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Hygiene concerns regarding SARS-CoV-2 (COVID-19, Novel Coronavirus) and considerations when using public washrooms and restaurants

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Executive Summary

Due to the present pandemic situation with COVID-19, two scientists have conducted a short literature review to add their microbiological and hygiene perspectives on the spreading of SARS-CoV-2 with a focus on the areas of public washrooms and restaurant environments.

The topics discussed are: How the virus spreads; the risk of touching surfaces in public washrooms; surface contamination risks of different materials including plastic towels and napkin dispensers and paper refills; and the importance of handwashing.

This summary represents the current knowledge as of July 2020.

What is SARS-CoV-2?

SARS-CoV-2 is the name of the virus which causes the disease COVID-19, also called the Novel Coronavirus. In early 2020, after a December 2019 outbreak in China, the World Health Organization identified SARS-CoV-2 as a new type of coronavirus which causes a disease called COVID-19 with symptoms ranging from mild to deadly.

COVID-19 spreads very easily and sustainably between people – mainly through close contact from person-to-person [3]. Also, people without symptoms may be able to spread the virus. Information from the ongoing COVID-19 pandemic suggests that this virus is spreading more efficiently than influenza, but not as efficiently as measles, which is highly contagious. In general, the more closely a person interacts with others, and the longer that interaction, the higher the risk of COVID-19 spread [25].

SARS-CoV-2 is one of seven types of human coronavirus. Generally, coronaviruses are a large family of viruses which may cause illness in animals or humans. In humans, several coronaviruses are known to cause respiratory infections ranging from the common cold to more severe diseases such as Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS) [28, 31].

Coronaviruses are enveloped viruses – which in electron micrographs of spherical particles create an image reminiscent of the solar corona. Enveloped viruses have an outermost lipid bilayer coating and structures within the envelope – different proteins – are used to attach to and enter human cells [6]. The envelope does not make the virus more resistant, as may be thought at first glance. Due to its lipid bilayer, the envelope is quite easily destroyed by heat, soaps, alcohol, UV light, etc. When the envelope is destroyed, the virus becomes unable to infect.

Different coronavirus species are not identical, but they have some qualities in common. As SARS-CoV-2 is a new coronavirus, there is not much known about its properties. For this reason, studies of other coronaviruses could be considered when making assumptions regarding SARS-CoV-2. Experience is taken from SARS(-CoV-1) and MERS. Additionally, it is also easier to experiment with less pathogenic species, and therefore more data is available if studies on related viruses are considered.

What is the route of infection for SARS-CoV-2?

This virus is primarily spread from person to person, via small air droplets, coming from infected people sneezing and coughing, but also when speaking [7, 21]. It is most important to keep a distance from infected people. Outdoor air is preferable to being indoors in small, inadequately ventilated environments [24]. It may be possible that a person can get COVID-19 by touching a surface or object that has the virus on it, and then touching their own mouth, nose or possibly their eyes [25]. This way of transmission cannot be excluded but this is not thought to be the main way the virus spreads because the environmental stability of SARS-CoV-2 is regarded as low [4, 22]. To avoid surface transmission, washing and/or disinfecting hands is very important [1]. At this point, there is no evidence that people can be infected via water or food [7, 15].

What is the survivability of SARS-CoV-2 on surfaces and in the air?

In contrast to bacteria, which are living organisms, viruses are infectious particles without their own metabolisms. In order to multiply, viruses need a living cell as a host. Therefore, they can never grow on their own, e.g., in humid areas, as bacteria do. It is more precise to talk about inactivating a virus, rather than killing it. An inactivated virus can no longer cause infection.

Generally, the environmental survivability of coronaviruses depends on many different factors, including humidity, temperature, how many virus particles were initially added, material, presence of substances, etc. Furthermore, some parameters seem to benefit human coronaviruses, such as the stabilising effect of low temperature and high relative humidity [2, 8, 19]. The analysis of several studies reveals that human coronaviruses such as SARS, MERS or endemic human coronaviruses (HCoV) can persist on inanimate surfaces like metal, glass or plastic for up to several days.

The aerosol and surface stability of SARS-CoV-2 and SARS-CoV-1 was investigated by van Doremalen *et al*. [22]. The results indicate that aerosol and fomite transmission of SARS-CoV-2 is plausible, since the virus can remain viable and infectious in aerosols for hours and on surfaces for days (depending on the inoculum shed). The amount of virus on a surface is important. If many viruses are applied, it will take longer before decreasing to a sufficiently low number of viruses so they cannot infect anymore, compared to very few viruses being applied from the beginning. All these parameters, the difference in amount of virus applied, and the method of virus detection make it difficult to compare results between different studies.

Chin *et al*. [4] investigated the stability of SARS-CoV-2 in different environmental conditions, including survivability on tissue papers. In an experimental setting, droplets of virus culture were pipetted onto different materials and the virus titre was measured at different points of elapsed time. It was shown that at the first measurement time after 30 min of incubation, the virus load on paper was greatly reduced. After 3 hours, no virus was detectable.

In another study, data are reported on the presence of SARS-CoV-2 on inanimate surfaces under real-life conditions. An Infectious Disease Emergency Unit and a Sub-Intensive Care ward that were deemed likely to be contaminated by the presence of the virus were investigated by swabbing surfaces and objects. The results suggest that a lower level of virus was found under real-life conditions (which is different to the above-mentioned experimental studies conducted under controlled lab conditions) [5].

