Water Research Center
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**"Qwaterly" drop:** The new reality imposed by the outbreak of the coronavirus COVID-19 drives our focus of interest to study its direct and indirect spread, and its influence on our lives. This Qwaterly is devoted to the virus's spread through wastewater. ENJOY!

Sincerely, Qwaterly

# Can the coronavirus COVID-19 spread via wastewater?

Avisar Dror, Tal Nadav, and Brumberg Gidon

## 1. Introduction

The outbreak of COVID-19 poses a huge challenge for all of humanity, and great effort is being made to control the epidemic's spread and eradicate the virus. But what do we really know about its behavior in an aquatic environment?

## 2. COVID-19 in wastewater and effluent in Israel

Israel is the world leader in wastewater recycling (87%) and its treatment plants are some of the most advanced in the world. Most of the treated effluent is transferred as irrigation water to the agricultural sector, or to the environment, sea and streams as surplus. On the other hand, along with our Palestinian neighbors, many homes are not connected to any sewage infrastructure at all, and most of the raw sewage flows into streams, seeps into the groundwater or at worst, flows into the streets and near the houses. It is therefore important to determine, as quickly as possible, whether the COVID-19 coronavirus has the potential to endanger public health through wastewater or effluent. This calls for an understanding of the coronavirus's "behavior" in the aquatic environment.

## 3. The coronavirus

Coronaviruses are part of a large family of viruses that cause colds, respiratory complications and fever. In severe cases, the infection can cause pneumonia, kidney failure and death. Viruses from this family have been previously identified as SARS disease transmitted to humans by cats, and MERS disease transmitted to humans by camels. Common to all types of coronaviruses is that they originate in animals and as a result of a mutation, can be passed to humans. The new strain discovered in China at the end of 2019, identified as COVID-19, is a virus that was not previously detected in humans, and whose behavior and long-term effects are still unknown.

## 4. What are the environments that can potentially contribute to the outbreak of the COVID-19 epidemic?

During the outbreak of an epidemic, due to the potential for global infection, health systems must be prepared to cope with exposure to the virus in various environments, including wastewater and effluent. If the epidemic is found to have an environmental aspect—passing through wastewater and treated water—water resources and agricultural products will also need to be monitored, which could create great difficulties for many countries and loss of control over how the virus spreads. The potential extent of the current epidemic is still unknown, but today we can see that a large and diverse population (in location and age) in most countries of the world is infected, or is at risk of becoming infected. Therefore, there is a likelihood—which should be thoroughly examined—that the world population, but particularly those in developing countries and in areas that use and depend on reclaimed water (including developed countries), will be exposed, through wastewater distribution, to the virus in an uncontrolled manner.

## 5. COVID-19 and wastewater

Despite statements by the World Health Organization and the Israeli Ministry of Health that there is no evidence of infection by exposure to wastewater, and because the world is currently dealing with the epidemic, for the time being, surveys of workers in wastewater-treatment plants in

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**5. COVID-19 and wastewater – continue…**

Israel and across the globe, and of farmers exposed to these plants' effluent, have not yet been conducted. The question "Are there any patients who have been exposed to effluent or sewage?" has not been answered, so how do we monitor the connection between sewage and infection?

**6. Does the coronavirus COVID-19 exist in wastewater?**

To answer this important question, data from the recent outbreak in China, India, and other countries in the Far East must be collected and analyzed. Assuming that true data and reliable information can be obtained, will it be possible to learn from these countries about the possibility of contamination through wastewater?

Recent research in China has shown that diarrhea may be a secondary way of transmitting the virus. In Wuhan City Hospital, 14 out of 138 patients (about 10%) were diagnosed with symptoms of diarrhea and nausea a day or two before the common symptoms of fever and dyspnea developed. Further reports of many other patients around the world experiencing bowel symptoms just days before the virus was discovered have emerged.

Furthermore, in early April 2020, a new study was published in the Netherlands that was conducted during the outbreak of COVID-19 in Europe. The study showed the presence of coronavirus RNA samples in the wastewater in large quantities, which were proportional to the size of the infected population in the area. Therefore, it was suggested that the concentration of viral RNA could be used to pinpoint areas of disease and its severity. During April and May 2020, several additional studies were conducted in other countries, showing the same results.

The findings of these preliminary studies completely contradict the World Health Organization's statement and the Israeli Ministry of Health's view, and serve as a new, critical and important factor that provides a new world view regarding the coronavirus. Thus, monitoring the discharge of wastewater and effluent must be established and implemented.

**7. Water-treatment systems and COVID-19**

Modern water and wastewater-treatment systems play an important role in public health protection. Their job is to keep potential contaminants out of the effluent and drinking water. With the outbreak of the coronavirus epidemic and with reference to the findings of the Dutch study, the following questions arise: What is the survival potential of the COVID-19 in wastewater systems? In effluent? Does it "behave" like less violent viruses? Do we have to worry about acquiring this new virus through wastewater systems as well? Or through the intense use of effluent for agricultural crop irrigation.

**8. Are we protected in our nearby environment?**

Beyond the sanitary hazard of using effluent, large quantities of raw wastewater from the West Bank and the Gaza Strip are flowing into Israel every day. As a result of the outbreak of the epidemic in our area, large titers of the virus will be present in the wastewater, in the aquatic environment and near population centers in the territories and in Israel. This wastewater, which does not undergo any disinfection process, may well contain many pathogens, coronaviruses in particular, and endanger both the Israeli and Palestinian public. Furthermore, in countries and regions where the wastewater is not treated and may even flow into the streets and streams, secondary infection of the virus can occur through domestic and wild animals. As this is a zoonotic virus, the path of infection back to humans may thus be "restored".

As mentioned, COVID-19 is a new virus for science, and at present there is no clear scientific information regarding its survival in wastewater-treatment and aquatic environments. However, because it is a health issue with real and immediate consequences for humanity as a whole, its careful and rigorous examination must be considered immediately, before deciding to proceed with "business as usual" – a potentially disastrous operation.