ECDC TECHNICAL REPORT

Disinfection of environments in healthcare and non-healthcare settings potentially contaminated with SARS-CoV-2

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Scope of this document

This document provides guidance to EU/EEA Member States on environmental cleaning in healthcare and non-healthcare settings during the COVID-19 pandemic.

Target audience

Public health authorities in EU/EEA Member States and the United Kingdom.

Background

SARS-CoV-2 virus has been detected in respiratory secretions (upper and lower respiratory tract) and faeces. The main route of transmission is considered to be through inhalation of large respiratory droplets or deposition on mucosae. Viral RNA has been detected in blood but there is no evidence that SARS-CoV-2 can be transmitted through contact with blood [1,2].

Contact with contaminated fomites due to persistence of the virus on surfaces [3] is another route implicated in the transmission of SARS-CoV-2 virus. Faecal-oral and airborne modes have also been considered, but their role in the transmission of SARS-CoV-2 is currently unknown. In order to reduce the risk of infection through fomites, it is essential to establish procedures for the correct disinfection of environments that could have been contaminated with SARS-CoV-2.

Evidence of environmental persistence

Recent publications have evaluated the survival of SARS-CoV-2 on different surfaces. According to van Doremalen et al., the environmental stability of SARS-CoV-2 is up to three hours in the air post-aerosolisation, up to four hours on copper, up to 24 hours on cardboard and up to two to three days on plastic and stainless steel, albeit with significantly decreased titres [3]. These findings are comparable with results obtained for environmental stability of SARS-CoV-1. These findings resulted from experiments in a controlled environment and should be interpreted with caution in the real-life environment.

Moreover, different levels of environmental contamination have been detected in rooms of COVID-19 patients, ranging from 1 out of 13 to 13 out of 15 samples testing positive for SARS-CoV-2 before cleaning. No air samples were positive in these studies, but one sample from an air exhaust outlet was positive indicating that virus particles may be displaced by air and deposited on surfaces [4,5].

In a study of environmental contamination in a Chinese hospital during the COVID-19 outbreak, SARS-CoV-2 was detected in environmental samples from the COVID-19 dedicated intensive care units (ICU), the COVID-19 dedicated obstetric isolation ward and the COVID-19 dedicated isolation ward. SARS-CoV-2 was also detected on objects such as the self-service printers used by patients to self-print the results of their exams, desktop keyboards

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and doorknobs. Virus was detected most commonly on gloves (15.4% of samples) and rarely on eye protection (1.7%) [6]. This evidence shows the presence of SARS-CoV-2 in the environment of a COVID-19 patient, therefore reinforcing the belief that fomites play a role in transmission of SARS-CoV-2; however, the relative importance of this route of transmission compared to direct exposure to respiratory droplets is still unclear.

Disinfectants

Disinfectants are classified as biocidal products and are regulated by the Biocidal Products Regulation (BPR) (EU) No 528/2012 [7] to ensure that risks are properly assessed before they are placed on the market in EU/EEA countries.

Currently, for most disinfectant products available in the European Union market for SARS-CoV-2 disinfection, the transitional measures of the BPR apply, as set out in Article 89 [7]. This means that most disinfectants are placed on the market subject to national legislation until the evaluation of the contained active substance(s) is finalised in the EU review programme.

In general, alcohol-based disinfectants (ethanol, propan-2-ol, propan1-ol) have been shown to significantly reduce infectivity of enveloped viruses like SARS-CoV-2, in concentrations of 70-80% with one minute exposure time [8,9]. However, ethanol has not yet been approved under the BPR, so biocidal products based on ethanol are not authorised under the BPR but are available under transitional measures. Most Member States do not have an authorisation or registration system for the products under transitional measures and, therefore, do not have an exhaustive overview of the disinfectant products on their market.

Biocidal products having virucidal activity and authorised under the BPR are efficacious against SARS-CoV-2 coronavirus. This also applies to products used as hygienic hand and skin disinfectants, which state they have limited virucidal activity or activity only against enveloped viruses.

For more information and for an indicative list of authorised disinfectant products, please visit the European Chemicals Agency (ECHA) at https://echa.europa.eu/covid-19.

Cleaning options for healthcare settings after the management of a suspected or confirmed case of COVID-19

