An Overview About The Efficacy of COVID-19 Vaccines Used In Iraq

Professor

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01 **Vaccine development**

02 **Types and Mechanism of action**

03 **Their original efficacy**

04 **The new variants of Corona virus 2**

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SAFETY

Vaccines should be free of deadly side effects

VS

Efficacy

The efficacy of the vaccine to prevent disease or infection

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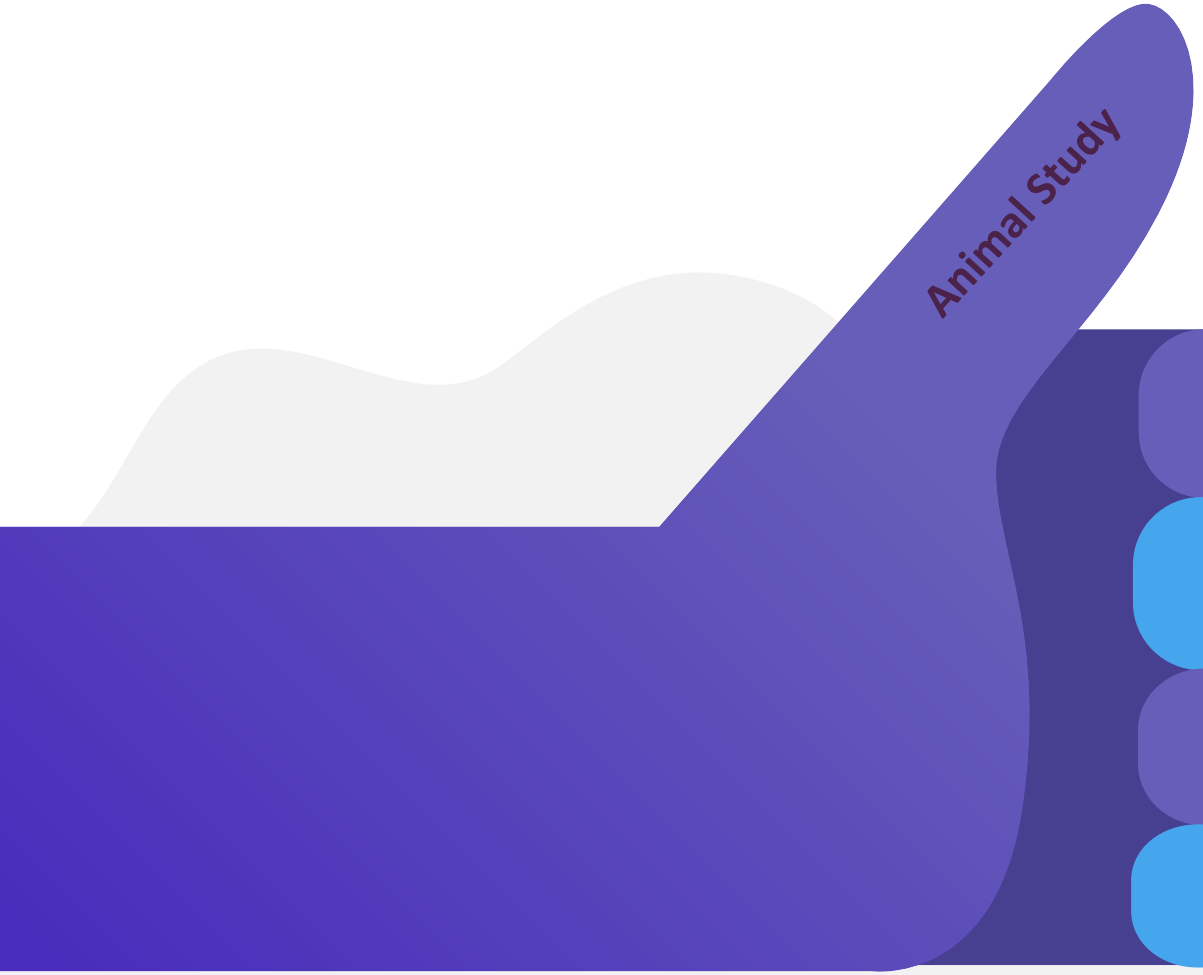

01 Phase I Clinical Study

02 Phase II Clinical Study

03 Phase III Clinical Study

04 Phase IV Clinical Study

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Experimental
Mice

1-giving the vaccine to mice
2- monitoring of side effects (skin irritation, fatigue, fever)
3-efficacy (AB production)
4-give the mice the virus
5- did the vaccine prevent the disease? If yes move to phase I

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CLINICAL TRIAL

Giving Vaccines To Human

Phase 1

SAFETY

- Small sample size
- Healthy participants
- Testing the SE
- Dosage (upper and lower limit)

Phase 2

EFFICACY & SE

- Intermediate sample
- Matching
- Still looking for SE
- Is the dosage is basically effective

Phase 3

EFFICACY, EFFECTIVENESS AND SAFETY

- Large sample size
- Matching
- Monitor the effectiveness of vaccine in real life
- Monitor S&S and PCR

Ideally, a vaccine will:

- produce the same immune protection which usually follows natural infection but without causing disease
- generate long lasting immunity so that the person is protected if they are exposed to the antigen several years after vaccination

Ideally, a vaccine will:

- **interrupt the spread of infection by preventing carriage of the organism in the vaccinated person**

Vaccines need to be safe and the risk from any side effects should be much lower than the benefit of preventing deaths and serious complications of the disease.

Ideally, a vaccine will:

For the COVID-19 vaccines, many of these properties can be confirmed from the clinical vaccine trials.

Longer term ongoing surveillance of the disease and of those vaccinated will show whether:

- **vaccine protection is long lasting or booster or annual doses are needed**
- **the vaccine prevents a vaccinated person fr carrying and spreading the virus**

COVID-19 Vaccines Used In Iraq!

