Information about COVID-19

Dr. Kimberly Mulligan, Asst. Professor at Sacramento State, wrote this informational piece on COVID-19. She shared this with all of us and would like me to share it with all of you.
The following information is based on what the medical and scientific communities currently know about SARS-CoV2. I hope you find this helpful! (Please feel free to pass the information along to anyone else you think might find it helpful.)

COVID-19 Basics
SARS-CoV-2 is the name of the virus, COVID-19 is the name of the disease caused by the virus. SARS-CoV-2 is in a family of viruses termed coronaviruses. The acronym "SARS" stands for severe acute respiratory syndrome. "CoV" is short for coronavirus.
COVID-19 is very different from the flu. The flu is caused by influenza A or B, and is a type of orthomyxovirus, not coronavirus.
In addition to SARS-CoV2, there are six other coronaviruses that commonly infect people. Four of them cause common colds, the other two—SARS and MERS—have more serious symptoms.
SARS-CoV2 is most genetically similar to SARS (also called SARS-CoV1). Unfortunately for us, SARS-CoV2 sticks to our cells MUCH more efficiently than the original SARS. SARS-CoV2 also enters our cells much more easily.
Similar to the original SARS, SARS-CoV2 binds to receptors called ACE2 receptors on cells within our airway.

Why are public health officials so concerned?
SARS-CoV2 infects cells in BOTH our upper and lower airways, which is unusual for respiratory viruses—usually they stick to upper or lower, but not both. This is a potent combination.
The fact that SARS-CoV2 can infect the lower respiratory tract (i.e., the lungs) is what makes the symptoms so severe. The fact that it infects our upper respiratory tract (i.e., the trachea) makes it easier to transmit—when we cough, sneeze, sing, yell…even talk, the virus can enter the airspace in microscopic droplets in front of us and linger in the air. The virus is also stable on hard surfaces for hours to days.

How long can SARS-CoV2 survive in the air and on surfaces?
From a summary of a recent study: "The virus that causes coronavirus disease 2019 (COVID-19) is stable for several hours to days in aerosols and on surfaces, according to a new study from National Institutes of Health, CDC, UCLA and Princeton University scientists in *The New England Journal of Medicine*. The scientists found that severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was detectable **in aerosols for up to three hours, up to four hours on copper, up to 24 hours on cardboard and up to two to three days on plastic and stainless steel."**

The CDC is recommending disinfecting surfaces that infected individuals may have come in contact with using 70% ethanol or bleach (5 tablespoons of bleach per gallon of water, or 4 teaspoons of bleach per quart of water). Be sure your bleach has not expired. The CDC also notes that most common EPA-registered disinfectants should be effective. *(Scroll to the bottom for the CDC COVID-19 site URL.)*

Transmission & symptoms

A big reason for the shelter-in-place orders is that it appears SARS-CoV2 can be transmitted before symptoms appear—potentially for many days before symptoms appear. Data indicates the average onset of symptoms is 4-5 days following exposure, with 95-98% of individuals exhibiting symptoms by day 11. I saw one report indicating outliers as far out as 24 days post-exposure.

The fact that SARS-CoV2 causes a range of symptoms from "no symptoms" to "death" is really alarming. If a person has no symptoms or mild symptoms, that person serves as a very efficient vector, unknowingly spreading the virus throughout their community.

The common symptoms are fever, dry cough, tiredness, and (in severe cases) difficulty breathing.

Why does viral load matter & why are smokers thought to be at higher risk of experiencing more severe COVID-19 symptoms?

First, a mini-biology lesson on our upper airway. The trachea is the tube that leads to our lungs. It is lined with a few important cell types that work together.

First, goblet cells secrete a protective lining of mucus all along the trachea, which traps particles that we breathe in. Second, there are tightly connected "ciliated" cells that have finger-like projections (cilia) that are constantly beating. The beating motion pushes the mucus up to our mouth, we then swallow it into our stomach where respiratory pathogens either die in the acidic pH or just don't have any cells to infect (most viruses can only infect specific cell types). This design is intended to remove particulates before they have a chance to reach our lungs.

