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CHAPTER

# Diagnostic biosensors for coronaviruses and recent developments

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## 15.1 Introduction

Coronaviruses, members of the Coronaviridae family and Coronavirinae subfamily are well-known airborne viruses that infect humans, birds, and other mammals. The long-range airborne route, the fomite route, or the close contact route are the primary methods of transmission of most respiratory infections (Li, 2021). Coronavirus disease 2019 (COVID- 19) is a newly emerging disease that has not been previously identified in humans. Some animal coronaviruses do not infect people or transmit from person to person via close contact. However, two specific coronaviruses have been previously found to spread from animals to humans causing severe illness. These two viruses are the: severe acute respiratory syndrome-coronavirus (SARS-CoV) and the Middle East respiratory syndrome-coronavirus (MERS-CoV) (Killerby et al., 2020). The high global spread, prevalence, and associated mortality of the new SARS-CoV-2 causing the COVID-19 disease have made it a serious concern. World Health Organization reported that COVID-19 is airborne and can be transmitted through aerosol and stay alive on surfaces such as metals and textiles for a number of hours and even up to few days (Marquès & Domingo, 2021).

Coronaviruses are enveloped RNA viruses that can mainly cause respiratory, neurologic, hepatic, and enteric diseases (Peiris, 2012). Several coronaviruses have appeared such as NL63 and 229E Human coronavirus (HCOV) which belong to the alphacoronavirus type (Fung et al., 2020). On the other hand, SARS-CoV-2 belongs to the betacoronavirus which includes SARS, MERS, OC43 HCOV, HKU1, and HKU1. Four of the six coronavirus types usually cause common cold-like symptoms. However, MERS-CoV and SARS-CoV are zoonotic in origin and can result in more serious infections and even fatal illnesses (Ye et al., 2020). In 2002 and 2003, SARS-CoV has caused severe acute respiratory syndrome outbreaks in Guangdong Province, China (Peiris & Poon, 2008), whereas MERS-CoV resulted in severe respiratory disease outbreaks in 2012 in KSA which was then spread within the Middle East (Aleanizy et al., 2017). Because of the large genetic diversity and frequent recombination of coronavirus genomes, as well as the increase in human–animal interface activities, novel coronaviruses are likely to emerge periodically in humans (Wang et al., 2020). COVID-19 has long positive-sense RNA with 30,000 base pairs with two types of proteins known as structural and nonstructural proteins. The spike (S) (characteristics of all coronaviruses), matrix (M), nucleocapsid (N), and envelop (E) protein are the structural proteins

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