

Coronavirus: how to disinfect it, and how to stay safe

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This document provided by Smell Fresh Arizona, LLC. in response to the recent Coronavirus pandemic in our community. It is intended to help people understand the science behind viruses, and how to reduce exposure. This document aims to go beyond catches phrases. We believe the better you understand the science of viruses and disinfection measures, the better equipped you will be to protect yourself, your loved ones, and your community.

- By Michael Samora

What is a virus?

Generally speaking, viruses are submicroscopic infectious agents that are usually regarded as nonliving extremely complex molecules that typically contain a protein coat surrounding an RNA or DNA core of genetic material but no semipermeable membrane, that are capable of growth and multiplication only in living cells of a host, and that cause various important diseases in humans, animals, and plants.

While seemingly a complex, and overly scientific explanation, we in the general public in our desire to understand how to stop its spread, and not get infected ourselves, need to understand two fundamental points from this explanation of a virus:

1. It is only capable of growth in living cells.
2. It remains an active threat in its protein or lipid coating.
 - a. SARS-CoV-2 (Coronavirus) rely on a protective lipid coating, and are the easiest type to deactivate.

* SARS-CoV-2 is the name of the virus that causes the coronavirus disease COVID-19.

What to make of these two fundamental points in stopping the spread of a virus, or more specifically, the Coronavirus?

“It is only capable of growth in living cells.”

Let's first understand what makes viruses such a threat to people, and why we don't have a catch all medical cure for all or most viruses. For starters, they are such small molecules, that they cannot be individually seen by light microscopy available in most labs. Furthermore, they mutate so a vaccine for

one mutation may not work on another. SARS-coV-2 is a specific mutation of a broader class of Coronaviruses, which has recently found its way into humans, and has caused this current pandemic.

Let's next understand why or how it spreads among people, especially given the quote: "it is only capable of growth in living cells". Once a person becomes infected, they are a host to the virus. The virus now has living cells to multiply and thrive in. The virus can attach itself to all of your living cells, so when you breathe, sneeze, cough, or rub your eyes, your secretions will contain the virus. With nothing around the virus molecules, or as these secretions dry out, these virus molecules can cease to be a threat. HOWEVER, your saliva, mucus, tears, and oils from your skin can provide protective coverings for the virus molecules to remain active for days, particularly on hard surfaces like glass, metals and plastics. **Some other points to note:**

- A virus can be active in your body before you feel the symptoms.
- A virus is obviously active while you know you have the symptoms.
- Provided you survive, your body's immune system will eventually "kill off" the virus.
- You can receive transmission from taking a breath of air that was expelled by someone infected.
- You can receive a transmission from touching biomatter deposited on a surface from an infected person, typically only if you then touch your eyes, nose, or mouth.

** While acknowledging viruses are regarded as "nonliving", we'll often reference some form of expression of "killing" viruses to imply a destruction of the virus's molecular structure.*

So two typical transmission scenarios are:

- An infected person coughed or sneezed on a surface. That surface was then touched by someone else. That person then rubs their eyes or nose, or touches something that they then put in their mouth.
- An infected person is talking close enough to another person for them to breathe in a breath of air expelled by the infected person. When a person breathes out, their breath is rich in moisture (water molecules) that can carry the virus over to another person's inhalation, and/or possibly be deposited on a hard surface.

So how do we stop its spread in knowing that "it is only capable of growth in living cells"?

The main methods are:

- Practice social distancing: 6 feet is the common standard right now. Do not get too close to other people, and don't shake hands.
 - Avoid touching surfaces recently touched by people who could potentially be infected.
 - o If you go out into the general public, you should wash your hands outside your home before entering, or at least immediately upon entering your home.
 - Clean surfaces: wipe surfaces touched by other people who could potentially be infected.
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“It remains an active threat in its protein or lipid coating.”

Understanding this quote, is what enables us to clean, or disinfect surfaces and air.

So what to clean with?

In understanding that a virus only **“remains an active threat in its protein or lipid coating”** gives us a vital understanding of how to kill or neutralize them outside of a host body. Inside a person, it’s hard for medical science to keep up with treating infected people. Outside of a person, the science, available technology, and chemicals are quite stout in eliminating viruses.

A virus’s protein or lipid coating is easily pierced rendering the virus molecule “killed” or inactive, inert matter. Outside of a host, a virus is a relatively weakly structured molecule that can be broken down relatively easily. Certain chemical-based products break open the viruses outer coating and its internals fall apart, effectively “killing” the virus. What cleaners do this?

