

FREQUENTLY ASKED QUESTIONS ABOUT WEARING A MASK FOR COVID-19

Prepared By: John D. Mikan, CIH - Certified in the Comprehensive Practice of Industrial Hygiene by the American Board of Industrial Hygiene® (ABIH®) and Parishioner of St. Martha's Catholic Church. Certified Industrial Hygienists (CIHs) are experts in the recognition, evaluation, and control of chemical, physical, and biological health hazards and are employed by large multi-national corporations, large hospital networks, universities, and our military. CIHs are experts in the design of local exhaust ventilation systems and the selection and use of all types of respiratory protection to control hazardous inhalation exposures in the form of gases, vapors, dust, mist, fume, fine aerosols, and nano-particles. Medical professionals are consumers of our expertise and are generally not themselves experts in such areas. CIHs are informed by research and science, and are therefore not easily influenced by politics or false media claims. I have over 30 years of professional experience and my certification was earned early in my career shortly after qualifying based on education, work experience, and rigorous testing. Since that time, I have maintained my certification with ABIH® through ongoing professional work and continuing education. As a CIH, I am bound by a professional code of ethics. Should anyone feel my comments are incorrect, misleading, or unethical, they can report me to ABIH® and recommend me for disciplinary action.

1. Does wearing a mask decrease my oxygen intake?

No, not significantly. When you breathe in, you breathe in air containing 20.95% oxygen, 78% nitrogen, 0.03% carbon dioxide, and small amounts of other gases. When you exhale, you breathe out mostly carbon dioxide and, during exhalation, your contracted lungs, trachea, and mouth are filled mostly with carbon dioxide during exhalation. This is often referred to as a "dead space" because it is oxygen deficient. Your body has adapted to this dead space because you live with it every day. Adding any kind of face covering or respirator will create additional dead space volume between the respirator and your nose and mouth, and thus additional carbon dioxide to breathe back in. For persons with severely compromised respiratory systems, this additional volume can be problematic. However, for most individuals, even those with asthma or even mild COPD, that additional dead space volume will be largely unrecognizable by the human body and will cause no significant change in blood-oxygen levels. This has been demonstrated through the use of a pulse oximeter, which is the standard method used in hospitals to make sure patients are properly oxygenating their blood. Doctors routinely prescribe face covering even for the sickest of cancer patients, though it would be far more effective for everyone around the cancer patient to also wear a face covering to help further reduce the spread of pathogens.

2. I've seen videos showing that masks create an oxygen deficient atmosphere; doesn't that prove this is a real problem?

No. The use of an oxygen meter inside the mask is not the appropriate way to assess this effect because the meter is significantly influenced by the position of the probe inside the mask or mouth and by the delay between the time the probe is inserted and the pump is able to carry the atmosphere to the sensors. You can place the probe of the oxygen meter inside your mouth without a mask and, in doing so, the sensors will detect an oxygen-deficient atmosphere and begin to alarm.

The correct way to assess the impact of wearing a mask on blood-oxygen levels would be to wear a pulse oximeter.

3. Are masks, face coverings, and respirators effective at trapping SARS-Cov-2 virus?

This is a complicated question because so much depends on the type of mask, face covering or respirator; the manner in which the respiratory droplets are expelled; and whether or not the mask is intended to protect the wearer or is worn instead to prevent the wearer from infecting others. However, the debate over these protective measures are most often centered around claims that virus particles are too small to be trapped by these masks; that it's like picking up sand with a fishing net. This is absolutely false.

First, particle filtration is governed by many factors. Most everyone can understand how larger particles are trapped and then assume that smaller particles are not. This is not the case. Most high-efficiency filters are tested using a particle size of 0.3 microns. This is because particles of this size have been found long ago to be the most penetrating. Larger particles get trapped because they are too big to pass through the pores of the filter but particles smaller than this also get trapped because of what is called Brownian motion. Particles smaller than 0.3 microns don't travel through the air in a straight line. Instead, they travel in a zig zag motion which makes them more likely to come into contact with the surfaces of the filter fibers. They are like drunken bulls in a china shop, eventually they will run into something. So, a filter that is said to be 99.5% efficient actually has a far higher efficiency for particles larger than 0.3 microns but also a higher efficiency for particles smaller than 0.3 microns.