Pfizer/ Biontech

AstraZeneca/Oxford

Sinopharm

is a messenger ribonucleic acid (mRNA) that contains the genetic sequence of the antigens found on the surface of the SARS-CoV-2 virus

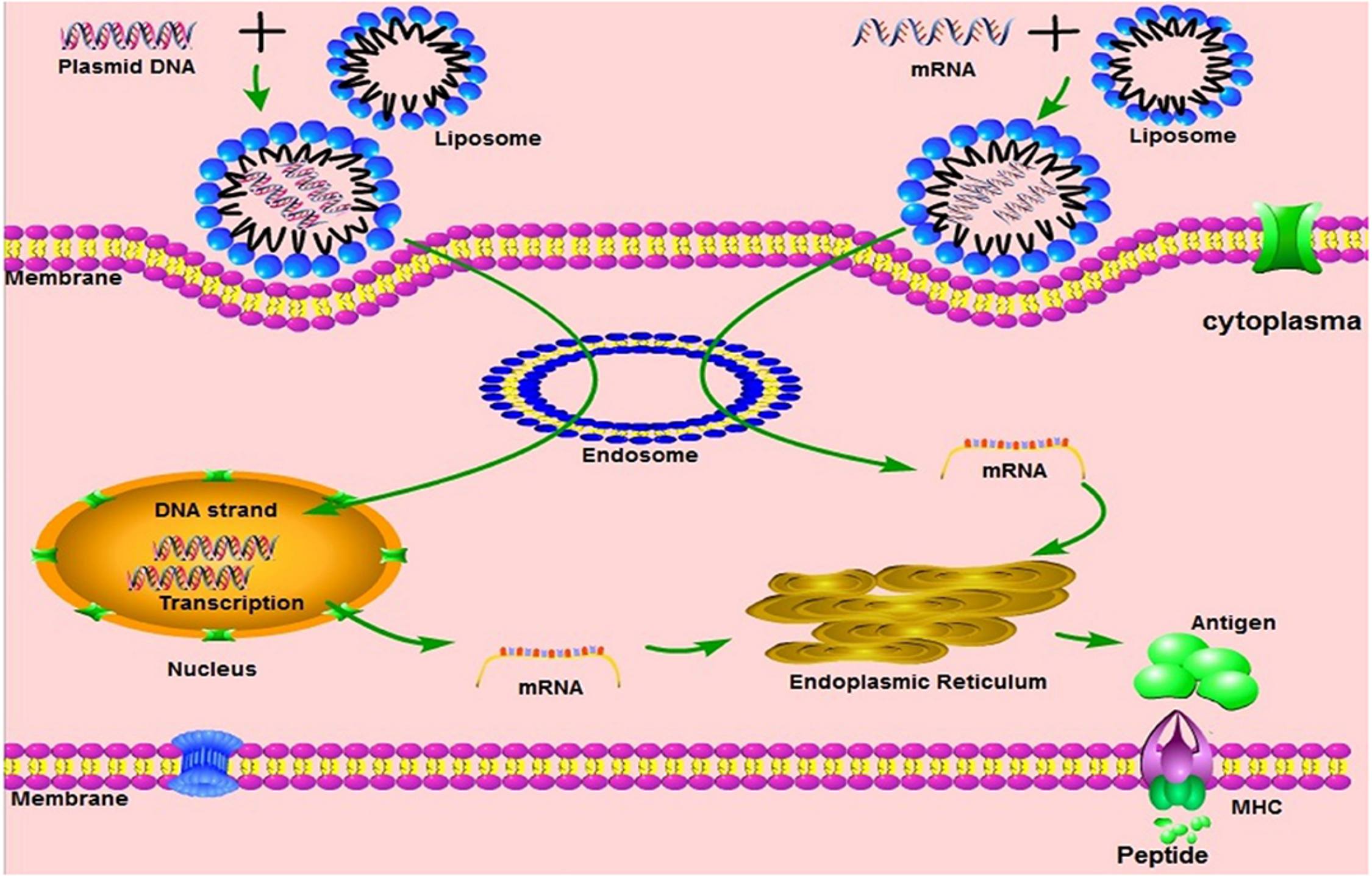
The COVID-19 mRNA Vaccine BNT162b2 vaccine is a messenger ribonucleic acid (mRNA) vaccine.

It contains the genetic sequence (mRNA) for the spike protein which is found on the surface of the SARS-CoV-2 virus, **wrapped in a lipid envelope (referred to as a nanoparticle) to enable it to be transported into the cells in the body.**

When injected, the mRNA is taken up by the host's cells which translate the genetic information and **produce the spike proteins**.

These are then displayed on the surface of the cell. This stimulates the immune system to produce antibodies and activate T-cells which prepare the immune system to respond to any future exposure to the SARS-CoV-2 virus by binding to and disabling any virus encountered.

As there is no whole or live virus involved, the vaccine cannot cause disease. The mRNA naturally degrades after a few days.


Plasmid DNA
Liposome
mRNA
Liposome
Membrane
cytoplasma
Endosome
mRNA
DNA strand
Transcription
Nucleus
mRNA
Endoplasmic Reticulum
Antigen
Membrane
MHC
Peptide

It is given at day zero followed by a second dose on day 21

7 days later if any symptoms developed any symptom they should test for Covid-19 (PCR)

43000 participants subdivided into two groups; vaccine and placebo group

162 participant showed a + test for Covid-19 among the placebo group, 9 cases of them showed a sever sign and symptom

Only 8 participant showed a + test for Covid 19 among the vaccine group , 1 case only showed sever sign and symptoms

Efficacy against disease = 162-8/162=95% affective

Efficacy against severity of disease = 100%-1/8=87% effective

The COVID-19 mRNA Vaccine BNT162b2 should not be given to people who have had a confirmed anaphylactic reaction to a previous dose of the same vaccine or to any components of the vaccine

In addition to the highly purified BNT162b2 messenger RNA, the vaccine also contains:

ALC-0315 = (4-hydroxybutyl) azanediyl)bis (hexane-6,1-diyl)bis(2-hexyldecanoate)

ALC-0159 = 2-[(polyethylene glycol)-2000]-N,N-ditetradecylacetamide

1,2-Distearoyl-sn-glycero-3-phosphocholine

cholesterol

potassium chloride

potassium dihydrogen phosphate

sodium chloride

disodium hydrogen phosphate dihydrate

sucrose

water for injections

Polyethylene glycol (PEG) is from a group of known allergens commonly found in medicines and also in household goods and cosmetics. Known allergy to PEG is rare but would contraindicate receipt of this vaccine.

