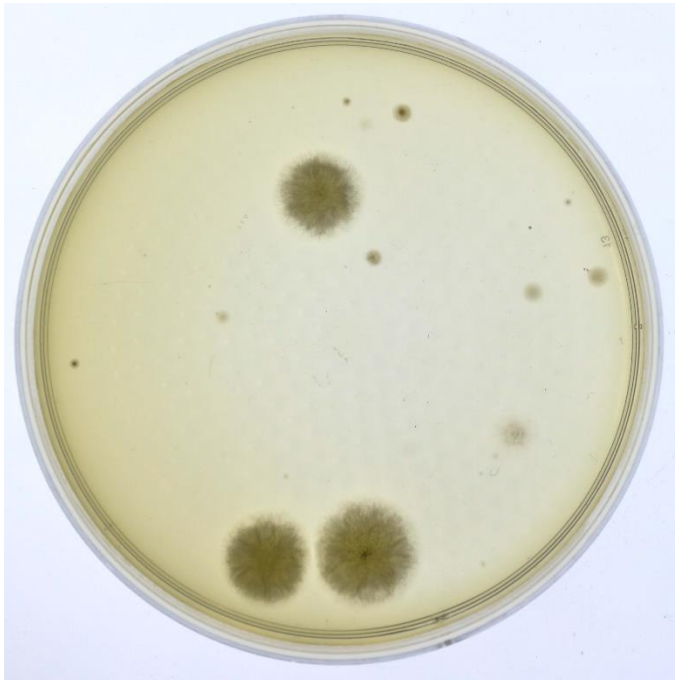
- After:
  1. Carefully cleaning all dust from the floor.
  2. Purchasing a Vornado (powerful) humidifier from Amazon. Shown in middle.
  3. With cleaned Titan bulbs.
- Turned humidifier on for 30 min. Measured indoor humidity of 80%.
- Turned on Titan. Could see humidity levels drop quickly to 70% and below while humidifier is on.
- Clearly making lots of hydroxyl ions. Proves Titan is working.

Test room with large humidifier

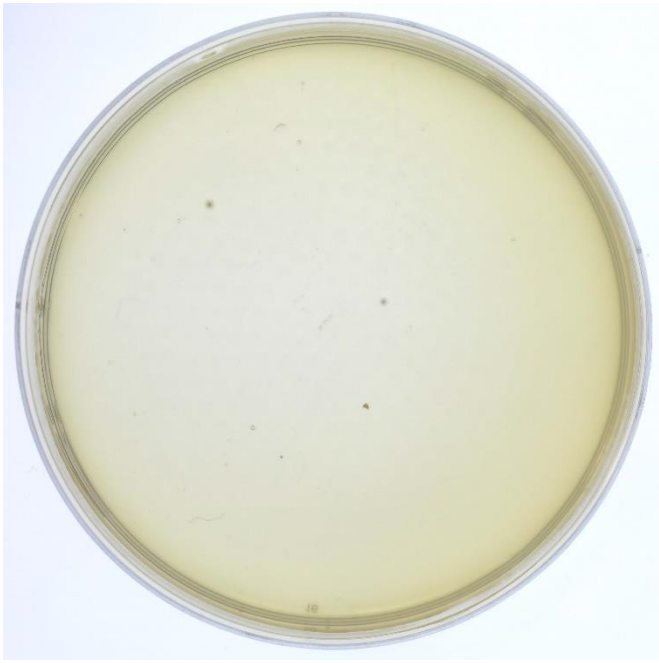
Hydroxyl Generators. With Vornado Humidifier

Vornado Humidifier

Hydroxyl Generator. Now Working with Humidifier



No Hydroxy Treatment



With Hydroxy

- Both samples. 10 minute at 28 lpm. 48 hour incubation at 93 degrees. Clear difference with hydroxyl when you use the more powerful humidifier.
- What does this mean? **LET'S DISCUSS.**

Test Chamber in Garage is Now Decontamination Chamber

Warranty. No Warranty.

