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Key Points of Cleaning and Disinfection for Sars-Cov-2

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Abstract

Recent studies show that people without any symptoms play a major role in the spread of COVID-19. As is known, the new coronavirus is spread primarily among people by respiratory droplets (most often in close contact, within approximately 1-2 meters) (with coughs, sneezes, spits). In other words, transmission from person to person is the most common way. The second important way of smearing SARS-CoV-2 to people from contaminated surfaces. We know that SARS-CoV-2 can live on various surfaces for hours and days. The best practice is to clean dirty surfaces and then disinfection to prevent the spread of COVID-19 from all kinds of surfaces, as well as in homes, community settings and hospitals.

1. Introduction

The coronavirus that causes COVID-19 mainly spreads from person to person easly. When someone who is infected coughs or sneezes, they send droplets into the air that may contain the virus. Later then a healthy person may breathe those droplets. You may also catch the virus if you touch a surface or object that has the virus on it and then can be easly transferred to the mouth, nose, or eyes. Preventing from further transmission is the priority off all applications. Bai, Yao et al., 2020 and Ferretti, Wymant et al.(2020) analyzed key parameters of epidemic spread to estimate the contribution of different transmission routes to stop the epidemic. They found that 45% infections happens from carriers before they develop symptoms, 40% of infections happen while patients have symptoms, 10% of infections happen from the environment and 5% happen from people who never develop symptoms (Figure 1). Environmental transmission (10%) is also a high risk for having the infection.

2. General considerations

All surfaces and objects (countertops, tables, doorknobs, bathroom fixtures, phones, keyboards,

remote controls, toilets) at healthcare facilities, in your home and office may be contaminated by the virus. Coronaviruses can live on the variety of other surfaces, like fabrics, dirty laundry of infected/suspected persons, cardboard packages and countertops, glasses, coins etc. If possible, do not shake these stuffs. This will minimize the possibility of dispersing of the virus through the air.

Coronavirus doesn't seems to much to spread through contaminated food and water. But, it's better to wash or scrubbing fruits and vegetables under running water with a brush or with your hands before eating them. Wash your hands after your every visit to the supermarkets etc., and when coming home from outside. Coronavirus hasn't been found in drinking water. If it gets into the water supplies, local water treatments like filtering and disinfecting the water with chlorine should kill the Coronavirus (EPA, 2020; WHO 2020; ECDC 2020).

3. Aerosol and Surface Stability of SARS-CoV-2

Published studies showed that there was a link between the life of the virus and the ambient temperature and environmental humidity level. The virus continues its activity in a test tube at 4□C for up to two weeks, while the temperature is raised to 37□C, this time decreases to 1-2 days, 30 minutes at 56□C and 5 minutes at 70□C (Wang, Tang, et.al. 2020). SARS-CoV-2 maintains its activity in aerosols for 3 hours, but its infectious titer reduced from 103.5 to 102.7 per liter of air. Virus is more permanent on plastic and stainless steel than copper and cardboards. As a result, the virus has been shown to be viable and infectious in aerosols, from hours to days (depending on the viral load, humidity and the temparature) (Ferretti and Wymant et al.2020; van Doremalen, Bushmaker, et al. 2020; CDC 2020). The coronavirus can live for hours to days on surfaces like countertops and doorknobs, paper, copper, cardboard, wood etc.. How long it survives depends on the material the surface is made of and how much its used and exposure to heat, cold, or sunlight (Table 1). (WebMD. 2020).

4. Hand hygiene and other preventive measures

Practicing hand hygiene is a simple and effective way to prevent all kind of infections including Coronavirus. Cleaning your hands can lower the spread of microorganisms, including those that are resistant to all antibiotics. The “Core Infection Prevention and Control Practices for Safe Care Delivery in All Healthcare Settings” recommendations of the “Healthcare Infection Control Practices Advisory Committee” (HICPAC) include the following strong recommendations for hand hygiene in healthcare facilities (HICPAC, 2017).

Healthcare personnel should use an alcohol-based hand rub or wash with soap and water for at least 20 seconds for the following clinical indications (CDC, 2020):

• immediately before touching to a new patient
• after touching a patient or the patient’s immediate environment
• before performing an aseptic task (e.g., placing an indwelling device) or handling invasive medical devices
• before changing the body side on the same patient
• after contact with blood, body fluids, or contaminated surfaces
• immediately after removing the gloves

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• when hands are visibly dirty or feel dirty

• if soap and water are not readily available, use a hand disinfectant that contains at least 60-70% alcohol. Cover all surfaces of your hands and rub them together until they dry.