- a very small number of individuals have experienced **anaphylaxis** when vaccinated with the COVID-19 mRNA Vaccine BNT162b2 vaccine

- following close surveillance of the initial roll-out, the MHRA has advised that individuals with **a history of anaphylaxis to food, an identified drug or vaccine, or an insect sting can receive any COVID-19 vaccine**, as long as they are not known to be allergic to a component (excipient) of the vaccine

- all recipients of this vaccine should be kept for observation and monitored for a minimum of 15 minutes

- facilities for management of anaphylaxis should be available at all vaccination sites

COVID-19 Vaccine AstraZeneca which is a non-replicating viral vector vaccine. It uses a weakened adenovirus as a carrier to deliver the genetic sequence for part of the SARS-CoV-2 virus into the body

AstraZeneca COVID-19 vaccine

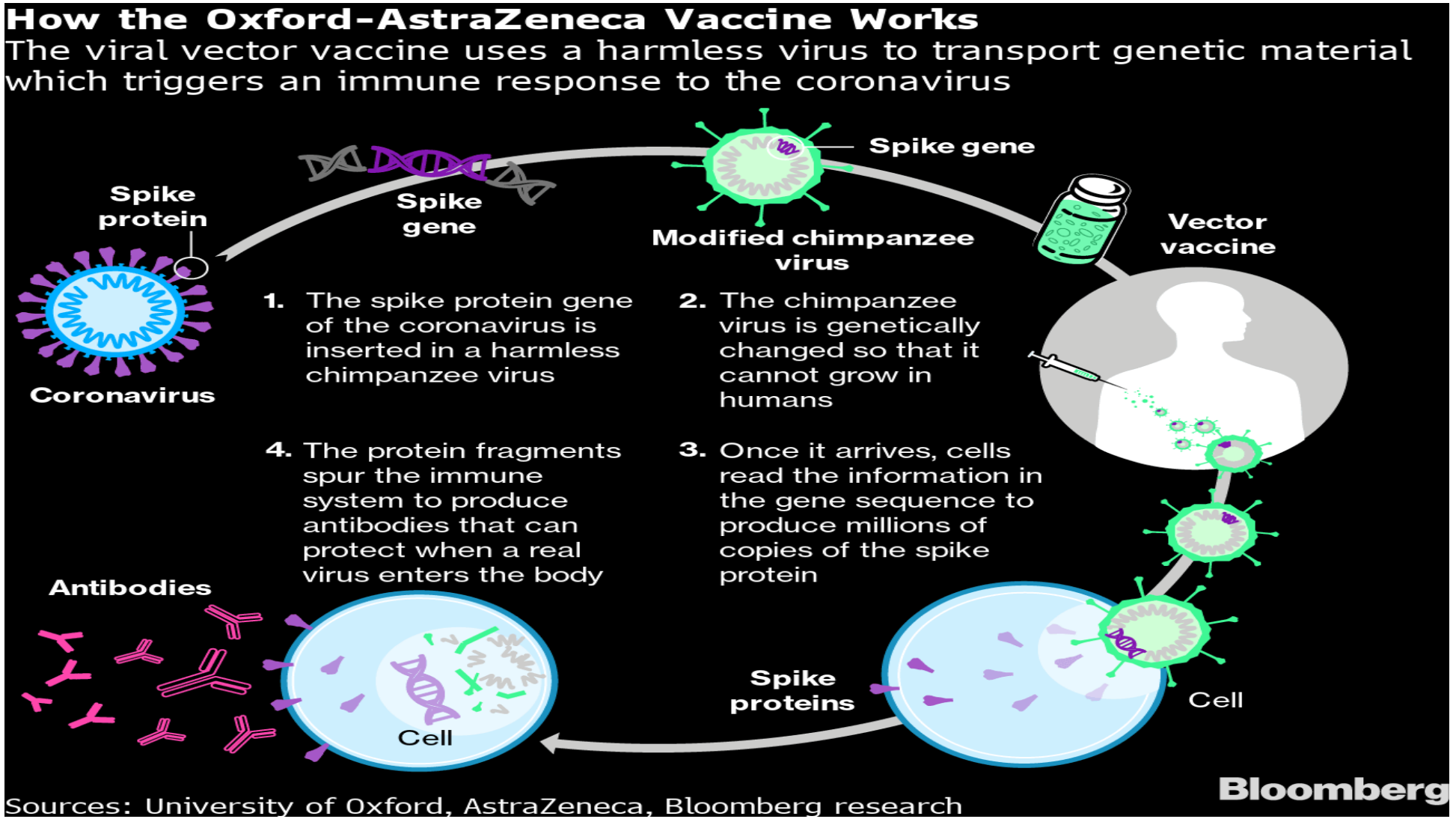
AstraZeneca COVID-19 vaccine is a viral vector vaccine which uses a weakened adenovirus as a carrier to deliver the SARS-CoV-2 antigen.

The adenovirus has been modified so that it cannot replicate (grow and multiply by making copies of itself) in human cells and therefore cause any disease.

The genes that encode for the spike protein on the SARS-CoV-2 virus have been inserted into the adenovirus's genetic code to make the vaccine.

When the vaccine is injected, it enters the host's cells which then manufacture the spike protein.

