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The novel coronavirus and irrigation of crops

Irrigation of crops generates droplets and mist, to which employees and passers-by may be exposed leading to possible exposure to potential pathogens in this irrigation water, such as bacteria and viruses. The following question arose: is there risk of infection with the novel coronavirus (SARS-CoV-2) through irrigation of crops? The answer to this question is given below; it is based on the currently available information about SARS-CoV-2.

Irrigation with surface water

Surface water in the Netherlands is to a greater or lesser extent contaminated through discharge of treated wastewater, sewer overflow, run-off of manure from livestock, and input of animal fecal matter. In relation to COVID-19, domestic wastewater seems the most relevant contamination source of the surface water. Surface water may be contaminated with the novel coronavirus through sewage overflow of untreated domestic wastewater, or through discharge of treated domestic wastewater. When the wastewater is discharged onto the surface water, it is diluted. Subsequently, the concentration of the novel coronavirus decreases, but this strongly depends on the relative volume of the wastewater and whether it is treated or not. So the dilution rate will vary for each location. Still, it is unknown if and for how long the novel coronavirus remains infectious in surface water.

The novel coronavirus has been detected in untreated sewage water in the Netherlands^{1,2}. Studies in France and Spain have detected genetic material of the novel coronavirus in treated sewage water as well^{3,4}. It is unknown how many infectious virus particles are present in the (un)treated wastewater. Due to dilution of the (un)treated wastewater, the concentration of SARS-CoV-2 in surface water will be (much) lower than in the (un)treated wastewater. In an Italian study, genetic material of the novel coronavirus was detected in a few river waters¹⁹. There are no data on whether SARS-CoV-2 remains infectious in surface water. However the duration of infectivity in surface water seems shorter than that of other viruses, such as hepatitis A virus and norovirus⁵. Based on these data, an infection with SARS-CoV-2 contracted through irrigation with surface water seems unlikely.

The extraction of water for irrigation at discharge points of domestic wastewater is discouraged, not only because of the possible presence of SARS-CoV-2, but also because of the potential presence of other pathogens. It is recommended to position the irrigation installation in such a way that workers or passers-by do not come into contact with water droplets or mist. A previous study on the health risks of fountains has shown that there is a risk of infection with pathogens in the fountain water when the mist of the fountain is tangible⁶.

Irrigation with groundwater

The presence of SARS-CoV-2 in groundwater in the Netherlands has not yet been investigated. The quality of groundwater in the Netherlands is good, because soil passage naturally removes micro-organisms, including viruses^{7,8}. Groundwater protection is, amongst others, determined by the depth of the groundwater and the composition of the soil layers on top of it. Also, there are various protection zones, areas in which soil threatening activities are restricted or banned to protect the

groundwater quality. This is particularly the case in areas where the groundwater is used for the production of drinking water. In the Netherlands, the possibility of groundwater becoming contaminated with domestic wastewater or human feces is minimal. Consequently, exposure to SARS-CoV-2 when using groundwater for irrigation of crops is neglectable.

Background information about the novel coronavirus in feces and wastewater

The major transmission route for SARS-CoV-2 is through droplets that come into the air when an infected person coughs or sneezes⁴. SARS-CoV-2 is present in the feces of about half of the confirmed coronavirus patients. This has been shown in several, for instance in China^{9,10}, Singapore¹¹, Germany¹², France¹³ and the United States¹⁴. The novel coronavirus excreted with the feces enters wastewater and subsequently wastewater treatment plants. In the Netherlands, the genetic material of the new coronavirus has been detected in untreated wastewater^{1,2}. In France, the genetic material has also been detected in treated wastewater³. Based on the amount of genetic material, a hundred times less was detected in the treated wastewater than in the corresponding untreated wastewater. To what extent the novel coronavirus is inactivated by wastewater treatment processes is unknown.

It is yet unsure whether the novel coronavirus in wastewater is infectious for humans. Human infections through wastewater have not yet been demonstrated. In two studies^{17,18}, infectious virus has been isolated from feces, however, others studies have not been able to isolate infectious virus from feces¹². It is unclear how many infectious particles of the novel coronavirus are excreted by infected persons and enter the wastewater. A study could not culture infectious virus from wastewater⁴. It is also unknown how long the virus remains infectious in wastewater. Whether the novel coronavirus in Dutch wastewater is infectious or not, is currently investigated by RIVM. The RIVM also investigates the possible spread of SARS-CoV-2 via aerosolization.

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