WHAT ARE RNA VACCINES AND HOW DO THEY WORK?

WHAT ARE RNA VACCINES?

SARS-CoV-2

Viral RNA
The virus's genetic material. Contains instructions for making proteins.

Spike protein
Protein which helps the virus penetrate cells and initiates an infection.

The genetic code of the SARS-CoV-2 virus is made up of RNA. Scientists isolated the part of this genetic code that contains the instructions for making the virus’s spike protein.

RNA VACCINES FOR COVID-19

Viral RNA
The virus's genetic material. Contains instructions for making proteins.

Spike protein
Protein which helps the virus penetrate cells and initiates an infection.

RNA VACCINES: BENEFITS AND CHALLENGES

Synthetic RNA which codes for the virus spike protein is packed in lipid nanoparticles (very small fat droplets). This stops our bodies’ enzymes breaking it down and helps our cells take it in.

Once the synthetic RNA is inside one of our cells, the cell follows the RNA instructions to produce the virus spike protein. Its production then triggers an immune response in our bodies.

RNA can’t cause infection and is broken down by normal processes in our cells. An RNA vaccine hasn’t been licensed for use in humans before but they’ve been under development for several years for other viruses, including influenza, HIV, and Zika.

RNA vaccines must be stored at low temperatures to remain stable, which makes storage and transport more challenging.

SAFETY OF THE VACCINES

RNA is easy to make in a lab, so RNA vaccines can be developed quicker than other vaccines.

STORAGE AND TRANSPORT

Some RNA vaccines must be stored at low temperatures to remain stable, which makes storage and transport more challenging.

VACCINE PRODUCTION

RNA stands for messenger ribonucleic acid

Untranslated regions
Regions which don't contain code for proteins.

RNA cap
Stops RNA breaking down; helps start protein synthesis in human cells.

Poly-A tail
Long chain of adenine (A) bases which help stabilise the RNA.

Vaccines

mRNA
- Moderna
- Pfizer & BioNTech
- CureVac

saRNA
- Imperial College
- Arcturus

RNA AND saRNA: WHAT’S THE DIFFERENCE?

mRNA vaccines

saRNA vaccine

Several proposed vaccines for COVID-19 are RNA vaccines. They can be based on two different types of RNA.

mRNA
- mRNA stands for messenger ribonucleic acid
- RNA cap
- Stop RNA breaking down; helps start protein synthesis in human cells.

saRNA
- saRNA stands for self-amplifying ribonucleic acid
- Code for viral replicase enzyme
- Once in human cells, the creation of the viral replicase enzyme helps make multiple copies of the viral RNA.

As saRNA produces more copies of itself once it’s in a cell, it can be given in smaller doses than mRNA vaccines. This makes the cost per dose lower and means higher numbers of doses can be produced from the same volume of vaccine.

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