This then stimulates the immune system which reacts by producing antibodies and memory cells to the SARS-CoV-2 virus without causing disease.


How the Oxford-AstraZeneca Vaccine Works
The viral vector vaccine uses a harmless virus to transport genetic material which triggers an immune response to the coronavirus
Spike protein
Coronavirus
Spike gene
Spike gene
Modified chimpanzee virus
Vector vaccine
1. The spike protein gene of the coronavirus is inserted in a harmless chimpanzee virus
2. The chimpanzee virus is genetically changed so that it cannot grow in humans
3. Once it arrives, cells read the information in the gene sequence to produce millions of copies of the spike protein
4. The protein fragments spur the immune system to produce antibodies that can protect when a real virus enters the body
Antibodies
Cell
Spike proteins
Cell
Sources: University of Oxford, AstraZeneca, Bloomberg research
Bloomberg

Clinical trial summary

- It is given at day zero followed by a second dose on day 28 (updated later to be 12 weeks)
- 14 days later , they should test for Covid-19 (PCR)(not looking for classical s&s. because their end point is to prevent the infection not only the disease.

BRAZIL STUDY

- Total of about 9000 participant
- Divided into placebo and vaccine groups
- 1 full dose at day 0 and full dose at day 28
  EFFICACY = 62%

UK STUDY

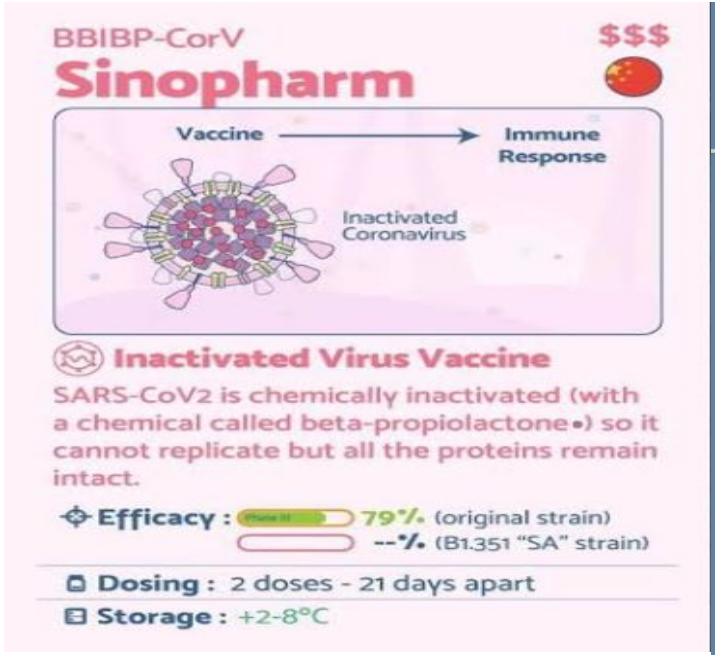
- Total of about 3000 participant
- Divided into placebo and vaccine groups
- Half dose at day 0 and full dose at day 28
  EFFICACY= 90%

