Aptamer-Based Strategies to Address Challenges in COVID-19 Diagnosis and Treatments

ABSTRACT

Coronavirus disease (COVID-19), a highly contagious and rapidly spreading disease with signifcant fatality in the elderly population, has swept across the world since 2019. Since its frst appearance, the causative agent, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has undergone multiple mutations, with Omicron as the predominant circulating variant of concern at the moment. Te gold standard for diagnosis of COVID-19 by real-time polymerase chain reaction (RT-PCR) to detect the virus is laborious and requires well-trained personnel to perform sophisticated procedures. Also, the genetic variants of SARS-CoV-2 that arise regularly could result in false-negative detection. Meanwhile, the current COVID-19 treatments such as conventional medicine, complementary and alternative medicine, passive antibody therapy, and respiratory therapy are associated with adverse efects. Tus, there is an urgent need to discover novel diagnostic and therapeutic approaches against SARS-CoV-2 and its variants. Over the past 30 years, nucleic acid-based aptamers have gained increasing attention and serve as a promising alternative to the antibodies in the diagnostic and therapeutic felds with their uniqueness of being small, nonimmunogenicity, and thermally stable. Aptamer targeting the SARS-CoV-2 structural proteins or the host receptor proteins represent a powerful tool to control COVID-19 infection. In this review, challenges faced by currently available diagnostic and therapeutic tools for COVID-19 are underscored, along with how aptamers can shed a light on the current COVID-19 pandemic, focusing on the critical factors afecting the discovery of high-afnity aptamers and their potential applications to control COVID-19 infection.