VIGIE COVID-19: better monitoring the epidemic's resurgence

Having taken advantage of the experience acquired since April, Veolia created and developed VIGIE COVID-19 in France, an early warning system for the presence of traces of coronavirus SARS-CoV-2 in wastewater, an indirect reflection of the virus' circulation in the population. Its aim is to give local authorities a new indicator of choice to better anticipate and monitor epidemiological trends in their region.

A warning indicator, this offer is an additional tool in local authorities' health arsenal to anticipate hospitalization peaks by almost two weeks on average. Of course, a strict correlation has not been established between the concentration of traces of the virus entering the wastewater treatment plant and the epidemic's development in the population. However, the international scientific literature generally agrees that it is possible to detect the virus' genetic material in wastewater up to several weeks before the spike in hospitalizations. It makes a good addition to more targeted epidemiological measurement tools that is all the more representative as it takes the entire population into account (including people who have not been tested or are asymptomatic). To develop its tool, keen above all to protect its employees at wastewater treatment facilities, Veolia relied on its Research & Innovation (R&I) laboratory — at the forefront of environmental microbiological analysis — and on partner laboratories selected by the R&I teams based on criteria concerning the reliability and robustness of their analysis protocols and their results. To convey its expertise, the Group also joined the OBÉPINE network (see boxed text), of which it is a partner. The VIGIE COVID-19 offer therefore combines a detection tool and a dashboard for interpreting and communicating the results. The Group delivers it to local authorities looking to supplement the epidemiological data available on a departmental scale. In the long term, VIGIE COVID-19 could be rolled out to all its public and tertiary sector clients worldwide, possibly incorporating more precise tracing.

OBÉPINE TRACKS THE VIRUS IN WASTEWATER

From April 2020, several laboratories supported by the French Ministry of Higher Education, Research and Innovation launched the OBÉPINE *(OBservatoire ÉPIdémiologique daNs les Eaux usées* – Wastewater Epidemiological Observatory) monitoring network. Its mission is to monitor the activity of the virus across France by analyzing samples from over 150 wastewater treatment plants, in order to make forecasts about its circulation. As a provider, Veolia is responsible for its operational implementation in the forty or so chosen facilities that it manages on behalf of its clients, with their prior agreement. And for the local authorities not selected by the OBÉPINE project, Veolia's VIGIE COVID-19 offer is available as an alternative means of closely monitoring a region.

https://www.enseignementsup-recherche.gouv.fr/cid152984/suivi-des-traces-de-covid19-dans-les-eaux-usees-le-m.e.s.r.i.-augmente-l-ambition-du-projet-obepine.html

