World Journal of Advanced Research and Reviews
eISSN: 2581-9615 CODEN (USA): WJARAI
Cross Ref DOI: 10.30574/wjarr
Journal homepage: https://wjarr.com/

(REVIEW ARTICLE)

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Evaluation of simple biosensors for efficient detection of coronavirus: A comprehensive review for the development of real-time monitoring systems

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World Journal of Advanced Research and Reviews, 2022, 14(02), 499–504

Publication history: Received on 15 April 2022; revised on 17 May 2022; accepted on 20 May 2022

Article DOI: https://doi.org/10.30574/wjarr.2022.14.2.0470

Abstract

The origin of the virus known as coronavirus is unknown; the fact that this is the case lends credence to the opinion of the World Health Organization (WHO), which states that humans were most likely responsible for its genesis. At this very moment, the whole universe is confronted with a problem in the form of a catastrophic health crisis brought on by a widespread outbreak of the coronavirus. Even though it has been under control for a substantial length of time, this outbreak has not yet been brought under control or generated positive outcomes. Despite this, there has been no indication that it will. This is in spite of the fact that significant efforts have been invested in testing for COVID-19 contamination, isolating infected individuals, and isolating people who have been in touch with those infected cases. The Review of Simple Biosensors for Rapid Detection of Coronavirus recognized the evaluation of current proposals uncovered by researchers and bioengineers from all over the world about methods to control a coronavirus pandemic by rapid testing, in particular the review of simple biosensors. These researchers and bioengineers found current proposals about methods to control a coronavirus pandemic by rapid testing. These researchers and bioengineers uncovered the examination of the most recent suggestions. In recent years, the primary focus of biosensors as effective analytical equipment has been on full samples, with the ability to mark specimens. This shift in emphasis came about because of a shift in terminology. This has been shown to be the case in human as well as animal samples. In light of this, we have decided to do a comprehensive assessment of recently established biosensing technologies. Our main goal in doing this is to make it easier to spot coronavirus pandemics, which is why we are doing it.

Keywords: SARS-CoV-2; COVID-19; Rapid; Point-of-care testing; Coronavirus; Facile Biosensor

1. Introduction

A formal declaration was made that the most recent pandemic, which is a coronavirus infection and is known as COVID-19, is a pandemic. According to [1], the coronavirus utilizes its spike protein in order to infiltrate the cell and delay the reaction of the immune system. Because of this, by the time the immune system reacts, the infection will have developed to a point where it will be difficult to fight, and this will take place before the immune system has the chance to respond [2]. Consequently, the infection will be difficult to combat. Coronaviruses are contagious viruses that may move easily between animals and people. Transmission may take place in either direction. People in the Middle East are becoming ill with a respiratory illness that is not caused by one coronavirus, not caused by two coronaviruses, but is caused by all three forms of coronavirus. This means that the disease cannot be traced back to a single coronavirus. Researchers are investigating the SARS coronavirus in the hopes of generating an immediate response for the angiotensin-changing

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enzyme II (ACE2) in its position as a mobile permitting admission strain [3]. Antibodies, vaccines, and drugs are being made right now to stop the virus from getting into cells, slow down the immune response, and treat the disease [3].

Conventional procedures, which must be completed after a significant amount of time and effort, are still considered to be the industry standard in the field of biosensor production [4]. The preliminary report from the project, which is based on biosensors for quick detection and the capacity to infect several species, including humans, is now being evaluated for its usefulness. There is a possibility that several animals, including humans, might be infected. The modern lateral flow method, which is completely based on mature structures and has a more rapid detection approach that has developed with the assistance of biosensors and 3D printing, amongst other technologies, may now be used for efficient screening of coronavirus. This method was developed with the assistance of biosensors and 3D printing, amongst other technologies. This method was made with the help of technologies like biosensors and three-dimensional printing, among others.