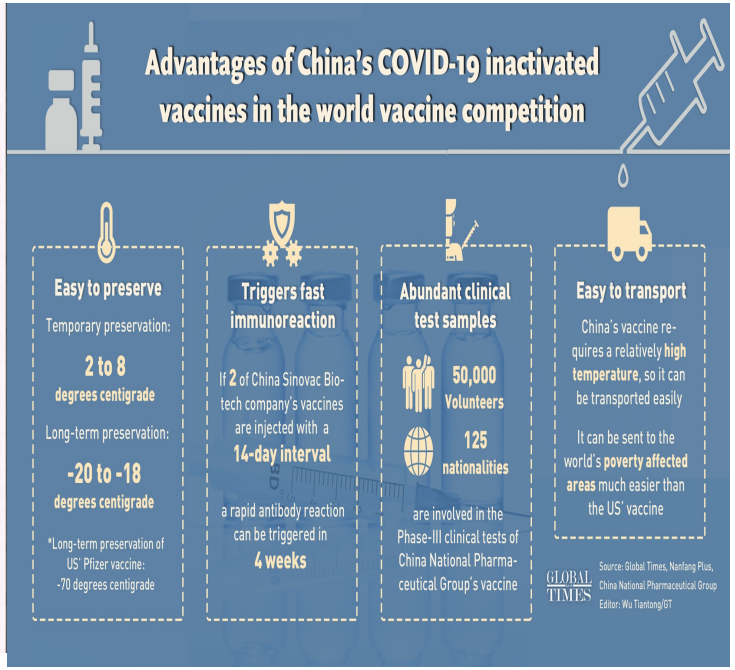
Brazil/ UK study

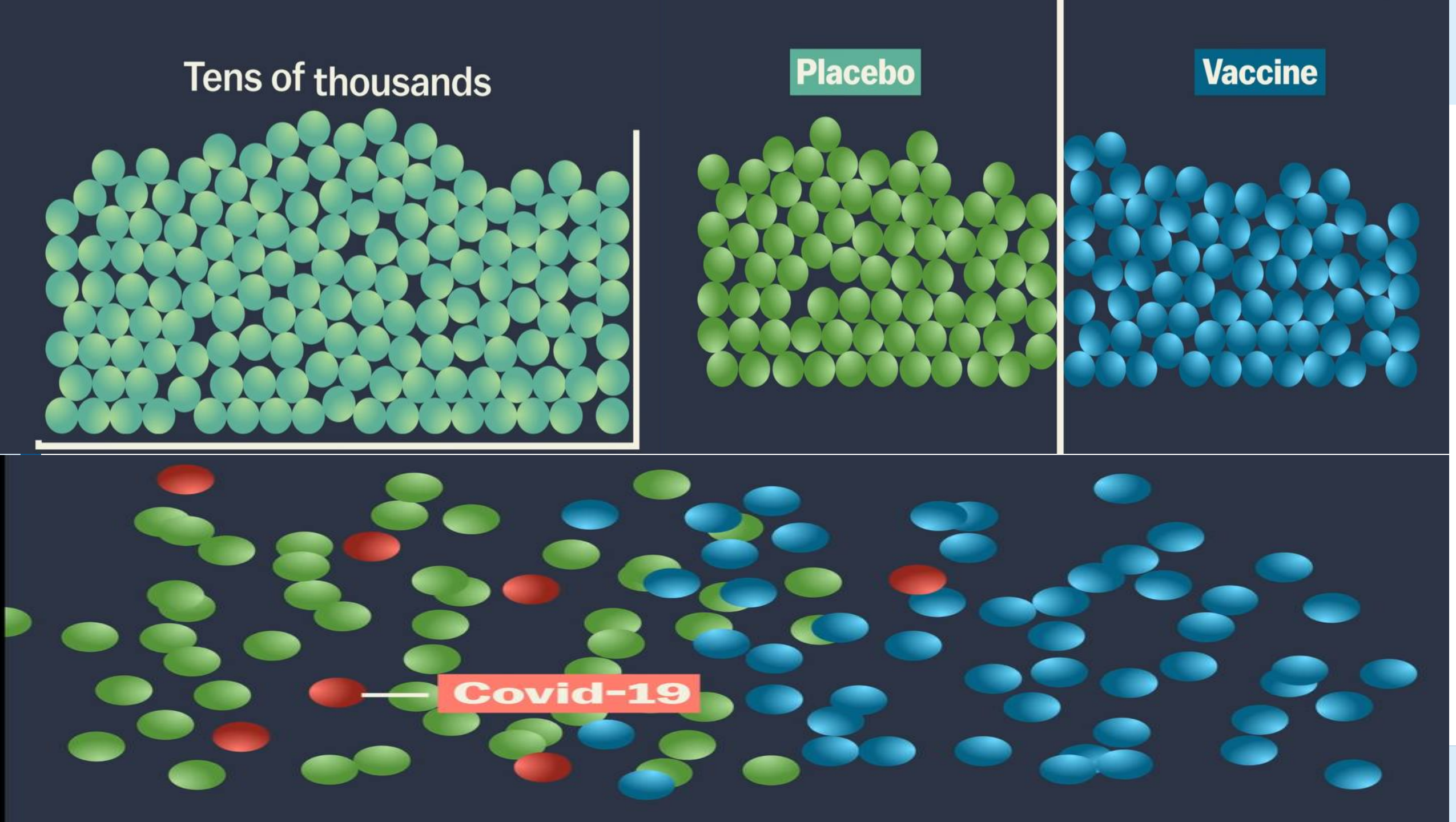
- Total number = 12000
- 13 case tested +
  Combined EFFICACY = 70%
- No case has sever disease

