Perspectives of Biosensors Integrated Point of Care Testings for Personalized Screening of Coronavirus Disease

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Abstract

As the COVID-19 pandemic is rapidly spreading, low-cost, reliable, fast, and sensitive testing methods are urgently required to mitigate the global spread of the COVID-19 pandemic and to screen for immunity among large populations. Over the past decades, diagnostic testing of infectious disease has steadily moved out of the central laboratory and into testing sites closer to patients. This testing modality, referred to as point-of-care testing (POCT), has enabled laboratory service providers to perform testing wherever the patient is located, facilitating disease diagnosis, monitoring, and management. Dramatic technological innovations in POCT have been made during the past few years. For instance, the development of miniaturized biosensing devices with integration of functional materials, artificial intelligent, and internet of things, has been considered the most critical component of POCT for mass public testing; due to the increased test accuracy, fast response, precision, and easier connection and management of data. POCT provide users the ability to perform all steps of the test, from sample collection to test result readout, users can know, within minutes, whether their test result is positive or negative.

Without the need for a trained professional, POCTs are typically designed in a manner that does not require complicated machinery or devices and can ideally be used in an at-home setting by consumers. Anyone and everyone can therefore be tested anywhere and everywhere to allow them immediately to act to seek professional help, which is especially essential during the COVID pandemic.

In this talk, we describe a novel design that combines the traditional POC lateral flow strip tests and electrochemical impedance sensor with a commercialized smartphone-enabled glucometer for portable and quantitative detection of a non-glucose target. The concept is demonstrated by using an oxidative DNA damage biomarker and the protein biomarker of Zika virus. We establish a novel method that transforms the detection of the target to the detection of an nanozyme based converting enzymatic reaction for enabling quantitative analysis. Considering the inherent advantages of the personal glucose meter, the demonstration of this device, therefore, may inspire you the new opportunities for the development of an ASSURED i.e., affordable, sensitive, specific, user-friendly, rapid, robust, equipment free, and deliverable systems for COVID infection diseases.

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