

Desirable And Undesirable Effects Of Air Purifier In Clinical Settings During Covid-19 Pandemic

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Abstract- *The novel SARS-CoV-2 virus which causes the COVID-19 disease, is mainly transmitted through contact with infected persons according to WHO. Breathing, as well as coughing and sneezing releases tiny infectious droplets into the air which potentially contaminate surrounding surfaces and of course the air in the immediate surrounding. These droplets, so called aerosols, can be of varying sizes, from 1 to over 10 µm (micron or micrometre, 1 micron equates to 0.001 mm). It is assumed by experts that viruses do not fly occasionally in the air but are always enclosed in droplets or attached to other particulate matter. This raises the question in which way ventilation and air-conditioning systems play a role in the transmission or containment of epidemic diseases like COVID-19. Maintaining a healthy indoor air quality thus becomes a general, basic – yet extremely important – necessity. While this is true at all times, it's imperative in times of a wider health crisis to avoid not only the direct spread of a virus, but to support peoples immune systems to withstand more serious impacts by an aggressive disease and thus reducing pressure on a healthcare system fighting against overload.*

Keywords- COVID-19, AIR PURIFIERS, HEALTH CARE SETTINGS, SARS-CoV-2

1. MANUSCRIPT

Increased spread of Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) causing coronavirus disease 2019 (COVID-19) infections worldwide has brought increased attention and fears surrounding the prevention and control of SAR-CoV-2 from both the scientific community and the general public. While many of the precautions typical for halting the spread of respiratory viruses are being implemented, other less understood transmission pathways should also be considered and addressed to reduce further spread. Environmentally mediated pathways for infection by other pathogens have been a concern in buildings for decades, most notably in hospitals. Coronaviruses (CoVs) most commonly

cause mild illness, but they have occasionally, in recent years, led to major outbreaks of human disease. Typically, mutations that cause structural changes in the coronavirus spike (S) glycoprotein enable binding to new receptor types (Fig. 1) and permit the jump from an animal host to a human host (1). (zoonotic transmission) and can increase the risk of large-scale outbreaks or epidemics (2).

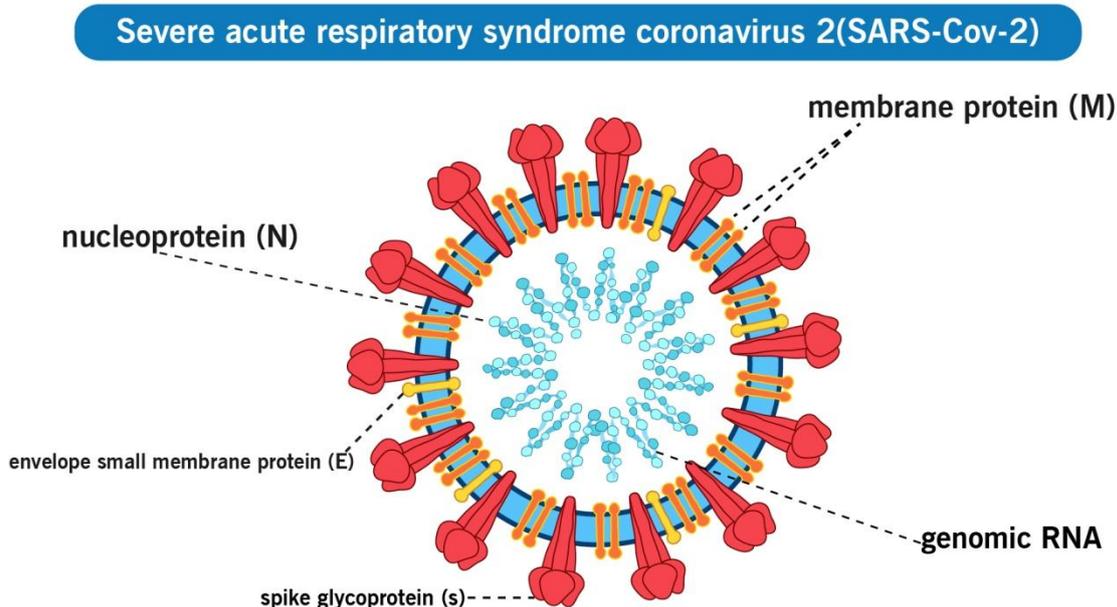


Fig. 1 Severe Acute Respiratory Syndrome Coronavirus 2 (SARS CoV-2)