2. A platform for microfluidic biosensors that integrates numerical analysis

This article shows a numerical model that is dependable and stable, and it is constructed fully using CVFEM. The model is an exact reproduction of a microfluidic biosensor, and it takes into account the many adjustments that may be made to the input values as well as the repercussions of an acceptable level of agreement with data that is already available from reviews. The first four steps of the process of constructing a biosensor that makes use of microfluidics are shown in Figure 1, as is well known to those familiar with the topic. In the first step of the process, the virus and the environment in which it was found are researched. In the second step, a microfluidic device that contains a biosensor is theoretically built. In the third phase of the process, a numerical model is used to simulate the flow of the buffer fluid, in addition to convection, diffusion, and the reactivity of the molecules that are centered inside the biosensor. The layout is then adjusted based on the findings in step 4, and the maximum design parameters that affect the performance of the proposed biosensor are assessed [12].

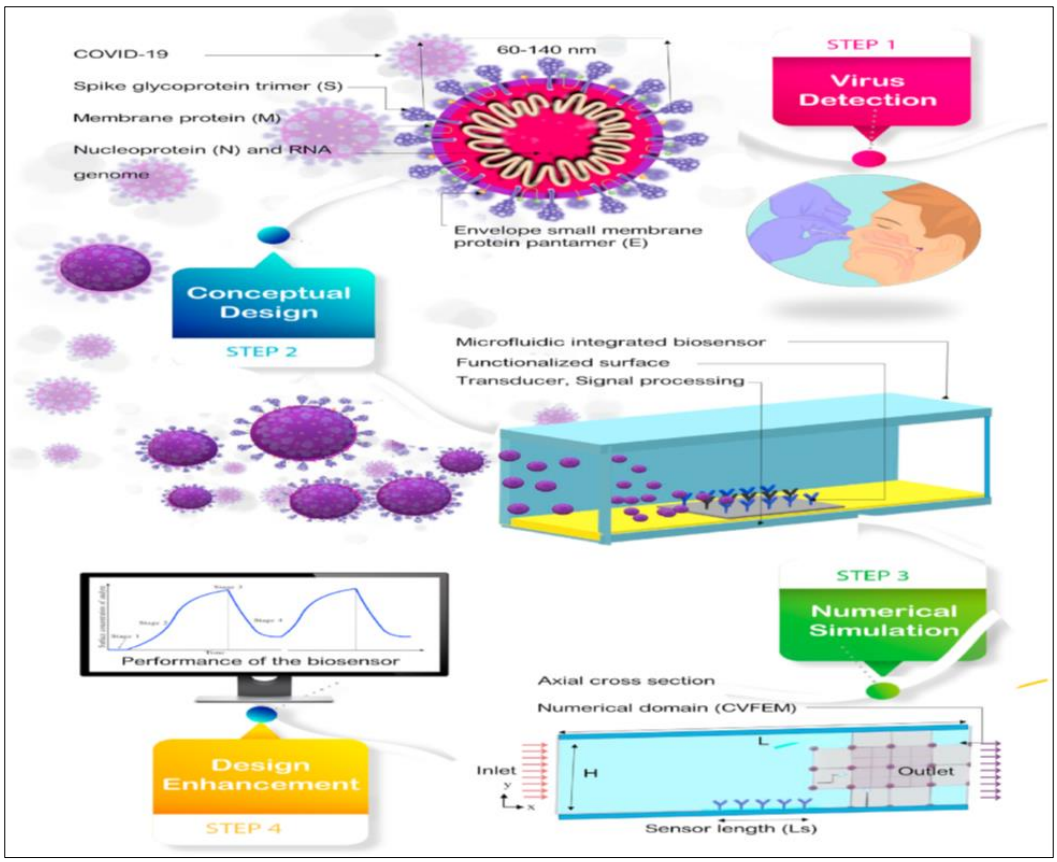

Figure 1 Four distinct design ranges for biosensors

Four distinct design ranges for biosensors that are conceivably attainable via the use of computational fluid dynamics are shown in Figure 1. In Step 1, research is conducted on the virus that is the subject of this inquiry. In Step 2, a

conceptual design is produced. In step 3, you will do numerical analysis at the specified location and adjust the design; in step 4, you will concentrate on the outcomes of the simulation [11].

