SURVEILLING THE SARS-CoV-2 IN SEWAGE: THE CATALAN CASE

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Introduction. Shortly after the outbreak of the COVID-19 pandemic, scientists renewed their interest on the application of wastewater-based epidemiology (WBE) to track the communal circulation of SARS-CoV-2 through the quantification of its genetic traces in sewage. At national scale, such strategy was firstly implemented in The Netherlands in February 2020 and, following the Dutch example, similar sewage surveillance programs were later put into action by other countries at different scales and coverages. At the time of writing, 58 countries are currently monitoring the circulation of SARS-CoV-2 in wastewater as reported at the COVID-Poops19 website. The purpose of this work is to describe the roadmap for the implementation of a wastewater surveillance network at a national scale and to discuss the main challenges faced during its functioning.

Material and methods. It should be noted that all data generated are free for scientific use, and it can be downloaded from a public repository at the Zenodo website. The database is weekly updated and contains all molecular data obtained from the samples analyzed.

Results. In Catalonia, a Spanish region of 7,5 million inhabitants, the Public Health Agency of the Catalan government and the Catalan Water Agency promoted and funded the implementation of the Catalan Surveillance Network of SARS-CoV-2 in Sewage (SARSAIGUA) to provide information on the circulation of SARS-CoV-2 at community level that complement epidemiological & clinical data. SARSAIGUA started in 2020 by monitoring 56 WWTPs that assist 193 municipalities, representing 80% of the Catalan population. Within less than 72 hours, weekly samples are collected, analyzed, and results reported to Health authorities and finally published in an on-line dashboard. After 19 months of monitoring, the normalized daily loads of SARS-CoV-2 genes in the 56 WWTPs monitored, fairly matched the sum of COVID-19 cases along the successive pandemic waves. Moreover, a good fit was obtained between the aggregated viral load (gen copies/day/100.000 inhabitants) and the epidemiological evolution of diagnosed cases in the municipalities, served by the monitored WWTPs (r_{xy}=0.59). In 2021, SARSAIGUA started the monitoring of SARS-CoV-2 variants by sequencing sewage samples every two weeks using Oxford nanopore technology and ARCTIC primers targeting the S gene. The deployment of this sequencing approach has allowed to track the introduction and spread of the Omicron variant and the concomitant wane of the Delta variant across the territory.

Conclusions. Overall, and despite the difficulties and limitations associated to the inherent complexity of wastewater, the usefulness of WBE to rapidly detect viral transmission at community level is very helpful to Health authorities to better manage the pandemic situation. This is particularly relevant under the current scenario, where new emerging SARS-CoV-2 variants with higher fitness and transmission potential outcompete old ones in a weekly time scale.

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