SURFACE PLASMON RESONANCE IMMUNOSENSOR FOR ACCURATE DETECTION OF ANTIBODIES AGAINST SARS-COV-2 NUCLEOCAPSID PROTEIN

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SARS-CoV-2 virus continues to be a global challenge, impacting numerous countries [1]. As of March 2023, more than 760 million confirmed cases of COVID-19 and more than 6.8 million reported deaths have been reported to the World Health Organization (WHO) [2]. The evolution of the COVID-19 pandemic highlights a vital requirement for the development of rapid and precise tests to effectively manage disease spread and monitor illness advancement. Immunosensors appear to be the most appropriate type of sensor for this purpose, capable of identifying the SARS-CoV-2 virus to confirm the disease presence or monitoring antibodies against the virus to assess immunity [3]. Throughout the pandemic, numerous techniques were developed to detect SARS-CoV-2 virus and diagnose COVID-19 infection. These methods encompass various tests designed to detect viral antigens or specific antibodies. Microscale thermophoresis (MST), isothermal titration calorimetry (ITC), biolayer interferometry (BLI) and surface plasmon resonance (SPR) approaches have been widely used to investigate real-time biomolecule interactions, in particular the formation of antigen-antibody immune complexes [4]. The health challenges posed by the swift dissemination of Severe Acute Respiratory Syndrome SARS-CoV-2 have prompted thorough study of the SARS-CoV-2 nucleocapsid protein and specific antibodies against it. While much research has concentrated on the SARS-CoV-2 spike protein, exploring the nucleocapsid protein is equally significant because of its crucial role in the packaging of the coronavirus genomic RNA and viral replication [5]. This study introduces a direct, label-free method for sensitive detection of antibodies against SARS-CoV-2 nucleocapsid protein using a surface plasmon resonance device. Optimization of SARS-CoV-2 nucleocapsid protein immobilization and selection of regeneration solution were performed. The immunosensor, fabricated under optimal conditions demonstrated effective performance. The immunosensor exhibited a linear range from 0.5 to 50 nM for anti-SCoV2-rN, with a limit of detection of 0.057 nM and a limit of quantification of 0.19 nM. Notably, the immunosensor is also suitable for detecting multiple anti-SCoV2-rN antibodies.

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