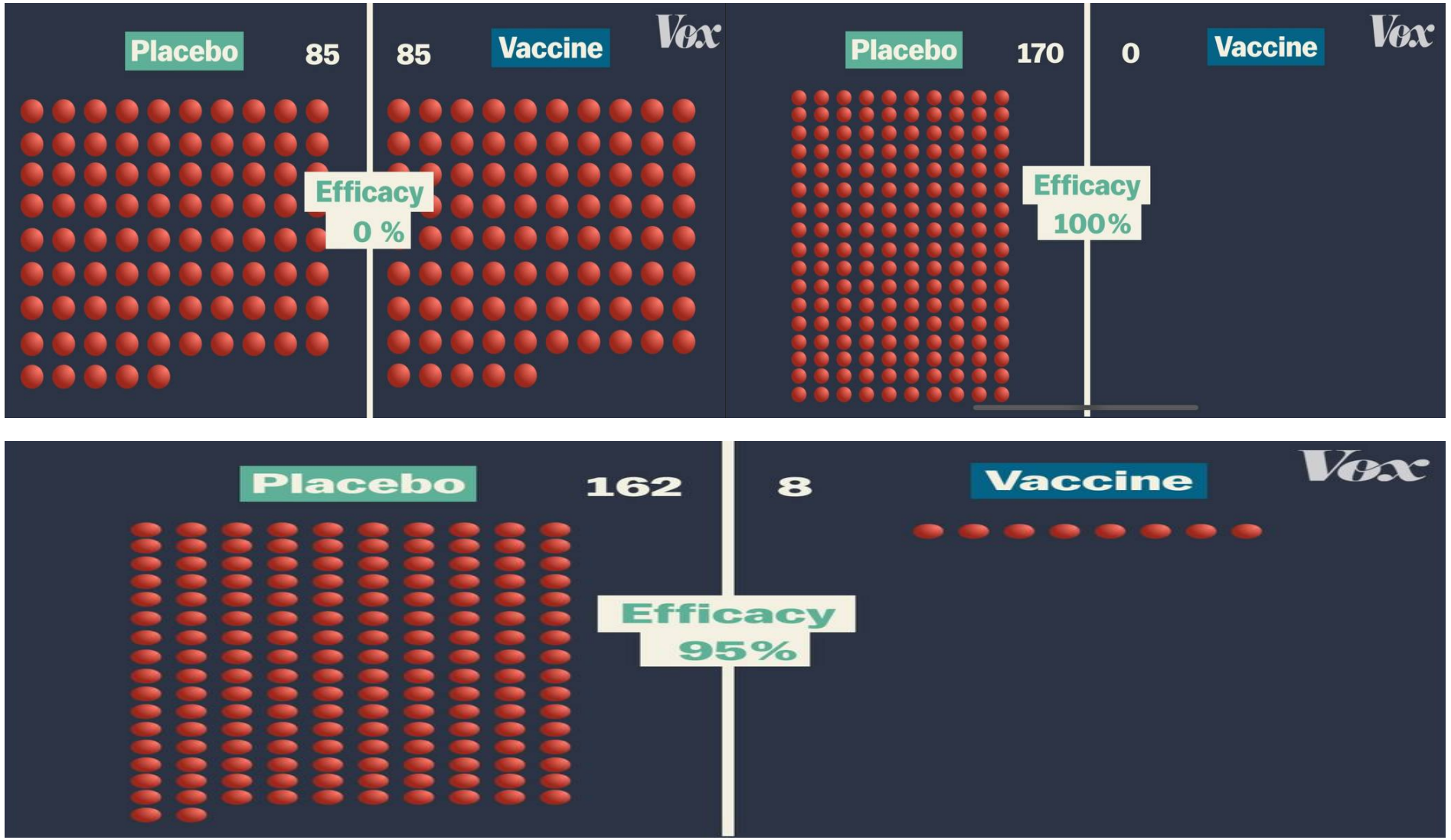
BBIBP-CorV Sinopharm Vaccine

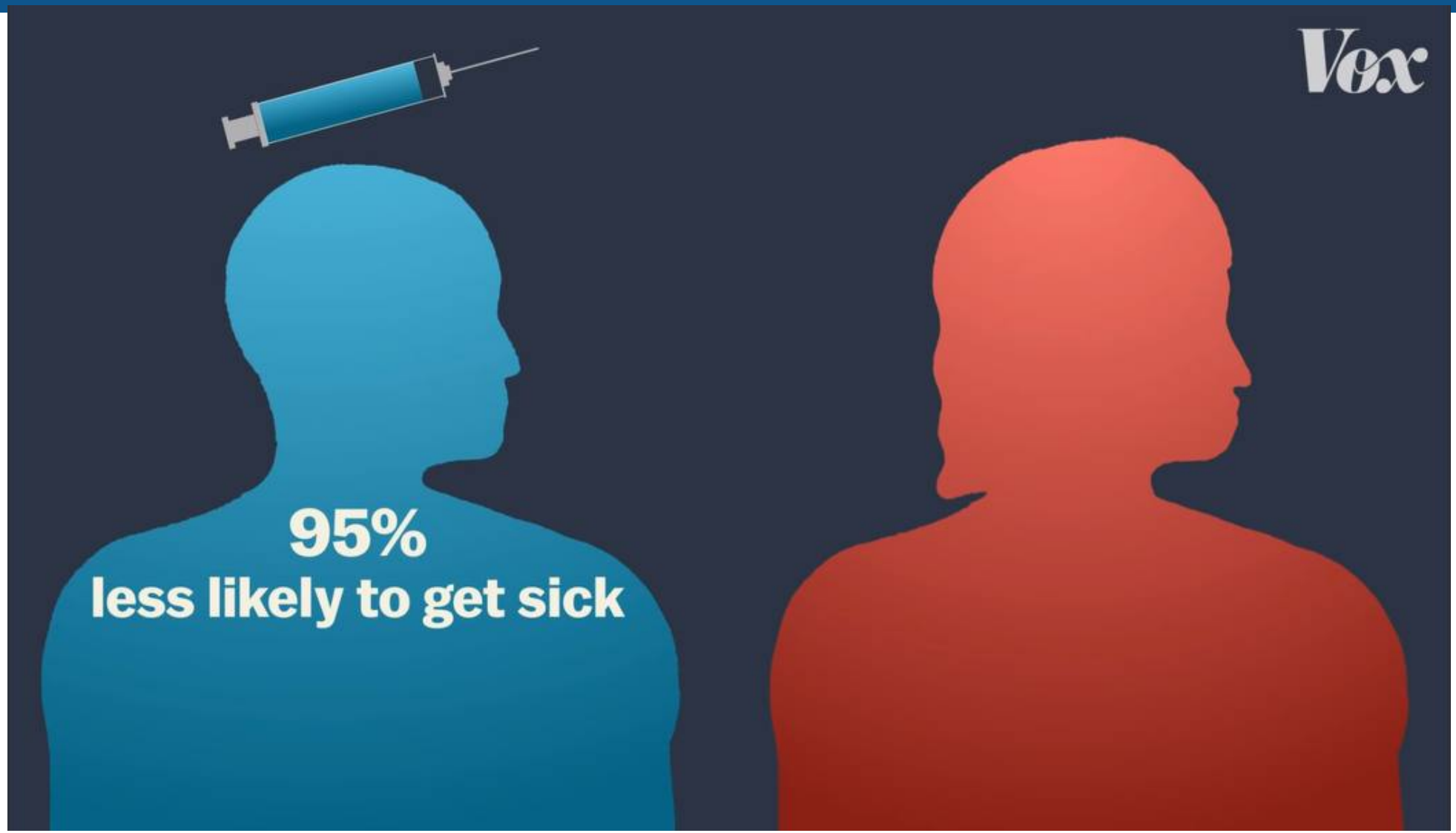
Active Corona virus injected to kidney cells of monkey(Vero cells) , it will replicate to produce huge number of the active virus which will then inactivated by beta propiolactone. It will be reinjected to Vero cells to ensure that its inactive.