- **Soap**
- **Alcohol based cleaners (often hand sanitizers)**
- **Quaternary cleaners**
- **Oxidizers**

Soap

Soap is very effective in two ways. First, soap is a surfactant (most soap products are surfactants). Surfactant molecules contain a lipophilic (fat-loving) end that attaches to grease and dirt, and a hydrophilic (water-loving) end which makes the molecule dissolve in water. Water alone can be good at cleaning soiled surfaces, but we know soapy water is better. In reducing the surface tension of water, soapy water lets the water molecules work their way into smaller holes or pores of surfaces invisible to the human eye; thus making soapy water better than plain water in removing loose matter from objects.

Secondly, soap dissolves the fatty membrane (lipid) that holds the virus together. Given soaps are often made from fat-like substances known as amphiphiles, the soap molecules compete with the lipids holding the virus together. The cell is then broken up, becoming inert, harmless matter.

Alcohol based cleaners

Most hand sanitizers are alcohol-based cleaners. Alcohol also breaks down the protein or lipid coating of a virus molecule. The CDC suggests that alcohol-based cleaners are not as effective as soap for two reasons:

- The concentration may not be high enough. Generally speaking, hand sanitizers should be at least 70% concentration levels of alcohol for best effectiveness.
- If you do not remove the greases and soil on your hands or surfaces, the virus molecule could “hide” in these oils on your hands. Soap is more effective at removing oils and soil from your skin and other surfaces.

All considered, soap is a better option, but alcohol and alcohol-based sanitizers can also be effective.

Quaternary cleaners

Quaternaries are among the most common ingredients in common household disinfectants. The most common quaternary ingredient is a form of **ammonium chloride**. If you are going to buy a household disinfectant, I strongly recommend you look for this ingredient on the label somewhere.

Quaternaries or “Quats” are cationic (positively charged) ions that disinfect surfaces by binding to the negatively charged protein or lipid coating of viruses, thus breaking down the virus molecule. Most suppliers and manufacturers describe using their product on surfaces “like laying down a bed of spikes that pierce the outer coating of viruses or outer membranes of microorganisms on contact”.

These cleaners are very effective, and are some of the most common disinfectants used in hospitals and restaurants.

Oxidizers

Common and familiar oxidizing disinfectants are: chlorine, bleach, and peroxide. We’ve all used these to clean our homes. Some not so familiar oxidizers are ozone, fluorine, hydroperoxides, and hydroxy groups. Oxidizers in general are highly reactive molecules that attach themselves, or an oxygen atom or electron to other molecules. In doing so, they change the molecular structure of that other molecule. Viruses are highly susceptible to oxidation. It’s outer protein or lipid is easily oxidized, breaking down the molecular structure of the virus molecule.

While they are great disinfectants, some downsides with oxidizers is they can be highly corrosive to surfaces, harmful to people if ingested, and can “bleach” or stain some materials.

What did we learn from this reading so far?

- **Viruses can survive outside the human body.**
- **How viruses are transmissible from person to person.**
- **Viruses are weak and easy to destroy outside the human body through cleaning.**

Something important to understand with cleaning products:

They will clean and disinfect your skin or surfaces contaminated with a virus, but they are not “protective layers” against new exposures to the virus. So if you clean your skin or a surface, and the surface is re-exposed to the virus, the virus can then again survive on your skin or surface after you have cleaned it. In other words, you must keep cleaning surfaces that are repeatedly exposed to people.

So this creates an incredible challenge in combatting the spread of the coronavirus.

How do we keep up with the constant demand for the required repeated cleaning of surfaces? For one, most are experiencing a shortage of available cleaning products in our stores. There is the continuous costs incurred of cleaning products. **Then there is the human or discipline element: Can or will everyone be disciplined in cleaning EVERY touched or exposed surface, all the time?**

From a practical and realistic standpoint, “NO”!

I was recently at the checkout line in my grocery store, and noticed they implemented a “good citizen” policy of wiping down the checkout lanes regularly. This is great in theory, but it’s a human cashier... she wiped down the food conveyor and most of the surfaces she could reach from behind the counter. She did however fail to clean the credit/debit keypad surface. Not to fault her, but this is the human or discipline factor that make “good citizen” policies and practices still flawed. The cashier will occasionally forget a surface, miss a spot, or cut corners as she sees a line forming. We’ve all been there and done that, so let’s not be too hard on someone doing their best to implement a good citizen practice.

- Michael Samora

Smell Fresh Arizona, LLC. is familiar with two widely unknown, under-rated, and underutilized solutions to eliminate the human or discipline factors from the diligent disinfecting of surfaces required to reduce the spread of the coronavirus.

- Durable disinfectant coatings

- Unlike common cleaners, durable coatings or “durables” are coatings that continue to work as disinfectants or “virus killers” well after the initial application. Quaternaries or photocatalytic oxidizers are often the common active ingredients in these durable coatings, both of which we have learned are great at killing viruses.

