Development of Cost-effective Sensitive Methods for Pathogen Detection in Community Wastewater for Disease Surveillance

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Abstract : Global pandemic coronavirus disease (COVID-19) caused by Severe acute respiratory syndrome SARS-CoV-2, to control the spread of the COVID-19 pandemic, wastewater surveillance has been used to monitor SARS-CoV2 prevalence in the community. The challenging part is establishing wastewater surveillance; there is a need for a well-equipped laboratory for wastewater sample analysis. According to many previous studies, reverse transcription-polymerase chain reaction (RT-PCR) based molecular tests are the most widely used and popular detection method worldwide. However, the RT-qPCR based approaches for the detection or quantification of SARS-CoV-2 genetic fragments ribonucleic acid (RNA) from wastewater require a specialized laboratory, skilled personnel, expensive instruments, and a workflow that typically requires 6 to 8 hours to provide results for just minimum samples. Rapid and reliable alternative detection methods are needed to enable less-well-qualified practitioners to set up and provide sensitive detection of SARS-CoV-2 within wastewater at less-specialized regional laboratories. Therefore, scientists and researchers are conducting experiments for rapid detection methods of COVID-19; in some cases, the structural and molecular characteristics of SARS-CoV-2 are unknown, and various strategies for the correct diagnosis of COVID-19 have been proposed by research laboratories, which are presented in the present study. The ongoing research and development of these highly sensitive and rapid technologies, namely RT-LAMP, ELISA, Biosensors, GeneXpert, allows a wide range of potential options not only for SARS-CoV-2 detection but also for other viruses as well. The effort of this study is to discuss the above effective and regional rapid detection and quantification methods in community wastewater as an essential step in advancing scientific goals.