

COV-2 UPDATES

#2 How to kill the virus

Also, my routine for preventing infection.

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The Complete review is below, Reference list at the end of the document

Summary

The Cov-2 pandemic is something that has not been faced in recent memory. First because it is so infectious, and can transmit without symptoms for extended times, is global in scope, and has a death rate that is potentially 10x that of seasonal flu (likely about 1.5% on average though many factors play a role in determination of the figure and I will address this issue in COVID-2 Update #3). The secondary contagion is fear, partly of the unknown, and so scientific studies of good design to inform us of what to expect and how to avoid infection is crucial. In this piece I have tried to look at recent studies on Cov-2 to either confirm or dispel the common recommendations we are hearing everywhere.

The most effective means of deactivating and washing away coronavirus particles is thorough hand washing with soap and rinsing with hot water. Alcohol is also effective for some viruses like coronavirus, (Covid-2 has been directly studied) which studies show can deactivate most of it within 30 seconds if at least 30% ethanol, but 60% is better to be safe. However, alcohol is not as effective as soap for some viruses like rhinovirus, and is just as effective for Covid-2. High and low pH solutions like ammonia, baking soda, and white vinegar are effective, but tend to be harsher and not as effective as hand washing and 60% ethanol. Industrial disinfectants found in some hand sanitizers like Benzalkonium chloride are also less effective, take longer to work, and are synthetic compounds that can be irritating to skin.

Heat is very effective for killing corona virus, especially over 167 deg. C (75 C). Saunas, steams, and cooking foods (baking, broiling, boiling soups, teas) are all highly effective for killing coronavirus. However, no studies show if coronaviruses will be killed or eliminated once they invade epithelial cells in your mucus membranes. I would consider it for prevention for 20 minutes a day if I had one, cool off with cold water afterwards.

Finally, ultraviolet light is highly effective for killing bacteria, molds, and viruses of various types. Of the 3 major types of UV light (A, B, C), UV-C is the best and most potent type to use for home sanitation. UV-C is widely used in hospitals, and other medical settings to get rid of contagious pathogenic microbes.

Please see the details of the research on these topics in the full document which is attached, with references. All my Covid-2 research summaries will be on my website soon on the home page.

My routine

After the research I've done on how best to kill and prevent the coronavirus from persisting in the environment, I have modified my routine precautions. I have a number of spray bottles,

both small and large filled with Everclear (120 proof, 60% ethanol) and use this as a hand sanitizer after the occasional grocery shopping I do for my son (spraying my hands and rubbing them together for 30 seconds), and on any mail, packages delivered to my house. I also wash my hands the first thing after getting home (see sections below for details). My son gets Door Dash with food sometimes, but for the most part we are staying home. He thinks all my cautions are hilarious. Still I'm over 65 and despite being healthy I choose to not tempt fate.

A major part of my routine is to stay very active. I spend at least 4-6 hours a day in my gardens, and have wonderful aerobic walks near me. My thought is that by getting more aerobic walking up hills my lungs expand, stretch, more blood comes in, repair takes place, cleansing, and if the virus were to infect me having healthy lungs is a key. I guard my sleep carefully and take a nap in the late afternoon when I start to feel tired. I get 8 hours of good sleep for sure. Research clearly shows the link between 7-8 hours of quality sleep and our immune strength to prevent viral infections. Since green tea was affecting my REM sleep if I consume too much or after about noon, I cut back to 1 bag of green matcha tea with other herbs every morning. That doesn't bother me at all and yet gives me the morning ritual of a hot drink while the weather is still cold.

Meditation, even if for 15 minutes to calm the mind helps as well, I notice it. Also 30 minutes of yoga and polarity stretches for 30 minutes daily, more or less. Taking the time to keep in touch with friends by phone is also a great mood elevator. I find that it's so easy to say "I love you" to my friends and really mean it! When I do, it's like taking a powerful medicine for my immune system, and I hear expressions of care and love from them as well. Yes, love is powerful.

Finally, I keep away from the mainstream political news. At the top of the news I find stories immediately that are not what I want to see (usually Trump and partisan politics and news about coronavirus deaths) and immediately scare me and bring me down. Of course I do keep up with Cov-2 virus cases through my county health department website, or the California website. They don't trade in fear as much as the mainstream news media. Nothing sells advertising and media like fear! I also listen to great audiobooks which often makes me very happy. I also read a lot of scientific studies on different aspects of the corona virus, respiratory tract infections and general health topics. My favorite newsletter is "Science X," which has many interesting research articles condensed and nicely written. It's free and comes to your desktop every other day or so.

I live on a 3 ½ acre farm outside of a town with 10,000 people in it, and don't go out much to town (8 minutes away), except for my son who is just getting ready to turn 18. Well, don't know if he's ready, but I certainly am! I pick up things he wants a couple of times in the week. He isn't really into a lot of the things I make and eat, but once in a while he will deign to eat some broccoli or lentil soup. My needs are simple, I could survive on grains and beans which are dried and don't take up too much space and last forever. I have lots of greens in my garden, including giant mallow plants full of tender and nutritious leaves. I take time in the summer to dehydrate fruits of all kinds and herbs, as well as can many pints of elderberry juice and tomato juice and sauce.

