

High negative pressure limits dispersion of airborne contaminants in hospitals and renovation sites

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Local exhaust ventilation is important in renovation sites. Credit: Anna Kokkonen

Maintaining a high negative pressure in airborne infection isolation rooms of hospitals (over -10 Pa) and in renovation sites (over -5 Pa) effectively limits the dispersion of airborne contaminants and dust, a new study from the University of Eastern Finland shows.

Inhaled airborne particles at work can cause [adverse health effects](#), and this is why it is important to prevent exposure to them. Moreover, the control of contaminants released from internal sources within an enclosed workspace also plays an important role in protecting other persons working in or occupying adjacent areas from adverse biological and chemical exposure.

Better ventilation is needed in hospital anterooms

The containment capability of airborne infection isolation rooms, AIIRs, was studied by measuring air change rates of the patient room and anteroom, [pressure](#) differences, contaminant removal, and contaminant transmission during door openings and human movement. The researchers used a tracer gas method to simulate the release of infectious agents from a patient.

The findings indicate that a high air change rate in AIIRs does not ensure efficient removal of infectious agents in the breathing zone of a healthcare worker. Instead, the local airflow patterns are more important. A high mean negative pressure between an AIIR and its surroundings was shown to significantly limit particle transmission outside an AIIR. An anteroom aided in controlling the particle transmission.

"In practice, however, the dilution is not effective enough—at least not in the anterooms we studied. Generally, a health care worker does not stay in the anteroom for more than 2-3 minutes. To achieve at least 90% contaminant removal, the minimum air change rate requirement of 40 1/h would be needed after entering the anteroom. This would enhance

the total containment of an AIIR," Early Stage Researcher Anna Kokkonen from the University of Eastern Finland explains.

Local exhaust ventilation is important in renovation sites

The [dust](#) containment capability of [renovation](#) sites was studied by measuring pressure differences and dust concentrations (filter samples and real-time monitoring) simultaneously from the renovation sites and their adjacent areas. The researchers also investigated the effect of using on-tool local exhaust ventilation on limiting the dispersion of dust, and they studied the efficiency of a short-term water misting method in airborne particle removal. The method was applied after the work was completed to limit the dispersal of airborne dust that had not been captured in real-time by source controls.

The results indicate that maintaining a continuous negative pressure over -5 Pa limits the dispersion of dust outside a renovation [site](#). Enclosure containment was achieved by sealing the junctions between the temporary and existing partitioning structures to obtain better airtightness and by building an airlock between the enclosure and adjacent areas. Although the renovation sites studied were at times under positive pressure, no dust dispersion outside an enclosure was observed, when the mean target concentrations at the renovation sites remained

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