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Towards the veterinary diagnostics of the future

Main topic : One Health

Monitoring respiratory viruses in wastewater in a one health purpose

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INTRODUCTION

During the coronavirus disease 2019 (COVID-19) pandemic, the importance of the one health concept has been established. Indeed, it had been demonstrated that respiratory viruses like SARS-CoV-2 responsible of the COVID-19 or the influenza viruses are shed in feaces even in asymptomatic patients and before first symptoms for symptomatic ones. Moreover, with the decreasing of contamination and the end of isolation when contracting the COVID-19 in more and more countries, the number of screenings test has declined. However, it is difficult to exclude an emergence of new variants which could create a rebound in contaminations, without forgetting that other respiratory viruses such as influenza virus are rarely researched with screening tests. Therefore, a solution to monitor in time epidemics of multiples pathogens without realize millions of individual testing could be to follow the contamination level in Human environment. The wastewater seems to be a good way to assess the contamination level for pathogens. For those reasons we evaluated the feasibility of detecting and quantifying the SARS-CoV-2 and influenza viruses in wastewater. Another key issue in the monitoring of epidemics is the spreading flow between countries. In order to offer a global epidemiological surveillance BioSellal also assessed the possibility of researching those viruses in aircraft wastewater.

MATERIAL & METHODS

To evaluate the possibility of quantifying the SARS-CoV-2 and influenza viruses in wastewater, some pilot missions have been realized in France, in United states of America, in United Arab Emirates and in Ukraine. In any of these missions, a quantification of SARS-CoV-2 with a variant identification and a quantification of influenza viruses was performed by reverse transcription real time polymerase chain reaction (RT-qPCR) kits manufactured by BioSellal. Those studies concerned both aircraft wastewater and sewers wastewater.

RESULTS

In these different studies results, it has been possible to detect and quantify the SARS-CoV-2 in wastewater as well as influenza viruses. We could observe that sensitivity is a key for detecting the low quantity of nucleic acids contained in wastewater. Moreover, it was also possible to demonstrate an important correlation between patients in hospital and the quantity of SARS-CoV-2 present in wastewater. Concerning SARS-CoV-2 variant, specifics mutations for the Delta variant and for the Omicron variant where targeted by RT-qPCR. It was also possible to quantify these mutations but difficult to establish a ratio of different variants comparing the global SARS-CoV-2 quantification and at the sight of the rapid mutations of viruses.

DISCUSSION AND CONCLUSION

These different studies confirm the interest of quantifying respiratory viruses in wastewater and more broadly in Human environment. Following this, BioSellal has developed two detection and quantification kits especially designed for the pressures of wastewater: Bio-T kit® Environmental SARS-CoV-2 and Bio-T kit® Environmental Covid & Flu. Moreover, given that monitoring the variant evolution can be difficult, we currently evaluate the possibility of sequencing those viruses in wastewater.