AN EARLY WARNING TOOL: THE VIGIE COVID-19 PROCESS

1 IN WASTEWATER

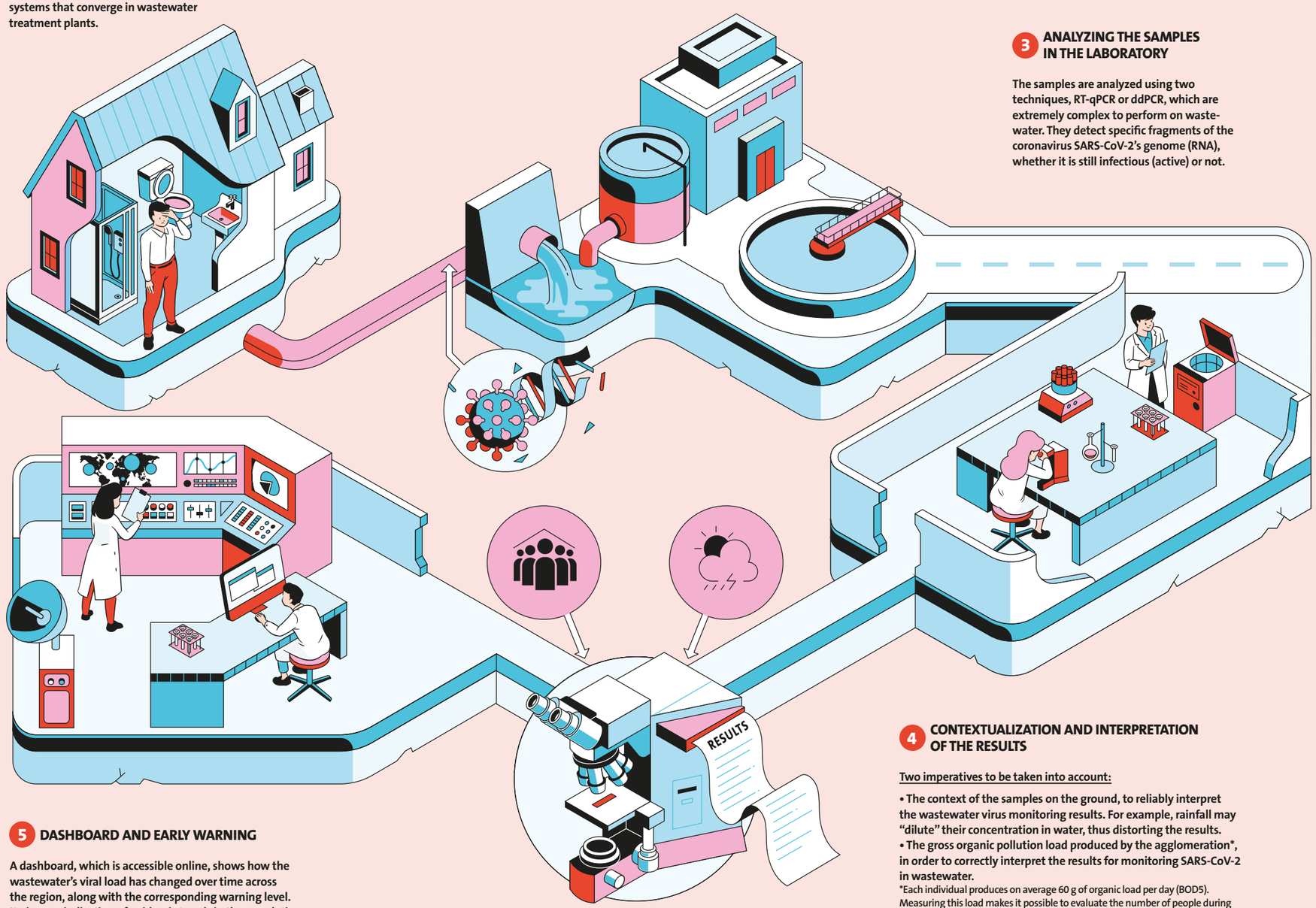
Infected individuals, whether symptomatic or not, excrete the virus in their feces. Traces of SARS-CoV-2 are therefore found in the wastewater collected by sewer systems that converge in wastewater treatment plants.

2 SAMPLING FROM THE INFLOW TO THE WWTP

Once a week, a sample is taken from the inflow to the wastewater treatment plant. Due to its 24-hour duration, it takes into account effluent variability over the course of the day. The samples are then sent to a partner analytical laboratory.

3 ANALYZING THE SAMPLES IN THE LABORATORY

The samples are analyzed using two techniques, RT-qPCR or ddPCR, which are extremely complex to perform on wastewater. They detect specific fragments of the coronavirus SARS-CoV-2's genome (RNA), whether it is still infectious (active) or not.



4 CONTEXTUALIZATION AND INTERPRETATION OF THE RESULTS

<u>Two imperatives to be taken into account:</u>

• The context of the samples on the ground, to reliably interpret the wastewater virus monitoring results. For example, rainfall may "dilute" their concentration in water, thus distorting the results.
• The gross organic pollution load produced by the agglomeration*, in order to correctly interpret the results for monitoring SARS-CoV-2 in wastewater.

*Each individual produces on average 60 g of organic load per day (BOD5). Measuring this load makes it possible to evaluate the number of people during the sampling. This will determine if the population sampled is comparable from one week to the next. Finding 10 viruses per liter for 100 people and 10 viruses per liter for 150 people the next week is not comparable.

5 DASHBOARD AND EARLY WARNING

A dashboard, which is accessible online, shows how the wastewater's viral load has changed over time across the region, along with the corresponding warning level. It gives an indication of epidemic trends in the population. The higher the number of people affected by Covid-19, the more the virus is detected in wastewater.