

Experimental study of HVAC On-Off effects on Aerosol Transmission in A Classroom

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ABSTRACT

Since the arrival of COVID-19 indoor events have been postponed or canceled due to the high risk of viral transmission. Schools and classrooms are among the places occasionally closed due to the pandemic. They pose a higher risk of COVID-19 transmission because students sit for hours in high dense areas where one infected person can pass the disease to others. In this research, an experimental study is performed to investigate the aerosol transmission in a medium sized classroom (dimension) and the influence of ventilation on particle clearance. A nebulizer was placed at a desk and a phosphate buffer saline (PBS) solution seeded with 1 μ m polystyrene particles was aerosolized for 18 minutes. Different locations of the aerosol generation were considered to study the effect of an infected student or lecturer on the particle concentration in the classroom. A hand-held particle counter was used to measure the concentration of the released particles in different distances (3-feet and 6-feet) from each source location. Two cases were studied and compared, the particle spread of a fully active heating, ventilation, and air conditioning (HVAC) system with one that was turned off. The results showed that the HVAC has a significant impact on the particle concentration distribution and on the fallow time after the aerosol generation stops. For the full load HVAC cases, particle concentrations are back to baseline levels after roughly 10 minutes after aerosolization. For the no HVAC circulations, however, the concentration of the released particles remains higher than the baseline after 30mins. These data show the importance of considering classroom HVAC parameters currently and in future pandemic responses.