

Evidences of airborne coronavirus transmission and necessary cautionary measures

Since the outbreak of the COVID-19 pandemic, various mechanisms of the virus transmission have been the focus of considerable research. Initially, it was believed (and observed) that the virus spreads primarily through the droplets that are expelled while an infected person speaks, sneezes or coughs. Because of their huge size (several micrometres), these droplets are heavy and can travel only short distances before they fall on to the ground. Thus, an individual 6 feet (2 metres) away was deemed to be safe from such droplets and this led to formation of the familiar social distancing protocol. While some researchers had proposed the possibility of aerial transmission of the virus around that time itself, the overall scientific literature remained inconclusive for lack of observational evidences. However, with persistent research, the global health community is increasingly accepting that the coronavirus could be transmitted through air, to distances longer than previously believed to be. According to a research by six experts¹ from the UK, USA and Canada at the Cooperative Institute for Research in Environmental Sciences (CIRES) and the University of Colorado Boulder, public health interventions that fail to address the virus as primarily airborne leave individuals defenceless and allow the virus to spread.

SARS-CoV-2 virus multiplies in the respiratory system of an affected person. It is dispersed in particles of various sizes expelled by an affected person's nose and throat while breathing, speaking, singing, coughing, sneezing, etc. While the large droplets, like visible spatters of spittle, fall quickly and settle on the earth or surrounding objects within the 2 m distance of the affected person, the smaller (invisible to the human eye) can remain aloft for longer, based on their size, humidity, temperature and airflow. These suspended particles, or aerosols, are capable of getting dispersed with the ventilation system and have sparked the newer concern. According to a study conducted by the National Centre for Biotechnology Information (NCBI) in US², SARS transmission across apartments on various floors is possible. It says that one of the concerns is that there

may be numerous transmission pathways among families in high-rise residential buildings, one of which being the natural ventilated airflow induced by buoyancy effects through open windows across flats. Also, the on-site measurements with tracer gases verified subjectively and quantitatively that the re-entry of exhaust-polluted air from the lower floor's window into the neighbouring upper floor is also a fact.

Laboratory studies have shown that SARS-CoV-2 could remain contagious in the air for up to 3 h under laboratory conditions, with a half-life of 1.1 h. The viruses have been found in air filters and building vents in hospitals with COVID-19 patients; in areas that could only be reached by aerosols. Similarly, studies involving infectious caged animals³ attached to separate caged uninfected animals by an air vent revealed SARS-CoV-2 transmission through the vent, supporting aerosolized transmission. Also, no research has presented clear or consistent evidence to refute the hypothesis that SARS-CoV-2 transmits through air.

There are several diseases transmitted via air, such as tuberculosis, measles and chickenpox; which are more difficult to track and contain than pathogens transmitted by contaminated food and water (such as cholera and typhoid). Research conducted over the last 16 months confirms the role of aerosolized transmission of the SARS-CoV-2. Accordingly, the official guidelines for public mask-use and other infection-control measures are being revised regularly. After reviewing existing findings, the team of researchers identified ten lines of evidence that collectively support the hypothesis that SARS-CoV-2 transmits through the airborne path: significant SARS-CoV-2 propagation is accounted for by super-spreading cases, which are associated with SARS-CoV-2 airborne dissemination and cannot be sufficiently explained by droplets or fomites transmission. The intensity of such events clearly indicates that: (1) aerosol transmission is dominant; (2) long-distance transmission of SARS-CoV-2 has been recorded in quarantine hotels between people in adjacent rooms but never in each other's presence; (3) asymptomatic or pre-symptomatic

transmissions from individuals who are not coughing or sneezing (which accounts for at least one-third, and possibly up to 59%, of all transmission worldwide); (4) transmission is relatively high indoors than outdoors and is significantly reduced by indoor ventilation; (5) nosocomial infections have been reported in health-care settings where stringent contact-and-droplet precautions and the use of personal protective equipment (PPE) intended to protect against droplet but not aerosol contamination; and (6) a viable SARS-CoV-2 strain has been found in the air.