How to Kill the Virus Review

Coronavirus

This group of viruses has 7 known strains—4 cause mild symptoms of common cold, and the other 3, MERS-CoV (34.5% death rate), SARS-CoV (10% death rate), and SARS-CoV-2 (~1.5% death rate, but widespread under-testing makes the exact figure uncertain). Other strains cause symptoms in other animals like dogs, cats, chickens, cows and pigs, and it is thought that the deadlier human strains arose and have evolved in bats, transmitted through civet cats (Masters, 2006).

Soap and Water

It is more than a little ironic that hand sanitizers disappeared from store shelves and online so rapidly, for it is simple everyday soap that is the most powerful agent against viruses and bacteria, and the most widely-available. We could literally cut the number of flu cases and deaths worldwide in half or more if we used the same hand-washing vigilance recommended for the coronavirus.

We've heard over and over to wash our hands for at least 20 seconds (while singing various tunes) to wash away and deactivate the virus. It turns out soap is so effective because the virus is a tiny nanoparticle that is assembled rapidly with ribonucleic acid (RNA), proteins and lipids. No strong covalent bonds (the intermolecular forces that hold molecules like a flavonoid together) are holding the virus particle itself together, only weaker type of intermolecular bonds. Coronaviruses are especially susceptible to chemicals that disrupt these bonds because of the outside spikes used to attach to host cells you can see in the picture.

A number of studies show that soap is highly effective for not only removing virus particles from our skin but also disrupting the forces that hold them together (Grayson *et al.*, 2009; Simmerman *et al.*, 2010; Savolainen-Kopra *et al.*, 2012). Viruses contain a lipid (fat) layer on the outside that is exposed and vulnerable to being penetrated by soap molecules, which are 2-phased molecules—one side is fat-soluble and the other water-soluble. When the fat-soluble portion of the soap molecules bind to the viral lipid coating on the outside, the hot water washing and rinsing part of the hand washing will literally tear the virus apart and deactivate it, while washing whole viral particles and pieces of them off of your hands on the skin itself or on oils on your skin makes continually throughout the day which viral particles can adhere to. Always wash and rinse your hands with hot water, as hot as is comfortable. The increased temperature will help the soap work better, pulling up more oils and virus particles.

When washing with soap, we keep foaming up and spreading the soap all around between our fingers and on the end of our fingers for at least 20 seconds before thoroughly rinsing because it takes that long to get in all the micro-crevasses in our skin and to completely break apart and

deactivate the viruses.

Alcohol is also highly effective for killing some viruses and is very useful for spraying surfaces, packaging, high-use areas like light switches, doorknobs, water faucets, and toilet handles. It can also be used on the hands as detailed below, but it is still not quite as effective as everyday soap, especially for rhinovirus infection (Savolainen-Kopra *et al.*, 2012)!

Effect of heat

In one study (Darnell *et al.*, 2004), Covid-2 was tested for sensitivity to exposure to 3 temperatures, 133 (56 C) deg. F, 149 deg. F (65 C), and 167 deg. C (75 C). The authors found that heat of at least 133 could strongly alter the conformation of viral proteins involved with attachment to host cells, reducing infectiveness and slowing growth. They found that “most of the virus was inactivated after 20 minutes at 133 deg. F, which is easily achievable by directing a hair dryer to a possibly affected area. By the way, a common hair dryer set on high can reach 140 deg. F. At 149, nearly achievable with a hair dryer on high, “most of the virus was inactivated if incubated longer than 4 minutes.” At 167 deg. F, all of the virus was completely inactivated after 45 minutes, while a minor amount was still detectable at the lower temperatures even after an hour. The researchers speculate that detection at this point was likely pieces of virus and not active virus. They conclude that pasteurization is effective at these temperatures.

The practical side of this study to me is that cooking foods in the oven will definitely kill the virus completely at baking and broiling temperatures, and by boiling at 212 deg. F. after making tea or a soup, even for a few minutes. Likely anything from a restaurant or store that has been baked or cooked then is safe, except for the packaging.

I talked with a friend recently at the health club where I work out (before the shutdown). He told me he likes to go into the sauna for 10-20 minutes, or the steam room every other day when he comes. He said he used to get colds and flu all the time during the winter until he did that, after which he was completely symptom-free for the last 2 years. He theorized that the hot temperatures kill the viruses. Looks like he might have been right. Saunas are typically 180 to 195 deg. F (78-90 deg. C). Adding water to the sauna dry heater and breathing the steam, or sitting in a steam room brings the temperature to 160 to 200 deg. F. Likely even 10 minutes of breathing this will kill all viruses within the sinus cavity, throat and bronchial airways.

A funny story (and image) I read recently was about someone who “invented” a method to get over a cold or flu faster by turning a hair dryer on high and directing it up the nose into the sinus cavity. It was a funny image to me, as it might be to you. If anyone came into the room and saw their friend or family member sitting there with a dryer up their nose, you might think they needed psychiatric attention. Well, at least before Covid-19!

