

Surface sampling of coronavirus disease (COVID-19):
A practical “how to” protocol for health care and public health
professionals

Version: 1.1

Date: 18 February 2020

Contact: EarlyInvestigations-2019-nCoV@who.int



Surface sampling of coronavirus disease (COVID-19): A practical “how to” protocol for health care and public health professionals

Protocol summary	4
1 Background	5
1.1 Objectives	5
2 Study procedures	6
2.1 Study setting	6
2.2 COVID-19 case data collection	6
2.3 Environmental sampling collection sites.....	6
2.3 Timing of environmental sampling collection	8
2.4 Environmental sampling methods and procedures	8
2.5 Labeling, shipment and storage of samples	9
2.6 Ethical considerations	10
3 Laboratory evaluations	12
4 Reporting of findings.....	13
4.1 Reporting.....	13
5.1 References.....	14
5.2 Further references for COVID-19	14
6 Acknowledgements.....	16
Appendices	17
Appendix A: Sample questionnaire - Surface sampling of COVID-19: A practical “how to” protocol for health care and public health professionals.....	17

Protocol summary

Surface sampling of COVID-19: A practical “how to” protocol for health care and public health professionals	
Objectives	To assess the extent and persistence of surface contamination with COVID-19 To identify environmental surfaces which may play a role in onwards transmission of COVID-19
Minimum information and specimens to be obtained from participants	Daily environmental samples of high-touch surfaces linked to where COVID-19 infected patient is receiving care in a health care setting or is in isolation in a closed setting (household, hotel room etc.)
Study duration	Up to 7 days after patient has left sampling location
Potential output and analysis	Identification of COVID-19 contaminated surfaces and possible routes of transmission

1 Background

The detection and spread of an emerging respiratory pathogen are accompanied by uncertainty over, among other factors, key virological characteristics of the novel pathogen and particularly its persistence in certain environments. This is the case for the coronavirus disease (COVID-19), for which the virus was first detected in Wuhan city, China in December 2019 (1).

During past coronavirus outbreaks, a number of studies evaluating virus persistence and stability have been carried out. For example, the role of environmental contamination has been evaluated in a number of hospitals following the 2015 MERS-CoV outbreak in the Republic of Korea, as well as experimental studies on viability and persistence of MERS-CoV on surfaces and in the air (2-4). In these settings, MERS-CoV environmental contamination has been identified, but the extent of environmental contamination, the amount of viable virus that can be isolated and therefore the role of environmental contamination in transmission are not clear. These virological characteristics also need to be determined for COVID-19. This information will then be able to inform risk assessments and infection prevention and control measures, with an aim of limiting onwards transmission.

This protocol has been designed to determine (viable) virus presence and persistence on fomites in various locations where a patient infected with COVID-19 is currently receiving care or being isolated, and to understand how this may relate to COVID-19 transmission events in these settings. It is therefore important that it is done as part of a comprehensive outbreak investigation and that information obtained by environmental studies is combined with the results of epidemiological, laboratory and sequence data from COVID-19 patient investigations. COVID-19 investigation protocols currently under development include:

- Household transmission investigation protocol for COVID-19
- Assessment of potential risk factors for COVID-19 infection among health care workers in a health care setting.
- First Few X (FFX): Cases and contact investigation protocol for COVID-19 infection.

These protocols are available on the [WHO website](#).

With any novel pathogen, it is particularly important that such information can be gathered quickly and in a way that enables the results to be easily aggregated, tabulated and analyzed across many different settings globally to inform public health responses and policy decisions. For this reason, the following protocol has been designed to conduct surface sampling for COVID-19. Each country may need to tailor some aspects of this protocol to align with public health, laboratory and clinical systems, according to capacity, availability of resources and cultural appropriateness.

Comments for the user's consideration are provided in purple text throughout the document as the user may need to modify methods slightly because of the local context in which this study will be carried out.

1.1 Objectives

The specific objectives of this protocol are to:

- Assess the extent and persistence of surface contamination of COVID-19
- Identify environmental surfaces and fomites which may play a role in onwards transmission of COVID-19.

This investigation can permit evaluation of secondary objectives such as, but not limited to:

- Characterize the sequence diversity of COVID-19 in environmental samples, as capacity and resources permit.

2 Study procedures

2.1 Study setting

Once a case of COVID-19 has been identified, the patient should be isolated. This investigation should be conducted in any setting in which the patient is receiving care, such as a health care facility, or is isolated in a closed setting, such as a household, hotel room, cruise ship etc.

In order to link data from environmental sampling to outbreak investigations, and to identify risk factors for environmental contamination and for onwards transmission to other individuals, it is important to collect background information, including:

1. Link with COVID-19 outbreak investigation: environmental sampling data provide supplementary information, which need to be interpreted in the context of the outbreak dynamics and characteristics, patient sampling and sequencing, and testing of contacts.
2. A detailed plan of the location layout, including ventilation inlets, doors, placement of major furniture and beds, etc. For health care settings this includes: area function (Emergency Department, Intensive Care Unit, ward, primary health clinic etc.), hospital equipment and the location of other COVID-19 patient(s). The layout should be detailed as a map and the exact sampling locations can be determined using the information on the maps.
3. The movements of the COVID-19 patient and/or the locations that the patient visited prior to being isolated. Each room or location where the patient stayed should be noted, with a list of activities done there, and an estimate of the amount of time spent. This information should be known when developing the sampling plan.
4. In health care settings: information on the routes, patients and treatment procedures that healthcare workers in the affected hospital were involved in. For each health care worker, the rooms and patients that were visited and treatments that were given, including dates and time, should be recorded.

