Recent Developments in Nanotechnology-Based Biosensors for the Diagnosis of Coronavirus

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Abstract

The major challenge in today's world is that medical research is facing the existence of a vast number of viruses and their mutations, which from time to time cause outbreaks. Also, the continuous and spontaneous mutations occurring in the viruses and the emergence of resistant virus strains have become serious medical hazards. So, in view of the growing number of diseases, like the recent COVID-19 pandemic that has caused the deaths of millions of people, there is a need to improve rapid and sensitive diagnostic strategies to initiate timely treatment for such conditions. In the cases like COVID-19, where a real cure due to erratic and ambiguous signs is not available, early intervention can be life-saving. In the biomedical and pharmaceutical industries, nanotechnology has evolved exponentially and can overcome multiple obstacles in the treatment and diagnosis of diseases. Nanotechnology has developed exponentially in the biomedical and pharmaceutical fields and can overcome numerous challenges in the treatment and diagnosis of diseases. At the nano stage, the molecular properties of materials such as gold, silver, carbon, silica, and polymers get altered and can be used for the creation of reliable and accurate diagnostic techniques. This review provides insight into numerous diagnostic approaches focused on nanoparticles that could have been established for quick and early detection of such diseases.

Keywords COVID-19 · SARS-CoV · Viral diagnostics · Diagnostic approach

Introduction

In the year 2020, the whole world witnessed the biggest pandemic, which affected every individual in every sector. The disease was termed "coronavirus disease" (COVID) by the World Health Organization (WHO) and is also regarded as one of the deadliest pandemics since the last century, affecting the whole world. COVID was first identified in Wuhan, China, on December 31, 2019; that is why it is called "COVID-19" [1, 2].

COVID-19 has become a leading cause of death worldwide, almost halting the socioeconomic development of the world. It was considered the third outbreak of coronavirus in the twenty-first century, which has caused serious fatalities. The other two were the Severe Acute Respiratory Syndrome coronavirus (SARS-CoV) and the Middle East Respiratory Syndrome coronavirus (MERS-CoV), which occurred in the years 2002 and 2012, respectively. The point of concern with COVID-19 is its highly transmissible nature which has reached every corner of the world within a 4–5 month span and caused serious illnesses leading to death [3].

The symptoms of COVID-19 are generally similar to those of the flu, but it was found to cause more deaths. The majority of people remain asymptomatic; however, others may have mild to serious symptoms. Initially, the disease causes fever, dry cough, sore throat, fatigue, and runny nose. Later, it can progress to pneumonia, shortness of breath, and chest pain, necessitating the hospitalization of patients in critical units. There have also been cases with no symptoms to little symptoms taking up to 14 days to appear after exposure to the virus, but even an asymptomatic person may shed the virus and make others ill [4]. Except for patients with co-morbidities such as hypertension, diabetes, and heart disease, the symptoms of COVID-19 are very non-specific in nature and cannot be used for an accurate diagnosis.

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