

COVID-19 Airborne Transmission

April 2021

Background

Since the COVID-19 pandemic was declared on March 11, 2020, there has been much debate around the main ways in which COVID-19 transmission occurs. For the majority of the last year, public health has stated that COVID-19 transmission occurs primarily through droplet and surface contact. In March 2020, the World Health Organization (WHO) even announced that COVID-19 infection was mainly transmitted through respiratory droplets greater than 5 to 10 microns in size and through contact routes, as investigations at that time did not detect airborne transmission, which would require the droplets to be less than 5 microns in size (also known as aerosols or droplet nuclei).ⁱ To date, the WHO has further clarified this information, stating that while it may be possible for the COVID-19 to be transmitted through particles of various sizes including aerosols, that is not the main mode of transmission, therefore COVID-19 cannot be classified as an airborne virus.ⁱⁱ However, other researchers believe that if particles can be inhaled, regardless of their size, they count as aerosols.ⁱⁱⁱ Other studies in recent months have also claimed that COVID-19 should be categorized as airborne, outlining the evidence and potential dangers associated with this type of transmission.

A recent analysis of the available body of literature has reinforced the airborne thesis, confirming that a considerable proportion of global infection has occurred from 'superspreading' events, long-range transmission across physical boundaries, and even from asymptomatic and presymptomatic cases.^{iv} If the primary method of transmission was through droplet and direct contact, then the spread of COVID-19 could be significantly curbed by cleaning surfaces, providing physical barriers, and wearing masks when within droplet distance.^v However, even despite these best efforts, COVID-19 transmission still takes place at high rates. Various international studies have tried to understand this by investigating how people are able to transmit COVID-19 when they have remained in quarantine for 14 days. One study out of New Zealand (Aotearoa in Maori) reported an incoming traveller who tested positive for COVID-19 was kept in strict quarantine in a designated facility for 14 days upon entry, and then had two negative tests before they were released into the community. In spite of this, genomic sequencing later determined a chain of transmission from this individual including probable aerosol transmission, as they had not come into direct contact with another person.^{vi}

Additionally, other studies have discovered that COVID-19 airborne droplets and particles can remain infectious in the air for up to three hours,^{vii} and can sit in air filters and ventilation systems for prolonged periods of time, explaining how some people have been infected by COVID-19 without direct contact, but by being located in an adjacent room.^{viii} Aerosols behave differently than larger droplets, and can attach themselves to dust particles in the air and can even travel on air currents for distances greater than two metres.^{ix} This is why indoor settings have historically been more hazardous than outdoors. If people can inhale enough of the virus to cause infection after the originally infected person has departed, then fresh air replacement and ventilation becomes more critical.^x The make and fit of face masks also become more important, as masks need to be more tightly fitted and have better filtering features to provide adequate protection if the virus is airborne.^{xi} Furthermore, new evidence estimates that transmission of COVID-19 from asymptomatic individuals could make up more than half of all transmissions (59%).^{xii} This is important to note because individuals with asymptomatic or presymptomatic COVID-19 do not cough or sneeze but can still disseminate the infection widely. In fact, measurements show that typical speaking produces thousands of aerosolized particles with very few droplets, substantiating the case for airborne spread.^{xiii}

Despite this information, some jurisdictions are still hesitant to update public health protocols to account for airborne transmission. This is because it can be difficult to detect viable (infectious) COVID-19 virions in all circumstances. In some cases, the SARS-CoV-2 RNA has been detected, but not inclusive of the surrounding viral proteins, particularly the spike protein, which is responsible for attaching to a host's receptor proteins thereby initiating entry to the host cell.^{xiv} One study asserts that this is because of the air sampling devices used and their harsh collection process, which potentially inactivates the viable virions upon collection.^{xv}