5. For household members

Household members should follow normal preventive actions while at work and home including recommended hand hygiene and avoiding touching eyes, nose, or mouth with unwashed hands. Hand washing is the best way to prevent virus contamination.

Household members should clean hands often (at least 20 seconds with soap and warm water), after visiting the drugstore or supermarket, or bring in takeout foods or packages to home, after coughing, or sneezing, after using the restroom, before and after eating or preparing food, after contact with animals or pets, before and after providing routine care for another person who needs assistance. If soap and water are not available and hands are not visibly dirty, an alcohol-based hand sanitizer that contains at least 60-70 % alcohol may be used (CDC, 2020).

6. Disinfection for Coronavirus

Decontaminating a surface needs a 2-step application. People often forget the first step and spray disinfectant directly (EPA 2020; CDC 2020; Business insider 2020).

- Cleaning
- Disinfection

6.1. Cleaning

Means removing the germs, and dirts from surfaces. It can not kill germs, but by removing them, it lowers their numbers and the risk of spreading infection and reducing the chance of infection. You must clean the areas that you touch often (like door knobs, sinks, toilets).

Cleaning applications

If there are organic or inorganic dirt in the environment, the disinfectant will not be able to contact with microorganisms at an effective level. For effective disinfection applications first of all, cleaning should be done with soap and water properly and dirt should be removed from the hands, body and environment. So disinfectant will reach to the microorganisms. During this application, mask and disposable gloves must be worn. Frequently touched surfaces of living areas (tables, door handles, light switches, counters, handles, tables, telephones, keyboards, toilets, taps, sinks, etc.) should be especially cleaned routinely. We must remember that “Cleaning” wipes do not kill viruses (EPA 2020; CDC 2020; Business insider 2020; ECDC 2020).

6.2. Disinfection

Means killing the microorganisms which are living on the surfaces by using some chemicals called disinfectants (for example, EPA-registered disinfectants). Proper disinfectant usage is also an important part of preventing and reducing the spread of diseases. This process does not clean dirty surfaces or remove germs, but by killing germs on the surfaces after cleaning, can lower the risk of spreading of an infection.

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Disinfection applications

Coronavirus is a virus with a lipoid membrane and is highly affected by low levels disinfectants. In addition to washing with water and soap, it is very easy to remove with alcohol, ethanol, oxygen water and other disinfectants. Disinfectants affect the virus and reduce its affinity to the surfaces. Different disinfectant solutions are effective against this virus; "ethanol" (60-71%), "hydrogen peroxide" (0.5%) or "sodium hypochlorite" (0.1%). When these disinfectants used in appropriate concentrations on contaminated surfaces, they reduce the number of infectious coronavirus from 100 million pathogen particles to 100 particles just in one minute. Other less effective disinfectant solutions are; benzalkonium chloride (0.05-0.2%) and chlorhexidine gluconate (0.02%) (EPA 2020; CDC 2020; Business insider 2020; ECDC 2020).

For completely removing the virus:

- Wear disposable gloves when disinfecting the surfaces.
- If surfaces are dirty, they should be cleaned as mentioned below.
- Sure that the product's expiration date has not been passed.
- To ensure safe and effective usage read the manufacturer's instructions of the disinfection products and follow carefully.
- Disinfectant should be at appropriate concentrations. Sometimes practitioners prepare high concentrations with the idea of providing more effectiveness. However, this type of application may disrupt the cellular osmotic balance, especially for living microorganisms, and also cause toxic effects due to the excess chemical in the environment.
- To kill the virus, the surface must stay wet for the entire contact time. To be effective surface must remain wet untill it dries spontaneously.
- The environment should be properly ventilated according to the manufacturer's ventilation instructions, so that the people in the environment will not be affected. Step away from odors if they become too strong. Keep children, pets, and other people away during the application. Keep cleaners and disinfectants out of reach from children and pets.
- Clean hands immediately after gloves are removed.
- At the end throw the disposable items (like gloves and masks) to the medical waste containers. They mustn't be cleaned.

