# Can coronavirus spread through airborne transmission of aerosols?

A study measured the size distribution, travel distance and velocity of droplets when a person coughs or speaks

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Direct contact with an infected person, droplet transmission and contact with contaminated surfaces are some of the most common routes of transmission suggested for novel coronavirus. But a Perspective piece published in *Science* by a team led by Kimberly A. Prather seems to suggests that a "large proportion of the spread of coronavirus disease 2019 (COVID-19) appears to be occurring through airborne transmission of aerosols produced by asymptomatic individuals during breathing and speaking". Dr. Prather is from the Scripps Institution of Oceanography, University of California San Diego, La Jolla, California.

In the case of 2002 SARS, airborne transmission was reported by several studies. It was retrospectively explained as the route of spread in the case of Hong Kong's Prince of Wales Hospital, and health care facilities in Toronto.

In the case of SARS-CoV-2, it is said that "aerosols can accumulate, remain infectious in indoor air for hours, and be easily inhaled deep into the lungs". Yet, there has not been any study to confirm this.

**Buoyant aerosol:** Smaller droplets, less than five microns, evaporate faster than they settle, hence, get carried away by air to longer distances. ▪ GETTY IMAGES

## Viability in aerosols

A Correspondence published in the *New England Journal of Medicine* suggested that SARS-CoV-2 remained viable in aerosols for as long as three hours, though with time there was a reduction in the amount of infectious virus.. But the equipment used to generate aerosol may not mimic natural conditions of cough. "This is a high-powered machine that does not reflect normal human cough conditions. Further, the finding of COVID-19 virus in aerosol particles up to 3 hours does not reflect a clinical setting in which aerosol-generating procedures are performed—that is, this was an experimentally induced aerosol-generating procedure," WHO cautioned.

But a team led by Daniel Bonn from the Institute of Physics, University of Amsterdam, the Netherlands, has in a paper published in *The Lancet Respiratory Medicine* studied droplet production when a person coughs and speaks and also measured the droplet size distribution, travel distance and velocity, and the airborne time in relation to the level of air ventilation.

## Droplet sizes

They used a laser to determine the droplet sizes in a single cough and during speech. When a healthy volunteer coughed, they found both large droplets (100-1,000 microns) and small droplets (1-10 microns) being produced. But smaller droplets were more prevalent than the larger ones. During speech, the smaller droplets were the only ones produced.

They then used another laser system to track droplets for speed and trajectory when a person coughed. Larger droplets (500 microns) did not travel long and fell to the ground in about one second. Based on this information, they estimate that smaller droplets (5 microns) will remain in the air for nine minutes before settling on the ground.

Next, they used specially designed spray nozzle to disperse small droplets into the air, reproducing the effect of coughing. The droplets produced were on average 5 micron in diameter. In the case of a room with no ventilation, the droplets took five minutes to reduce by half. While in a well-ventilated room it reduced by half in just 30 seconds, and 1.4 minutes in a poorly ventilated room.

## Borne by air

The team led by Dr. Prather note that while larger droplets settle faster than they evaporate, the smaller ones (aerosols), which are less than five microns, evaporate faster than they settle. As a result, they are buoyant and can get carried away by air to longer distances.

A study published in *Nature* found higher concentration of the viral RNA in aerosols in the toilet areas used by patients in two Wuhan hospitals but low concentration in isolation wards and ventilated rooms. Though the researchers did not establish infectivity of the virus, they did find that small droplets expelled during normal breathing and talking can remain in the air and can infect others when inhaled. They proposed that novel coronavirus "may have the potential to be transmitted through aerosols".

But WHO has cautioned that "detection of RNA in environmental samples based on PCR-based assays is not indicative of viable virus that could be transmissible. Further studies are needed to determine whether it is possible to detect COVID-19 virus in air samples from patient rooms where no procedures or support treatments that generate aerosols are ongoing".