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Background:

During the COVID-19 pandemic, water has played a key role in epidemiological monitoring of SARS-CoV-2. Our study aimed to verify if flood spillways activity during heavy rain events could be a source of SARS-CoV-2 contamination of a rural canal and consequently of human infection.

Methods:

A total of 12 water samples (2L) were collected in four sampling campaigns conducted in 2022 (April, September, November, and December) during heavy rainfall. An automated sampler located in an irrigation stream collected 250mL of water at intervals of 10' for 80' since the spillways activation (sample A), then every 20' for 160' (sample B), and finally every 30' for 240' (sample C). Each sample was pre-filtered and concentrated by tangential flow ultrafiltration according to an in-house protocol. The presence of SARS-CoV-2 and Pepper Mild Mottle Virus (PMMoV, internal control) RNA was investigated by real time RT-PCR. SARS-CoV-2 viability was tested on VERO E6 cell culture, verifying the cytopathic effects and the viral load by real time RT-PCR every 24 hours for 7 days.

Results:

PMMoV RNA was detected in all specimens assessing RNA quality. Although SARS-CoV-2 RNA was detected in all samples, except in those of November and in April sample C, there was no evidence of cytopathic effect or active replication in cell culture. RNA concentrations were generally low (0.27-6.95 gc/μL) but slightly higher in samples A than in B and C.

Conclusions:

Despite the limited number of samples collected during the experimental campaign and due to the severe drought that affected Northern Italy, our results suggest that spillways activation could be a source of SARS-CoV-2 contamination in freshwaters, but there was no evidence of risk to human health. The detection of small concentrations may be associated with the circulation, during the monitoring, of the Omicron variants, which rarely cause gastrointestinal symptoms.

Key messages:

- Spillways activation could be a source of SARS-CoV-2 contamination.
- Both environmental diffusion and infectivity of SARS-CoV-2 were investigated to better understand the risk of disease for humans.