

COVID-19 Science and Medicine Updates - compiled by University of Maine faculty and students

Maine Updates:

As of Mar 24, Maine has 118 confirmed cases and 3014 negative tests

<https://www.maine.gov/dhhs/mecdc/infectious-disease/epi/airborne/coronavirus.shtml>

Today Governor Mills ordered many non-essential Maine businesses to close by 12:01AM Wednesday

<https://bangordailynews.com/2020/03/24/politics/janet-mills-orders-nonessential-maine-businesses-to-close-to-fight-coronavirus/>

The Executive Order **excludes** businesses that provide essential services including (but not limited to):

- agriculture
- animal feed and supply stores
- auto repair
- banks
- behavioral health providers
- biomedical
- childcare providers
- construction
- food processing
- gas stations
- grocery and household goods (including convenience stores)
- hardware and home repair
- health care providers
- hotel and commercial lodging
- industrial manufacturing
- insurance
- laundromats
- life science
- pharmacy and other medical facilities
- post offices and shipping outlets/stores
- public transportation
- trash collection
- veterinary clinics

Other News (as of Mar 24, 2020):

The National Institutes of Health (NIH) is now providing guidance for workers who are dealing with the spread of COVID-19. A website will be launched with advice and evidence-based practices, and more information is found at this site:

<https://www.nih.gov/news-events/news-releases/covid-19-workers-get-training-protect-their-own-health>

COVID-19 survival on surfaces/materials over time

- A recent study published in The New England Journal of Medicine investigated the stability of COVID-19 on different surfaces, giving the following results.

Material	Detectable up to	Amount COVID-19 detected	Half-life
Aerosols	3 hours	15.85% of original amount	1.09 hours
Copper	4 hours	None	0.774 hours
Cardboard	24 hours	None	3.46 hours
Stainless steel	48 hours	0.079% of original amount	5.63 hours
Plastic	72 hours	0.079% of original amount	6.81 hours

- Although it is still detected on stainless steel and plastic for up to 48 hours and 72 hours, respectively, the amount of virus detected at those time points was only 0.079% of the original amount. So, although theoretically you could be infected by contacting these surfaces at these timepoints, the concentration of virus that is still surviving is unlikely to be enough to cause infection.
- On all tested materials, the concentration of virus is characterized by exponential decay, meaning the concentration will reduce rapidly at earlier time points. Because of this, the half-life (amount of time it takes for the concentration of virus to reduce to 50% of the initial concentration) of the virus on each material is a better measure of how long surfaces will remain infectious.
- The aerosols used in the study were less than 5 microns in diameter. Aerosols produced by humans range from 0.01 microns to 1000 microns in diameter, with a median diameter of 81 microns when produced by talking and 26 microns when produced by coughing (Bake *et al*, 2019). Smaller aerosols are able to stay suspended in the air

longer than larger aerosols, therefore infectious aerosols produced by individuals with COVID-19 are less likely to remain airborne for as long as suggested by this study. It's important to note that aerosols produced by coughing are smaller than those produced by talking, emphasizing the importance of covering your mouth when you cough to prevent spread of aerosols you produce.

- Article: N van Doremalen, et al. Aerosol and surface stability of HCoV-19 (SARS-CoV-2) compared to SARS-CoV-1. The New England Journal of Medicine. DOI: 10.1056/NEJMc2004973 (2020).

How COVID is spread

- COVID-19 is primarily spread from person-to-person via respiratory droplets produced by infected individuals when they cough, sneeze, or exhale. These aerosols can then be inhaled by another individual within close contact (typically within 6 feet) (CDC).
- Contact with contaminated surfaces can result in infection if the individual then touches their mouth, nose or eyes, however, this is not believed to be the main mode of spread (CDC).
- Typically people are believed to be most contagious when their symptoms are the worst, however recent studies have found that some people with COVID-19 have high levels of the virus in throat swabs when they are asymptomatic or early in their illness, when their symptoms are mild. In asymptomatic individuals, these levels are similar to individuals with symptoms (Woelfel, R. et al, 2020, preprint; Zou, L. et al, 2020).
- The median incubation period, or time from exposure to symptoms, of COVID-19 is estimated to be 5.1 days and those who develop symptoms are estimated to do so within 11.5 days of infection (Lauer et al, 2020).

Why a COVID testing shortage?

- Qiagen, a major supplier of one of the key products for testing, has a shortage of the necessary components for the current testing method.
- The reagents needed from Qiagen isolates the RNA (genetic material of the virus) to test it for COVID-19 expression
- Qiagen released a statement that more workers are being hired to increase production of the testing kits, including working to have three shifts at production sites in Germany and Spain.
- Other companies, such as Invitrogen owned by ThermoFisher, are working to create their own versions of these kits, but of course they need to be validated by the FDA (<https://www.statnews.com/2020/03/10/shortage-crucial-chemicals-us-coronavirus-testing/>)
- There is also a material shortage of swabs, extraction materials, and other supplies that are necessary for testing. The demand for these materials is completely unprecedented. Qiagen has already sent out twice as many RNA kits in the few months of 2020 than it did for all of 2019

<https://www.cnn.com/2020/03/18/us/coronavirus-testing-supply-shortages-invs/index.html>)

Re-infection with COVID-19: Immune after getting the virus or still susceptible?

