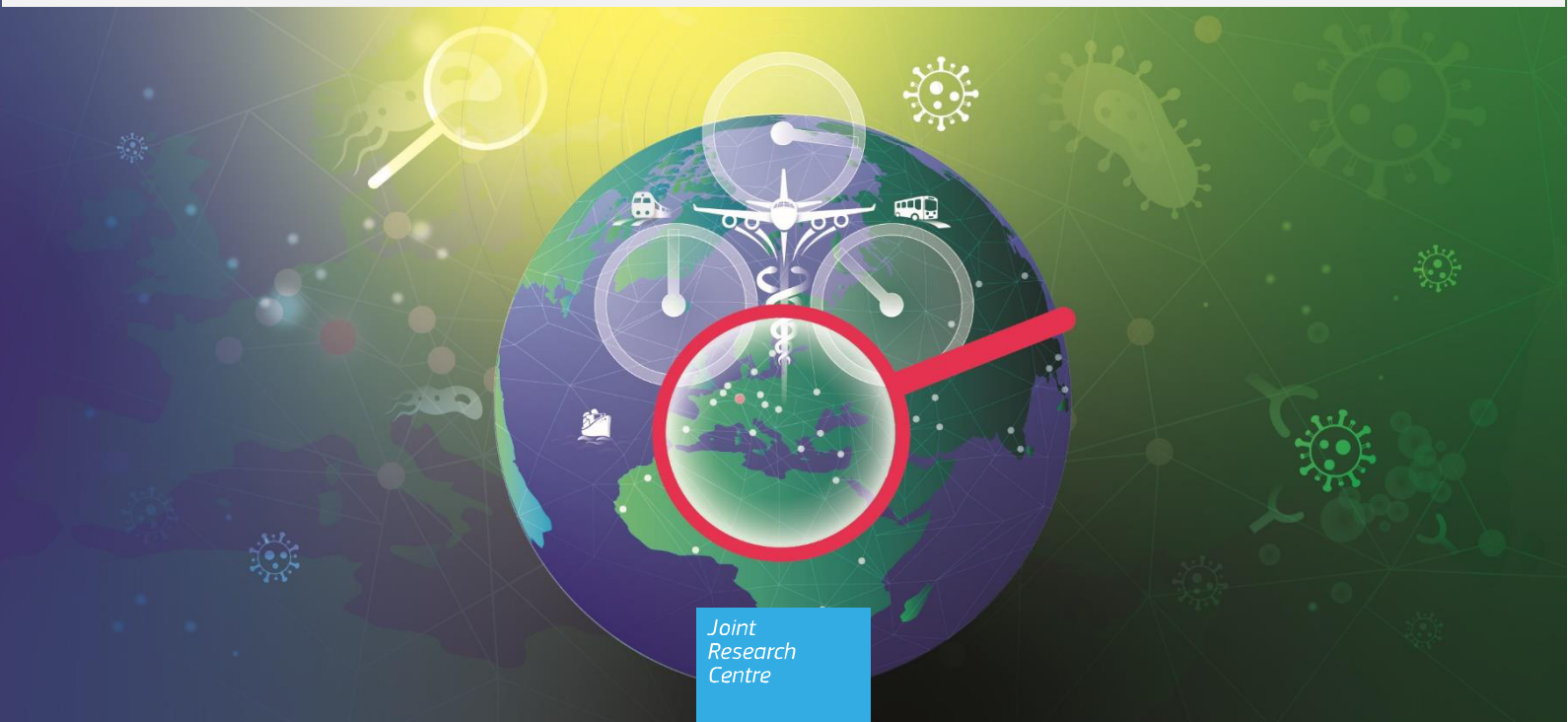
European Commission

The International Conference "Towards a Global Wastewater Surveillance System for Public Health"

GLOWACON 2023 - The Conference Proceedings

Gawlik, B.M., Comero, S., Tavazzi, S., Maffettone, R., Głowacka, N., Pierannunzi, F., Sion, S., Casado Poblador, T., Bausa Lopez, L., Philipp, W., Tessarolo, A., Burgos-Gutierrez, A.