- Healthcare setting areas (patient rooms, waiting areas, procedure rooms, resuscitation rooms) where a suspected or confirmed case of COVID-19 has been assessed or hospitalised should be first ventilated well.
  - Rooms where aerosol generating procedures (AGP) have been performed (bag-valve ventilation, intubation, administration of nebulised medicines, bronchoscopy, etc.) need to be ventilated with fresh air for 1–3 hours, if they are not functioning under negative pressure, before cleaning and admitting new patient(s).
  - In buildings where windows do not open and the ventilation system functions in a closed circuit, High-efficiency particulate air (HEPA) filtration should be used for the recycled air. Other options may include, after expert engineering advice: placing temporary HEPA filters over the vents and exhausts in the rooms housing COVID-19 patients or using a portable HEPA air filtration system placed in close proximity to where the patient was located.
- After ventilation, the above mentioned areas should be carefully cleaned with a neutral detergent, followed by decontamination of surfaces using a disinfectant effective against viruses. Several products with virucidal activity are licensed in the national markets and can be used following the manufacturer's instructions. Alternatively, 0.05% sodium hypochlorite (NaClO)[1] (dilution 1:100, if household bleach is used, which is usually at an initial concentration of 5%) is suggested. For surfaces that can be damaged by sodium hypochlorite, products based on ethanol (at least 70%) can be used for decontamination after cleaning with a neutral detergent.
- Cleaning of toilets, bathroom sinks and sanitary facilities need to be carefully performed, avoiding splashes. Disinfection should follow normal cleaning using a disinfectant effective against viruses, or 0.1% sodium hypochlorite.
- All textiles (e.g. towels, bed linens, curtains, etc.) should be washed using a hot-water cycle (90°C) with regular laundry detergent. If a hot-water cycle cannot be used due to the characteristics of the material, bleach or other laundry products for decontamination of textiles need to be added to the wash cycle.

[1] The use of 0.05% of sodium hypochlorite in the cleaning of surfaces in healthcare and non-healthcare settings is suggested in order to reduce the irritant effects on the mucosae.

- The use of single-use disposable cleaning equipment (e.g. disposable towels) is recommended. If disposable cleaning equipment is not available, the cleaning material (cloth, sponge etc.) should be placed in a disinfectant solution effective against viruses, or 0.1% sodium hypochlorite. If neither solution is available, the material should be discarded and not reused.
- The use of different equipment for cleaning the different areas of healthcare settings is recommended.
- In the event of shortage of cleaning equipment, the cleaning process should start from the cleanest areas moving to the dirtiest areas (e.g. an area where AGP have been performed).
- Staff engaged in environmental cleaning in healthcare settings should wear PPE. Due to the current shortage of PPE, the following minimal PPE set is suggested for use when cleaning healthcare facilities likely to be contaminated by SARS-CoV-2:
  - surgical mask
  - disposable long-sleeved water-resistant gown
  - gloves.

  The use of a filtering facial piece (FFP) class 2 or 3 should be considered when cleaning facilities where AGP have been performed. The use of heavy-duty gloves should be also considered.
- Hand hygiene should be performed every time PPE, such as gloves, are removed
- Staff engaged in waste management should wear PPE. Waste should be treated as infectious clinical waste category B (UN3291) [10] and handled in accordance with healthcare facility policies and local regulations.

Cleaning options for non-healthcare premises after the presence of a suspected or confirmed case of COVID-19

- In the event a suspected or confirmed case of COVID-19 has been in a specific location (e.g. public waiting area, office space, hotel room, as well as a regular houseroom for self-isolation), this should be first well ventilated with fresh air for a minimum of 1 hour, and thereafter carefully cleaned with a neutral detergent, followed by decontamination of surfaces using a disinfectant effective against viruses.
- Cleaning procedure, use of disinfectants and textile cleaning should follow the instructions outlined in the section above for healthcare settings (see also Table 1).
- Disposable, single-use cleaning equipment is suggested.
- Staff engaged in environmental cleaning in public spaces after a suspected or confirmed COVID-19 person was present should wear personal protective equipment (PPE) as follows:
  - surgical mask
  - uniform and single-use plastic apron
  - gloves.
- For the cleaning of a household room where a COVID-19 patient was isolated, the same procedures apply. The cleaning person should wear gloves and a surgical mask.
- Hand hygiene should be performed each time after removing gloves or mask.
- Waste material produced during the cleaning should be placed in a separate bag, which can be disposed in the unsorted garbage.

Cleaning options for all type of premises during the COVID-19 pandemic

When cleaning premises attended by the public, we recommend to change equipment between spaces attended by the public and spaces dedicated to the employees, and to proceed as follows:

- Frequently touched surfaces should be cleaned as often as possible (at least daily and if possible more frequently). Examples of these surfaces are doorknobs and door bars, chairs and armrests, tabletops, light switches, handrails, water taps, elevator buttons, etc.
- The use of a neutral detergent for the cleaning of surfaces in general premises (i.e. not for premises where a suspected or confirmed case of COVID-19 has been) should be sufficient.
- The cleaning of public toilets, bathroom sinks and sanitary facilities used by several people (e.g. in shopping centres, airports, etc.) should be carefully performed. Consider the use of a disinfectant effective against viruses, such as 0.1% sodium hypochlorite, or other licensed viricidal products following the instructions for use provided by the manufacturer.
- Staff engaged in environmental cleaning should wear PPE when performing cleaning activities. The use of the usual set of PPE (e.g. uniform – which is removed and frequently washed in warm water – and gloves) is enough for the protection when cleaning general premises.
- The cleaning material should be properly cleaned (see Table 1) at the end of every cleaning section.

