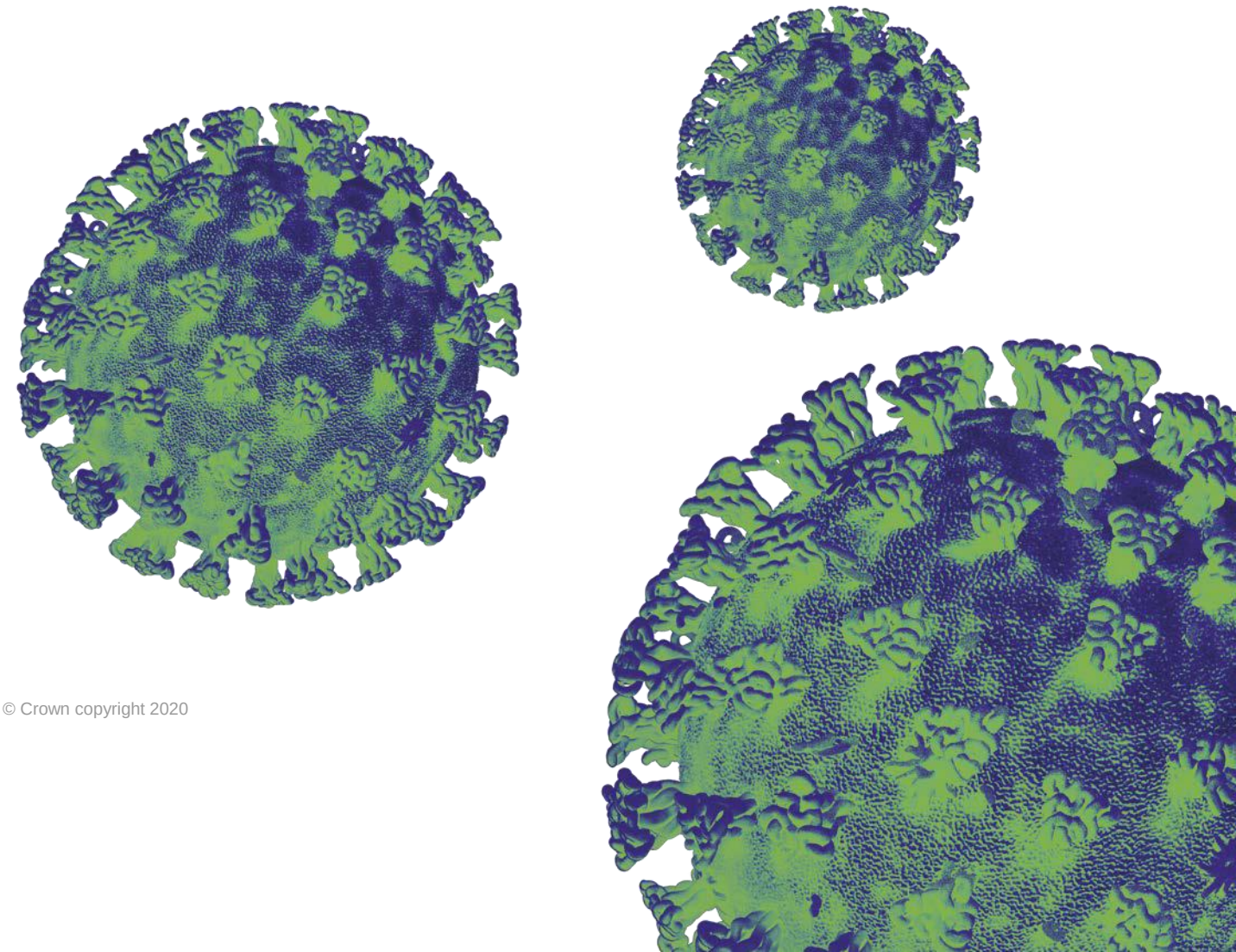
Llywodraeth Cymru
Welsh Government

Technical Advisory Group

Air Cleaning Devices

29 January 2021



Technical Advisory Group Environmental Sub Group

Air Cleaning Devices

Key points:

- Air cleaning devices are not a substitute for ventilation and every effort should be made to increase ventilation before considering them (high confidence)[1].
- Air cleaning devices may be of benefit in poorly ventilated spaces where it is not possible to improve it be other means (medium confidence) but are of little use in well ventilated spaces[1].
- Air cleaning devices where the primary principle of operation is based on fibrous filtration (such as HEPA filters) and germicidal UV (UVC) are likely to be beneficial if deployed correctly (medium confidence)[1].
- The performance of most devices is based on data measured in idealised controlled environments, and is likely to be different and often lower in a real-world setting (high confidence). Caution is therefore advised when considering manufacturer's performance data[1].
- SAGE suggested that further research is needed on the efficacy of devices including evidence of the technology against SARS-CoV-2 virus (or a suitable viral surrogate) and other pathogens and their performance in real-world settings. For them to be effective, there needs to be sufficient time for the air in the room to pass through the purifier[1].
- There may be unintended consequences from the application of air cleaning devices.