- Ann Falsey from the University of Rochester Medical Center notes that while initial introduction of the virus into our systems produces antibodies and memory cells in our immune responses, this antibody production naturally declines over time and could potentially make individuals susceptible to re-infection
(<https://www.npr.org/sections/goatsandsoda/2020/03/20/819038431/do-you-get-immunity-after-recovering-from-a-case-of-coronavirus>).
- Harvard Health released a statement that it is unknown whether or not an individual could contract the same form of coronavirus once previously infected. While one will develop at least a short-term immune response, he/she would still be susceptible to a different coronavirus infection or mutated version of the same virus
(<https://www.health.harvard.edu/diseases-and-conditions/coronavirus-resource-center>).
- Patients previously positive for COVID-19 may continue to test positive long after signs, symptoms, or consequences of the virus have been treated
(<https://jamanetwork.com/journals/jama/fullarticle/2762452>)
- More research is needed on this topic, and data will become available from patients with previous COVID-19 infection as time goes on

What does COVID do in our lungs? How does it infect? Why is it causing respiratory failure?

- COVID-19 is mostly transmitted from human to human via direct contact with infected secretions or respiratory droplets
(<https://www.ncbi.nlm.nih.gov/wv-o-ursus-proxy02.ursus.maine.edu/pmc/articles/PMC7081812/>)
- This novel coronavirus to humans appears to use the same receptor as SARS (another coronavirus) to infect human cells and make it capable of human transmission.
- The virus has many proteins essential to its survival and can interfere with the host immune response.
- A mutation in certain proteins (NSP2 and NSP3) play a role in the virus's ability to infect and differentiate.
- The known cell receptor for COVID-19 is ACE2, which is found in the lower respiratory tract of humans (trachea, bronchi, bronchioles, alveoli).
- Once the virus attaches to the surface of the human cell, the viral genome is released into the human cell where it can replicate and release its progeny.
- Those with previously underlying disorders (i.e., immunocompromised patients, those with cardiovascular or prior respiratory issues, diabetes, hypertension, etc.) and elderly patients have been more susceptible to the infection developing into acute respiratory distress syndrome, septic shock, coagulation dysfunction, and more.

- Inflammatory factors increase in response to infection (causing inflammation) in the lower airway and can lead to lung injury.
- The virus infects respiratory mucosa first, and then other cells. This causes a series of immune responses and recruitment of immune response cells, which could be correlated to the critical condition of these patients.
- <https://www.ncbi.nlm.nih.gov/wv-o-ursus-proxy02.ursus.maine.edu/pmc/articles/PMC7068984/>

Ibuprofen vs Tylenol, do these worsen COVID?

- There is some evidence linking Non-Steroidal Anti-Inflammatory Drugs (NSAIDs), such as ibuprofen, to worsened symptoms of COVID-19. However, this evidence does not conclusively prove that ibuprofen exacerbates COVID-19 symptoms.

<https://www.fda.gov/drugs/drug-safety-and-availability/fda-advises-patients-use-non-steroidal-anti-inflammatory-drugs-nsaids-covid-19>

<https://www.thelancet.com/action/showPdf?pii=S2213-2600%2820%2930116-8>

- In the place of NSAIDs, some health organizations recommend taking paracetamol (Tylenol) to treat COVID-19 symptoms.

<https://www.bmj.com/content/368/bmj.m1086>

<https://www.nhs.uk/conditions/coronavirus-covid-19/self-isolation-advice/>

Process of making a vaccine; how long until available, etc.

- The Center for Disease Control (CDC) requires vaccines go through several developmental stages before they are widely distributed to the public. These stages involve vaccine creation, testing in humans for safety and efficacy, FDA approval, manufacturing, and distribution.

<https://www.cdc.gov/vaccines/basics/test-approve.html>

- Currently, no COVID-19 vaccine has yet moved past the testing phase in America.

<https://www.raps.org/news-and-articles/news-articles/2020/3/covid-19-vaccine-tracker>

- Experts predict that it will take 12-18 months before a viable vaccine is released to the public broadly. At this point, vaccinated individuals and those with prior infection who may be immune, will start to provide 'herd immunity' in society.

<https://www.raps.org/news-and-articles/news-articles/2020/3/covid-19-vaccine-tracker>

<https://www.newyorker.com/news/news-desk/how-long-will-it-take-to-develop-a-coronavirus-vaccine>

Portland Press Herald's coverage about working from home:

<https://www.pressherald.com/2020/03/22/coronavirus-how-to-working-from-home-some-tips-on-how-to-do-it/>