Editorial

Recent improvements in mRNA and immunogenicity

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Vaccines avoid many illnesses and save many lives every year. As a result of common vaccine use, the smallpox virus has entirely been eradicated and the occurrence of measles, polio and other childhood diseases have considerably been abridged around the world. Classical vaccine strategies, for instance inactivated pathogen, live attenuated and subunit vaccines, offer strong protection against diversity of hazardous diseases. In spite of this achievement, there remain chief obstacles to vaccine development against a diversity of infectious pathogens, part-icularly those better able to avoid the adaptive immune response. Furthermore, for most emer-ging virus vaccines, the main barrier is not the efficiency of usual approaches but the requirements for more rapid development and large-scale use. Nucleic acid therapeutics have appeared as hopeful option to classical vaccine approaches. The messenger ribonucleic acid (mRNA) is the intermediate step connecting the translation of protein-encoding DNA and the manufacturing of proteins by ribosomes in the cytoplasm. Global efforts have been taken to develop SARS-CoV-2 vaccines since the initiation of the current COVID-19 pandemic. The mRNA vaccines (i.e., mRNA-1273 and BNT162b2) are the most commonly approved vaccines worldwide which are utilized in different clinical trials on a global scale [1]. More recent, a variety of mRNA vaccine platforms have recently been developed and validated [2]. Engineering of the RNA sequence has made synthetic mRNA further translatable than ever before. Exogenous mRNA is intrinsically immuno-stimulatory, as it is acknowledged by an assortment of cell surface, endosomal and cytosolic innate immune receptors. Depending on the beneficial function, this characteristic of mRNA could be beneficial or harmful. It is potentially beneficial for vaccination because in some cases it may offer adjuvant activity to drive dendritic cell (DC) maturation and thus bring out strong T and B cell immune responses. Though, innate immune sensing of mRNA connected with the inhibition of antigen expression and might unconstructively affect the immune response. Although the inconsistent effects of innate immune sensing on different formats of mRNA vaccines are partly understood, some progress has recently been made in the COVID-19 vaccine in elucidating these phenomena [3]. The mRNA vaccines work by introducing a portion of mRNA that corresponds to a viral protein, frequently a small piece of a protein found on the virus's outer membrane. As part of a usual immune response, the

immune system recognizes that the protein is foreign and produces specialized proteins called antibodies. Antibodies help protect the body against infection by recognizing individual viruses or other pathogens, attaching to them and allocating the pathogens for destruction. Once produced, antibodies stay in the body, even after the body has rid itself of the pathogen, with the intention that the immune system can rapidly react if exposed again. If a person is exposed to a virus after receiving mRNA vaccination for it, antibodies can quickly recognize it, attach to it, and mark it for destruction before it can cause serious illness. mRNA vaccines have emerged as promising alternatives to provide protection against COVID-19 due to their high potency with the capacity for rapid development and low-cost production. Now, the Pfizer-BioNTech COVID-19 vaccine (Comirnaty®) and Moderna COVID-19 vaccine (Spikevax™) use mRNA to stimulate an immune response that can protect against future COVID-19 infection.

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