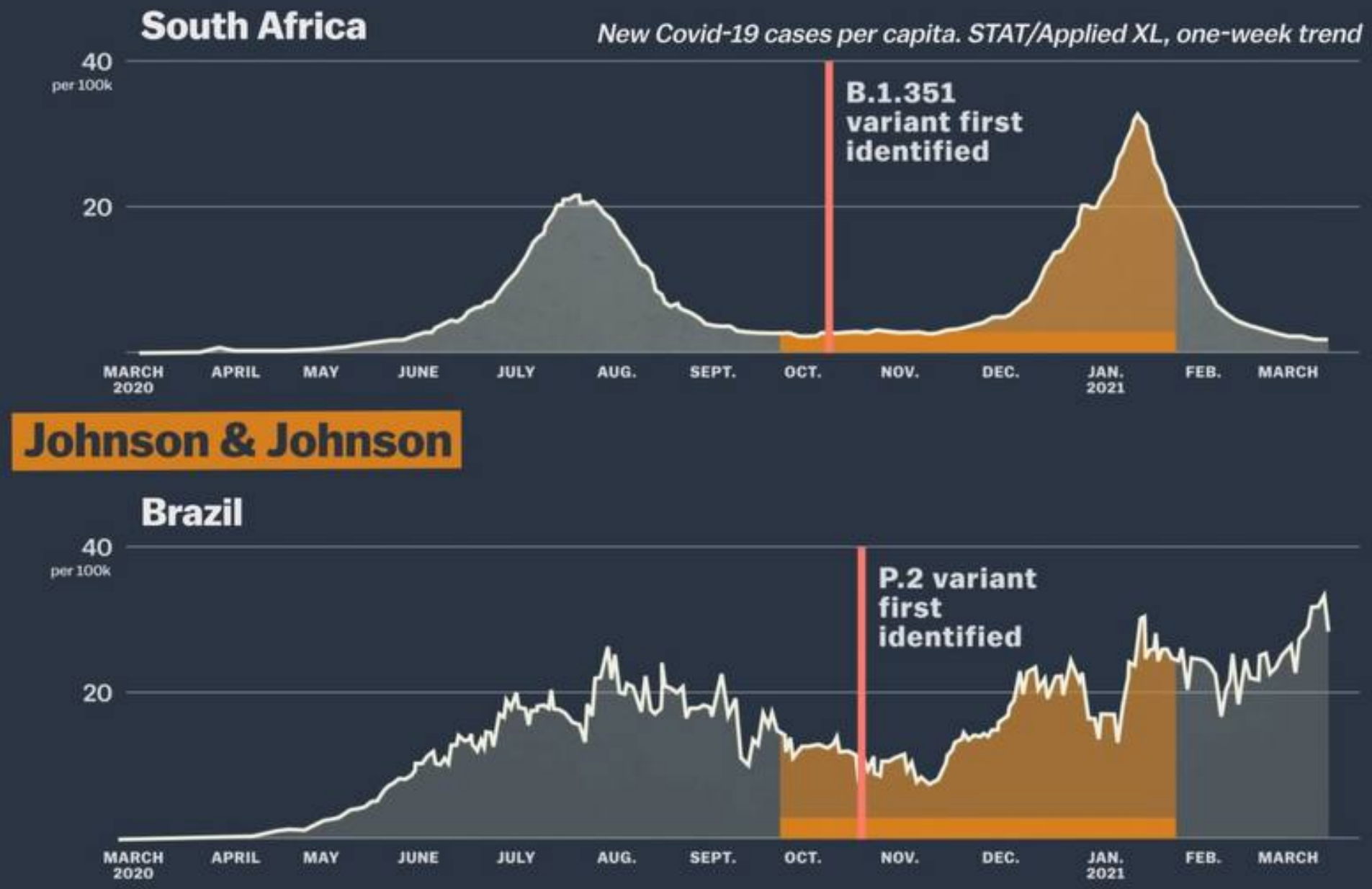



Tens of thousands
Placebo
Vaccine
Covid-19


Placebo
85
85
Vaccine
Vox
Efficacy
0 %
Placebo
170
0
Vaccine
Vox
Efficacy
100%
Placebo
162
8
Vaccine
Vox
Efficacy
95%


Vox
95%
less likely to get sick


95%
Pfizer/BioNTech
7 days after second dose
94%
Moderna
14 days after second dose
92%
Sputnik V
21 days after first dose
89%
NovaVax
7 days after second dose
67%
Oxford/AstraZeneca
15 days after second dose
66%
Johnson & Johnson
28 days after single dose

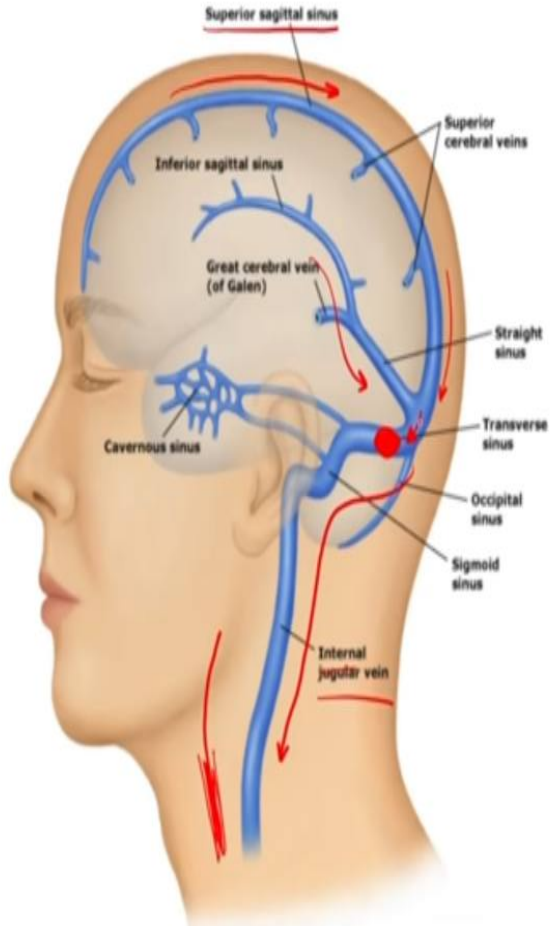

South Africa
New Covid-19 cases per capita. STAT/Applied XL, one-week trend
40
per 100k
20
B.1.351 variant first identified
MARCH 2020
APRIL
MAY
JUNE
JULY
AUG.
SEPT.
OCT.
NOV.
DEC.
JAN. 2021
FEB.
MARCH
Johnson & Johnson
Brazil
40
per 100k
20
P.2 variant first identified
MARCH 2020
APRIL
MAY
JUNE
JULY
AUG.
SEPT.
OCT.
NOV.
DEC.
JAN. 2021
FEB.
MARCH