Other studies suggest that even if SARS-CoV-2 can be located in its full infectious form in aerosols and ingested or inhaled by another person, there is uncertainty around what would be a sufficient quantity of infectious

aerosols in order to fully infect another person.^{xvi} One report reveals that aside from 'dramatic expiratory events' such as coughing and sneezing which would produce droplets, there is high variability between people as to how many airborne particles they produce and whether those are large enough to contain communicable pathogens, perhaps depending on the loudness of the speaker.^{xvii} The same report claims that there is simply a small fraction of individuals whom they denote as 'speech super-emitters' who tend to emit significantly more aerosol particles than the rest of the population, irrelevant of language, loudness of speech, or other currently quantifiable elements.^{xviii} With this in mind, some say that there is insufficient evidence demonstrating that airborne transmission can occur in all, or even a majority, of circumstances. It is possible that the very small number of 'speech super-emitters' among the general population are more responsible for the airborne transmission of infectious diseases such as that causing COVID-19, but this would require further exploration. Thus, given various angles of inquiry and study results, the science continues to evolve and it is difficult to be definitive with respect to conclusions.

To date, the WHO maintains resources which claim that the predominant transmission of COVID-19 occurs through droplet contact, and this is why the majority of COVID-19 cases are spread between close contacts, friends and family members.^{xxix} In addition, the BC Centre for Disease Control (BCCDC) says that 'the majority of COVID-19 infections are spread from one person to another through larger droplets' which usually fall to the ground within two metres, and that surface contamination and transmission through smaller droplets are less common.^{xx} The US Centers for Disease Control and Prevention (CDC) has acknowledged that there are some rarer reports of people transmitting COVID-19 even though they kept distance of more than two metres or had left the space prior to when the next person entered, but these reports are considered to be uncommon and occurred under exceptional circumstances.^{xxi} It is possible that these reliable sources will adjust their messaging as the evidence for airborne transmission becomes more clear.

Often it can be difficult to discern which information is correct, especially when the information coming from reputable sources is nuanced, or if news stations and other media present conflicting reports. Nurses understand the importance of following science and evidence-based information when it comes to disease prevention. Authorities such as the BCCDC, the WHO and Health Canada are continually evaluating new and evolving research prior to making recommendations or presenting any information to the public. It is always a best practice to check with these sources first, rather than relying on media messaging, which tends toward sensationalism. Nurses recognize the significance in relaying these scientific advances to patients and the public, and in maintaining a moderated approach when it comes to fluctuating data or conflicting evidence. It can be tough to know where to go for updates on this information, but nurses know that the BCCDC and Health Canada will remain the most credible authorities. Thus, at present the safest ways to lower your risk of transmitting or catching COVID-19 is by following public health protocols including handwashing, masking, and maintaining physical distance boundaries – even for those who are fully immunized.

Key Messages

- The way COVID-19 transmission occurs has been an ongoing discussion since the pandemic was declared in March 2020.
- Studies of superspreading events show that COVID-19 transmission takes place long-range, across physical boundaries, and even from presymptomatic and asymptomatic cases of infection.
- Airborne COVID-19 particles remain infectious for up to three hours and have been found in air ducts and air filters of rooms containing COVID-19 patients, demonstrating airborne travel as droplets would not be able to reach those places.
- If COVID-19 is deemed to be an airborne virus, then effective air filtration, staying out of small poorly ventilated areas, and wearing appropriately fitted, high-quality masks become more important to provide adequate protection against illness.
- Current estimates are that asymptomatic and presymptomatic transmission of COVID-19 may account for more than half of global transmission.



- At this time, the WHO and BCCDC maintain that the majority of COVID-19 cases are caused by the spread of droplets through close contacts (within two metres).
- Nurses know that the best way to prevent the spread of COVID-19 is through public health protocols such as wearing a mask, washing your hands, avoiding indoor gatherings, and by practicing physical distancing.

Further Reading/Resources

- [NNPBC: COVID-19 Resources](#)
- [BCCDC: COVID-19: How It Spreads](#)
- [WHO: Coronavirus Disease \(COVID-19\): How is it transmitted?](#)
- [Immunize BC: COVID-19](#)

Please feel free to direct questions and additional comments to info@nnpbc.com.

ⁱ WHO. March 29, 2020. Scientific brief. [Modes of transmission of virus causing COVID-19: implications for IPC precaution recommendations](#).

