COVID-19 and the third route

Are ventilation systems able to reduce the risk of contaminated aerosols? Do we need to reconsider the current ventilation rates?

As HVAC professionals we care for the indoor environment. Health and comfort for our clients, the people using buildings where they spend more than 80% of their time.

Long debates about the required level of fresh air supply via our ventilation systems reflect our involvement to realise healthy and comfortable indoor environments. The process of finalising in 2019 the EN 16798-1 on indoor environmental input parameters for design and assessment of energy performance of buildings addressing indoor air quality, thermal environment, lighting and acoustics, reflects this. As its scope says this standard specifies amongst others requirements for indoor air quality. At the same time restricting to the criteria for indoor environment that are set by human occupancy. In Annex B of this standard there are tables with recommended values for ventilation. Due to health reasons the total minimum airflow rate during occupancy should never be below 4 ℓ/s per person (14.4 m³/h p.p) and the WHO guideline values on chemical and particular matter have to be met.

It is clear that the ventilation systems we realise in buildings for human occupancy are based on comfort requirements (perceived air quality) limiting the CO_2 concentration as human tracer, taking humidity and indoor emissions of some chemicals into account. The given ventilation rates are not based on possible virus transmission via aerosols in the air. The danger to get infected by aerosols containing viruses was never considered. Because we don't know dose effect relations and it is difficult to prove that those aerosols contain active viruses. This last issue seems now more clear. In the New York Times Dr. Lednicky revealed that "We can grow the virus from air – I think that should be the important take-home lesson,"*. This is supporting the importance of the 3rd route.

The REHVA Taskforce on Covid-19 took this third infection route via aerosols very serious in the guidance paper published August 3rd see: www.rehva.eu/activities/covid-19-guidance. The REHVA Taskforce summarises this as follows: New evidence on SARS-CoV-2 airborne transmission and general recognition of long-range aerosol-based transmission have developed recently. This has made ventilation measures the most important engineering tool in the infection control. While physical distancing is important to avoid a close contact, the risk of an aerosol concentration and cross-infection from 1.5 m onward from an infected person can be reduced with adequate ventilation and effective air distribution solutions. In such a situation at least three levels of guidance are required: (1) how to operate HVAC and other building services in existing buildings right now during an epidemic; (2) how to conduct a risk assessment and assess the safety of different buildings and rooms; and (3) what would be more far-reaching actions to further reduce the spread of viral diseases in future in buildings with improved ventilation systems.

In Appendix 1 of the REHVA guidelines we say: Ventilation improvement in existing or new buildings brings a question if more outdoor air ventilation needed to reduce the risk of cross-infection? Infection risk is currently not addressed in this standard as design criterion. On the other hand, cross-infection risk is well known and applied in the design of hospital buildings where it leads to ventilation with a 6–12 air change per hour (ACH) rate. Hospital ventilation systems have worked well in COVID-19 conditions as cross-infections have been under control, illustrating that high capacity ventilation is capable to keep aerosol concentration at low level. In non-hospital buildings, there are evidently lower emission rates and smaller numbers of infected persons per floor area. So, a lower ventilation rate than in hospitals, for instance Category I ventilation rate (see EN 16798-1), could be considered as a starting point for the risk reduction. It is also worth noting that 4 ℓ/s per floor m² in meeting rooms and classrooms corresponds to 5 ACH and is not much below the air change rate of patient rooms with precautions against airborne risks.

Concluding: Yes, increase of ventilation rates will help to reduce the infection risks, and as this will not be the last epidemic we will encounter, we should reconsider the basis of our ventilation standards. ■

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*See : https://www.nytimes.com/2020/08/11/health/coronavirus-aerosols-indoors.html.