The role of aerosol science on understanding and preventing SARS-CoV-2 transmission in the community

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The worldwide spread of the SARS-CoV-2 virus has quickly become a pandemic partly due to the fast and unconstrained mechanism or mechanisms of transmission. Infection is usually present in the upper respiratory tract, which is typically the initial site of infection and source of replication for transmission for influenza viruses [1]. Despite the well-known potential for airborne spread of coronavirus disease (COVID-19) the mechanical properties, airborne behaviour, transport and capture as inhaled micro-nano particles by human subjects present in the same area as the host, has not been adequately recognized. However, there is well documented evidence for the significant potential for inhalation exposure to viruses in microscopic respiratory droplets (aerosol) at short to medium distances (up to several meters, or room scale). Before the current pandemic airborne infectious disease transmission was found not only to occur by coughing and sneezing, but also during normal speech, which also yields large quantities of particles that are too small to see by eye, but are large enough to carry a variety of communicable respiratory pathogens [2].

This work will demonstrate examples of the aerosol properties governing residence time and transmission in indoor space and explore the use of preventive measures to mitigate this route of airborne transmission. Studies have demonstrated beyond any reasonable doubt that viruses are released during exhalation, talking, and coughing in aerosol particles small enough to remain aloft in air and pose a risk of exposure at distances beyond 1–2 m from an infected individual

References

[1] Lakdawala, S. S. et al. The soft palate is an important site of adaptation for transmissible influenza viruses. Nature 526, 122–125 (2015).

[2] Asadi, S., Wexler, A.S., Cappa, C.D. et al. Aerosol emission and superemission during human speech increase with voice loudness. Sci Rep 9, 2348 (2019).