ⁱⁱ Baraniuk C. April 22, 2021. BMJ. 373(1030). [Covid-19: What do we know about airborne transmission of SARS-CoV-2?](#)

ⁱⁱⁱ Tang J, Marr L, Li Y and Dancer S. April 14, 2021. BMJ. 373(913). [Covid-19 has redefined airborne transmission](#).

^{iv} Greenhalgh T, Jimenez J, Prather K, Tufekci Z, Fisman D, and Schooley R. April 15, 2021. The Lancet. [Ten scientific reasons in support of airborne transmission of SARS-CoV-2](#).

^v Greenhalgh T, Jimenez J, Prather K, Tufekci Z, Fisman D, and Schooley R. April 15, 2021. The Lancet. [Ten scientific reasons in support of airborne transmission of SARS-CoV-2](#).

^{vi} Eichler N, Thornley C, Swadi T, Devine T, et al. May 27, 2021. Emerging Infectious Disease (EID) Journal. Vol 27(No5). [Transmission of Severe Acute Respiratory Syndrome Coronavirus 2 during Border Quarantine and Air Travel, New Zealand \(Aotearoa in Maori\)](#).

^{vii} Van Doremalen N, Morris D, Holbrook M, Gamble A, et al. March 17, 2020. New England Journal of Medicine (NEJM). 382:1564-1567. [Aerosol and Surface Stability of SARS-CoV-2 as Compared with SARS-CoV-1](#).

^{viii} Nissen K, Krambrich J, Akaberi D, Hoffman T, et al. November 11, 2020. Scientific Reports Journal. 10(1) :19589. [Long-distance airborne dispersal of SARS-CoV-2 in COVID-19 wards](#).

^{ix} Nikiforuk A. April 26, 2021. The Tyee. [If You Want to Avoid the Variants, Read This](#).

^x Tang J, Marr L, Li Y and Dancer S. April 14, 2021. BMJ. 373(913). [Covid-19 has redefined airborne transmission](#).

^{xi} Tang J, Marr L, Li Y and Dancer S. April 14, 2021. BMJ. 373(913). [Covid-19 has redefined airborne transmission](#).

^{xii} Johansson M, Quandelacy T, Kada S, Venkata Prasad P, et al. January 4, 2021. JAMA Network Open. [SARS-CoV-2 Transmission from People Without COVID-19 Symptoms](#).

^{xiii} Greenhalgh T, Jimenez J, Prather K, Tufekci Z, Fisman D, and Schooley R. April 15, 2021. The Lancet. [Ten scientific reasons in support of airborne transmission of SARS-CoV-2](#).

^{xiv} Lednicky J, Lauzardo M, Fan Z, Jutla A, et al. November 2020. International Journal of Infectious Diseases (IJID). 100:476-482. [Viable SARS-CoV-2 in the air of a hospital room with COVID-19 patients](#).

^{xv} Lednicky J, Lauzardo M, Fan Z, Jutla A, et al. November 2020. International Journal of Infectious Diseases (IJID). 100:476-482. [Viable SARS-CoV-2 in the air of a hospital room with COVID-19 patients](#).

^{xvi} WHO. July 9, 2020. Scientific brief. [Transmission of SARS-CoV-2: implications for infection prevention precautions](#).

^{xvii} Asadi S, Wexler A, Cappa C, Barreda S, et al. February 20, 2019. Scientific Reports Journal. Vol 9. [Aerosol emission and superemission during human speech increase with voice loudness](#).

^{xviii} Asadi S, Wexler A, Cappa C, Barreda S, et al. February 20, 2019. Scientific Reports Journal. Vol 9. [Aerosol emission and superemission during human speech increase with voice loudness](#)

^{xix} WHO. 2021. [Transmission package: protection yourself and others from COVID-19](#).

^{xx} BCCDC. January 5, 2021. [About COVID-19: How It Spreads](#).

^{xxi} Baraniuk C. April 22, 2021. BMJ. 373(1030). [Covid-19: What do we know about airborne transmission of SARS-CoV-2?](#)