Second, viruses are contained in small respiratory aerosol droplets that generally exceed 1 micron in size, though aerosol droplets as small as 0.7 microns are also expelled. Normal talking expels predominately smaller particles with low velocity. Talking loud, singing, and coughing results in predominately larger aerosol droplets being expelled with far greater velocity thus allowing them to travel further from their source. Particles smaller than 50 microns are generally not visible to the naked eye. Since viruses, including SARS-Cov-2, are relatively small (20 - 500 nanometers or 0.02 - 0.5 microns), a single respiratory aerosol droplet from an infected individual who is shedding the virus can contain multiple virus particles. Likewise, the smaller the respiratory aerosol droplet the fewer number of virus particles that droplet can carry. That's not to say, however, that smaller droplets are less infectious. That would be a topic for a different discussion and more appropriate for a virologist to answer. However, it is reasonable to conclude that fewer virus particles can mean less exposure and possibly less risk of serious illness.

Third, infected persons who are shedding the virus will expel respiratory aerosol droplets into a small micro-environment surrounding their person and any other person who enters into that small micro-environment will be exposed. Small particles can remain airborne for many hours while large particles generally drop to the ground relatively quickly. However, as small particles (containing fewer virus particles) remain airborne, they tend to dry out which is not conducive for viruses to maintain their infectivity. This is why social-distancing is so important. Wearing a mask or other face covering not only reduces the number of respiratory aerosol droplets being expelled into a person's micro-environment, doing so also reduces the velocity at which the aerosol droplets are expelled and thus reduces the distance traveled away from the source. That's not to say, however, that social

distancing isn't still necessary if someone is wearing a mask. Applying both mitigation measures together is more effective at reducing the risk of contracting COVID-19 than applying one or the other.

So, where does that leave us? A proper mask, face covering, or respirator (without an exhalation valve) worn by someone who is shedding the virus will reduce, but not eliminate, the overall number of respiratory aerosol droplets that become airborne and will reduce the velocity at which those aerosol droplets are expelled which, in turn, reduces the distance they will travel from the source. Fewer respiratory aerosol droplets in the air means fewer virus particles to infect others. When a non-infected person wearing a mask, face covering, or respirator (without an exhalation valve) comes into close contact with an infected person who is shedding the virus and wearing a mask, face covering, or respirator (without an exhalation valve), the number of virus particles entering the respiratory system of the non-infected person will be fewer than if only one person were wearing a mask. Fewer virus particles can equate to a lower risk of infection or can lower the severity of infection. Risk isn't eliminated completely, but the same can be said for seatbelts, bicycle helmets, motorcycle helmets, and batting helmets.

4. I have a medical condition that prevents me from wearing a mask, face covering, or respirator; should I still wear one?

No, not if your doctor has advised you not to or if you've tried wearing one and it causes you difficulties. However, having asthma, mild COPD, or other lung conditions does not automatically mean you cannot safely wear one. Talk with your doctor and follow their advice.

5. I'm pregnant; can I wear a mask, face covering, or respirator?

Pregnancy by itself is not a condition that normally excludes someone from being able to wear a mask, face covering, or respirator. However, your OB/GYN is in the best position to advise you in this regard. Generally speaking, if you and your developing baby are well enough to be out in public during Houston's mid-day heat, it's reasonable to conclude that the benefits of wearing a mask, face covering, or respirator are likely to outweigh the risk to you or your baby.

6. Will wearing a mask prevent me from getting COVID-19?

No, but it will reduce the risk.

7. There is no proof that SARS-Cov-2 is an airborne virus, so why should I wear a mask?

The evidence is becoming increasingly clear that this virus is, in fact, airborne. If wearing a mask reduces this risk, then there is benefit.

8. I have heard wearing a mask can increase my risk because I'm more likely to touch my face to adjust my mask; is this true?

Touching your face is not, in and of itself, a problem. The virus has to come into contact with mucous membranes inside the respiratory system and possibly your eyes. If you are practicing good hand sanitation, touching a contaminated mask on your face is no different than touching a

contaminated door knob. In no way possible can wearing a mask increase the number of virus particles in the air or the number of virus particles that are inhaled. This is indisputable.

9. I'm claustrophobic, can I wear a mask, face covering, or respirator?

That depends on you. I've personally trained people who are claustrophobic to wear "full face" respirators and, less successfully, even "Level A" protective suits used by first responders. Unlike COVID-19 face coverings, these individuals don't have the option to remove the mask or protective suite in a hazardous atmosphere if they begin to feel anxious.

10. Does wearing a mask, face covering, or respirator protect me or does it protect others?

Both you and others, but the benefit to others is likely greater. It is a gift you can give to others with little or no sacrifice.