

The COVID-19 pandemic and recycled water

With the rapid pandemic spread of the novel coronavirus COVID-19 and its devastating health, economic and social impacts all over the globe, many concerns and uncertainties arise as to the safe reuse of recycled water and the potential transmission of the COVID-19 virus via recycled water/wastewater to humans.

As with other human coronaviruses, the principal transmission route of COVID-19 is during close contact with infected persons via respiratory droplets from coughs, sneezes and nasal secretions. Respiratory droplets may be produced during breathing but the virus is not generally airborne.

Coronaviruses are a large and diverse family of enveloped, single-stranded RNA viruses known to cause diseases in mammals and birds. In humans, coronaviruses cause respiratory infections, including common cold, which are usually mild but may also take a more severe illness such as SARS, MERS and the newly detected COVID-19. **Human coronaviruses are generally considered more fragile than other viruses with respect to disinfection and environmental factors¹.**

Research on COVID-19 is still at its very beginning and scientific data on its survival in wastewater or recycled greywater is almost non-existent. However, more scientific data is available on surrogate human coronaviruses, such as the SARS-CoV and the MERS-CoV, which also frequently cause severe illness and which may shed some light on this issue.

A study done on the survival of coronaviruses in water and wastewater found that coronaviruses die off very rapidly in wastewater, with a 99.9% reduction in 2-4 days. Survival of coronaviruses in primary wastewater was only slightly longer than secondary wastewater, possibly due to the higher level of suspended solids that offer protection from inactivation².

Coronaviruses can be found in faeces of infected persons. Based on this, it is theoretically possible that COVID-19 may be present in wastewater, where COVID-19 infections are present. More importantly, the same is true for other pathogenic viruses, bacteria and protozoa. The design and operation of processes used for the disinfection of water and wastewater are based on the most resistant and more readily transmissible and well established faecal-oral pathogens such as noroviruses, adenoviruses and hepatitis A virus. Coronaviruses are not among those most resistant to disinfection methods. This means that

¹ Wang et al. (2005) Study of the resistance of severe acute respiratory syndrome-associated coronaviruses. *Journal of Virological Methods*, 126: 171-177.

² Gundy, P.M., Gerba, C.P. and Pepper, I.L. (2009) Survival of Corona viruses in water and wastewater. *Food and environmental Virology*, 1: 10-14

conventional disinfection methods, applied to inactivate the most resistant viruses would be expected to readily inactivate COVID-19.

The US Centers for Disease Control and Prevention (CDC) is currently reviewing all data on COVID-19 transmission. At this time, the risk of transmission of the COVID-19 through sewerage systems is considered to be low. Although transmission of COVID-19 through sewage may be possible, there is no evidence to date that this has occurred³.

The WHO⁴ declared in its Technical Brief from 19.03.2020 the following:

*“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). (...) Heat, high or low pH, sunlight and common disinfectants (such as chlorine) all facilitate die off.”*

Greywater usually undergoes a 3- to 4-stage treatment (multi-barrier system) including disinfection, before the recycled (grey)water is safely used for non-potable applications.

fbr, as a professional association for the promotion and enhancement of water recycling and rainwater harvesting, and a partner in the [City Water Circles \(CWC\) Interreg project](#), can only emphasise the above assessments on the transmission potential of COVID-19 via wastewater/recycled water. Based on long experience and technical expertise in this field, we are convinced that properly operated and maintained (grey)water recycling systems are safe to operate and use with no health or environmental risks.

Given the above, we also consider that the conventional disinfection of water and wastewater, designed and operated to meet the current standards, technical specifications and guidelines, will be more than adequate to control the transmission of COVID-19 via recycled water.

According to the currently available information there also exists no increased risk of infection with the novel coronavirus COVID-19 for workers at treatment facilities, if the standard hygiene and protective measures are complied with.

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³ Centers for Disease Control and Prevention (CDC)

<https://www.cdc.gov/coronavirus/2019-ncov/php/water.html>

⁴ WHO. Water, Sanitation, hygiene and waste management for COVID-19. Technical Brief 19 March 2020. <https://www.who.int/publications-detail/water-sanitation-hygiene-and-waste-management-for-covid-19>