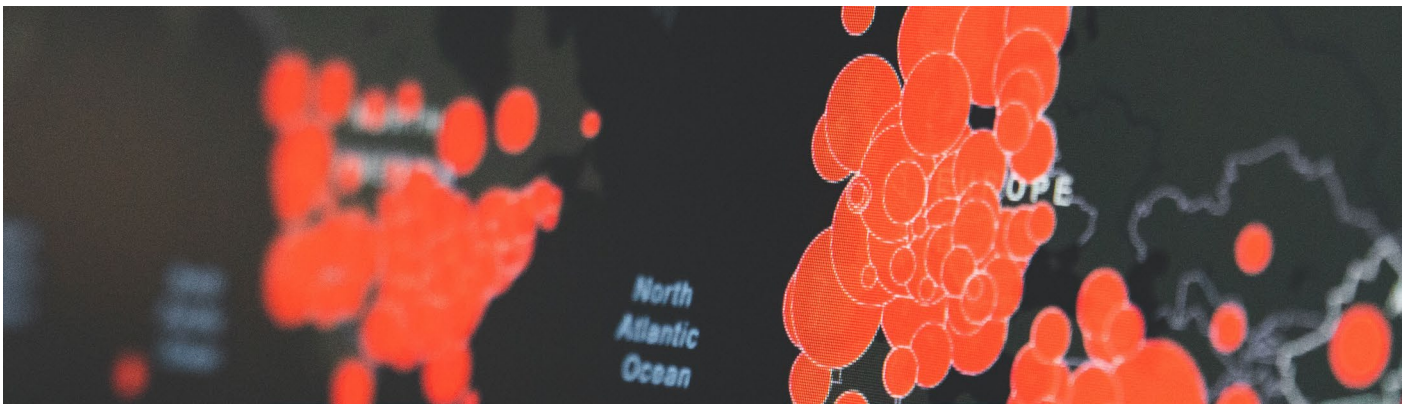


A review of the risks of airborne transmission of COVID19

Note: This article aims at providing a summary of the specific risk of aerosol transmission of the COVID19 virus. This is a continuously updated article which will incorporate new research results and data as they are made public. Versions of this article are dated below.

General summary

- **The main transmission of COVID19 virus occurs by direct contact with infected people and indirect contact with surfaces in the immediate environment or with objects used on/by the infected person.**
- **The risk of aerosol transmission (meaning transmission through ambient air) is still relatively unknown. Current research has underlined that this transmission route remains plausible.**
- **Public perception is that this potential routes is a risk and once lock-down laws are lifted, businesses will need to take such risks into account to rebuild consumer confidence.**
- **Certain indoor air filters have the capacity to sterilize viruses using UVC, Photocatalytic and/or Plasma filtration and these can be used in conjunction with other best hygiene practices as a means to rebuild consumer confidence.**
- **A recent AGFG article (AGFG, 2020) recommends that *to see them through these tough times, restaurants need to ensure they are going above and beyond the guidelines of the World Health Organisation and make sure their customers know it*.**

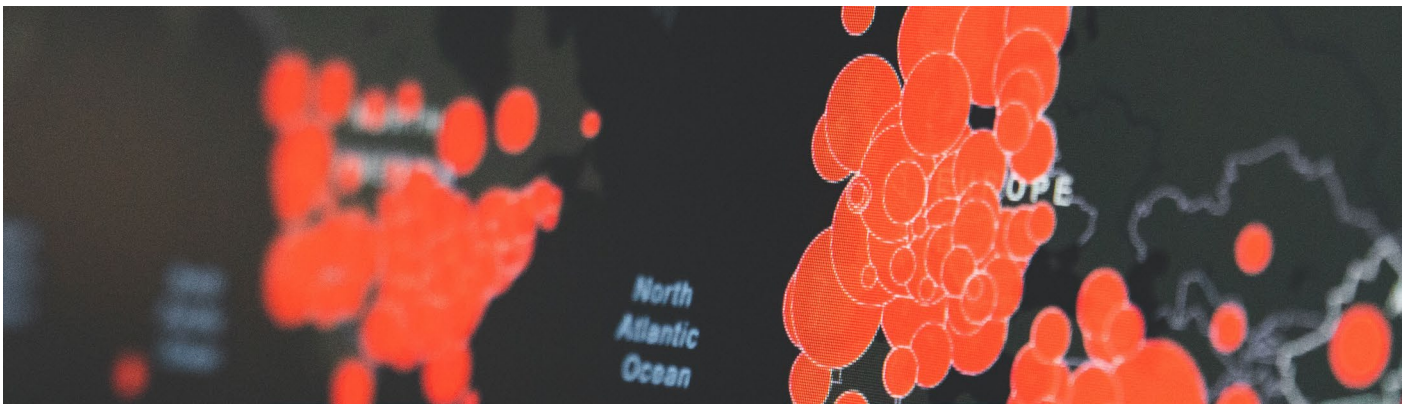
Current knowledge regarding transmission of COVID19

