Excerpt from World Health Organization Technical Brief -Dated 3 March 2020
Water, sanitation, hygiene and waste management for the COVID-19 virus

The following excerpt is copied in its complete form but is only a small section of the entire document. Only the sections pertaining to water and wastewater are included.

The entire document can be accessed at:
https://www.who.int/publications-detail/water-sanitation-hygiene-and-waste-management-for-covid-19

Currently, there is no evidence about the survival of the COVID-19 virus in drinking-water or sewage. The morphology and chemical structure of the COVID-19 virus are similar to those of other surrogate human coronaviruses for which there are data about both survival in the environment and effective inactivation measures. Thus, this brief draws upon the existing evidence base and, more generally, existing WHO guidance on how to protect against viruses in sewage and drinking-water. This document is based on the current knowledge of the COVID-19 virus and it will be updated as new information becomes available.

1.1 COVID-19 transmission

There are two main routes of transmission of the COVID-19 virus: respiratory and contact. Respiratory droplets are generated when an infected person coughs or sneezes. Any person who is in close contact with someone who has respiratory symptoms (for example, sneezing, coughing) is at risk of being exposed to potentially infective respiratory droplets (1). Droplets may also land on surfaces where the virus could remain viable; thus, the immediate environment of an infected individual can serve as a source of transmission (known as contact transmission).

The risk of catching the COVID-19 virus from the feces of an infected person appears to be low. There is some evidence that the COVID-19 virus may lead to intestinal infection and be present in feces. Approximately 2−10% of cases of confirmed COVID-19 disease presented with diarrhea (2−4), and two studies detected COVID-19 viral RNA fragments in the fecal matter of COVID-19 patients (5,6). However, to date only one study has cultured the COVID-19 virus from a single stool specimen (7). There have been no reports of fecal−oral transmission of the COVID-19 virus.

1.2 Persistence of the COVID-19 virus in drinking-water, feces and sewage and on surfaces.

While persistence in drinking-water is possible, there is no current evidence from surrogate human coronaviruses that they are present in surface or groundwater sources or transmitted through contaminated drinking-water. The COVID-19 virus is an enveloped virus, with a fragile outer membrane. Generally, enveloped viruses are less stable in the environment and are more susceptible to oxidants, such as chlorine. While there is no evidence to date about survival of the COVID-19 virus in water or sewage, the virus is likely to become inactivated significantly faster than non-enveloped human enteric viruses with known waterborne transmission (such as adenoviruses, norovirus, rotavirus and hepatitis A). For example, one study found that a surrogate human coronavirus survived only 2 days in dechlorinated tap water and in hospital wastewater at 20° C (8). Other studies concur, noting that the human coronaviruses transmissible gastroenteritis coronavirus and mouse hepatitis virus demonstrated a 99.9% die-off in from 2 days (9) at 23° C to 2 weeks (10) at 25° C. Heat, high or low pH, sunlight and common disinfectants (such as chlorine) all facilitate die off.

It is not certain how long the virus that causes COVID-19 survives on surfaces, but it seems likely to behave like other coronaviruses. A recent review of the survival of human coronaviruses on surfaces found large variability, ranging from 2 hours to 9 days (11). The survival time depends on a number of factors, including the type of surface, temperature, relative humidity and specific strain of the virus. The same review also found that effective inactivation could be achieved within 1 minute using common disinfectants, such as 70% ethanol or sodium hypochlorite (for details, see Section 2.5 Cleaning practices).

1.3 Keeping water supplies safe

The COVID-19 virus has not been detected in drinking-water supplies, and based on current evidence, the risk to water supplies is low (12). Laboratory studies of surrogate coronaviruses that took place in well-controlled environments indicated that the virus could remain infectious in water contaminated with feces for days to weeks (10). A number of measures can be taken to improve water safety, starting with protecting the source water; treating water at the point of distribution, collection or consumption; and ensuring that treated water is safely stored at home in regularly cleaned and covered containers.

Conventional, centralized water treatment methods that utilize filtration and disinfection should inactivate the COVID-19 virus. Other human coronaviruses have been shown to be sensitive to chlorination and disinfection with ultraviolet (UV) light (13). As enveloped viruses are surrounded by a lipid host cell membrane, which is not robust, the COVID-19 virus is likely to be more sensitive to chlorine and other oxidant disinfection processes than many other viruses, such as coxsackieviruses, which have a protein coat. For effective centralized disinfection, there should be a residual concentration of free chlorine of $\geq$0.5 mg/L after at least 30 minutes of contact time at pH < 8.0 (12). A chlorine residual should be maintained throughout the distribution system.

In places where centralized water treatment and safe piped water supplies are not available, a number of household water treatment technologies are effective in removing or destroying viruses, including boiling or using high-performing ultrafiltration or nanomembrane filters, solar irradiation and, in non-turbid waters, UV irradiation and appropriately dosed free chlorine.

1.4 Safely managing wastewater and fecal waste

There is no evidence to date that the COVID-19 virus has been transmitted via sewerage systems with or without wastewater treatment. Furthermore, there is no evidence that sewage or wastewater treatment workers contracted severe acute respiratory syndrome (SARS), which is caused by another type of coronavirus that caused a large outbreak of acute respiratory illness in 2003. As part of an integrated public health policy, wastewater carried in sewerage systems should be treated in well-designed and well-managed centralized wastewater treatment works.

Each stage of treatment (as well as retention time and dilution) results in a further reduction of the potential risk. A waste stabilization pond (that is, an oxidation pond or lagoon) is generally considered to be a practical and simple wastewater treatment technology that is particularly well suited to destroying pathogens, as relatively long retention times (that is, 20 days or longer) combined with sunlight, elevated pH levels, biological activity and other factors serve to accelerate pathogen destruction. A final disinfection step may be considered if existing wastewater treatment plants are not optimized to remove viruses. Best practices for protecting the health of workers at sanitation treatment facilities should be followed. Workers should wear appropriate personal protective equipment (PPE), which includes protective outerwear, gloves, boots, goggles or a face shield, and a mask; they should perform hand hygiene frequently; and they should avoid touching eyes, nose and mouth with unwashed hands.