



INDOOR AIR FACTS

How to Protect Yourself and Your Loved Ones From COVID-19

Health Commissioner Boyd Hoddinott, MD, MPH, attaches to all of his emails the following statement, “COVID is a disease of crowded indoors with poor air exchange and no masks.” So then where are we the safest? In our homes, shopping, at work, at school, in an airplane?

Actually, the safest place to avoid catching the coronavirus (COVID-19) is outdoors. By being at least 6 feet away from others, the wind can blow away the infectious droplets from coughs or sneezes while the ultraviolet (UV) light produced by the sun disinfects surfaces within 30 seconds. Surface spread is also easily prevented by wearing masks to decrease the droplets, cleaning surfaces, and washing hands. The real problem now is if we can't stay outside 100% of the time, especially as we enter the colder seasons, what can we do?

The answer is we must treat our indoor air to make it as much like the outdoors as we can. We know that COVID-19 spreads indoors through surfaces, droplets and aerosolization. Droplets from coughing and sneezing are the primary way of spreading COVID-19. Droplets are usually large enough (between 20 and 100 microns in size) that they are pulled down by gravity, so social distancing of at least 6 feet is often adequate for protection. They are also readily trapped in facial masks. When the particles are so small that they can become airborne (around 5 microns) they are called aerosols, which is now the increasing method of spread. It is then that other measures must be employed. There are three indoor air improvements that the Logan County Health District advocates and which are already being used both individually and in combination for additional benefit throughout Logan County: ventilation, filtration and purification.

1. With ventilation, we are trying to get the indoor air to match as closely to outdoor air as possible by diluting it with fresh air from the outside. Studies have shown that by measuring the amount of carbon dioxide (CO₂, which is what we breathe out) in a room, we can have a substitute value for determining the safety of indoor air. Outside air in Logan County has a CO₂ level of around 375 parts per million (ppm). If we exchanged our indoor air at a 100% level by only using outdoor air as the supply air into a building, we would have attained our goal. But if it is really hot or cold or humid outside, it would make our indoors just as uncomfortable as the outdoors. Therefore, we have to limit how much fresh air is brought in to around 10% which allows for adequate cooling, heating and dehumidifying. An acceptable CO₂ level is below 1000 ppm, with between 600 ppm and 800 ppm being optimal. Engineers were able to end a tuberculosis (an even more contagious airborne disease) outbreak in a university by improving air circulation to reduce the CO₂ levels to below 600 ppm.

Other ways to increase the air changes per hour (ACH) include opening windows and doors to the outside, especially when using exhaust fans that blow the air out, and running the heating, ventilation and air conditioning (HVAC) systems so that the fan runs all the time and not just when heating or cooling. An ACH of 3 is good, 4 to 5 are very good, but above 6 is ideal. Controlling humidity is also still important because particles around 20 microns in size that contain COVID-19, influenza and other illness-causing pathogens dry out and they can shrink so much that they can begin to float in the air instead of falling to the floor, which creates the problem of aerosolization. Viruses themselves survive longer than bacteria after drying out, so keeping humidity around 50% is recommended as a way to decrease spread by reducing their airborne numbers.

2. The second treatment is filtration. Filters are used on forced air heating devices, but not with fireplaces, stoves, steam radiators and geothermal systems. Room air conditioners also have filters. The problem is that most

household filters are not able to remove viruses. High-Efficiency Particulate Air (HEPA) rated filters can remove particles down to 0.1 microns in size effectively trapping airborne viruses, bacteria, pollen and mold spores. Commercial HVAC systems in schools and businesses may also use special filters that have a Minimum Efficiency Reporting Value (MERV) of at least 13.

3. The third treatment is purification. UV light and ionization can be added to HVAC systems to kill pathogens brought into the system. “Far UV” light operates at a wavelength of 222 nanometers and has been proven to be safe and not absorbed by human skin. Ionization involves units that can be installed on a building’s main HVAC unit or placed in individual room vents. The advantage is that the negatively charged particles (called ions) are able to combine with particles in the air and neutralize them or land on surfaces where they are still able to disinfect the particles when they eventually settle out of the air. These two options are not to be confused with ozone which can be a harmful irritant to the lungs.

These treatments can stand alone or be used in an additive fashion to become an even more effective indoor air treatment program. For example, if a building’s HVAC system can only provide 3 ACH, by placing a portable room air purifier that has HEPA filtration (some also come equipped with UV germicidal light, ionization, and even charcoal filtering simply for removal of odors), an additional 3 ACH can be provided giving the room an excellent ACH of 6 for the benefit of the occupants.

To answer the original question, where are we the safest when we are not outside? It is in those indoor atmospheres that have installed these air treatments: airliners with HEPA filters, commercial buildings and businesses with MERV-13 or above filters, schools with ionization and churches with increased air exchanges. Many cases of COVID-19 have been traced back to household settings because of the lack of such treatments and little fresh air introduction, but that could be reduced with the use of room air purifiers.

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For additional information, visit www.ashrae.org.

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COVID-19 spreads indoors through surfaces, droplets and aerosolization. So how do we stop the indoor spread of COVID-19?

- Droplets: Wear a mask and maintain a minimum of 6-foot social distance.



- Aerosols: There are three different options:

- Ventilation: Dilute indoor air with fresh, outdoor air.



- Filter: Use HEPA Filters on forced air HVAC devices which filters down to less than 1 micron.



- Purify: Add UV light and/or ionization to HVAC systems.



- Surfaces: Clean and disinfect frequently touched surfaces.



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