For disinfection, most common EPA (United States Environmental Protection Agency) -registered disinfectants should be efective. A list of products that are EPA-approved for using against the virus that causes COVID-19 is available at web site of (EPA 2020). Manufacturer's instructions and EPA recommandations must be fallowed. Additionally, diluted household bleach solutions (at least 1000 ppm sodium hypochlorite) can be used if appropriate for the surface. Ensuring a contact time of at least 1 minute, and allowing proper ventilation during and after application. Never mix household bleach with ammonia or any other cleaners. Unexpired household bleach will be efective against coronaviruses when properly diluted. Prepare a bleach solution by mixing: 5 tablespoons (1/3rd cup) bleach per 4 litre of water or 4 teaspoons bleach per litre of water

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Table 1: The life span of the virus on different surfaces

Surface; (general)	**Life time**
Paper; (all kind)	3 hours - days
Copper; (pennies, tea kettles, cookware)	4 hours
Cardboard; (shipping boxes)	24 hours
Wood; (furniture)	2-4 days
Textile; (all kind)	2 days
Aluminum; (soda cans, tinfoil, water bottles)	2 to 8 hours
Stainless steel surfaces; (refrigerators, pots and pans, water bottles)	2-3 days
Plastics; (packaging like milk containers and detergent bottles, bus seats, backpacks, elevator buttons)	2-3 days
Metals; (doorknobs, jewelry, silverware)	5 days
Glass; (drinking glasses, bottles, measuring cups, mirrors)	4-5 gün
Ceramics; (dishes, pottery, mugs)	5 days
Money (Paper, not coins)	4 days
Surgical masks; (inside and outside)	4-7 days

Table 2: Cleaning options for different settings. S: Suggested, O: Optional. (ECDC 2020)

	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 waterresistant 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]

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Table 3: Some EPA-approved disinfectants against the SARS Cov-2 (Check the usage concentrations from the EPA list (Registration number) and the manufacturer's documents)

EPA registration number	Active ingredients	Disinfection for these viruses	Contact time (minute)	Surface type	Use site
9480-14	Hydrogen peroxide	Norovirus	1	Hard nonporous	Healthcare institutional
1839-216	Quaterner ammonium	Human Coronavirus	5	Hard nonporous, Food contact	Healthcare institutional, Residential
777-139	Citric acid	Human Coronavirus	5	Hard nonporous, Food contact	Healthcare institutional, Residential
10324-230	Hydrogen peroxide	Human Coronavirus	1	Hard nonporous	Healthcare institutional, Residential
10492-4	Quaterner ammonium; isopropanol	Human Coronavirus	30 seconds	Hard nonporous	Healthcare institutional, Residential
1672-65	Sodium hypochlorite	Human Coronavirus	5-10	Hard nonporous	Healthcare institutional, Residential
1677-204	Octanoic acid	Human Coronavirus	2	Hard nonporous	Healthcare institutional, Residential
4091-23	Sodium hypochlorite Sodium carbonate	Human Coronavirus	30 seconds	Hard nonporous	Healthcare institutional, Residential
42964-17	Quaterner ammonium; Ethanol	Human Coronavirus	2	Hard nonporous	Healthcare institutional, Residential
46781-6	Quaterner ammonium; isopropanol	Human Coronavirus	2	Hard nonporous	Healthcare institutional, Residential
4822-548	Quaterner ammonium; Triethylene glycol	Human Coronavirus	2	Hard nonporous	Healthcare institutional, Residential
4822-606	L-Lactic acid	Human Coronavirus	10	Hard nonporous	Healthcare institutional, Residential
4822-607	Quaterner ammonium;	Human Coronavirus	5	Hard nonporous	Healthcare institutional, Residential Food contact, rinse
54289-4	Peroxyacetic acid	Human Coronavirus	1	Hard nonporous	Healthcare institutional,

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					Residential
5813-86	Glycolic acid	Human Coronavirus	30 seconds	Hard nonporous	Healthcare institutional, Residential
70627-6	Phenolic	Human Coronavirus	10	Hard nonporous	Healthcare institutional, Residential
72977-3	Silver ion-citric acid	Human Coronavirus	3	Hard nonporous	Healthcare institutional, Residential
777-136	Ethanol	Human Coronavirus	30 seconds	Hard nonporous	Healthcare institutional, Residential
8383-12	Hydrogene peroxide; Peroxyacetic acid	Human Coronavirus	2	Hard nonporous	Healthcare institutional, Residential
89896-2	Hypochlorous acid	Human Coronavirus	10	Hard nonporous	Healthcare institutional, Residential
9402-14	Hydrogene Peroxide Qmmonium carbonate Ammonium bicarbonate	Human Coronavirus	5	Hard nonporous	Healthcare institutional, Residential

7. Conclusion

To reduce the spread of COVID-19 people must know all the information about disinfectant products (application time, concentration stc). Unfortunately, most of the people and even most healthcare professionals do not have enough information about disinfection and are aware of reading the instructions before usage.

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