3. Comparative analysis of the various nucleic acids

Biosensors are valuable pieces of analytical equipment because they give sensitive readout alerts and assessment of coronavirus. This combination was referred to as the "MRT-LAMP-LFB" [5]. For virus, a biosensor that is principally CRISPR gene Cas12 has been created, and this biosensor has been combined with a lateral float test. Because of the combination of these factors, the result may be produced in about half an hour (Fig. 2A) [6]. After the RNAs have been extracted from the patient's samples, they are put through a process known over a period of twenty minutes at a temperature of sixty-five degrees Celsius. This occurs after the first step has been completed. A dual-practical plasmonic biosensor that combines plasmonic photothermal (PPT) impact and localized surface plasmon resonance (LSPR) sensing transduction could detect COVID-19 in a clinical setting. This biosensor is referred to as a dual-practical plasmonic biosensor [7] (Fig. 2B). Both of these benefits contribute to an improvement in the diagnostic accuracy of medical screenings; the first is that the strain that is put on tests based on PCR is reduced, and the second is that a reliable and clean effect detection platform is provided. [8] created a fluorescent biosensor that was entirely based on a DNA nano-scaffold hybrid chain reaction expeditiously RNA biosensor for quick detection (DNHCR). After that, this investigation was written up and presented in Science, which is a scholarly publication (Fig. 2C). Long strands of DNA are used to build the DNA nano scaffolds in this specific biosensor. The sensing details in this biosensor are self-quenching probes (H1), and the biosensor itself is a kind of biosensor. Both of these processes will be carried out by the biosensor on its own. It is responsible for doing so. This particular DNHCR biosensor demonstrates outstanding capability in recurrent medical diagnosis by having the ability in little ten minutes and temperatures ranging from 15 to 35 degrees Celsius. Additionally, it is able to do so regardless of whether the sample is at 15 degrees Celsius or 35 degrees Celsius.

