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Advisory on Surface Cleaning and Disinfection for COVID-19

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1. Introduction

COVID-19 can be acquired through contact with surfaces contaminated with SARS-CoV-2, the virus that causes COVID-19. Laboratory tests have demonstrated that SARS-CoV-2 can survive on environmental surfaces for two to three days[1-2], and a study conducted by the Environmental Health Institute of the NEA has detected the presence of SARS-CoV-2 RNA on surfaces of a room occupied by a case. These studies highlight the risk of fomite[a]-mediated transmission. Disinfection of spaces exposed to COVID-19 cases is thus essential, and ensuring environmental hygiene through regular cleaning of places with high footfall will minimise the risk of transmission in the community.

For general disinfection, **a wipe-down of surfaces with an effective disinfectant is recommended**. There are many modes of applying chemical disinfectant on surfaces, as marketed by many suppliers. **Not all are effective as claimed and some precautionary measures may be needed during application**. For example, applications of chemical disinfectant by **handheld misters and electrostatic sprayers** are not adequate on their own, and should only be used to supplement a wipe-down. NEA has not received any robust scientific evidence to support the effectiveness of auto-misters and surface coatings against coronaviruses, or the long-lasting effect of surface coatings. As for **whole-room fumigation and ultraviolet irradiation**, these are effective for specific purposes, such as in hospitals and laboratories. They must only be executed by trained professionals, as the processes are complex and exposure to chemical vapours and UV can cause harm. As UVC radiation can cause injury to the skin (e.g. sunburn) and eye (e.g. inflammation of the cornea), NEA does not recommend the household use of such products.

For more information, please refer to the following guidelines/advisory on the use of UVC devices:
1. Safety Guidelines for Use of UVC Devices
2. Advisory on the Use of UVC Sterilisers in the Home

When choosing a disinfectant for use against coronaviruses, suppliers and users must understand the efficacy of the active ingredient(s), the effectiveness and

limitations of the applications, and the potential hazards that accompany the product or application. To assist owners and operators of non-healthcare premises in carrying out environmental cleaning for areas exposed to confirmed case(s) of COVID-19, NEA has released a set of Interim Guidelines for Environmental Cleaning and Disinfection of Areas Exposed to Confirmed Case(s) of COVID-19 in Non-Healthcare Premises

[a] Fomites are objects or materials which are capable of transmitting infectious organisms from one individual to another.

2. Chemical Disinfectants

2.1 Active ingredients

NEA has provided a list of active ingredients and household disinfectant and cleaning products for disinfection of the COVID-19 virus. The listed products contain at least an ingredient that has been shown to be effective against coronaviruses. The **right concentration** of the active ingredient and **contact time** are critical for the effectiveness of the disinfection process.

Other chemicals may be effective, but their performances could be affected by the mode of application, environmental conditions and the short shelf-life. Data is thus required to demonstrate effectiveness of the product used in conjunction with its applicator or according to the accompanying protocol. An example of this group of chemicals is hydrogen peroxide which is marketed in different formulations and applications. Though generally known to be effective, its performance in vapour state may be influenced by humidity. Another example is active chlorine generated from different precursors. Though active chlorine is effective against coronaviruses, the effectiveness of the product which generates active chlorine by electrolysis of sodium chloride is limited by its poor stability.

Products that have been shown to reduce bacteria or other virus count are not necessarily effective against coronaviruses, as bacteria and different viruses differ in their biological and chemical makeup. Further, test data that use adenosine triphosphate (ATP) levels are NOT applicable to viruses, as ATP is present in bacteria and organic material, but NOT viruses.

Users must also be aware of the hazards of the active ingredients in use. For instance, alcohol-based products such as those containing isopropanol or ethanol are flammable, and should not be used in the presence of open flame. Concentrated solutions of bleach or benzalkonium chloride can cause irritation to the skin and eyes. As such, gloves should be worn when handling them.

The public is therefore advised to read product labels to look for the active ingredients and their concentrations, to understand their hazards and to ensure

that they meet NEA's guidelines for effectiveness against coronaviruses.

Importers and suppliers of disinfectant products should also obtain data that demonstrate the effectiveness and safety of the products, as well as data that support their claims. Businesses can contact NEA if they would like to include their disinfectant products in our Interim List of Household Products and Active Ingredients for Disinfection of the COVID-19 Virus.

2.2 Application of chemical disinfectant

NEA has provided guidelines for safe and effective disinfection of premises.

2.2.1 Wipe-down

A wipe-down of surfaces with an effective chemical disinfectant is recommended. A wipe-down offers two modes of action in reducing biorisks – i) disinfection and ii) removal of the virus and dirt/organic matter that could interfere with disinfection.

Other modes of application may be considered to supplement wipe-down, but should not completely replace it. Effectiveness of these applications must be validated and hazards associated with these applications must be fully understood and mitigated before implementation.

