

Peer Reviewed Scientific Research

Respiratory Transmission of COVID-19:

Speech droplets generated by asymptomatic carriers of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) are increasingly considered to be a likely mode of disease transmission.

Highly sensitive laser light scattering observations have revealed that loud speech can emit thousands of oral fluid droplets per second. In a closed, stagnant air environment, they disappear from the window of view with time constants in the range of 8 to 14 min, which corresponds to droplet nuclei of ca. 4 μm diameter, or 12- to 21- μm droplets prior to dehydration. These observations confirm that there is a substantial probability that normal speaking causes airborne virus transmission in confined environments.

At an average viral load of 7×10^6 per milliliter, it is estimated that 1 min of loud-speaking generates at least 1,000 virion-containing droplet nuclei that remain airborne for more than 8 min. These therefore could be inhaled by others and, according to independent action hypothesis (IAH), trigger a new SARS-CoV-2 infection.

Some patients have viral titers that exceed the average titer of Wölfel et al. by more than two orders of magnitude, thereby increasing the number of virions in the emitted droplets to well over 100,000 per minute of speaking.

The SARS-CoV-2 virus has been found to remain viable in aerosols for 3hrs, while it, in the form of droplets, is more stable on plastic and stainless steel, copper, cardboard, and glass with durations detected up to 72, 4, 24, and 84 h, respectively.

The following chart relates to size of some common particles:

Lower Limit	Upper Limit	Contaminant
Micron	Micron	
0.3	0.4	Smoke, Paint Pigments
0.4	0.55	Bacteria
0.55	0.7	Lung Damaging Paint
0.7	1.0	Atmospheric Dust
1.0	1.3	Molds
1.6	2.2	Flour Mill Dust
3	4	Cement Dust
4	5.5	Pulverized Coal
5.5	7	Commercial Dust
7	10	Pollen
10	75	Silt
75	1000	Sand

References:

1) *The airborne lifetime of small speech droplets and their potential importance in SARS-CoV-2 transmission.* Valentyn Stadnytskyi, Christina E. Bax, Adriaan Bax, Philip Anfinrud. Proceedings of the National Academy of Sciences Jun 2020, 117 (22) 11875-11877; <https://doi.org/10.1073/pnas.2006874117>

Data deposition: Movies that show the experimental setup and the full 85-minute observation of speech droplet nuclei have been deposited at Zenodo and can be accessed at <https://doi.org/10.5281/zenodo.3770559>.

2) Wölfel, R., Corman, V.M., Guggemos, W. et al. Virological assessment of hospitalized patients with COVID-2019. Nature 581, 465–469 (2020). <https://doi.org/10.1038/s41586-020-2196-x>

3) Jayaweera M, Perera H, Gunawardana B, Manatunge J. Transmission of COVID-19 virus by droplets and aerosols: A critical review on the unresolved dichotomy. Environ Res. 2020;188:109819. <https://dx.doi.org/10.1016%2Fj.envres.2020.109819>

Scientific Research Discussion in Everyday Language **Respiratory Transmission of COVID-19:**

The invisible speech droplets generated during everyday conversations are considered a likely mode of disease transmission, including COVID-19, Delta, and Omnicron variations.

Highly sensitive laser light scattering observations have revealed that speech droplets in a room environment can stay in the air for 8-14 minutes. These observations confirm a substantial probability that normal speaking causes airborne virus transmission in confined environments.

An average person with a virus infection can generate at least 1,000 virus-containing speech droplets within 1 min of speaking, remaining airborne well over 8 minutes. These speech droplets remaining in the air could be inhaled by others and trigger a new virus infection.

In medical environments, patients can have viral titers that are double the average concentration of viral infections, thereby increasing the number of virus load in their speech droplets to well over 100,000 per minute of speaking. Considering that frequent person-to-person transmission is reported in community and health care settings, it appears likely that this applies to COVID-19 and other highly contagious airborne respiratory diseases, such as influenza and measles.

The SARS-CoV-2 (COVID-19) virus can survive in aerosols for 3 hours, and can be detected on plastic and stainless steel (72hrs), copper (4hrs), cardboard (24hrs), and glass (84hrs) surfaces.

Mist Disinfectant

Produce a safe disinfecting fine mist (7-10um) that stays airborne longer* to kill more germs in the air and on surfaces, providing up to 200ppm of virus-killing power —covering 3500 sqft within 20 mins.

* pending temperature and relative humidity of ambient air