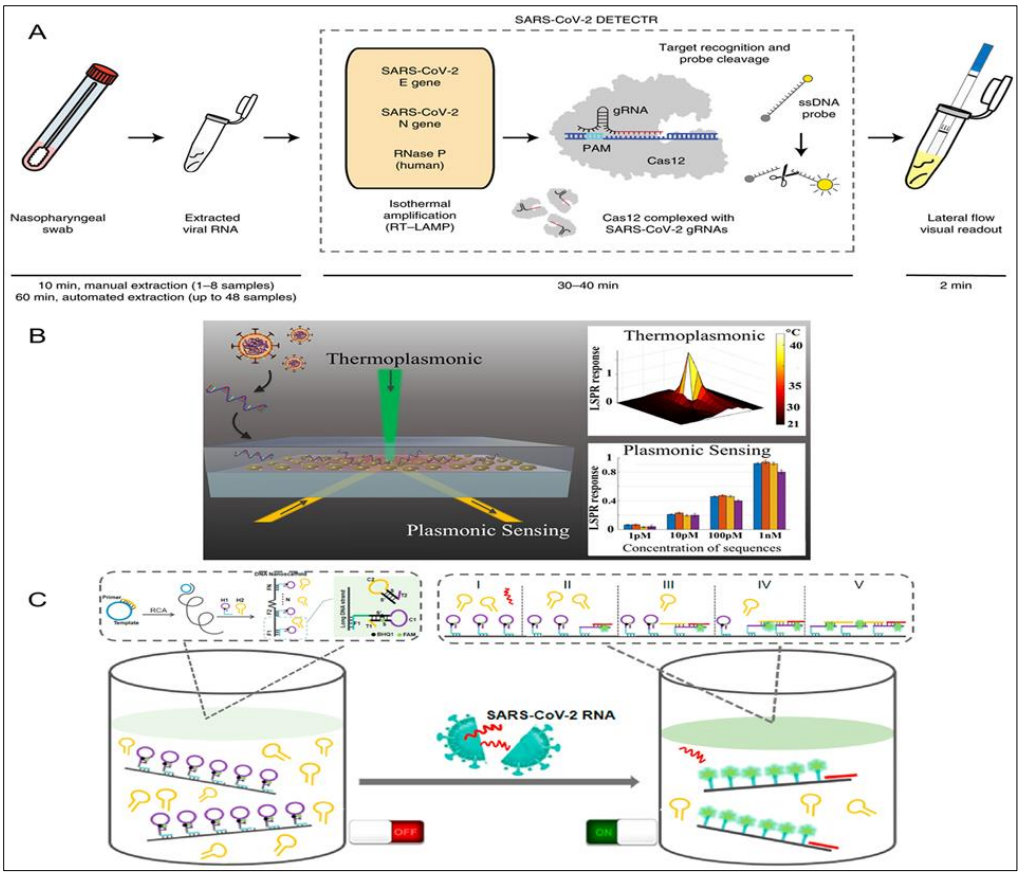

Figure 2 Biosensors reported for viral RNA detection of SARS-CoV-2.

The virus shown in Figure 2, explains how biosensors work. (A) The method by which the SARS-CoV-2 detector works An RNA extraction detector with a fluorescence reader that allows for observation of the extracted RNA [6]. (B) The use of plasmonic dual-functional biosensor referencing [7]. (C) A biosensor RNA that, also known as DNHCR [8].

4. An analysis of surface antigens

Because there have only been a few studies that are significant to research that has focused on the diagnostic of COVID-19, the production of an area-impact has been the primary focus of an ongoing effort to facilitate the simplification and acceleration of the screening procedure for COVID-19. This is because there have been only a handful of studies that have concentrated on the diagnostic of COVID-19 (Fig. 3A) [5]. Evidence of the notion has been shown by the examination of coronavirus debris rather than native antigen proteins, which highlights the promise of the Gr-FET era for sensitive and speedy detection. Validating the assay and analyzing the results of clinical investigations are the two main goals of this study. In order to ease the direct detection of SARS-CoV-2, an additional subject-impact transistor (FET)-based graphene biosensing device was covered with a particular antibody against SARS-CoV-2 spike protein (Fig. 3B). This was done in order to facilitate the detection of SARS-CoV-2. The [3] study identified this specific antibody as being present. Due to the findings of this research, which indicate a high level of assay sensitivity together with a sizeable number of spurious positive results, it is necessary to devise techniques that will make it possible to create realistic programs. The use of graphene sensors with FET technology will, in the near future, make it possible to determine the presence of cells [13]

