

## **DOES SARS COV-2 SPREAD PRIMARILY BY DROPLET OR AEROSOL TRANSMISSION?**

### **WHY DOES IT MATTER?**

On 2/1/2021, the American Industrial Hygiene Association (AIHA) issued a statement in conjunction with nine other occupational safety and health organizations titled **Joint Consensus Statement on Addressing the Aerosol Transmission of SARS CoV-2 and Recommendations for Preventing Occupational Exposures**<sup>1</sup>. The premise of this document was that understanding the role of aerosol transmission of SARS CoV-2 is an important component of adopting appropriate worker and community protection strategies. Key points were:

- “People generate aerosols while breathing, talking, singing, coughing, and sneezing in a wide range of particle sizes (0.1 to > 100 µm). Some of the larger-sized particles will rapidly settle while some will rapidly evaporate to smaller droplet nuclei. Particles less than 10 µm will take minutes and hours to settle, during which they can be distributed throughout a space by diffusion and air currents.
  - SARS-CoV-2 can remain viable in air up to and perhaps longer than 3 hours, thus someone located both near and far from an infectious source could inhale infectious SARS-CoV-2 particles.
  - The receptors for SARS-CoV-2 in the body (ACE2) are located throughout the respiratory system. People are capable of inhaling particles over the entire particle size range of aerosols, with larger particles more likely to deposit in the upper respiratory system and smaller particles having a greater probability of penetrating into and depositing in the lungs, bronchioles, and alveoli.
  - None of the modes of transmission – contact, droplet, airborne, and aerosol – should be ruled out, although inhalation appears to be more important than contact transmission.
  - We do not yet know what level or amount of virus is associated with transmission from person-to-person. Recent data suggest that viral RNA levels greater than 10<sup>6</sup> are more likely to be associated with culturable virus, and that people shed infectious virus for only the first 8 days after symptom onset.
  - So much of infection prevention and control is based on practices in healthcare focused on patient safety and now it is clear that public health efforts need to also be focused on worker safety in all industries.”
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None of the above statements are particularly controversial. However, public health authorities, both the World Health Organization and CDC, while acknowledging the potential of aerosol transmission, maintain that “The principal mode by which people are infected with SARS-CoV-2 (the virus that causes COVID-19) is through exposure to respiratory droplets carrying infectious virus<sup>2</sup>.” CDC states that the control of certain bacteria (e.g., *Mycobacterium tuberculosis*) and viruses (e.g., rubeola, varicella-zoster) is based on their transmission through the air. However, CDC cites the epidemiology of SARS-CoV-2 to conclude that SARS-CoV-2 is more like other respiratory viruses than TB or measles and that SARS-CoV-2 spreads by respiratory droplets directly impacting the mucosa at close range rather than to individuals farther away or to individuals entering a space hours after a SARS-CoV-2 infected individual left the area. Although aerosol transmission is recognized to occur, the situations when this occurs are not considered common (i.e., enclosed space, prolonged exposure as with singing, shouting or exercising, and inadequate air exchange).

The CDC emphasis on droplet exposure favors current preventive actions; social distancing, use of masks in the community, hand hygiene, and surface cleaning and disinfection, while limiting ventilation and avoidance of crowded indoor spaces to situations where activities such as singing or exercising would increase airborne aerosols.

In 2015, two industrial hygienists proposed an approach to evaluate the possibility of aerosol transmission of an infectious agent<sup>3</sup>. In this qualitative evaluation, the quality of the evidence for aerosol generation, viability of the infectious agent in the environment and access to target tissue are each characterized as weak, moderate, or strong. When the authors applied this evaluation to *Mycobacteria* and SARS CoV-1 there was a similar level of concern for aerosol transmission for both of these infectious agents.

A letter from 239 scientists from 32 countries was sent to the World Health Organization to encourage the recognition of the potential of airborne spread of SARS-CoV-2<sup>4</sup>. The letter recommended the following measures:

- “Provide sufficient and effective ventilation (supply clean outdoor air, minimize recirculating air) particularly in public buildings, workplace environments, schools, hospitals, and aged care homes.
- Supplement general ventilation with airborne infection controls such as local exhaust, high efficiency air filtration, and germicidal ultraviolet lights.
- Avoid overcrowding, particularly in public transport and public buildings.”

The AIHA statement also prioritizes providing better respiratory protection options to frontline health care workers, including elastomeric respirators (half or full faced tight fitting respirators with cartridges) and powered air purifying respirators, and freeing up supplies of filtering face piece respirators (N95) for other healthcare and all other essential workers whose jobs involve prolonged or close contact with co-workers or the public.

President Biden issued an executive order on 1/21/21 directing OSHA to issue revised COVID-19 guidance to employers and for OSHA to consider issuing an emergency standard<sup>5</sup>. In the meantime, physicians should consider the risk from airborne transmission for themselves, staff in their clinics and offices and for their patients, particularly those who interact with the public.

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## References

1. AIHA. Joint Consensus Statement on Addressing the Aerosol Transmission of SARS CoV-2 and Recommendations for Preventing Occupational Exposures. 2/1/21. <https://aiha-assets.sfo2.digitaloceanspaces.com/AIHA/resources/Fact-Sheets/Joint-Consensus-Statement-on-Addressing-the-Aerosol-Transmission-of-SARS-CoV-2-Fact-Sheet.pdf>.
2. Scientific Brief: SARS-CoV-2 and Potential Airborne Transmission. 10/5/20 <https://www.cdc.gov/coronavirus/2019-ncov/more/scientific-brief-sars-cov-2.html>
3. Jones RM, and Brosseau LM. Aerosol transmission of infectious disease. J Occup Environ Med 2015; 57: 501-508.
4. Morawska L, Milton DK. It Is Time to Address Airborne Transmission of Coronavirus Disease 2019 (COVID-19), Clinical Infectious Diseases 2020; 71: 2311-2313.
5. Presidential Executive Order on Protecting Worker Health and Safety 1/21/21. <https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/21/executive-order-protecting-worker-health-and-safety/>

### **Definitions**

*Airborne transmission is the spread of infection far from the source (i.e., another room) by inhalation of small particles  $\leq 5 \mu\text{m}$ , often termed droplet nuclei, inhaled by another person.*

*Aerosol transmission is the spread of infection of small particles  $\leq 5 \mu\text{m}$  near or in a shared space, inhaled by another person.*

*Direct contact transmission is the spread of infection via droplets  $> 5 \mu\text{m}$  that impact on the mucosa of another person.*

*Indirect contact transmission is the spread of infection via contamination of a surface then touched by another person.*

The Michigan Department of Health and Human Services (MDHHS) [MiTracking Program](#) through a cooperative agreement with the Centers for Disease Control and Prevention (CDC) maintains an interactive data web site (<https://mitracking.state.mi.us/?bookmark=34>) that has Michigan environmental (air quality, community drinking water, and ticks), population (number and percent of homes built before 1950 and 1980) and health data. Health data on Michigan adults with elevated blood lead levels was added this past month. Other work-related data on the site includes acute traumatic fatalities and paid workers' compensation claims. Queries can be done individually and in combination by age, gender, type of industry, type of injury and county.

**\*Project**  
**S E.N.S.O.R.** *News*

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**In this issue: V32n2: Does SARS CoV-2 Spread Primarily by Droplet or Aerosol Transmission?**

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