UNIVERSITY OF SOUTH ALABAMA

Department of Chemistry Presents Seminar Series Speaker

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mRNA Vaccines

An alternative vaccine approach has made rapid development and large-scale production and deployment of a new vaccine possible to combat the novel and infectious SARS-COV-2 virus. mRNA vaccines offer high potency, rapid development and inexpensive, large-scale manufacturing. Additionally, mRNA vaccines offer several benefits over conventional vaccine approaches such as avoiding active or inactivated viruses and viral vectors; therefore, there is no risk of infection or integration of the virus into host cell DNA, and the mRNA itself is noninfectious and non-integrating. Furthermore, mRNA is degraded by normal cellular processes and various modifications can be used to make mRNA more stable and more translatable by cells.

SARS-CoV-2 uses its spike protein to bind to an enzyme (ACE2) attached to the host cell membrane to gain entry into the cell and initiate infection. mRNA is genetic material that provide instructions to the cell to make proteins. Both the Pfizer-BioNTech and Moderna COVID-19 vaccines utilize synthetic mRNA encoding a spike protein to instruct human cells to produce the spike protein found on SARS-CoV-2. The body recognizes the spike protein and produces antibodies against it. If the body later encounters SARS-CoV-2, the antibodies will recognize the spike protein and be ready to destroy the virus before it is able to enter into the cell. Efficient delivery of the mRNA is achieved through lipid carrier molecules which allow for rapid uptake of the mRNA into the cytoplasm of the cell.

mRNA vaccines have also demonstrated protection against a wide variety of infectious pathogens including influenza virus, Ebola virus, Zika virus and Streptococcus. Moreover, mRNA vaccines have recently been shown to offer a promising strategy for treating malignancies by stimulating cell-mediated response to cancer cells. Currently, only two vaccines, Pfizer-BioNtech and Moderna, have been approved and recommended by the FDA for emergency use to prevent COVID-19. Both companies site a similar degree of effectiveness of approximately 94.5%.

Friday, April 30, 2021, 12:20 pm

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