Coronaviruses seem to have a low stability in the environment and are very sensitive to oxidants, like chlorine [15]. Sunlight (UV light) and ozone also help destroy this virus [24]. And the virus can be efficiently inactivated by surface disinfection procedures [12].

In a study by van Doremalen *et al*. it was shown that SARS-CoV-2 was more stable on plastic and stainless steel than on copper and cardboard. On plastics and stainless steel, it can survive for several days. Survival on absorbent surfaces like paper boards and tissue paper is in the range of minutes to hours. The risk of transmission via touching of contaminated paper is low [20]. The same experiment results have been published for SARS-CoV-1[16], where large respiratory droplets of SARS-CoV containing the virus fell onto paper. Even with a higher concentration of virus than would normally occur in nasopharyngeal aspirate samples, no virus infectivity remained after the paper had dried. These findings led to the conclusion that the risk of infection via contact with droplet-contaminated paper is small.

Is there a risk of getting COVID-19 visiting a public washroom?

Since spreading of this virus is attributed mainly to air droplets/aerosols from people with COVID-19, social distancing has been considered as a major action to prevent spreading of this disease [26,29]. Additionally, frequent and thorough handwashing is another highly recommended measure [30].

Within the COVID-19 pandemic, the use of public washrooms may bear the risk of being infected because these are visited frequently by different people and they are easily crowded. Additionally, the space often has poor ventilation. Evidence suggests that COVID-19 could be transmitted via air in inadequately ventilated environments [24]. Jet air driers for drying hands have been found to increase the spreading of many different microbes, including viruses, via air to different surfaces in the washroom [13].

Surfaces in the washroom could also be contaminated with SARS-CoV-2 by sneezing, coughing or via aerosols from speaking.

Flushing the toilet without a lid has also been discussed as a potential risk. Flushing a toilet without a lid (or without closing the lid) may create aerosols, and the stools of people infected can contain many viruses. However, it is unclear whether the virus in faeces is infectious but this may be an additional source of transmission [11, 17, 23].

Considering the spatial characteristics of public washrooms, together with the fact that they are highly frequented areas, washroom visits can present a risk. This creates a dilemma. On the one hand, washrooms are not ideal places to be, but on the other hand, they should be visited for hygienic reasons. The conclusion from this could be that the visit should be efficient and short, in order to limit exposure time and to help prevent overcrowding.

Why is handwashing important?

All surfaces outside and inside the washroom could potentially harbour unwanted bacteria and viruses. For this reason, handwashing is an important last step before leaving this space [27].

Washing one's hands with soap and water, followed by drying with towels, is an efficient way to reduce both bacteria and viruses on the hands [9, 10]. SARS-CoV-2 virus is sensitive to the detergents in soap as this destroys the envelope surrounding the virus, which is needed for the virus to be virulent. Alcohol-based disinfectants also work in the same way [14].

Hand drying is a very important part of handwashing. It is the last stage of the handwashing process and must leave the hands thoroughly dried and hygienic [9, 10]. A recommended way is to use hand towels which not only absorb water but additionally use manual effects to remove bacteria and viruses. The use of disposable paper hand towels is generally considered hygienic and efficient for this purpose [18].

What should be considered to hygienically dispense paper hand towels?

There have been discussions regarding the safe use of dispensers and paper in washrooms and the risk of self-infection by touching contaminated surfaces or materials – followed by virus transmission to eyes, mouth or nose (mucus contact). Hygienically designed dispensers for paper hand towels, toilet paper and paper napkins should be easy to clean and fill. Dispenser design should allow the user to take the paper product without touching the dispenser itself. There are touch-free sensor-activated and touch-free manual hand towel dispensers available. Bearing in mind that the length of time spent in public washrooms should be limited, intuitive systems with high-speed delivery of paper towels like touch-free manual hand towel systems are recommended.

The paper itself is considered a low-risk material for maintaining and transferring viruses [4, 16, 20, 22]. Reliable and fast access to paper towels allows the user to take an additional towel that can be used to cover the door handle of the washroom in order to prevent direct touching of the door handle with clean hands when exiting.

Is using paper dispenser napkins a concern in a restaurant?

Like paper towels, napkins are made of tissue paper. Virus inactivation on absorbent materials like paper tissues ranges from minutes to hours, and the risk of transmission via touching contaminated paper is low [20]. When napkins are hygienically protected within the dispenser casing, it provides a dry environment which is unsuitable for virus survival. Therefore, paper napkins provided in dispensers should not be cause for concern regarding the transmission of SARS-CoV-2.

Summary and Conclusions

Since SARS-CoV-2 is primarily spread via small air droplets from infected people, the most important preventive measures are social distancing and frequent handwashing.

The virus could be transmitted via the air in inadequately ventilated environments like small washrooms. Therefore, washroom visits should be efficient and short in order to limit exposure time and help prevent overcrowding in the washroom.

Hygienic handwashing includes efficient hand drying. Paper towels are recommended as they not only dry hands thoroughly but also provide manual removal of any viruses or bacteria. They also serve as a method to protect hands when touching surfaces and door handles.

Touch-free manual hand towel dispenser systems deliver paper towels hygienically in a quick, intuitive and reliable way.

Generally, the risk of transferring SARS-CoV-2 virus particles from paper used as an absorbent material in paper towels and napkins is regarded as low

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