An article published on the 02/04/2020 by Science Magazine (Science Magazine, April 2020) reported: *Thus far, the U.S. Centers for Disease Control and Prevention (CDC) and other health agencies have insisted the primary route of transmission for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is through the larger respiratory droplets, up to 1 millimeter across, that people expel when they cough and sneeze. Gravity grounds these droplets within 1 or 2 meters, although they deposit the virus on surfaces, from which people can pick it up and infect themselves by touching their mouth, nose, or eyes.*

These transmissions routes are backed by the World Health Organisation (WHO, 2020) findings. For this reason, Governments have until now recommended Social Distancing and Hand Washing as the two main means of limiting the transmission of COVID19.

The potential for transmission through airborne aerosols

Recently Morawska 2020 underlined that the predecessor to COVID-19 (SARS-CoV-1) had been proven to transmit by air. Theoretical laboratory research presented in the New England Journal of Medicine has shown that COVID19 virus remains viable in nebular created aerosols (particles of under 5 micron) for over 3 hours (Doremalen et al, 2020). Aerosol can be created through coughing as well as through the ultra fine mist that is created when we exhale. Recently, results were published from sampling of isolation rooms of confirmed COVID-19 patients (Santarpia et al, 2020) and found that:



Many commonly used items, toilet facilities, and air samples had evidence of viral contamination, indicating that SARS-CoV-2 is shed to the environment as expired particles, during toileting, and through contact with fomites. Disease spread through both direct (droplet and person-to-person) as well as indirect contact (contaminated objects and airborne transmission) are indicated, supporting the use of airborne isolation precautions.

Whilst random sampling of COVID19 patient hospital rooms in Iran (Faridi, 2020) at a distance of 2-5 m from patient's beds returned fully negative air samples, research in Singapore (Ong et al, 2020) found that air samples of COVID19 hospital rooms tested negative, but samples from exhaust ventilation outlets tested positive. This suggested that virus laden droplets or aerosols may be displaced by airflows. Further research in hospitals in Wuhan, China (Liu et al, 2020) found that viral RNA was found in aerosols in isolations wards, patient rooms and in patient toilet areas as well as crowded areas. Although the infectivity of the virus detected was not established, the findings tilt the balance towards there having a risk of aerosol transmission.