- **Air Purification Systems**, more specifically: Photocatalytic Oxidation Technology that puts hydroxyls or hydroperoxides in the air.
 - o Hydroxyls and hydroperoxides are oxidizers. Oxidizers destroy viruses on contact. The beauty of these systems is that they put active virus killers in the air. Because these put out product in a gas form safe for people, they offer “seek-and-destroy” technology in any indoor space. They not only kill airborne viruses on contact, but they kill viruses on surfaces as well. If you fill the air of an indoor space with hydroxyls and hydroperoxides, you in essence “can’t miss a spot” in disinfecting that entire indoor space. Relying on human cleaning with a rag or spray bottle, allows for the discipline factor of missing possible contaminated surfaces. A regenerated gas in a room is coming into contact with every surface in that space continuously and constantly.
 - o **Not to be confused...**
 - Filtration systems can remove viruses from the air, but they only clean the air that passes through them. What about pockets of air that are not circulated through a filter as often, if at all?
 - Ion generators do only that: generate ions. People often confuse ion generators for ozone generators, or other air purification systems. Ion generators work to charge particles to make them stick together with the hopes that they get heavy enough to fall out of the air. These can help to reduce airborne molecules, but are not the same as hydroxyl or hydroperoxide generators putting active virus killers in the air.
 - There are UV lamps that can be kept in a room, or installed in an HVAC system. These are germ killers, however like filtration systems, they only disinfect the air that passes through the UV light rays. These do not put out active “seek-and-destroy” product in the air.
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How Smell Fresh Arizona, LLC. can help you, your loved ones and your community stay safe:

We keep hearing the messages of “social distancing” and clean, clean, clean. Our frustration at Smell Fresh Arizona is in what we know to be the “human or discipline factor” and what we know are available technologies to reduce the potential spread of the Coronavirus due to discipline factors.

Why not use or require durable coatings and “seek-and-destroy” air purification systems in essential businesses, where we know lots of human interaction will persist during this pandemic:

- **Daycares**
- **Care facilities**
- **Hospitals**
- **Grocery stores**
- **Restaurants**
- **Essential business operations requiring people going to work in office spaces**

While our supplier chains are strained, we offer both durable coatings and “seek-and-destroy” technology-based Air Purification Systems for your home or business. We encourage these devices in every home for the ultimate peace of mind for you and your loved ones. If your employer is requiring you or other people to go to an office or workspace with other people, please demand they consider our products in that work environment. We will do what we can to keep up with demand. Keep a safe distance from others as much as possible, stay clean, and stay safe. **God bless!**

DISCLAIMER: Many cleaning products, disinfectants, and other products and technologies cannot yet legally “claim” to kill the coronavirus for the simple fact that they have not yet been tested directly on the SARS-CoV-2 strain. That is not to say they do not work or you can not trust them to work. The proven science is decades old. To my knowledge: there are no virus strains known to man resistant soap, alcohol, quaternaries, or oxidizers. These “cleaners” all break open the viruses outer protein or lipid shells. That said, thousands of experts have supported that the technology used in our coatings and air purification systems are virus killers, and this technology has been in use for the control of microorganisms in healthcare, hospitality, food processing, and research facilities for decades.

About the author

Michael Samora was born and raised in Phoenix, Arizona. He received a Mechanical Engineering degree from Arizona State University in 1997. He worked in Nuclear, Semiconductor, and Robotics industries before deciding to leave the corporate world when he started a family. Inspired by his grandmother who could neither read nor write, yet retired very comfortably owning several investment properties, he pursued a career in real estate to learn the ropes of real estate investing.

After a long career as a full time Realtor, he came across several “stinky” properties that needed remediation, but could not find any local resources to service the properties. Michael put his Engineering hat back on, and went to work on studying the science of smells, or Volatile Organic Compounds (VOC’s). Smell Fresh Arizona, LLC. was conceptualized in 2015 to specialize in odor remediation catering to the real estate community to help remediate challenging properties.

Being a small business owner, Michael had to be the chief scientist and chief engineer. He makes the distinction that a scientist does the research, and an engineer applies the science to real world needs. In his research of understanding VOC’s, Michael learned that the science behind remediating odor causing VOC’s, is similar to the science of remediating germs: bacteria, viruses, and fungi. Over the years, Smell Fresh Arizona, LLC. started working on addressing Indoor Air Quality issues beyond just odors. Michael has tirelessly researched the mitigation of VOC’s and germs, and has worked to apply his understandings of these sciences to create practical applications for homes and businesses in his community.

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