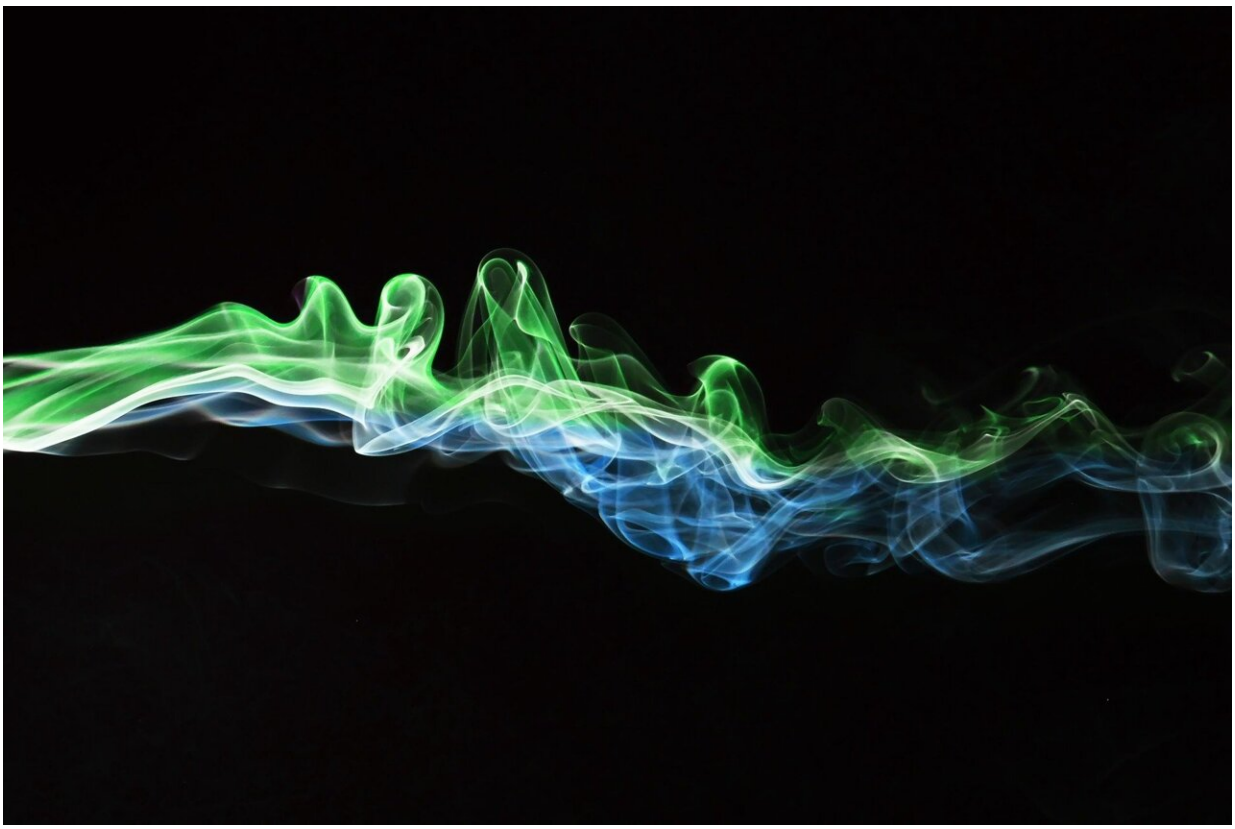
How mechanical ventilation affects the trajectories of aerosols that may carry viral particles

May 5 2022, by David Bradley



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We have known for a longtime now that the COVID-19 virus, SARS-CoV-2 is a mostly airborne disease. Ventilation of indoor spaces is

therefore one of the most useful ways in which we can keep people safe. Research in the *International Journal of Simulation and Process Modelling*, has investigated the fluid dynamics of how mechanical ventilation affects the trajectories of aerosols that might be carrying viral particles from infected people.

R.M.P.S. Bandara and W.C.D.K. Fernando of the General Sir John Kotelawala Defence University in Ratmalana, and R.A. Attalage of the Sri Lanka Institute of Information Technology in Malabe, Sri Lanka, point out that the COVID-19 is known to spread more readily indoors than in the open air. Measures such as face coverings and improved ventilation have been useful in attempting to reduce the rates of infection. However, we have much to learn about how different types of ventilation might affect the movement of virus-laden aerosols indoors. As such, the team has modeled the trajectories of simulated aerosols in cavity flow, displacement flow and two cases of mixing flow ventilation.

The models show that mixing-flow ventilation is the most effective form of ventilation for reducing the risk of the virus spreading between people sharing an indoor space. This form of ventilation finds the aerosol particles pulled along by the ventilation airstream and expelled to the outside through the system's ducting with much less chance of them being inhaled by another person in the room. This is not the case with the other types of ventilation where the air is essentially recirculated within the indoor space to large degree and so virus-laden aerosols might be inhaled by other people.

The team suggests that their models should be used to define optimal mechanical ventilation for different indoor settings and occupancy to minimize the risk of airborne virus being spread from those infected with the virus to others in the room. They point out that the placement of air diffusers and air flow rates, the position of people in the room, whether they are seated, standing, or moving around, as well the

geometry of the room, windows and doors, and heating systems are all variables that must be considered to find the best mitigation based on ventilation for any given building. The risk of spread of the virus in a given space must also be weighed against the overall comfort and well-being of the occupants of the building.

More information: R.M.P.S. Bandara et al, Modelling of aerosol trajectories in a mechanically-ventilated study room using computational fluid dynamics in light of the COVID-19 pandemic, *International Journal of Simulation and Process Modelling* (2022). DOI: 10.1504/IJSPM.2021.122504

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