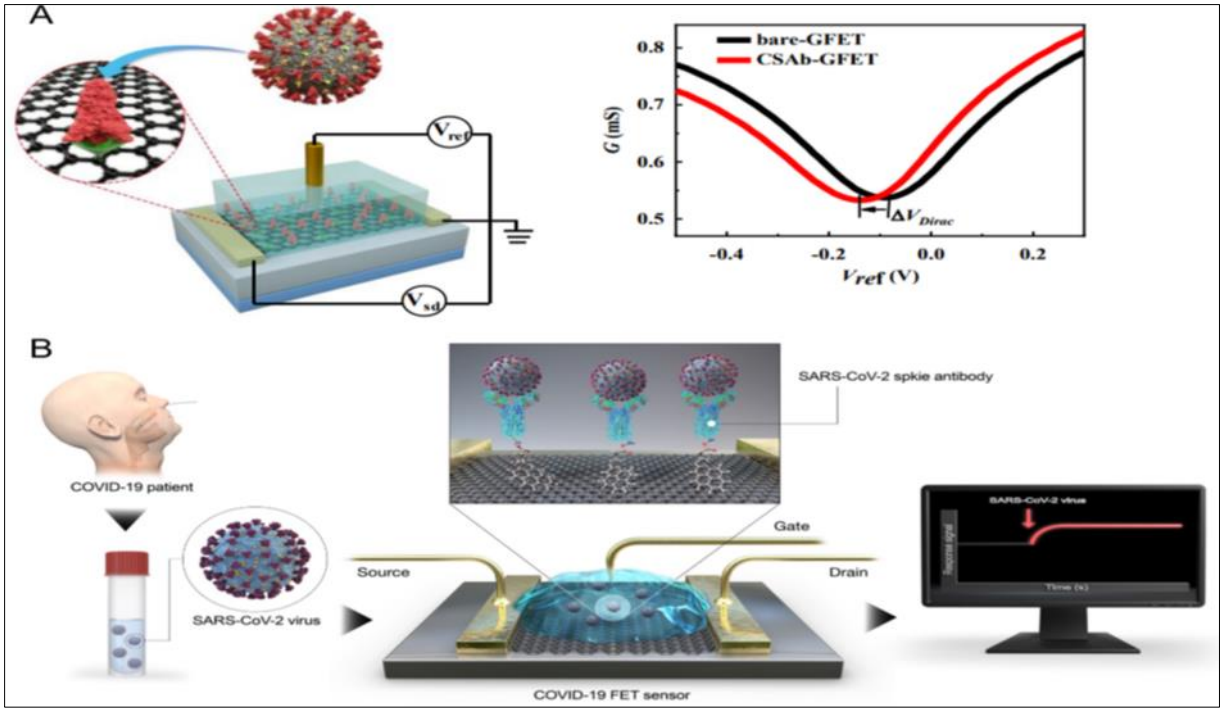

Figure 3 Biosensors reported for direct viral antigen or viral particle detection of SARS-CoV-2.

Figure 3 illustrates the biosensors' ability to detect the SARS-CoV-2 viral antigen in its native state. (A) A grapheme field-effect transistor that may be used to electrically probe the SARS-CoV-2 surface antigen [1]. (B) an impact transistor-based biosensor capable of rapidly diagnosing SARS-CoV-2 in humans [3].

5. Evaluation of Mitochondrial disposable sensor

[9] Recognized a diagnostic technique that emerged because of this inquiry, in addition to the work done by other scientists. These one-time-use reactive oxygen species mitochondria are both diagnostic component system and an automated (Fig. 3A). It also serves the purpose of (Fig. 3A). A sensor that is made up of three electrodes (Working (WE), Counter (CE), and Reference (RE) that are each spaced at a triangular distance of 3 mm from each other is able to sensitively measure current signal samples (Fig. 3B) while operating within a sweeping potential range of 0.8 to 0.8 V with a scan rate of 100 mV/s. The sweeping potential has a range of 0.8 to 0.8 V. Between 0.8 and 0.8 V is the sweeping potential's operating range. Clinical diagnostics (n > 140 patient samples) detected more than 97 percent of relevant

gorgeous individuals. Even though the ROS sensor might be able to send a diagnostic in less than 30 seconds, the situation is as it is.