In December 2019, SARS-CoV-2, a novel CoV, was identified in the city of Wuhan, Hubei Province, a major transport hub of central China. The earliest COVID-19 cases were linked to a large seafood market in Wuhan, initially suggesting a direct food source transmission pathway (3). Since that time, we have learned that person-to-person transmission is one of the main mechanisms of COVID-19 spread (4). In the months since the identification of the initial cases, COVID-19 has spread to 171 countries and territories, and there are approximately 5.11% active cases (as of 15 November 2020). The modes of transmission have been identified as host-to-human and human-to-human. There is preliminary evidence that environmentally mediated transmission may be possible, specifically, that COVID-19 patients could be acquiring the virus through contact with abiotic surfaces (5,6).

Although the transmission of COVID-19 occurs mainly via droplets during close contact or contaminated surfaces, a recent study showed that SARS-CoV-2 remains viable in aerosols for multiple hours (7), and the World Health Organization (WHO) is considering “airborne precautions” for medical staff (8). It is well known that even meticulous observation of protection protocols do not always protect individuals, including health care workers, from contagion. The report issued by the National Academies of Sciences, Engineering, and Medicine suggested that currently available research supports the possibility that SARS-CoV-2 could be spread via bioaerosols generated directly by patients' exhalation based on collected evidences (9). For control of opportunistic airborne transmission in health care settings, WHO recommends a ventilation rate at least 288 m³/h per person (10). As part of an effort to identify innovations that may help fight the Coronavirus outbreak, we propose considering the possibility that deploying commercial or industrial portable air purifiers with HEPA or ULPA air filters may help reduce the probability of contagion of the SARS-CoV-2 virus in locations where contact among people who have unknown or known risk are needed. In

health care settings without enough ventilation provided by their existing ventilation system, or none at all, use of indoor air purifiers may be an effective supplementary measure to improve the dilution of indoor air contaminated with virus-laden aerosols. A previous study has proved air purifiers can reduce the health-care workers' exposure to aerosols and droplets in dental clinics significantly (11). Most people in the industrialised world spend up to 90% of their time indoors. The exposure to air contaminants, from dust to spores, bacteria, viruses and chemical compounds has direct influence on people's immune systems and can cause a variety of conditions, from allergies to cancer or – an epidemic disease like COVID-19(12).

The selection of air filters depends on the application environment and should be carefully assessed. While regular air filters are not designed to prevent the spread of viruses, they are essential in minimising the risk as viruses tend to attach to airborne particulate matter and aerosols. Thus, regular filters with a high filtration efficiency (ePM1 filters) are crucial to reduce the risk of diseases transmitted through the air. HEPA filters (High Efficiency Particulate Air) are mandatory in critical environments such as hospitals and healthcare facilities and can be also recommended for medium risk environments (high density of people) like airports, schools or other public spaces.

Hospitals present unique challenges during the process of mitigating and protecting all inhabitants from an infectious disease outbreak. Not only do health care and hospital facilities have limited options for social-distancing measures to prevent infectious spread, but health care facilities also often cohause patients with vastly different requirements from the BE around them. For example, high-risk immunocompromised patients are often kept within protective environment (PE) rooms, designed to limit outside airborne infectious agents from entering into the room. To do this, these rooms are positively pressurized, relative to the corridor space, with a minimum of HEPA supply air (13).

In light of the COVID-19 problematic to severely affect the elderly and people with existing medical conditions, it is also recommended to use HEPA filters in all facilities designed to support, help, house or care for these groups. In general, the industry recommends increasing filter efficiencies for the duration of the epidemic.

Conflict of Interest

The authors have no conflict of interest relevant to this article.

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