Ultraviolet light

UV light may be one of the best methods to kill the virus and disinfect whole rooms, letters, packages, clothing, and surfaces. However, UV-C lights should be used knowing that exposure to our bodies and especially eyes should be strictly avoided.

I always heard that UV light will destroy pathogens of various types, but what does research say about UV and the Cov-2 virus?

Duan *et al.* (2003) found that with the Cov-1 SARS virus (closely-related to Cov-2) all the viral particles had lost their infectability with 1 hour of exposure of UV-C (The intensity of UV was >90 uw/cm²; 260 nm) at a distance of about 2 ½ feet. A number of online sources are available. I just watched a video showing the use of the “Germ Falcon” for disinfecting aircraft after each flight...check it out.

Hand Sanitizers and Alcohol (isopropanol or rubbing alcohol and ethanol)

Many sources on the web recommend that a solution of at least 60% ethanol should be used in hand sanitizers, wipes, and sprays to completely kill the virus. I have read it takes 5-10 minutes to finish them off. I wondered about this because when spraying 60% ethanol that is in straight Everclear in the car after shopping and then rubbing my hands together well and letting air dry didn't sound effective enough. The alcohol dries quickly and then is it going to kill all the viruses? A recent study (Kampf *et al.*, 2020) found that a concentration of 78% ethanol could completely reduce viral infectivity in SARS CoV-1 and MERS-CoV within 30 seconds, and 70% concentration of 2-propanol (rubbing alcohol) could disinfect SARS-Cov-1 after 30 seconds, they didn't look at Cov-2.

However, Annika Kratzel (2020) and her group did study Cov-2 and found that complete inactivation of the virus occurred after 30 seconds even with a concentration as low as 30% ethanol. Cov-2 appears to be more sensitive to alcohol than Cov-1 SARS or MERS-Cov.

I have found that at 60% or even 70% ethanol applied to my hands don't dry them out. You can put on aloe after 5 minutes if they do cause irritation for you. Constant washing and spraying one's hands can definitely tend to irritate your skin and start to dry it out. I would avoid any oil-based hand creams though because Cov-2 easily attaches to oily surface like the normal skin. Remember that our skin produces several kinds of natural oils throughout the day and night to protect it. That's why aloe is good.

My recommendation is not to dilute the ethanol below about 60%. Everclear is widely available in liquor stores and comes in different concentrations, 120, 151, 189 and 190 proof (cut these numbers in half to determine % of ethanol). Allowed concentrations vary by state. You can also buy 190 proof (95%) pure organic (or not) ethanol from a number of suppliers on the web if you want to go higher than 60%, say to 80% for disinfecting surfaces, letters, packages, car handles,

household faucets, doorknobs, refrigerator handles, etc. I bought from Ebay or Amazon a product called Extractohol which is organic and 190 proof. Aaper Alcohol is also well-known. Isopropol alcohol (rubbing alcohol) is just about as effective, but it is toxic to ingest or even inhale so I prefer ethanol if available.

Don't try to make a hand sanitizer with aloe gel and alcohol, especially Everclear 60% because that will dilute it to potentially ineffective concentrations. I pour straight Everclear 120, or more recently 160 proof (80% ethanol since I received a gallon of 190 proof) into small hand sanitizer bottles and spray down packaging from the store, my son's doordash orders, countertops, doorknobs, and faucet handles, refrigerator handles, etc. Call me paranoid if you want! Alcohol at this concentration doesn't seem to dry out my hands, even with frequent use. I keep a spray bottle in my car as well and spray my hands and rub them together. It dries fairly quickly. It takes only about 5 minutes to completely inactivate the virus, according to several studies I've seen.

NOTE: Remember that aloe gel is not soluble in high alcohol concentrations and so it just hardens into a ropy mess in my experience. You can mix the leaf juice with 190 proof and try that, but make sure to keep at least a finished concentration of at least 60%.

NOTE: hand sanitizers that contain industrial disinfectants such as benzalkonium chloride are not as effective as strong ethanol and can take up to 10 minutes to kill the virus. Besides why use these chemicals when alcohol is less toxic and more effective? Ammonia, hydrogen peroxide (0.5% concentration effective after 1 minute), and diluted chlorox solutions may work but are less desirable and more irritating to skin.

***pH, acid-alkaline treatment**

A strong acid or basic solution completely inactivated the virus by affecting the shape of the spike protein (by which it fuses with the host cell). Alkaline conditions didn't affect the virus until about pH 12, which also inactivated the virus, but only after an hour. pH 12 is the approximate pH of a standard ammonia cleaner. A 0.1 N solution of baking soda is made by dissolving 4 grams to 1 liter of water), and can result in a solution that is pH 13. A solution at around pH 2.5 could also deactivate coronavirus. White distilled vinegar is pH 2.5, This can be used for wiping down surfaces, but alcohol is likely more effective (Darnell *et al.*, 2004).

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