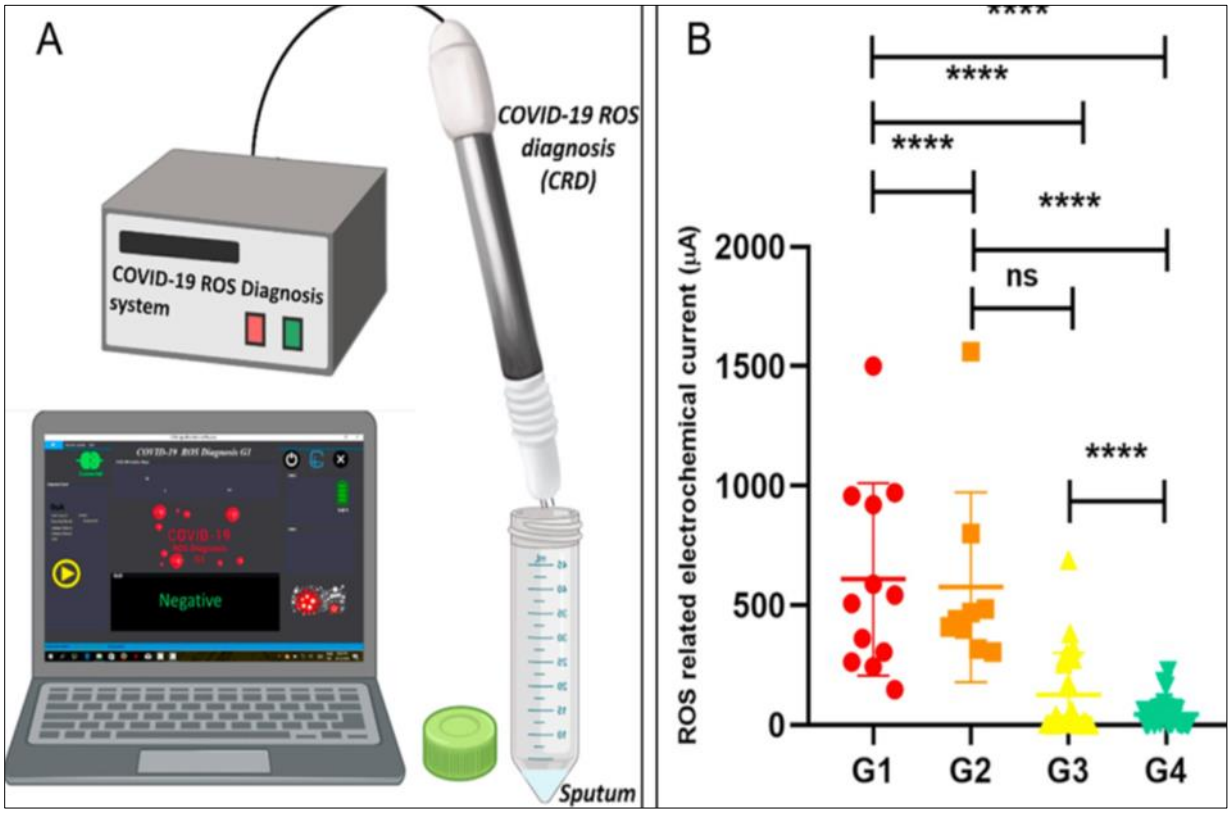

Figure 4 COVID-19 ROS detection system

The COVID-19 ROS detection system is shown to be composed that are nanotube in Figure 4. (A) Current measurement to differentiate between different patient samples. (B) G1: Patients hospitalized and receiving care in the Intensive Care Unit; G2: Patients hospitalized but did not require the level of care provided in the Intensive Care Unit; G3: PCR-positive patients who were not hospitalized; G4: PCR-negative patients who were healthy controls [9].

6. Conclusion and the Future

We acknowledge the COVID-19 outbreak because of the startlingly high number of deaths and the immense economic devastation that it has brought about. Because of this, it acts as a cautionary tale for any future epidemics that may be caused by infectious viruses or other harmful microbes. Because of this, it is of the utmost importance and need, hospital-decentralized, customized, tools that are also capable of high-throughput screening that is economical, rapid, and may be portable. Along with advancements in bioengineering, the development has made it feasible to detect new types of intelligent sensing with a higher degree of precision. The exceptionally high is combined current in these sensing systems [10]. From that point on, this evaluation made clear references to both how to stop future epidemics and how to handle them if they happen.

Compliance with ethical standards

Acknowledgments

Authors: David P. Tokpah, Evidence Akhayere and Doga Kavaz helped support the needs to write this paper. Henceforth, we extend our gratitude to the anonymous reviewers for their insightful remarks and ideas about our work.

Disclosure of conflict of interest

Everyone who took part in the research project provided his or her informed permission.

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