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The mRNA-based vaccine for better immunogenicity and safety

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The recent onset of COVID-19 has emphasised the need for a vaccine against the corona virus worldwide. Traditional vaccines consist of small inactive doses of the disease-causing specimen, which is introduced into the body to induce the immune system to generate the appropriate defence mechanism. However, this may not always work with all diseases. In recent studies, various pharmaceutical companies are considering the manufacturing of mRNA vaccines to meet the need for more rapid development and large-scale deployment. Messenger RNA (mRNA), which is a single-stranded RNA molecule complementary to one of the DNA strands of a gene plays a vital role in vaccine formulations as engineering the RNA sequence makes synthetic mRNA more translatable. It helps in the production of properly folded, fully functional proteins and this feature of mRNA is particularly advantageous in vaccine production and protein replacement therapy. Instead of live attenuated and inactivated pathogens, and subunit vaccines mRNA could be opted as it is non-infectious, non-integrating and degradable. The mRNA could be formulated into carrier molecules for its stability, rapid uptake and increased cytoplasmic expression. Studies reveal that, mRNA vaccines have shown protective immunity against many infectious diseases with their ability to generate potent neutralising antibody responses with minimum immunisations. For instance, the administration of the COVID-19 mRNA vaccine would give instructions in the body to our cells to produce spike proteins (of virus that cause COVID-19). The instructions are broken down post protein production but the immune system recognises the protein formed to be foreign and stores the information to protect the body from the future infection caused by the same virus. Owing to several beneficial features of mRNA vaccines, they are emerging as promising alternatives to conventional vaccine approaches for many infectious diseases and cancer too.

Keywords: mRNA vaccine, Infectious diseases, Cancer, Vaccine formulations, Immunisation

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