



mRNA 101

DNA

deoxyribonucleic acid

THE MAINFRAME COMPUTER

- Contains the biological instructions that make each species unique
- Guides the development, function, & reproduction of all known organisms & many viruses



RNA

ribonucleic acid

THE PERSONAL COMPUTER

- Single genetic strands made from DNA
- Stores genetic info, tells cells what to do, & may have helped life itself get its start
- Some viruses have only RNA & no DNA



mRNA

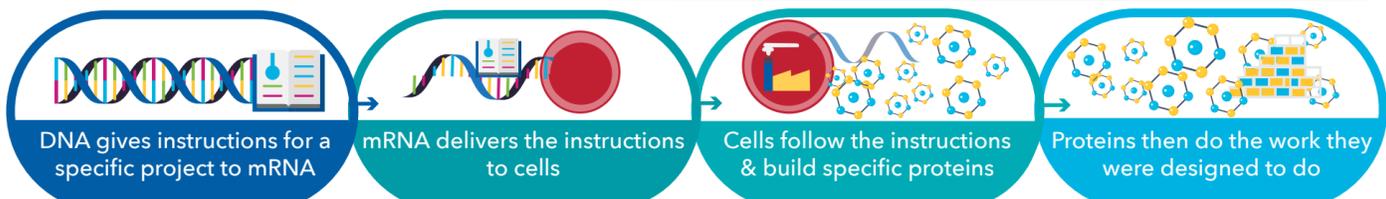
messenger ribonucleic acid

THE SOCIAL MESSAGING

- One of three types of RNA
- Responsible for helping cells build, maintain, & repair things
- Delivers recipes to cells telling them what proteins to create



mRNA AT WORK



SYNTHETIC mRNA

SYNTHETIC MRNA WAS CREATED MORE THAN 30 YEARS AGO. WITH ITS CREATION CAME HOPES OF CURING DISEASES & GENETIC CONDITIONS.

Synthetic, just like REAL mRNA, works like an e-blast or SnapChat: it sends a message to trillions of cells & then just disappears when its done.



Synthetic mRNA is a successful alternative to embryonic stem cells & it contains no biological ingredients.

Trials currently underway for synthetic mRNA therapies include treatments & vaccines for cancers, hereditary disorders, & infectious diseases.



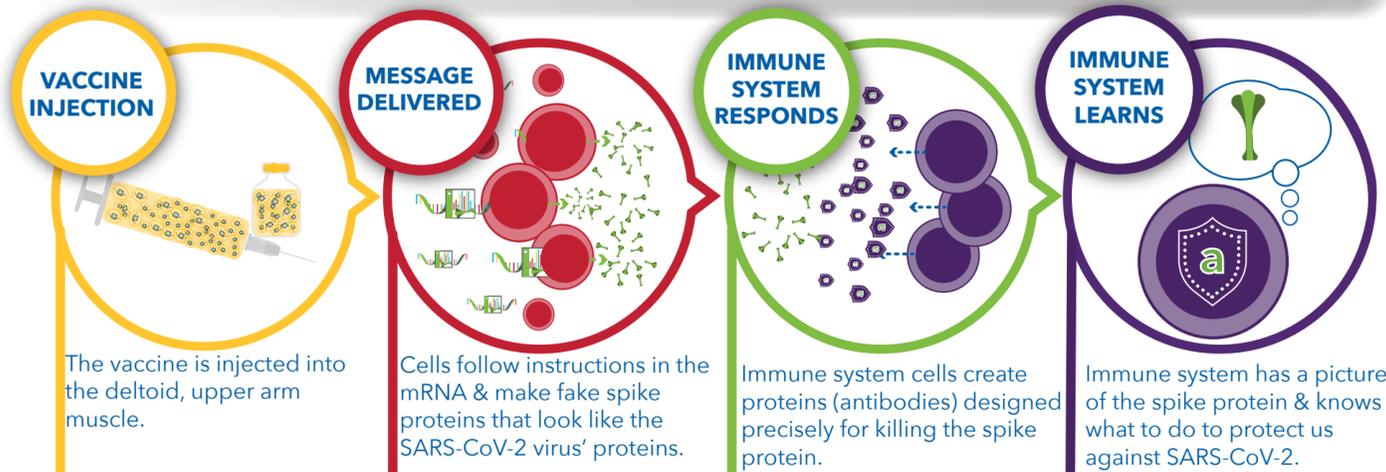
Synthetic mRNA was tricky at first: immune systems reacted to them as an invader, destroying them before they could deliver their messages.

Synthetic mRNA vaccines are known as 'genetic' vaccines. There are currently several genetic vaccines used in veterinary medicine.



Early 2000s: Katalin Karikó & Drew Weissman figured out how to make synthetic mRNA so it wouldn't be destroyed by immune systems.

HOW DOES THE mRNA COVID VACCINE WORK?



4 REASONS TO USE SYNTHETIC mRNA IN A COVID VACCINE

1



TIME

Typical vaccines take a lot of effort & time to make: the germ that causes the disease, replicating, purifying, & figuring out how to use it safely so that it helps us fight disease without making us sick.

2



COST

Genetic vaccines are pretty inexpensive & easy to manufacture because they basically contain the same base ingredients. The biggest change is the genetic code.

3



AVAILABILITY

A scientist in China shared the SARS-CoV-2 virus' RNA genetic sequence with the world in early January 2020 so a big part of the work was already finished!

4



SAFER

Like a SnapChat message, mRNA simply disappears after it has delivered its message. The ingredients, more like our own body's ingredients, are safe messengers, teaching our cells how to defend us against specific dangers.

A CLOSER LOOK AT THE VIRUS THAT CAUSES COVID-19

LIKE HIV, THE COMMON COLD, & INFLUENZA, THE VIRUS THAT CAUSES COVID-19 HAS ONLY RNA - NO DNA.

THE SPIKE PROTEIN IS WHAT THE VIRUS USES TO ATTACH & BREAK INTO OUR CELLS.

THIS SPIKE PROTEIN is powerful - it holds onto human cells up to 20 times more tightly than the SARS virus does.

This may be why COVID-19 is so contagious.



THE OUTER 'SHELL' IS MADE OF LIPIDS.

Washing with soap & water kills the virus by destroying the lipid barrier by breaking it into pieces, which helps to break the virus apart & makes it easy to rinse away.

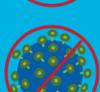
PFIZER'S & MODERNA'S MRNA VACCINES INGREDIENTS

DO NOT contain:

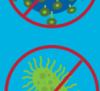
Eggs



Virus - live, weakened, or dead



Bacteria or toxins



Fetal tissue or stem cells



Preservatives

- no phenol, thimerosal, or 2-phenoxyethanol



DO contain:

mRNA



Lipids



Salts



Sugar



MODERNA ONLY:
Non-steroidal anti-inflammatory