COMMENT: Patients in an Intensive Care Unit may remain hospitalized for extended periods of time and, as such daily sampling may not be possible, particularly if there are multiple COVID-19 cases within the same health care facility. Feasibility and the outbreak context will determine the frequency and duration of repeated sampling.

2.2 COVID-19 case data collection

As previously mentioned, environmental sampling should be done as part of a comprehensive outbreak investigation and combined with the results of from COVID-19 patient investigations. For reference, a questionnaire covering patient and clinical information from the COVID-19 infected patient can be found in the Appendix.

2.3 Environmental sampling collection sites

The following sampling sites have been recommended based on 1) possible disease transmission routes and 2) current literature of high-touch surfaces (5-8). Moreover, standardizing the sampling sites across COVID-19 surface sampling studies will improve the comparability of results of multiple studies.

Recommended sampling sites based on location in a health care setting (9-12)

Possible route of COVID-19 hospital transmission	Essential sampling sites		Other sampling sites	
1. Patient (entry) routing	Ambulance	Medic bag handle, inside of blood pressure cuff, wall next to the patient stretcher	Ambulance	Front of defibrillator, handlebar ambulance ceiling,
	Entrance	Ventilation exits or air purifier filters, guardrails	Entrance, corridor, waiting room	Doorknob, light switch, sink, faucet handles
	Corridor	Ventilation exits or air purifier filters, guardrails	Elevator	Buttons, Ventilation exits or air purifier filters, guardrails
	Waiting room	Ventilation exits or air purifier filters, guardrails	X-ray room	Ventilation exits or air purifier filters, doorknob, light switch, X-ray table, sink, faucet handles
2. Hospital staff	Staff room	Doorknob, key board, clothes, ventilation exits or air purifier filters	Staff room, anteroom	Sink, faucet handles, desk/table, light switch, chairs
	Ante room	Doorknob, light switch, ventilation exits or air purifier filters	Patient room	Monitor controls, monitor touch screen, charts
3. Patient handling and care/patient virus excretion and risk procedures	Patient room	Doorknob, bed rails, bedside table, bed controller, call button, floor (<1meter from the patient, 2m, 3m, etc.), tubing, masks and filters of aerosol generating procedures, control panels	Patient room	Bedding, IV pole, telephone, chair, curtain, clothes , light switch, stethoscope, thermometer, hand soap dispenser, garbage bin, cup, curtains, oxygen flow meter
	Patient bathroom	Doorknob, faucet handles, sink, toilet/bed pan	Patient bathroom	Light switch, bed pan cleaner, guard rails
4. Air flow*	Patient room	Ventilation exits or air purifier filters	Patient room	Wall (<1meter from the patient, 2m, 3m, etc. if possible)
	Patient bathroom	Ventilation exits or air purifier filters	Patient bathroom	Wall (<1meter from the patient, 2m, 3m, etc. if possible)

Recommended sampling sites in a closed setting outside health care settings (household, hotel room, cruise ship etc.)

Possible route of COVID-19 transmission	Essential sampling sites		Other sampling sites	
1. Patient virus excretion	Patient room	Doorknob, bed rails, bedside table, floor (<1meter from the patient, 2m, 3m, etc.).	Patient room	Bedding, telephone, chair, curtain, clothes, light switch, hand soap dispenser, garbage bin, cup, curtains, oxygen flow meter (if applicable).
	Patient bathroom	Doorknob, faucet handles, sink, toilet/bed pan	Patient bathroom	Light switch, bed pan cleaner, guard rails
2. Air flow*	Patient room	Ventilation exits or air purifier filters	Patient room	Wall (<1meter from the patient, 2m, 3m, etc. if possible)
	Patient bathroom	Ventilation exits or air purifier filters	Patient bathroom	Wall (<1meter from the patient, 2m, 3m, etc. if possible)

Information on the timing and details of factors that can influence the outcomes of environmental sampling need to be systematically collected alongside the environmental samples:

- The time, frequency and details (e.g. disinfectant) of the cleaning and disinfection activities should be collected for all sampling locations.
- In health care settings, the place, time and duration of aerosol generating procedures, if any, should be indicated, including: positive pressure ventilation (bi-level positive airway pressure [BiPAP] and continuous positive airway pressure [CPAP]), endotracheal intubation, high flow nasal cannula, open airway suction, high frequency oscillatory ventilation, tracheostomy, chest physiotherapy, nebulizer treatment, sputum suction and bronchoscopy.

2.3 Timing of environmental sampling collection

Ideally, sampling should take place in patient rooms each day, from the day COVID-19 was suspected and/or diagnosed in a patient until at least 7 days after the discharge or passing of the patient. In case of aerosol generating procedures (listed above) in health care facilities, the environment should be sampled before and after (within 1 hour and 24h later) each procedure. Ideally, the temperature and humidity of the sampled rooms should be measured and noted daily, as well as the time the bed

预览已结束，完整报告链接和二维码如下：

https://www.yunbaogao.cn/report/index/report?reportId=5_24799

