

## Documents

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**Portable Electrochemical Biosensors Based on Microcontrollers for Detection of Viruses: A Review**

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**Abstract**

With the rise of zoonotic diseases in recent years, there is an urgent need for improved and more accessible screening and diagnostic methods to mitigate future outbreaks. The recent COVID-19 pandemic revealed an over-reliance on RT-PCR, a slow, costly and lab-based method for diagnostics. To better manage the pandemic, a high-throughput, rapid point-of-care device is needed for early detection and isolation of patients. Electrochemical biosensors offer a promising solution, as they can be used to perform on-site tests without the need for centralized labs, producing high-throughput and accurate measurements compared to rapid test kits. In this work, we detail important considerations for the use of electrochemical biosensors for the detection of respiratory viruses. Methods of enhancing signal outputs via amplification of the analyte, biorecognition of elements and modification of the transducer are also explained. The use of portable potentiostats and microfluidics chambers that create a miniature lab are also discussed in detail as an alternative to centralized laboratory settings. The state-of-the-art usage of portable potentiostats for detection of viruses is also elaborated and categorized according to detection technique: amperometry, voltammetry and electrochemical impedance spectroscopy. In terms of integration with microfluidics, RT-LAMP is identified as the preferred method for DNA amplification virus detection. RT-LAMP methods have shorter turnaround times compared to RT-PCR and do not require thermal cycling. Current applications of RT-LAMP for virus detection are also elaborated upon. © 2022 by the authors.

**Author Keywords**

amperometry; electrochemical biosensors; electrochemical impedance spectroscopy; potentiostat; RT-LAMP; virus detection; voltammetry

**Index Keywords**

diagnosis, genetic procedures, genetics, human, nucleic acid amplification techniques, pandemic, point of care system, procedures, virus; Biosensing Techniques, COVID-19, Humans, Nucleic Acid Amplification Techniques, Pandemics, Point-of-Care Systems, Viruses

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