Controlling and Preventing Covid-19 Clusters
with a Wastewater Testing Strategy
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Case study of nursing homes for the elderly
November 3, 2020

Synopsis

The detection of SARS-CoV-2 in wastewater is a forewarning of future Covid-19 outbreaks and enables the implementation of a targeted prevention strategy. This is the conclusion of a Sanitary Surveillance study carried out on wastewater from September to October 2020 by the French Navy firefighters battalion in Marseille (BMPM), in collaboration with C4Diagnostics biotech company. The study shows that new epidemic outbreaks can be anticipated, making it possible to enforce targeted preventive measures such as testing, tracing and isolating people, as well as verifying possible contamination of the premises.
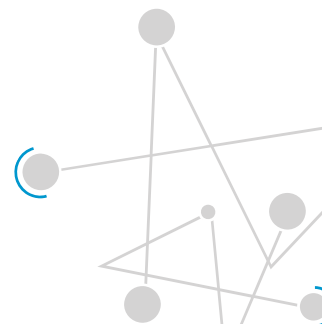
Used in the frame of a weekly surveillance of a network of 78 nursing homes for elderly people (EHPAD) in Marseille (France), the detection of SARS-CoV-2 in wastewater allowed these facilities to take the necessary sanitary measures to avoid the spread of the virus within their premises.

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Context

As Covid-19 arose in the winter of 2019, a fatal infectious disease caused by the SARS-CoV-2 virus, various detection tools were developed[1]. EHPAD surveillance makes a good case study of the usefulness of those tools to prevent Covid-19 outbreaks; using a combined approach of wasterwater testing and people screening for SARS-CoV-2.

Several reports showed a high mortality for the elderly residents living in EHPADs and in medico-social establishments (MSE), accounting for more than a third of Covid-19 deaths during the first epidemic wave[2]. A number of studies linked the presence of SARS-CoV-2 in wastewater systems to the clinical cases in the same areas [3-6]. Some have reported the detection of SARS-CoV-2 in environmental samples several days before clinical cases of the virus were reported. Hence, the WHO has issued recommendations on the relevance of testing wastewater to prevent clusters outbreak[7].

Development of a test for the detection of SARS-CoV-2 virus in wastewater.

C4Diagnostics, a French biotech company expert in designing, developing and marketing diagnostic solutions for infectious diseases, had previously developed a range of **solutions for the detection of SARS-CoV-2 from air samples, on surfaces and in Humans**. In the framework of its collaboration with the BMPM, C4Diagnostics has developed a protocol for sample collection, sample preparation and detection of SARS-CoV-2 from wastewater, by RT-PCR (detection limit of 100 genomic copies/ml, corresponding to 100 viral particles/ml).


Members of COMETE team
Photo credentials: ©BMPM

Tests being performed in C4Diagnostics lab

Result of the surveillance and prevention campaign of Covid-19 in EHPADs

In collaboration with the BMPM and its COMETE unit (COvid Marseille Environmental TEsting), from September 23rd to October 16th, C4Diagnostics has analyzed 272 samples from 78 EHPADs in Marseille. Of the 272 samples analyzed, 25 were found to be SARS-CoV-2 positive (Chart 1).
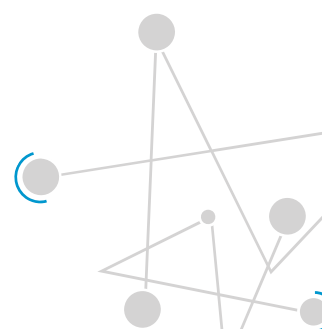
TEST RESULTS OF THE 272 WASTEWATER SAMPLES OF THE 78 EHPADS COLLECTED BY THE BMPM
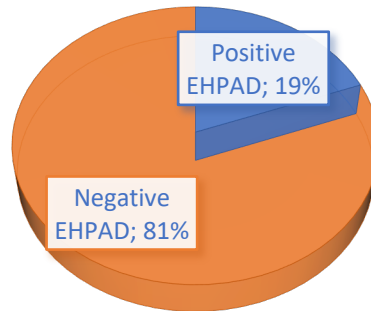
Positive EHPAD; 19%

Negative EHPAD; 81%

Chart 1: Test results of EHPAD surveillance campaign

Of the 78 EHPADs monitored on a weekly basis, 15 were tested positive for SARS-CoV-2 virus. These EHPAD were able to **quickly implement screening campaigns amongst their residents and their staff,** so as to trace back and detect as early as possible the contaminated persons (residents and staff) and put in place **appropriate measures to avoid an epidemic cluster.**

Name	Sampling date	Results	Sampling date	Results	Sampling date	Results	Sampling date	Results
Center 1	23/09/2020	Negative	30/09/2020	Negative	07/10/2020	Positive	12/10/2020	Negative
Center 2	25/09/2020	Negative	02/10/2020	Negative	09/10/2020	Positive	13/10/2020	Negative
Center 3	21/09/2020	Negative	30/09/2020	Negative	06/10/2020	Negative	13/10/2020	Positive
Center 4	22/09/2020	Negative	30/09/2020	Negative	07/10/2020	Positive	14/10/2020	Negative
Center 5	22/09/2020	Negative	30/09/2020	Positive	07/10/2020	Negative	14/10/2020	Negative
Center 6	22/09/2020	Negative	30/09/2020	Positive	07/10/2020	Negative	14/10/2020	Negative
Center 7	22/09/2020	Negative	30/09/2020	Positive	07/10/2020	Negative	14/10/2020	Positive
Center 8	23/09/2020	Positive	01/10/2020	Positive	08/10/2020	Negative	15/10/2020	Negative
Center 9	23/09/2020	Positive	01/10/2020	Negative	08/10/2020	Positive	15/10/2020	Positive
Center 10	24/09/2020	Negative	02/10/2020	Positive	08/10/2020	Negative	15/10/2020	Negative

Nothing to report

Warning to the EHPAD

Return to normal after systematic screening and isolation of positive cases

Table 1: Impact of Screening and Isolation Measures in EHPADs

At least two EHPADs where traces of the virus were found in the sewage system were not aware of any residents or staff infected with SARS-CoV-2. These EHPADs were able to confirm the presence of cases after a RT-PCR screening campaign of their residents and staff[*].

Following this screening campaign, **one of the EHPADs detected only a single positive resident who could be isolated immediately**. Being able to detect a single case among all residents demonstrates

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[*] Information obtained from EPHAD Managers

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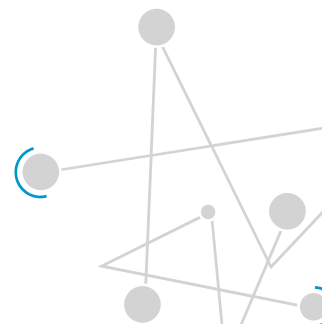
the high sensitivity of the test on wastewater. As a result of this early detection and the precautionary measures taken consequently, **no clusters were detected in the following day in that EHPAD**.

Conclusion

The current study carried out on EHPADs' wastewater demonstrates the benefit of a SARS-Cov-2 surveillance campaign in terms of prevention of new outbreaks of Covid-19, especially amongst a highly vulnerable population. Wastewater testing is a particularly efficient, rapid and cost-effective tool for routine monitoring of SARS-Cov-2. The case of the EHPAD with a single case of contamination mentioned above shows the sensitivity and relevance of this approach.

Tests on wastewater allow regular monitoring at the scale of a facility. Combined with targeted screening of individuals, this approach reduces the risks of virus clusters in this particularly fragile population and stands as **a potential tool for the surveillance and prevention of the Covid-19 epidemic**.

References:

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