Humidity From Masks May Lessen Severity of COVID-19

Study findings may help explain why wearing masks has been linked to lower disease severity in people with COVID-19.

February 28, 2021 By National Institutes of Health

Masks serve as a barrier to help protect the people wearing them from getting or spreading SARS-CoV-2, the virus that causes COVID-19. The virus spreads mainly from person to person through respiratory droplets. These droplets travel into the air when coughing, sneezing, or talking. Masks are a simple barrier to help block respiratory droplets. Studies show that masks reduce the release of droplets when worn over the nose and mouth.

Research suggests that wearing a face mask may also lessen the severity of COVID-19 if an individual is infected. It's possible that humidity created within the mask may play a role, as humidity is an essential factor in the process that clears inhaled particles from the lungs.

Drs. Joseph Courtney and Adriaan Bax of NIH's National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) carried out a study to compare how different face masks affected the humidity of inhaled air. Results were published on February 12, 2021, in the Biophysical Journal.

The scientists tested four common types of masks: an N95 mask, a three-ply disposable surgical mask, a two-ply cotton-polyester mask, and a heavy cotton mask. A volunteer wore each mask for at least 10 minutes before any measurements were taken. The researchers then measured the level of humidity when breathing into a sealed steel box. The volunteer's face was fitted tightly against the box using high-density foam rubber. Humidity measurements were taken at three different air temperatures, ranging from about 46 to 98 degrees Fahrenheit.

Masks absorb much of the water vapor that is exhaled and then release some of it during inhalation. By measuring the humidity changes in the box under the different conditions, the researchers were able to calculate how each mask affected the humidity of inhaled air.

All four masks increased the humidity of inhaled air substantially, but to different degrees. At all temperatures, the thick cotton mask led to a very large increase in humidity. At room temperature, the surgical mask resulted in the lowest but still sizable humidity increase, while both the N95 mask and the cotton-polyester mask increased humidity to an equal extent. The humidifying effects of all masks greatly increased at lower temperatures.

High levels of humidity may help limit the spread of a virus to the lungs. Humidity supports a defense mechanism that removes mucus from the lungs—along with potentially harmful particles, such as viruses, within the mucus. Low levels of humidity can also hamper the immune system's ability to fight against viruses. This may help explain why people are more likely to get respiratory infections in cold weather.

"We found that face masks strongly increase the humidity in inhaled air and propose that the resulting hydration of the respiratory tract could be responsible for the documented finding that links lower COVID-19 disease severity to wearing a mask," says Bax. "High levels of humidity have been shown to mitigate severity of the flu, and it may be applicable to severity of COVID-19 through a similar mechanism."

Earlier studies from Bax and other colleagues showed that any cloth mask can help block the thousands of saliva droplets that are released when speaking. This study suggests another way that masks may help in the battle against COVID-19.

This research report was published on the National Institutes of Health website on February 23, 2021.