- Hand hygiene should be performed each time PPE such as gloves are removed.
- Waste material produced during the cleaning should be placed in the unsorted garbage.

Table 1. Cleaning options for different settings. S: Suggested, O: Optional.

	Healthcare setting	Non-healthcare setting	General settings
Surfaces	• Neutral detergent AND • Virucidal disinfectant OR • 0.05% sodium hypochlorite OR • 70% ethanol **[S]**	• Neutral detergent AND • Virucidal disinfectant OR • 0.05% sodium hypochlorite OR • 70% ethanol **[S]**	• Neutral detergent **[S]**
Toilets	• Virucidal disinfectant OR • 0.1% sodium hypochlorite **[S]**	• Virucidal disinfectant OR • 0.1% sodium hypochlorite **[S]**	• Virucidal disinfectant OR • 0.1% Sodium hypochlorite **[O]**
Textiles	• Hot-water cycle (90°C) AND • regular laundry detergent • alternative: lower temperature cycle + bleach or other laundry products **[S]**	• Hot-water cycle (90°C) AND • regular laundry detergent • alternative: lower temperature cycle + bleach or other laundry products **[S]**	n/a

Cleaning equipment	• Single-use disposable OR
	• Non-disposable disinfected with:
	  • Virucidal disinfectant OR
	  • 0.1% sodium hypochlorite
	[S]
		• Single-use disposable OR
		• Non-disposable disinfected with:
		  • Virucidal disinfectant OR
		  • 0.1% sodium hypochlorite
		[O]
			• Single-use disposable OR
			• Non-disposable cleaned at the end of cleaning session
			[S]

PPE for cleaning staff	• Surgical mask • Disposable long-sleeved water-resistant gown • Gloves • FFP2 or 3 when cleaning facilities where AGP have been performed **[S]**	• Surgical mask • Uniform and plastic apron • Gloves **[S]**	• Uniform • Gloves **[S]**
Waste management	• Infectious clinical waste category B (UN3291) **[S]**	• In a separate bag in the unsorted garbage **[S]**	• Unsorted garbage **[S]**

Contributing ECDC experts (in alphabetical order)

ECDC Public Health Emergency COVID-19 Infection Prevention and Control (IPC) group: Agoritsa Baka, Orlando Cenciarelli, Bruno Ciancio, Diamantis Plachouras, Carl Suetens.

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References

1. Wang W, Xu Y, Gao R, Lu R, Han K, Wu G, et al. Detection of SARS-CoV-2 in Different Types of Clinical Specimens. JAMA. 2020.
2. World Health Organisation. Report of the WHO-China Joint Mission on Coronavirus Disease 2019 (COVID-19) 2020 [cited 2020 11 March]. Available from: https://www.who.int/docs/default-source/coronaviruse/who-china-joint-mission-on-covid-19-final-report.pdf.
3. van Doremalen N, Bushmaker T, Morris DH, Holbrook MG, Gamble A, Williamson BN, et al. Aerosol and Surface Stability of SARS-CoV-2 as Compared with SARS-CoV-1. New England Journal of Medicine. 2020.
4. Cheng VCC, Wong S-C, Chen JHK, Yip CCY, Chuang VWM, Tsang OTY, et al. Escalating infection control response to the rapidly evolving epidemiology of the Coronavirus disease 2019 (COVID-19) due to SARS-CoV-2 in Hong Kong. Infection Control & Hospital Epidemiology. 2020:1-24.
5. Ong SWX, Tan YK, Chia PY, Lee TH, Ng OT, Wong MSY, et al. Air, surface environmental, and personal protective equipment contamination by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) from a symptomatic patient. Jama. 2020.
6. Ye G, Lin H, Chen L, Wang S, Zeng Z, Wang W, et al. Environmental contamination of the SARS-CoV-2 in healthcare premises: An urgent call for protection for healthcare workers. medRxiv. 2020.
7. European Parliament and Council. Regulation (EU) No 528/2012 of the European Parliament and of the Council of 22 May 2012 concerning the making available on the market and use of biocidal products 2012 [cited 2020 22 March]. Available from: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32012R0528.
8. Siddharta A, Pfaender S, Vielle NJ, Dijkman R, Friesland M, Becker B, et al. Virucidal Activity of World Health Organization–Recommended Formulations Against Enveloped Viruses, Including Zika, Ebola, and Emerging Coronaviruses. The Journal of infectious diseases. 2017;215(6):902-6.
9. Kampf G, Todt D, Pfaender S, Steinmann E. Persistence of coronaviruses on inanimate surfaces and its inactivation with biocidal agents. Journal of Hospital Infection. 2020.
10. World Health Organisation. Guidance on regulations for the Transport of Infectious Substances 2013–2014 2012. Available from: https://apps.who.int/iris/bitstream/handle/10665/78075/WHO_HSE_GCR_2012.12_eng.pdf?sequence=1.