

COVID-19 mRNA VACCINES

mRNA VACCINE COMPONENTS

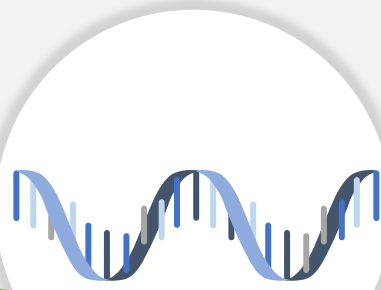
STABILIZED SARS-CoV-2 SPIKE ANTIGEN

Stabilization of the spike antigen located on the outside of the SARS-CoV-2 virus induces a strong immune response in the body.



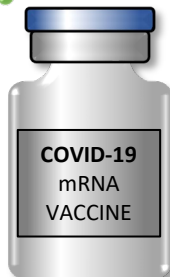
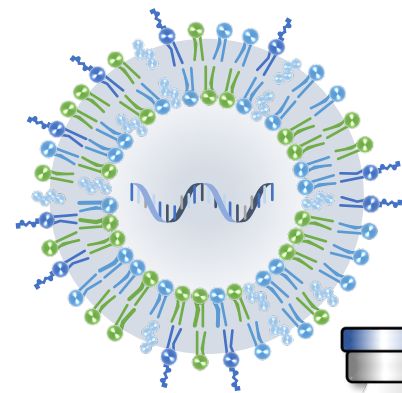
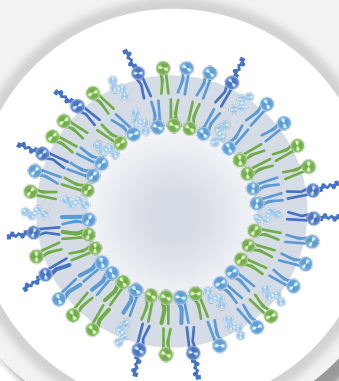
mRNA

Single stranded genetic molecule.
Encodes “recipe” for the stabilized SARS-CoV-2 spike antigen.



LIPID NANOPARTICLE

“Bubbles of fat” used to transport mRNA molecules into human cells.



Once the mRNA vaccine is delivered, the body makes SARS-CoV-2 spike protein from the mRNA.

The immune system remembers this foreign antigen and mounts a protective response when it encounters the SARS-CoV-2 virus.



mRNA VACCINE DEVELOPMENT TIMELINE

NIH Indicates NIAID involvement

1995: First proof-of-concept study proposing mRNA vaccines.

2012: First demonstration of a protective response by an mRNA vaccine.

2015: Lipid nanoparticle formulations optimized for mRNA delivery.

2017: First-in-human tests of mRNA vaccines.

Dec 2019: Novel coronavirus identified from patient in China.

Feb 2020: First clinical batch of Moderna mRNA vaccine completed.

Dec 2020: FDA grants EUA for Moderna and Pfizer-BioNTech COVID-19 mRNA vaccines.

1996-2005

2005-2011: Initial scientific advances: improved mRNA stability, translation, and reduced immunogenicity.

2013: Stabilization of a respiratory syncytial virus antigen demonstrated increased immunogenicity.

2017: MERS-CoV vaccine designed using stabilized spike antigen.

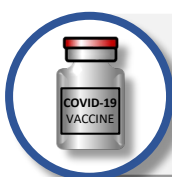
Jan 2020: Genomic sequence of SARS-CoV-2 released.

Mar-Dec 2020: Clinical trials leading to the EUA of Moderna COVID-19 mRNA vaccine conducted.



FDA grants full approval for Pfizer-BioNTech (Aug 2021) and Moderna (Jan 2022) COVID-19 mRNA vaccines.

COVID-19 VACCINATION: BY THE NUMBERS As of March 2022



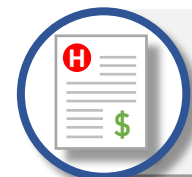
577
MILLION vaccine doses administered¹



2.3
MILLION U.S. lives saved²



17
MILLION hospitalizations prevented²



\$900
BILLION in health care costs averted²

¹https://covid.cdc.gov/covid-data-tracker/#vaccinations_vacc-total-admin-rate-total

²<https://www.commonwealthfund.org/blog/2022/impact-us-covid-19-vaccination-efforts-march-update>