2.2.2 Whole room fumigation

Decontamination of entire rooms is carried out by introducing chemical mist or vapour and maintaining the desired concentration for a required duration. The room is then aerated to remove any traces of the chemical disinfectant that may still remain. Whole room fumigation is typically carried out using hydrogen peroxide or chlorine dioxide in hospitals and laboratory settings.

Efficacy
Each decontamination cycle takes between 2 – 5 hours. This decontamination process has been shown to be a reliable method against a wide range of pathogens.

Precautions
The following points should be noted for whole room fumigation:

a) Proper sealing of the room during decontamination to prevent escape of the chemical vapours
b) Evacuation of all personnel from the room
c) Close monitoring to ensure that operators and bystanders are not exposed to chemical levels above the safety limit

2.2.3 Hand-held misters

Hand-held misters work by spraying a mist of disinfectant liquids onto the intended surface for disinfection. Another variant of such a device is an electrostatic sprayer, which delivers charged droplets that are attracted to surfaces, resulting in a more even layer of disinfectant on the surface. An effective hand-held misting/spraying process should deposit an even layer of disinfectant liquid on the targeted surfaces with the required contact time.

Efficacy

Hand-held misters are not intended to be used as a primary disinfection strategy. They should be used in conjunction with wipe-downs. Some limitations affecting the efficacy of hand-held misters are:

a) Need to ensure that targeted surfaces are fully covered, including obscure but frequently touched surfaces, e.g. side of a door handle facing the door.
b) The surface should not be grossly contaminated. Otherwise, pre-cleaning is required.
c) Moisture-sensitive areas or equipment, which should not be neglected during the disinfection process.

Precautions

The following points should be noted for hand-held misting:

a) Operators are to be properly protected, not just against the potential risks of viral aerosol but also against the chemical used. For example, the limit of exposure to hydrogen peroxide stipulated by the Ministry of Manpower is 1 ppm over 8 hours.
b) No bystanders are exposed to chemicals at levels beyond the safety limit.

2.2.4 Auto-misters in a space

There have been proposals to install auto-misters which release a spray of disinfectant at regular intervals in spaces such as toilets.

Efficacy

NEA has thus far not received any data that suggests the efficacy of auto-misters. Even if the auto-mister system uses disinfectants that are known to be effective against coronaviruses, there is currently no evidence that light misting of an effective disinfectant has any impact on virus viability on surfaces. The factors that could affect the utility of auto-misters are:

a) Amount of disinfectant dispensed
b) Distribution of the disinfectant, particularly if it reaches areas at high risk for contamination, e.g. the whole door knob
c) Contact time before the disinfectant dries out

Precautions

Before any implementation, a systematic scientific field test is required to determine the effectiveness and safety of the system. The spraying of such disinfectants may also cause skin, eye or respiratory problems for unprotected persons.

2.2.5 Surface coating

Sometimes termed biocide coating, "self-disinfecting" coating, or protective coating, such applications involve coating surfaces with disinfectants, where there have been claims of long lasting virus inactivation effect (90 days or more).

Efficacy

NEA has requested but not received robust scientific data on effectiveness of such applications against coronaviruses from suppliers of such products. There is also no data to support any long-lasting effect against coronaviruses.

3. Ultraviolet (UV) Irradiation

Ultraviolet Germicidal Irradiation (UVGI) is a disinfection method that uses short wavelength UV (UVC). This method of disinfection has been applied in the disinfection of surfaces and sanitisation of drinking water.

Efficacy

The efficacy of UVGI against a range of microbes has been demonstrated by numerous studies[4-5]. However, NEA does not recommend the use of UVC sterilisers marketed for home use against SARS-CoV-2 as the efficacy and safety of these devices have not been proven. Typically used in healthcare settings, UV decontamination has the advantage of short turn-around time (less than 30 min) and not leaving any chemical residues. However, the following are challenges that must be addressed before implementation, whether as a fixed installation or as a portable system.

a) The need for line of sight to be effective. High-touch points that are obscure may be missed, e.g. areas of door handles, handle bars, or toilet flushes not facing the UV light will not be disinfected.
b) The effectiveness of UVGI in inactivation of microorganisms depend on the duration of exposure, intensity, distance of surface from source, and wavelength of the UV radiation. There is therefore a need for careful calibration and monitoring.

Precautions

The adverse effects of UVC include potential harm to the exposed eyes and skin. Chronic exposure to UV radiation can also accelerate the skin aging process and increase the risk of skin cancer. The space must thus not be

occupied during UVGI, and measures must be in place to prevent accidental exposure[6 -7].

4. Conclusion

The NEA urges premises owners and operators to maintain high standards of sanitation and personal hygiene to minimise the transmission of COVID-19. Together with the implementation of a structured cleaning and disinfection regime, basics like regular handwashing and the provision of hand soaps and sanitisers are also necessary to keep members of the public safe.

Further information on the General Sanitation and Hygiene Advisory for Premises Owners and Operators can be found here.

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