

CSU

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1. Shifting thinking on aerosol transmission of SARS-CoV-2

Understanding the method of spread for any infectious agent has important implications for how to target strategies to limit transmission. Peak bodies, including the WHO and CDC previously stated SARS-CoV-2 primarily spreads via respiratory droplets, among people who are in close contact with each other. Both organisations have updated their guidance, and “a few sentences have shaken a century of science” ([link](#)).

The [WHO](#) update from 30 April 2021 states: “The virus can spread from an infected person’s mouth or nose in small liquid particles when they cough, sneeze, speak, sing or breathe. These particles range from larger respiratory droplets, which fall to the ground quickly, to smaller aerosols, which remain suspended in the air for many minutes or hours.” While this update still emphasises that transmission mostly occurs in close contact settings, it now acknowledges more clearly that this may occur via aerosols as well as droplets.

In October 2020, the CDC [published](#) updated guidance acknowledging airborne transmission, but only as a secondary route under some circumstances. On May 7 2021, the [CDC](#) updated their scientific brief on SARS-CoV-2 transmission “to reflect current knowledge about SARS-CoV-2 transmission”. This update resulted in further attention on this topic (see [here](#), [here](#) and [here](#)). The new guidance states:

“The principal mode by which people are infected with SARS-CoV-2 (the virus that causes COVID-19) is through exposure to respiratory fluids [aerosols and/or larger droplets] carrying infectious virus.

Exposure occurs in three principal ways:

(1) inhalation of very fine respiratory droplets and aerosol particles,

(2) deposition of respiratory droplets and particles on exposed mucous membranes in the mouth, nose, or eye by direct splashes and sprays, and

(3) touching mucous membranes with hands that have been soiled either directly by virus-containing respiratory fluids or indirectly by touching surfaces with virus on them.”

The CDC emphasises that airborne transmission can occur via inhalation of infectious aerosols at a distance of more than 6 feet from the source and that the risk of is increased in enclosed spaces with inadequate ventilation, with increased exhalation, i.e. activities that cause heavier breathing, or under prolonged exposure to such conditions. The CDC noted that the relative contributions of larger droplet-based transmission versus smaller aerosol-based transmission may be difficult to establish, however, current evidence strongly suggests transmission from surfaces does not contribute substantially to new infections.

So what “new evidence” has led to this shift of opinion in such influential organisations? Throughout the pandemic there have been increasing calls for recognition of aerosols as a key contributor to transmission. For example, in July 2020, hundreds of scientists [signed an open letter](#) urging the medical community and relevant peak bodies to recognise the potential for airborne viral transmission ([link](#)). While fundamental research to unequivocally determine the primary mode of transmission has not occurred, an overwhelming growth of empirical data appears to have shifted the early assumptions surrounding transmission of SARS-CoV-2. Two recent commentaries further outline some of this shift in thinking.

A paper published in *The Lancet* in April 2021 outlined ten streams of evidence that collectively support the hypothesis that SARS-CoV-2 is transmitted primarily by the airborne route ([link](#)). Briefly, these include:

- Superspreading events account for a substantial proportion of SARS-CoV-2 transmission.
- Long-range transmission of SARS-CoV-2 between people in adjacent rooms but never in each other's presence has been documented in quarantine hotels.
- Hospital infections have been documented in health-care organisations, where there have been strict contact-and-droplet precautions implemented and use of personal protective equipment (PPE) designed to protect against droplet but not aerosol exposure.
- Viable SARS-CoV-2 has been detected in the air (noting that sampling of airborne virus is technically challenging for several reasons, and that measles and tuberculosis, two primarily airborne diseases, have never been cultivated from room air).
- SARS-CoV-2 has been identified in air filters and building ducts in hospitals with COVID-19 patients; such locations could be reached only by aerosols.
- Studies involving infected caged animals connected to separately caged uninfected animals via an air duct have shown transmission of SARS-CoV-2 that can only be adequately explained by aerosols.
- Asymptomatic or pre-symptomatic transmission has been a key factor in the worldwide spread of SARS-CoV-2 (and direct measurements show that speaking produces thousands of aerosol particles and few large droplets).
- Transmission has been more frequently documented from indoor interactions as opposed to outdoor.
- No study to their knowledge has provided strong or consistent evidence to refute the hypothesis of airborne SARS-CoV-2 transmission.
- There is limited evidence to support other dominant routes of transmission—i.e., large respiratory droplets or fomites, and noting that the flawed assumption that transmission through close proximity implies a mode of large respiratory droplets or fomites was historically and incorrectly used for decades to deny the now well-established airborne transmission of tuberculosis and measles.

A recent opinion piece by one of the co-authors of the above paper ([link](#)) provides a further detailed analysis of the shift in thinking about aerosol transmission throughout the COVID-19 pandemic.

Comment: A recognition of the importance of aerosols as a major contributor to the spread of SARS-CoV-2 has important implications for the management of the disease. In particular, it requires more emphasis on managing air spaces and more advanced PPE. Further focus on mitigation strategies to specifically address aerosol transmission over distance and time will improve efforts to “Keep Out, and Stamp Out” SARS-CoV-2 within New Zealand. The Ministry of Health guidance has acknowledged the potential for airborne transmission ([here](#)) and there is an established process setup to continually assess and refine the ventilation adequacy of MIQ facilities.

Furthermore, the introduction of widespread genomic testing has dramatically changed the ability to link the source of infection to an individual case. In the setting of managed isolation facilities, for example, this has enabled the exclusion of close contact between two individuals as an activity related to transmission and this could be considered as epidemiological evidence of airborne transmission. As the evidence for airborne transmission continues to accumulate, it should always be considered as a possible mode of transmission.