Smoking can destroy the cilia, preventing efficient removal of pathogens and thereby making the lungs more susceptible to infection.

Viral load (the number of viral particles you are exposed to) matters because if you are exposed to a low amount, your ciliated tracheal cells have an increased likelihood of removing the virus. But if you are exposed to a higher amount, your tracheal cells have to work a lot harder to remove the virus….giving the virus a chance to move through the mucus, attach to your airway cells in your trachea and lungs, and infect those tissues.

When will there be a SARS-CoV2 vaccine?

Due to the time required for clinical trials—which are critical for establishing safety and effectiveness—it will likely be 12-18 months before a vaccine is released. I read one report suggesting the absolute fastest release would be by this December, but I am skeptical of that timeline.

Will COVID-19 be seasonal?

It is not known if SARS-CoV2 will be "seasonal," like the flu. Influenza is impacted by temperature and humidity. It is currently unknown if that will hold true for SARS-CoV2.

Why is testing so critical—for our health and our economy?

Wide-scale testing—as has been done in Singapore and South Korea—is obviously critical for our healthcare workers to identify COVID-19 positive individuals. But we also need people who have already recovered from COVID-19, who are on the other side of the disease, to be able to re-enter their communities and lift up their local businesses. If a large percentage of us will exhibit mild or no symptoms, there is no way to tell if we have been infected without testing.

What is the purpose of the shelter-in-place order and what happened when it is lifted?
Shelter-in-place mandates are one of the most effective public health measures for controlling the spread of infectious pathogens. These measures help to "flatten the curve," which refers to spreading out the number of infected individuals over time rather than a majority of individuals being infected all at once. This is critical to reduce the burden on our healthcare providers and services. There are simply not enough hospital beds and ventilators to treat people when there is massive surge in this disease.
Once the shelter-in-place order is lifted and schools and businesses resume, it is true that the virus will likely start spreading again. The hope of public health officials is that the current lull in community activity will prevent overwhelming our healthcare workers and hospitals, has allowed companies to produce more personal protective equipment (PPE) for our medical providers and, hopefully, our government leaders to come up with plans to secure more hospital bed space and ventilators. It has also provided more time for scientists who are trying to identify COVID-19 treatments among FDA-approved medicines originally intended to treat other illnesses.
Another *very* important consideration is that people who have recovered from the disease will, in theory, be immune from re-infection. Once the shelter-in-place orders are lifted, these individuals will provide an important herd immunity effect that should slow the rate of transmission (by reducing the number of people who can be infected and transmit the virus).

Don't panic!
Finally, there is no need for panic. I don't think panic ever serves us well. The most you can do is be prepared, as best you can be. Visit the CDC's COVID-19 preparation guide (link below), order the goods you need in case you or a loved one does get sick. Buy only what you need, not more, not less.

No, it's not man-made….
Oh, and finally, finally—because I have gotten this question—no, SARS-CoV2 is not man-made. A recent paper examining the genetic sequence of SARS-CoV2 elegantly debunked that claim using bioinformatics. In fact, there was a paper a few years back in which the authors essentially predicted mutations in SARS-CoV1 that would give rise to new coronaviruses with increased ability to bind ACE2 receptors (exactly what we see with SARS-CoV2). The genetic material of coronaviruses is RNA rather than DNA, which has a more error-prone replication process—meaning mutations occur more frequently. Virologists with expertise in viral molecular genetics can make predictions about how the RNA sequences might change. Changes that increase the viruses' ability to infect cells are more likely to persist because they increase the viruses' ability to infect hosts and replicate.
Given that this is a new virus, there is still much to learn. I hope you found this information helpful. I hope you and your loved ones stay safe.

URL for CDC's COVID-19 webpage: https://www.cdc.gov/coronavirus/2019-ncov/index.html