Complementary decentralised air cleaning methods or stand-alone HEPA filter devices

These include ion generators, ozonation and ultraviolet germicidal irradiation (UVGI) [1,35-38], as well as stand-alone HEPA-filter devices. These methods are usually relatively costly, require special maintenance, and can only treat a relatively small volume of air. The potential benefits in reducing the levels of particles that induce allergic reactions are not considered in this document [37].

Negative ion generators or air ionizers disperse charged ions, which attach to particles in the air, including those containing bacteria or viruses, which are subsequently trapped in the filters of the device. [35,36]. No data are currently available regarding the capacity of negative ion generators to reduce the amount of droplets or aerosols containing SARS-CoV-2. Filters can generate charged particles, such as ozone or volatile organic compounds (VOCs), which are detrimental to health, particularly if they are insufficiently dispersed [1,36,37]. Ozonators generate the ozone from oxygen. Ozone is toxic to bacteria and viruses at concentrations that exceed public health standards for ozone concentrations [1,36]. There are no standardised testing procedures to determine the conditions for use of this method in indoor air spaces that exclude health hazards linked to ion and ozone generators [1,35-37].

UVGI causes decomposition through ultra-violet C (UVC) radiation of bacteria and viruses [36]. However, UVC can generate ozone and free radicals, which are hazardous in closed spaces. Its surface disinfection effects are hindered by physical obstacles to direct UVGI [1,36]. Standardised testing procedures to determine conditions to exclude the health hazards of UVGI, for potential use to reduce SARS-CoV-2 in indoor air spaces, are very limited [1,36].

International professional societies for HVAC have produced guidelines on the principles and operation of ventilation in indoor spaces as a means to decrease the risk of transmission of SARS-CoV-2 [1,2,33,39-41]. In the context of the COVID-19 pandemic, available national guidelines from EU/EEA countries and the UK and from Canada and the US (see Table A1 in the Annex) consistently recommend an increase of air exchange compared to the pre-pandemic phase, the avoidance of re-circulation of air wherever possible, round-the-clock operation of HVAC systems, and for naturally ventilated closed spaces to create frequent air exchange through the opening of windows.

In summary, the available evidence indicates that:

- Transmission of SARS-CoV-2 commonly occurs in closed indoor spaces.
- HVAC systems may have a complementary role in decreasing transmission in closed indoor spaces by increasing the rate of air exchange, decreasing recirculation of air and increasing the use of outdoor air, and using adequate types of filter.
- The risk of human infection with SARS-CoV-2 caused by air distributed through the ducts of HVAC systems is rated as very low.
- The air flow generated by air-conditioning units may facilitate the spread of droplets excreted by infected people over long distances within closed indoor spaces.
- Well-maintained HVAC systems, including air-conditioning units, securely filter large droplets containing SARS-CoV-2. It is possible that aerosols (small droplets and droplet nuclei) containing SARS-CoV-2 spread through HVAC systems within a building or vehicle and through stand-alone air-conditioning units if air is recirculated. However, the extent to which such potential aerosol route contributes to COVID-19 transmission is unknown and rated as very low for well-maintained, central HVAC systems.
- There is limited evidence regarding the effect of stand-alone air filtration and other air cleaning technologies on the transmission of SARS-CoV-2.

Guidance

From outbreak reports and research studies published to date, it is not yet possible to clarify whether aerosols result in transmission through close proximity (airborne transmission), direct contact (aerosol contamination of hands, etc.) or through indirect contact (aerosol contamination of objects/surfaces). In addition, there is a potential for publication bias, with fewer communications of negative findings; and confirmation bias, with published studies re-confirming known science. However, the current body of evidence on COVID-19 more generally demonstrates the high risk of transmission in crowded indoor settings and the importance of combining bundles of prevention measures. The prevention measures proposed below are based on the scientific evidence shown above or, where evidence does not exist, derived from the technical regulations and current recommendations of international professional societies [1,2,39] [42]. They are mostly in line with the recommendations from existing national guidelines in EU/EEA countries and the UK (see Table A1 in the Annex).

In closed spaces and in the context of COVID-19, there are four groups of non-pharmaceutical interventions (NPIs) that include measures to reduce the risk for airborne transmission of SARS-CoV-2 [33,42]. These are:

1. The control of COVID-19 sources;
2. Engineering controls in mechanically ventilated and naturally ventilated closed spaces;
3. Administrative controls to reduce occupancy; and
4. Personal protective measures (see Table A2 in the Annex).

出典：Heating, ventilation and air-conditioning systems in the context of COVID-19: first update., 10 November 2020., Stockholm: European Centre for Disease Prevention and Control.

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