2024



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JRC137385

PDF ISBN 978-92-68-14831-0 doi:10.2760/425638 KJ-05-24-292-EN-N

Luxembourg: Publications Office of the European Union, 2024

How to cite this report: European Commission, Joint Research Centre, Gawlik, B.M., Comero, S., Tavazzi, S., Maffettone, R., Głowacka, N., Pierannunzi, F., Sion, S., Casado Poblador, T., Bausa Lopez, L., Philipp, W., Tessarolo, A. and Burgos-Gutierrez, A., *The International Conference "Towards a Global Wastewater Surveillance System for Public Health"*, Publications Office of the European Union, Luxembourg, 2024, https://data.europa.eu/doi/10.2760/425638, JRC137385.

Wastewater based surveillance for endemic pathogens: meaning for public health

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WBE is by now well known as a valuable tool to monitor the viral circulation in a community, to track emerging viruses/variants, to give early warning for the onset outbreaks.

But, to be really representative, WBE needs good quality data, coming from validated and standardized techniques, identification of biases, correction and normalization of data. Many studies have analyzed the correlations between WBE for SARS-CoV2 and clinical data for COVID, finding variable results, depending on uncertainties, coming from both kinds of surveillance (1).

The lesson learned from COVID during the pandemic emergency can today be transferred to the surveillance for the COVID itself, considering its present endemicity, as well as for other already endemic pathogens. Nevertheless, to this aim several conditions must be satisfied, e.g. the pathogen elimination through feces, the availability of reliable detection methods, the persistence along the sewerage network, the relations with cases.

In order to explore the possibility of applying WBE to other pathogens we analyzed sewages collected for the SARI Italian Surveillance (2), also for Human Adenovirus (HAdV), Norovirus Genogroup II (NoVGGII), Non Polio Enterovirus (NPEV), Influenza virus (IV) and Respiratory Syncitial Virus (RSV), besides SARS-CoV2. Samples were taken from 4 different Wastewater Treatment Plants (WWTPs), in the North of Tuscany (Italy), during a 12 months period and analyzed with the same methods applied for the SARI project.

The results show different correlations between SARS-CoV2 WBE data and the COVID incidence ones according to the period and site. For the other viruses, clinical data were unavailable or available only at national level (influenza and RSV). The detection of NoVGGII was the most frequent (84.3%), without differences observed according to the season. The HAdV was detected in the 80.2% of samples and showed differences among seasons and sites. NPEV were present in the 44.2 % of samples with a higher frequency during the summer. IV was never detected, probably for a method failure. RSV was detected only in 36.9 % of samples during the period corresponding to the peak in the Italian National Respiratory virus surveillance system.

In conclusion, WBE can be considered an important tool for the surveillance of endemic infections, owing to its advantages: the cost effectiveness, the anonymity, the acceptability, the possibility of showing all infections and not only the symptomatic ones. On the other hand, methods should be standardized specifically for all pathogens, taking in account possible interferences of biological and chemical factors, also along the sewerage networks. The advantages of clinical surveillance, coming from the availability of standard methodologies, the possibility of contact tracing and of evaluating the efficacy of vaccines and therapies, can be hampered mainly by the lack of data about asymptomatic infections and the difficulties in setting up such kind of surveillance.

Finally, and integrated surveillance, combining the WBE and the clinical ones, could be timely and useful to correct biases of both approaches, thus allowing a more effectiveness in planning and evaluating preventive measures and interventions

To build an integrated clinical and environmental surveillance a deep understanding of both is needed, with a strong relations and dialogue between the WBE specialists and clinical epidemiologists, to develop environmental and epidemiological models to represent situations and to simulate the effects of interventions.

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