IS THE CORONAVIRUS AIRBORNE? EXPERTS CAN'T AGREE

Health officials say the evidence is not compelling, but scientists warn that it could take years to collect.

By Dyani Lewis

Since early reports revealed that a new coronavirus was spreading rapidly between people, researchers have been trying to pin down whether it can travel through the air. Health officials say the virus is transported only through droplets from coughing or sneezing — either directly, or through contact with objects. But some scientists say there is preliminary evidence that airborne transmission — whereby a disease spreads in much smaller particles from exhaled air, known as aerosols — is occurring, and that precautions, such as increasing ventilation indoors and wearing masks, should be recommended to reduce the risk of infection.

In a briefing posted online on 27 March, the World Health Organization (WHO) said there is not sufficient evidence to suggest that SARS-CoV-2 is airborne, except in a handful of medical contexts.

But specialists in airborne respiratory illnesses and aerosols say that gathering unequivocal evidence for airborne transmission could take years and cost lives. We shouldn't "let perfect be the enemy of convincing", says Michael Osterholm, an infectious-disease epidemiologist at the University of Minnesota in Minneapolis.

"In the mind of scientists working on this, there's absolutely no doubt that the virus spreads in the air," says aerosol scientist Lidia Morawska at the Queensland University of Technology in Brisbane, Australia.

When public-health officials say there isn't sufficient evidence that SARS-CoV-2 is airborne, they mean transported in virus-laden aerosols smaller than 5 micrometres wide. Compared with droplets, which are heftier and thought to travel only short distances before falling to the floor or onto other surfaces, aerosols can linger in the air and travel farther.

Most transmission occurs at close range, says Ben Cowling, an epidemiologist at the University of Hong Kong. But the distinction between droplets and aerosols is unhelpful because "the particles that come out with virus can be a wide range of sizes. Very, very large ones right down to aerosols," he says.

And if SARS-CoV-2 is transmitting through aerosols, it is possible that virus particles could build up over time in enclosed spaces or be transmitted over greater distances.

Aerosols are also more likely than droplets to be produced by talking and breathing. These might pose a bigger risk than sneezing and coughing, which tend to cause people to turn away, says virologist Julian Tang at the University of Leicester, UK.

The evidence that SARS-CoV-2 is spreading in aerosols is mixed. At the height of the coronavirus outbreak in Wuhan, China, virologist Ke Lan at Wuhan University collected samples of aerosols in and around hospitals treating people with COVID-19, as well as at the busy entrances of two department stores.

In an unreviewed preprint[1], Lan and his colleagues report finding viral RNA from SARS-CoV-2 in a number of locations, including both shops. The study doesn't ascertain whether the aerosols collected were able to infect cells. But, in an e-mail to *Nature*, Lan says the work shows that "during breathing or talking, SARS-CoV-2 aerosol transmission might occur and impact people both near and far from the source". As a precaution, the general public should avoid crowds, he writes, and should also wear masks, "to reduce the risk of airborne virus exposure".

The question of viability

A study by researchers in Nebraska found viral RNA in nearly two-thirds of air samples collected in isolation rooms in a hospital treating people with severe COVID-19, and in a quarantine facility housing those with mild infections[2]. Surfaces in ventilation grates also tested positive. None of the air samples was infectious, but the data suggest that "viral aerosol particles are produced by individuals that have the COVID-19 disease, even in the absence of cough", the authors write.

The WHO says that the evidence of viral RNA "is not indicative of viable virus that could be transmissible". Its briefing also points to its own analysis of more than 75,000 COVID-19 cases in China, which did not report finding airborne transmission.

Scientists in the United States have shown in the laboratory that the virus can survive in an aerosol and remain infectious for at least 3 hours[3]. Although the conditions in the study were "highly artificial", there is probably "a non-zero risk of longer-range spread through the air", says co-author Jamie Lloyd-Smith, an infectious-diseases researcher at the University of California, Los Angeles.

But Leo Poon, a virologist at the University of Hong Kong, doesn't think there's enough evidence yet to say SARS-CoV-2 is airborne. He'd like to see experiments showing that the virus in droplets of different sizes is infectious.

Whether people with COVID-19 produce enough virus-laden aerosols to constitute a risk is also unknown, says Lloyd-Smith. Air sampling from people when they talk, breathe, cough and sneeze "would be another big part of the puzzle", he says.

PABLO MONSALVE/VIEWPRESS/GETTY

Some scientists say masks could reduce the general public's risk of coronavirus infection.

1. Liu, Y. *et al.* Preprint at bioRxiv http://doi.org/dqts (2020).
2. Santarpia, J. L. *et al.* Preprint at medRxiv http://doi.org/dqtw (2020).
3. van Doremalen, N. *et al. N. Engl. J. Med.* http://doi.org/ggn88w (2020).