The above recent recognition by the World Health Organization (WHO) and the US Centres for Disease Control and Prevention (CDC) comes with significant implications: Scientists are urging that ventilation systems be overhauled in the same way like municipal water sources were in the 1800s after fetid pipes were discovered to contain cholera. The researchers found that cleaner indoor air will not only help combat the pandemic, but it will also reduce the chance of contracting flu and other respiratory diseases than air in confined environments or in confined areas where air is forcefully circulated (for example, classrooms, theatres, auditoria, malls, gymnasiums, etc). The Indian authorities have also issued new advisories regarding aerial transmission through the air in the form of aerosols up to about 10 m away. The danger of surface transmission, which was thought to be very high in the early months of the pandemic, is now thought to be secondary.

To summarize, the emerging scientific evidences suggest that SARS-CoV-2 spreads through airborne transmission, in addition to the other earlier-accepted routes and adequate precautionary measures need to be practiced.

Major steps to defend the SARS-CoV-2

- *Get vaccinated:* Vaccination is your best bet for protecting yourself and those around you, as well as your best chance of achieving herd immunity.
- *Wear a face mask:* Wear a face mask while going out in public. This

saves you and others (if you are asymptomatic and have the ability to spread). Recently, wearing double masks has been recommended in India, especially in densely infected areas. People are also advised to wear masks even within the house, while living in apartments with a sizable number of infected patients.

- *Wash your hands:* The best way to avoid the transmission of infectious infections is to wash your hands properly with soap and water for at least 20 seconds, or to use hand sanitizer when soap and water are unavailable.

- *Keep clear from poorly ventilated indoor areas:* Now that we know COVID-19 can transmit through aerosols, we need to pay close attention to the air quality and ventilation quality in our households and other indoor areas. Air purifiers, high-quality AC filters and allowing outdoor air inside (i.e. opening the windows) will all help to increase your home's air exchange rate.

- *Avoid close contact with those who are sick or have been exposed:* This may seem obvious, but avoid getting too close to people who are ill or have been exposed to the coronavirus. Person-to-person contact is the main mode of transmission for the virus, so keep a safe

distance from others who are exhibiting symptoms.

- *Avoid needless travel:* It is always a good idea to avoid indoor public areas wherever possible, particularly if you have a high probability of developing serious complications. For e.g., instead of going to the bank, try doing your banking online. Plan the shopping list carefully so you do not have to make a second or third outing. If you used to eat out three nights a week, try only one night a week and consider take-away.

- *Adhere to public health guidelines:* All state governments have issued guidelines on how to slow the spread of the coronavirus. These involve social distancing, limiting the types of businesses that may operate and the types of activities that are permitted, such as outdoor exercise or private gatherings.

- *Boost the immune system:* A healthy immune system is the strongest protection against disease, in addition to basic illness prevention. When the immune system is working well, the body is able to fend off infections, and everybody should make an attempt to improve their immune system. Keep hydrated, limit the intake to highly refined foods, and ensure you get adequate vitamin D,

vitamin C, antioxidants, and other vital nutrients.

- *Maintain your calm:* In addition to your health and fitness, you should look after your mental health. High stress levels will have a negative impact on the immune system, which is the opposite of what you want if you want to prevent the coronavirus.

- *Stay up-to-date:* It is possible to get caught up in the ever-increasing amount of information available online, as well as the paranoia and disinformation that spreads on social media and your best bet is to get the information directly from the health agencies that are researching the problem first-hand.

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 2. Hwang, S. E., Chang, J. H., Oh, B. and Heo, J., *Int. J. Infect. Dis.*, 2021; doi: 10.1016/j.ijid.2020.12.035.
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Arjun R. Krishnan, Science Writing Fellow, Current Science.
e-mail: arjunkriz92@gmail.com

Addendum

2020 Nobel Prize for Physics: Black holes and the Milky Way's darkest secret

Joseph Samuel

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