1. In response to the recent request to evaluate the effectiveness of air cleaning devices to remove the impact of Covid-19 aerosols in indoor spaces. SAGE have recently published a paper on the use of air cleaning devices and Health Technology Wales have fed into this paper (reference 1). A lot of the evidence of the SAGE paper forms the basis of this summary and statement alongside views of members of the Technical Advisory Group – Environmental Subgroup.

2. SARS-CoV-2 transmission is usually through a result of exhaled virus or via the hands, so even where a person who is infected with COVID-19 has passed through a whole-body disinfection system/device, as soon as they breathe, speak, cough or sneeze they can still spread the virus to others (high confidence)[2].

3. SAGE emphasised that air cleaning devices are not a substitute for ventilation, and should never be used as a reason to reduce ventilation; all occupied spaces must have some background ventilation to be suitable for human habitation and to comply with building and workplace regulations[1]. All attempts should be made to improve ventilation first before considering whether there is a need to use an air cleaner (high confidence)[1].

4. Application of air cleaning devices may be a useful strategy to reduce airborne transmission risks in poorly ventilated spaces (medium confidence)[1]. Air cleaning

devices have limited benefit in spaces that are already adequately ventilated, and are not necessary for adequately ventilated buildings unless there are identified specific risks (medium confidence).

5. With air cleaning technologies there is some evidence for effectiveness against other coronaviruses, but there is as yet little data that demonstrates the effectiveness of most candidate technologies against SARS-CoV-2[1].

6. Air cleaning devices where the primary principle of operation is based on fibrous filtration or germicidal ultraviolet light (UV-C) are likely to be beneficial if deployed correctly (medium confidence)[1]. Ultraviolet C irradiation (UV-C) is ultraviolet light in the wavelength range (200nm to 280nm) which can inactivate microorganisms including viruses and may therefore be beneficial. However, the efficacy and safety of such devices should be evidenced by relevant test data. TAG-E suggest that devices which use HEPA filters and germicidal ultra-violet light (UV-C) are better than purifiers using other technologies such as oxidation etc. It is also SAGE's view[2] that the UV (UV-C) are better than devices based on other technologies (ionisers, plasma, chemical oxidation, photocatalytic oxidation, electrostatic precipitation) which may have secondary impacts. Spray booth type devices for decontaminating people are also not recommended[2]. They are unlikely to be effective against the virus and have serious health impact and safety concerns.

7. For those devises using UV-C, the radiant exposure (or fluence) delivered to the virus is a function of both the fluence rate and the duration of exposure. One of the reasons many of these devices are less effective in the real-world is that the duration of exposure to the UV-C is typically not sufficient to inactivate the virus in a single pass. For them to be effective, there needs to be enough time for the air in the room to pass through the device[2].

8. Effectiveness of air cleaning devices depends on multiple parameters including the underlying technology, the design of the device, the in-room location of the device, the environment that it is used in and the maintenance of the device. The performance of most devices is based on data measured in idealised controlled environments, and is likely to be different and often lower in a real-world setting (high confidence). There is evidence that upper room air cleaners using UV-C have good potential to be used effectively to reduce microbial load in the air in occupied rooms, although there is limited evidence for application against respiratory viruses in a real-world setting. However, local air cleaning devices, including those using filter devices and UV-C devices are unlikely to have significant benefit unless the airflow rate through the device is sufficient[2]. Caution should be used when considering idealised performance data stated by a manufacturer.

9. Furthermore, there is a lack of evidence as to how effective such devices are when there is an infected person in the room. The SARS-CoV-2 virus is transmitted via direct physical contact, close range aerosols and droplets (greatest risk at less than 2m), longer range fine aerosols (which can pose a risk beyond 2m) and contaminated surfaces[1]. It is unlikely that these devices will be effective at mitigating short-range

person to person transmission as they are designed to work in the background and not be in close proximity to individuals. In light of the new UK variant also, it is possible that the viral load is higher in those with the new variant, which could increase the amount of virus generated by respiratory activity. This would impact on all transmission routes. It is likely that close range interactions will remain the highest risk for transmission for the new variant[1].

10. There may be unintended consequences from the application of air cleaning devices including a relaxation of other ventilation measures, emissions that could cause health effects such as chemical by-products or UVC irradiation, noise, changes in temperature and drafts. Further, it is clear there is a requirement for regular maintenance and consumable requirements for some devices. In selecting devices it is important to consider all aspects, not just the potential ability to remove or kill the virus (high confidence)[1].

11. SAGE suggested that further research is needed on the efficacy of devices including evidence of the technology against SARS-CoV-2 virus (or a suitable viral surrogate) and other pathogens, performance of devices in real-world settings, and behavioural responses to the use of such devices[1]. TAG-E supports this position.

References

1. SAGE: Potential application of Air Cleaning devices and personal decontamination to manage transmission of COVID-19 (November 2020)

S0867_EMG_Potentia
l_application_of_air_cl

2. SAGE: Application of UV disinfection, visible light, local air filtration and fumigation technologies to microbial control. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/904656/S0440_EMG_-_Application_of_UV_disinfection__visible_light__local_air_filtration_and_fumigation.pdf