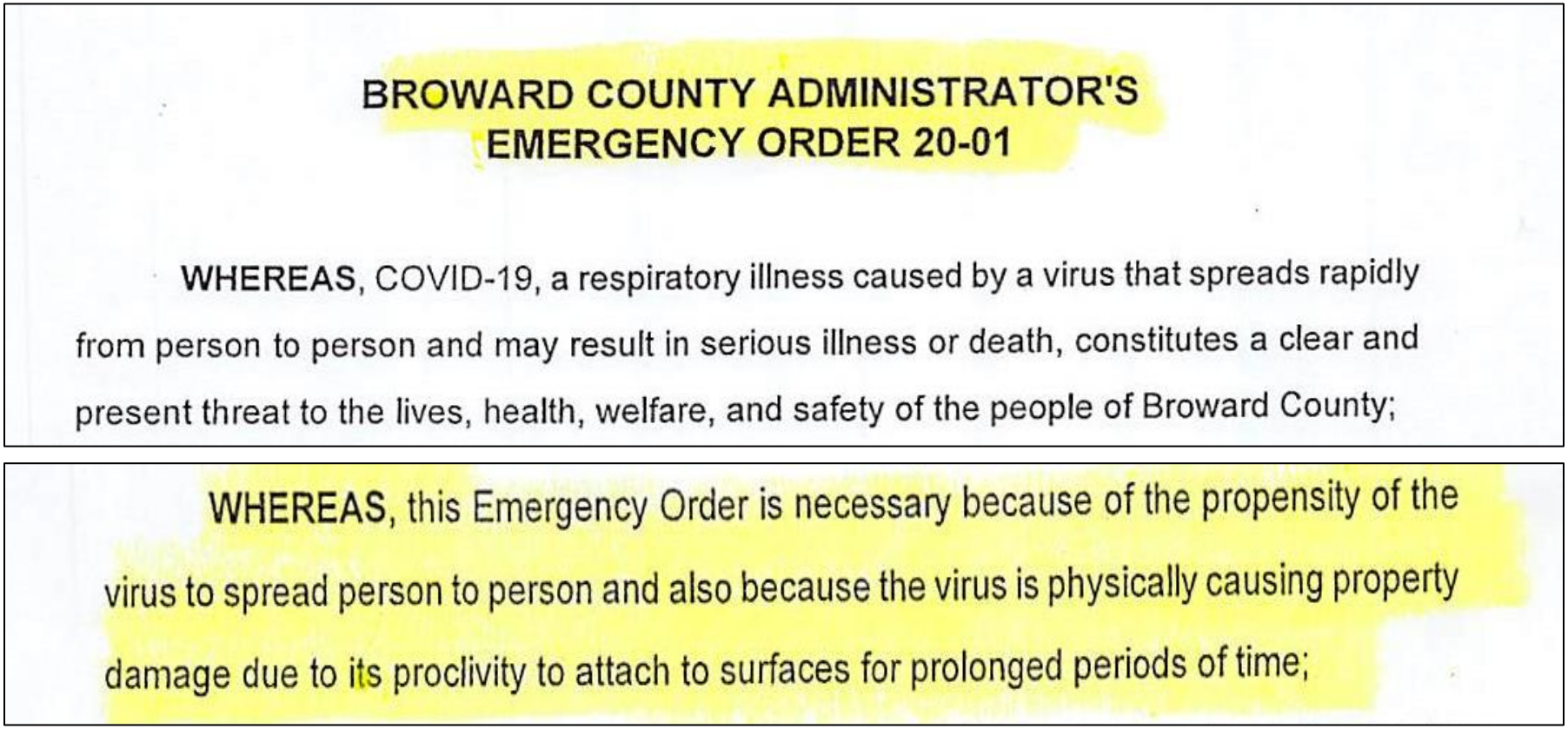
REPRESENTATIONS. NO WARRANTY FOR WORK PERFORMED.

This Agreement ….

- Service Provider is a State Licensed Mold Remediator. The extensive State-Approved mold remediation training is actually a more general training on all forms of Microbial Contamination and includes not only mold but also bacteria and virus decontamination.
- Service Provider/ Licensed Mold Remediator is in addition, trained and certified in Green, Chemical-Free disinfecting/ decontaminating COVID-19 by State Approved Mold Training/ Exam provider now offering COVID-19 training and exams.
- Service Provider is providing procedures, methods, and products as recommended and/or approved by the EPA/CDC for decontaminating COVID-19.
- Service Provider is using products that leave no toxic chemical residue that "keep on killing". Once the procedure is performed, there is no protective residue or film that will protect the occupants from future exposure/infection.
- **Service Provider makes no claim that said procedures are in any way appropriate for decontaminating COVID-19. There is no warranty either express or implied.**
- **Client(s) agree to fully release Service Provider for any and all liability related to or arising from Service Provider's services.**

PART VI: INSURANCE COVERAGE DISCUSSION

Insurance Coverage Discussion



BROWARD COUNTY ADMINISTRATOR'S EMERGENCY ORDER 20-01

WHEREAS, COVID-19, a respiratory illness caused by a virus that spreads rapidly from person to person and may result in serious illness or death, constitutes a clear and present threat to the lives, health, welfare, and safety of the people of Broward County;

WHEREAS, this Emergency Order is necessary because of the propensity of the virus to spread person to person and also because the virus is physically causing property damage due to its proclivity to attach to surfaces for prolonged periods of time;

- Coverage under $3K Emergency Services to protect property?
- Will any jury in the State deny coverage for this even if technically there is no coverage?