

Re-thinking the Potential for Airborne Transmission of SARS-CoV-2

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Evidence for the potential for airborne transmission of SARS-CoV-19 continues to accumulate, with important implications for healthcare workers, as well as the general public. Three lines of evidence support this conclusion.

1. Detection and survival of coronavirus in air

SARS-CoV-2 viral RNA in air has been detected in several studies in hospitals, including at distances greater than 2 m from patients and in outdoor air in crowded areas near a hospital and a department store.^{i ii iii} One study found that the majority of these viruses were associated with aerosols (i.e., microscopic droplets) of diameter 2.5 microns and smaller, which can remain suspended in air for 2 hours or more.ⁱ Another detected SARS-CoV-2 in aerosols in the size range of 1-4 microns.ⁱⁱⁱ Furthermore, viral RNA has been detected on the surfaces of an air exhaust outlet and fan, places where direct transfer from an infected person could not occur.^{iv} While these studies assayed viral RNA, the finding that SARS-CoV-2 in fine aerosols (<5 microns) has a half-life of 1 hour in terms of infectivity raises the possibility that some airborne virus is infectious.^v If we assume that SARS-CoV-2 survives in large droplets, there is no reason to think that the virus would not also survive in aerosols. Previous studies have shown that other viruses survive equally well, if not better, in suspended aerosols compared to large, stationary droplets.^{vi vii viii}

2. Asymptomatic Infectivity

There are reports of asymptomatic transmission of SARS-CoV-2.^{ix} By definition, asymptomatic patients are not coughing or sneezing, which means they are not frequently generating large droplets. Therefore, for these asymptomatic patients, other modes of transmission, namely fomite and airborne, must be occurring. Studies on patients with confirmed influenza infection, show that infectious virus in fine particles can be released by regular breathing and talking, without coughing.^x This is of concern because a new preprint shows high shedding of infectious SARS-CoV-2 in the throat pre-symptoms.^{xi}

3. Aerosol physics

While the traditional distinction between “droplet” and “airborne” transmission of infectious disease has been useful for setting guidelines on the use of personal protective equipment, it has also established a false dichotomy in understanding the behavior of viruses in the air. Virus-containing droplets that are released by breathing, talking, and coughing span a continuum of sizes, from 0.01 to hundreds of microns. It is impossible for someone to release “large droplets” (>5 microns) without also releasing smaller ones.^{xii} Thus, transmission that is purported to occur via the spray of large droplets from a cough could in fact be occurring through inhalation of

much smaller droplets at close range. In fact, a physics-based simulation suggests that the majority of exposure at close range occurs by inhalation of small droplets rather than by contact with large droplets that land on the mouth, nose, and eyes, unless the people are closer than 30 cm or the droplets are very large.^{xiii}

Conclusion and Implications

Evidence is emerging indicating that, in addition to transmission via large droplets and fomites, SARS-CoV-2 is also transmitted via airborne particles. Recognition of this transmission route is critically important because healthcare workers are experiencing high rates of infection. A shortage of N95 respirators and other personal protective equipment, and lack of administrative and engineering controls addressing airborne exposure, may be contributing factors. More comprehensive guidance on how to protect healthcare workers and the general public should be considered in light of this new scientific evidence.

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