Evolving recommendations

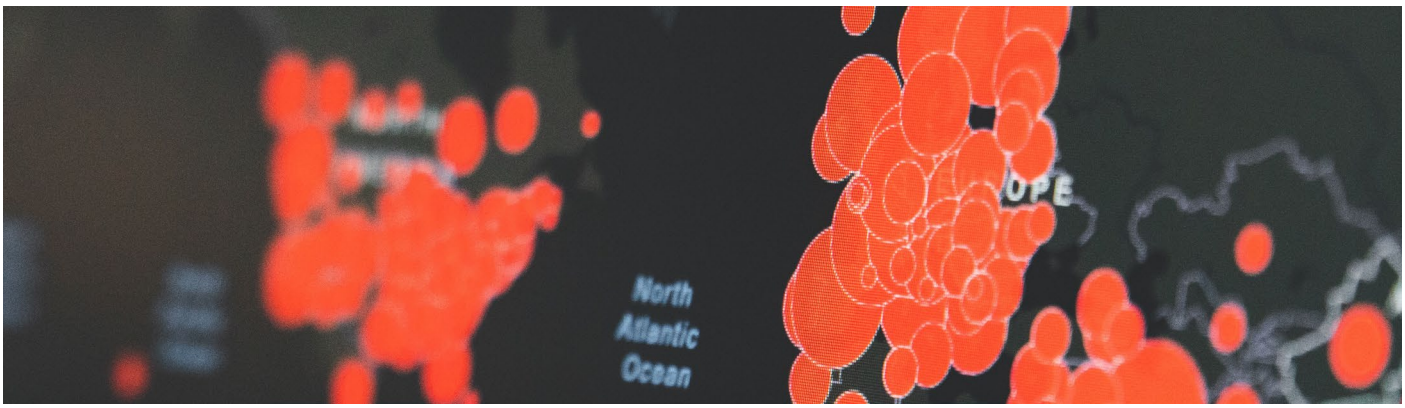
On the basis of research, the American National Academies of Science (NAS) published a letter (NRC, 2020) on the 01/04/2020 that stated *currently available research supports the possibility that SARS-CoV-2 could be spread via bioaerosols generated directly by patients' exhalation.* Furthermore, the letter states that w*hile the current SARS-CoV-2 specific research is limited, the results of available studies are consistent with aerosolization of virus from normal breathing.* This information has meant that the US Center for Disease Control (CDC) expand its recommendations to wearing a cloth mask in public settings (CDC 2020).

The ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers), who are one of the leading international voices in HVAC and indoor air quality, state through their Epidemic Task Force that (ASHRAE, 2020): *Transmission of SARS-CoV-2 through the air is sufficiently likely that airborne exposure to the virus should be controlled.* This document also provides a range of treatment and filtration equipment that could potentially be used.

In Australia, the Government recommendations have not evolved from the original World Health Organisation recommendations. Recent Australian newspaper articles have underlined that the air-borne transmission risk may exist. A Sydney Morning Herald article on the 9/04/2020 stated:

A growing number of scientists, including infectious disease expert Professor Raina MacIntyre and aerosol scientist and WHO advisor Professor Lidia Morawska, now say the risk from aerosols may have been underestimated. Warning signs are piling up, Professor Morawska says - the virus rips through a cruise ship even after passengers are isolated in their cabins, a choir meets in Washington and 45 out of the 60 singers leave the two hour rehearsal infected even though none have symptoms.

Whilst an ABC article on the 16/04/2020 also cited Professor Lidia Morawska from the Queensland University of Technology in stating *that the fact that there are no simple methods for detecting the virus in the air does not mean that the viruses do not travel in the air.*



Is better indoor air quality worth it?

Experts are clear that better indoor air is worth it from a public health perspective. However, with the current levels of uncertainty regarding the airborne transmission of COVID19, investing in improved indoor air is not guaranteed to have a significant impact on decreasing the risk of COVID19 transmission.

That said, once lock-down laws are lifted, public perception and rebuilding customer confidence will be key to getting businesses back on track. A recent AGFG article (AGFG, 2020) recommends that *to see them through these tough times, restaurants need to ensure they are going above and beyond the guidelines of the World Health Organisation and make sure their customers know it.*

There are two main ways that indoor air can be treated to potentially have an impact on airborne transmission of COVID-19 virus:

