

1 **What do we know about the SARS-CoV-2 coronavirus in the environment?**

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10 **Abstract**

11 In view of the current situation regarding the Covid-19 disease, a discussion is proposed
12 on the need for research focusing on the presence and evolution of the SARS-CoV-2
13 virus in water, soils and other environmental compartments, reached through
14 wastewater and sewage sludge spreading. Also, the evaluation of current treatments for
15 wastewater and sewage sludge, as well as the eventual development of new specific
16 techniques, based on sorption, nanotechnology, etc., would be of great interest for
17 controlling the environmental dissemination of these viruses in the current and eventual
18 future outbreaks.

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20 **Keywords:** Covid-19; sewage sludge; soil; viruses; water; wastewater

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22 **Discussion**

23 With thousands of people already affected by the Covid19 disease in various countries
24 around the world, and millions of people controlled regarding displacements in their

25 own countries and/or local geographic areas, it is time to add some comments on related
26 aspects, applicable now and in the coming future.

27 In fact, it should be taken into account that symptomatic (and maybe also
28 asymptomatic) affected people could spread the viruses through their excreta, which
29 would make appropriate to think on (and evaluate) effectiveness and consequences of
30 related wastewater and sewage sludge treatment and eventual subsequent spreading to
31 environmental compartments. Bowser (2020) has recently reported on the presence of
32 this virus in feces from humans. Also, Pan et al. (2020) published some of the first
33 results in this regard.

34 If this virus is not eradicated, we should think on further screening focusing on
35 wastewater (Martínez-Puchol et al. -2020- have recently published a paper dealing with
36 related aspects), but also on sewage sludge (as shown by Nag et al. -2020- evaluating
37 survival of bacteria and viruses causing different diseases, as well as in previous papers,
38 such as that by Zhao and Liu -2019), soils and sediments (Katz et al., 2018; Nag et al.,
39 2020; Zhao and Liu, 2019), crops (Ahmed et al., 2019; Nag et al., 2020; Zhao and Liu,
40 2019), animals (Pruvot et al., 2019), surface and ground-waters (Corsi et al., 2014;
41 Givens et al., 2016). Further research should also focus on eventual technical
42 treatments, including biosorbents and other materials to retain and/or inactive this and
43 other pathogens circulating in these environmental compartments, before and after
44 going out from wastewater treatment plants (in case of these treatment systems existing,
45 as it could be worse, with spreading of untreated wastes). Some previous papers (such
46 as those by Auffret et al., 2019; Hlongwane et al., 2019) could be considered as
47 reference to program future studies. Also, the “sewage epidemiology approach” could
48 be very useful, as this monitoring concept went from an initial focus on illicit drugs
49 (van Nuijs et al., 2011) to the current view (also called “wastewater-based

50 epidemiology”), covering a broad array of substances in wastewater, including virus
51 particles (Daughton, 2020; Sims and Kasprzyk-Hordern, 2020), and it would allow a
52 drastic reduction in the time needed to develop a wastewater monitoring approach
53 specifically designed for SARS-CoV-2 (Daughton, 2020).

54 When spread in the environment, some potential steps to be considered for these viruses
55 are transfer from one compartment to another, entering living beings (multicellular, but
56 maybe also unicellular in the future), proliferation, eventual mutation, transmission, ...
57 Currently, it is thought that these coronaviruses can survive for just few days in the
58 environment, out of living cells (Kampf et al., 2020), but it could be enough time to
59 reach other organisms, to mutate and change characteristics, etc. Multiple possible
60 scenarios should be considered for the coming future.

61 These eventual considerations for the close future would be taken into account as soon
62 as possible, in addition to the already in vigor measures implemented to control direct
63 spreading by the air.

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