

A controlled intervention study in two schools: impact and benefits of the air cleaning measures implemented

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ABSTRACT

The use of portable air cleaners (PACs) in public settings has increased as a preventative measure since the COVID-19 pandemic. A Canadian provincial government initiated a collaboration with the Ventilation and Indoor Air Quality (IAQ) team of the National Research Council of Canada (NRC) to conduct a controlled intervention study in 2 schools. The goal of the study was to determine the effectiveness of PACs in reducing indoor air contaminants and benefiting the health of students and staff. The study examined the presence of particulate matter of 1-, 2.5-, and 10-micron diameters (PM1, PM2.5, and PM10), carbon dioxide (CO₂), target viruses and bacteria, and sick days reported by staff and students under various operating conditions to determine if PACs could make a statistically significant difference in these IAQ and health indicators. The concentrations of PM1, PM2.5, and CO₂ measured between April and June 2023 were presented at the 43rd AIVC - 11th TightVent & 9th venticool Conference and published in [REHVA Journal in 2024](#). This presentation will provide an overview of the study methods with additional findings: 1) The indoor CO₂ concentrations were primarily dependent on the presence of occupants, the leaks/openings through the building envelope in the space, and the ventilation rates. 2) The advantages and limitations of calculating the ventilation rates based on the decay of CO₂ concentrations in the classrooms after school hours. 3) A particle removal efficiency index was defined and used to assess the effectiveness of filtration in removing particles. Based on the PM1 and PM2.5 removal efficiency results, the PAC units in the intervention school were able to remove some of the particles that entered indoors. 4) Two sampling devices with different flow rates and filter medias were used to detect viruses and bacteria chosen for the student age range. The two sampling devices generated comparable results. 5) The PAC units implemented in the intervention school did not appear to reduce the presence of airborne viruses and bacteria or occupant absenteeism due to illness. The observations from this study will be of interest to researchers, PAC users, practitioners, and manufacturers.

KEYWORDS

Air cleaning, ventilation, occupancy, particle measurement, CO₂ concentration