SAGE meeting paper: Cover sheet

Please complete this cover sheet for each substantive and non-routine paper being discussed at SAGE, unless these details are clearly provided in the paper itself.

SAGE meeting date:	14/05/2020
Paper title:	Summary of disinfection technologies for microbial control
Paper ID:	To be completed by SAGE Secretariat
Author(s):	Cath Noakes, Alan Beswick, EMG members
Supporting papers: (for storage in the repository)	Application of UV disinfection, visible light, local air filtration and fumigation technologies to microbial control
Handling instructions:	No specific instructions
Suitable for publication:	Immediately
(please include reason if not for immediate publication)	Choose an item. Click or tap here to enter text.
Written on:	18/05/2020
Considered at:	SPI-M ☐ SPI-B ☐ NERVTAG ☐ Nosocomial working group ☐ Environmental and Modelling group ☒ Children sub-group ☐ [Other] ☐ Click or tap here to enter text.
Word count:	Click or tap here to enter text.

Summary of paper

1. Reason for bringing to SAGE (include links to any commissions from SAGE or elsewhere); how does this build on previous SAGE discussions?
   Paper provides evidence for technologies that could be effective in decontamination or air cleaning for SARS-CoV-2

2. What are the key conclusions of the paper (and confidence in these)?
   Germicidal UV (GUV) is a technology that could be beneficial for decontamination and reducing aerosol concentrations in some occupied environments.
   Hydrogen Peroxide vapour fumigation is likely to be effective for decontamination but may be challenging to apply in many environments.
   Application of GUV and HPV have safety considerations and both are likely to require some validation testing before deployment in environemnts where they have not been used before.
   There are some emerging technologies (far UV, HINS light) that may be effective but require further research.

3. What are the key questions to be considered at SAGE?
   Is SAGE happy to endorse this paper?
   Which environments could these technologies benefit?

4. Are there any proposed next steps?
   Findings are of relevance to DfT for cleaning of transport and DHSC for applications in settings such as dentistry and healthcare.

Summary of disinfection technologies for microbial control

SAGE – Environmental and Modelling Group 18052020

Overview

This paper summarises evidence for ultraviolet (UV) disinfection, visible light, local air filtration and fumigation technologies to be applied to control COVID-19 transmission. Supporting evidence is presented in a companion paper "Application of UV disinfection, visible light, local air filtration and fumigation technologies to microbial control"

Key findings are:

1. There is good evidence that germicidal UV (GUV) that uses UV-C light and fumigation approaches (particularly Hydrogen Peroxide Vapour (HPV)) are likely to be viable decontamination approaches against SARS-CoV-2 for unoccupied rooms. Both are widely available as commercial systems and are already used in many hospitals for terminal disinfection. UV-C is more challenging to apply well in a complex space with surfaces in shadow but 'shadowing' effects can also affect fumigation efficacy, with areas facing away from delivery equipment or positions on the underside of room surfaces the most challenging to reach.

2. Both UV-C and fumigation decontamination require a sufficient duration of exposure to be effective. As such they are more likely to be effective as part of a terminal cleaning process rather than daily disinfection. This is particularly the case for fumigation which requires 30-90min cycle time, plus time for aeriation to remove of any excess fumigants. UV carousel devices are typically deployed for between 20 and 45 minutes, depending on the room to be treated, but may also require moving and repeat treatment to overcome shadowing effects. Removal of fumigant by aeration is a particular concern for fumigation approaches that should be considered particularly in environments with a high level of soft furnishings.

3. There is good evidence that upper room GUV has 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. The technology is only suitable in rooms with a high enough ceiling and is most effective in poorly ventilated spaces. It should not be seen as an alternative to ventilation but is likely to be beneficial where ventilation can't be improved. An upper room GUV system needs to be sized correctly for the size of the room and the microorganism, and needs to consider the interaction with the ventilation flow.

4. Local air cleaning devices, including filter devices and UV-C devices – which may be found in combination - are unlikely to have significant benefit unless the airflow rate

through the device is sufficient. There may be some poorly ventilated spaces where these may be useful.

5. Far-UV technology is promising as a control but is far too early in development to be applied in real-world settings without significant further research. There is some evidence that visible light or blue/violet (HINS) light may be effective in reducing bacterial contamination in buildings, but there is very weak evidence for the effect on viruses. Enhancing natural light in buildings (e.g opening blinds) is a no cost precautionary measure where good light ingress already exists, but it is unlikely to have more than a marginal benefit. The benefits of HINS light are worthy of further research as this has been developed to a level that it has been applied in hospitals.

6. Both UV-C and fumigation decontamination approaches have significant safety considerations and should only be carried out by trained staff with appropriate risk assessments and controls in place. Upper room GUV has significant safety considerations which must be taken into consideration in the design, installation and operation.

7. We have not considered the cost-effectiveness of any of these approaches, This would need to be considered alongside enhancing conventional strategies such as improving ventilation and increasing standard cleaning approaches to determine whether there is additional benefit to be gained from applying disinfection technology.

8. The approaches detailed in this paper should never be regarded as a substitute for good cleaning or good ventilation. They are technologies that could be used to supplement conventional methods but not to replace them. Importantly, chemical fumigation and UV based room treatments should be regarded as disinfection processes, not as sterilization, regardless of supplier claims.