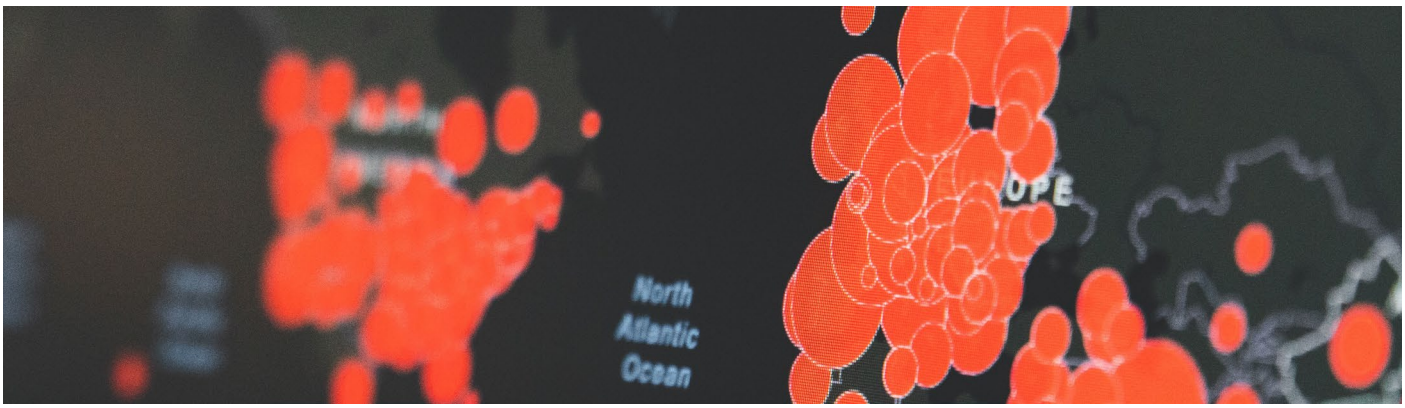
1. Treat the air as it is being conditioned in the building HVAC systems. For large building, this would be carried out through the building HVAC maintenance. The above cited research showed that COVID19 virus was found in a hospital building exhaust systems, meaning that there is a logic behind treating air as it is being recycled within the building air handling system. Treatment can include in duct UVC emitters, Ion emitters as well as improved Particle Filters. A.G Coombs recently produced an Advisory Note on HVAC and COVID-19 which provides more detail on this (A.G Coombs HVAC and COVID-19 Advisory Note 2020).
2. Treat the indoor air within a space using indoor air cleaners. This can be designed and organised within a tenancy and does not require access to building HVAC equipment as per point number 1. This option is also visible to customers and can be seen as a proactive step to minimizing risk in a building space. This could be accompanied by other sterilisation methods such as frequent surface cleaning and availability of hand sanitiser that could contribute to building consumer confidence.

Air filters that are effective on viruses such as COVID19

Main indoor air cleaners available on the market are focused on particle filtration, generally using high efficiency HEPA filters. These were sold in large quantities during the recent bushfire emergencies in order to decrease indoor particle air concentrations from bushfire smoke. As clearly stated in a recent Choice article (Choice, 2020), particles filtration in itself will not sterilize viruses. They will filter out aerosols, but virus are able to survive on the filter medium and be reintroduced into the space. The article goes on to underline that only filters equipped with either Photo catalytic and / or UVC sterilization steps can effectively breakdown viruses. For more information, see the AOM range of air purifiers which are either portable or ceiling mounted.

Recently, plasma filters have also been introduced as a readily available indoor air filtration technology with the ability, using a mixture of physical filtration and plasma ions, to trap and then neutralise viruses. A recent article in The Conversation (The Conversation 2020) summarized the potential of plasma filters in removing airborne viruses in aircraft. AOM Australia has recently developed the AOM AirSanitiser which is equipped with a plasma filter for treatment of indoor air of small spaces. These filters have the advantage of requiring limited maintenance. However, the main limitation to this filter is that the current development only allow for relatively small airflows and therefore for large spaces, multiple filters would be required.

For more detailed information regarding indoor air cleaners, we recommend to review the US EPA reports in the matter: either The Technical Summary (EPA, 2018) or the more concise Guide to Air Cleaners in the Home.



Please contact AOM Australia should you require any further information on the above as well as more detailed information on what AOM Asutralia can provide to support your business.

Version 1, 21/04/2020

Version 2, 29/04/2020: Update with publication Liu et al, 2020

Note : Every effort has been made to ensure the accuracy of the information in this publication. AOM Australia assumes no responsibility for errors or omissions for any consequence of reliance on this publication