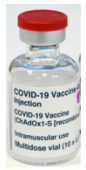
THROMBOTIC THROMBOCYTOPENIA OF ASTRAZENECA

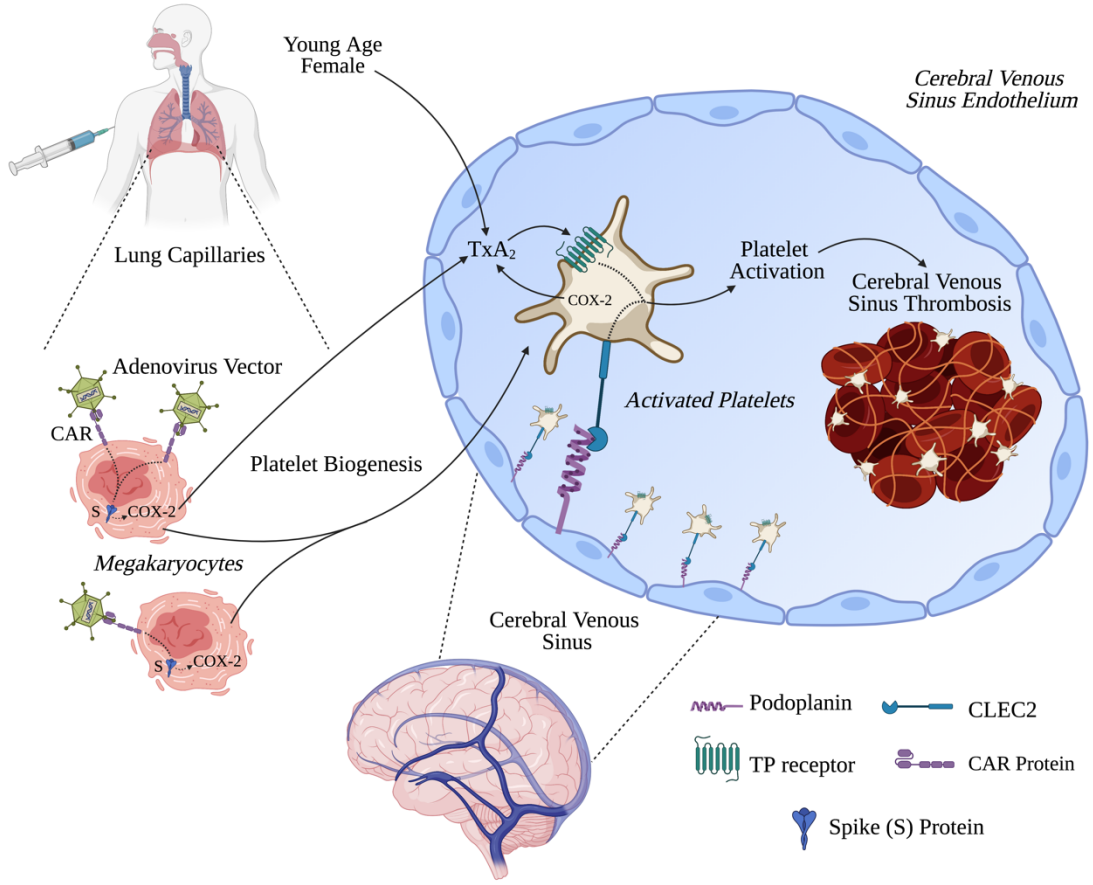
CVST

Symptoms

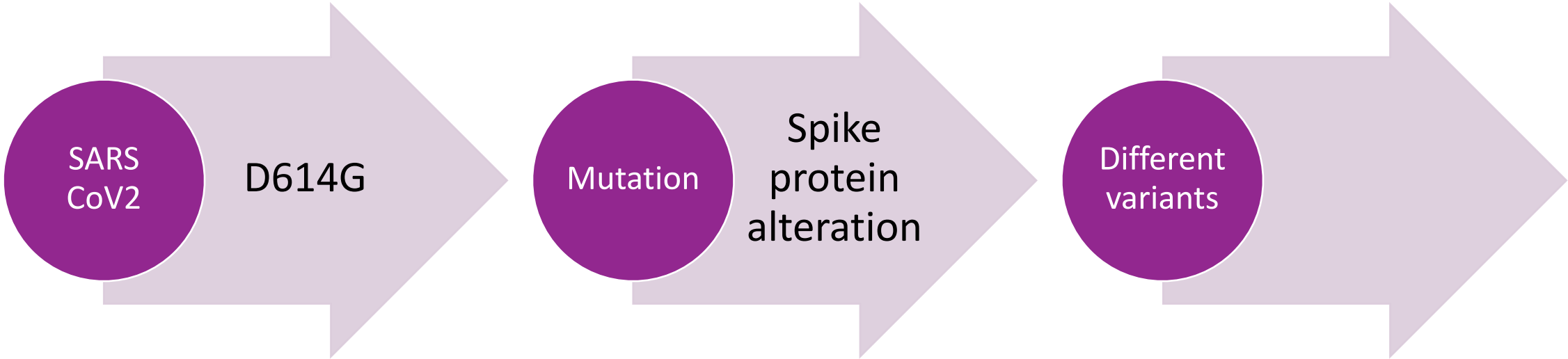
Headache
abnormal vision
Stroke.
Seizures







Variants of SARS CoV2 / Mutations



B.1.1.7 variant : Mostly predominant in **UK**

E484K

Escape mutation, help to evade the immune system

P681H

Enhances the viral entry to the cell by possibly abolishing the phosphoinhibtion of s1/s2site

Y144 DEL

Reduces antibody binding affinity

N501Y

This mutation increases the binding affinity toward the human ACE-2 receptor

H69-V70 DEL

Mutation leads to conformational change in spike protein

D614G

It reduces the S1 shedding and increases the infectivity

B.1.1.318 variant : Mostly predominant in **UK**

E484K

P681H

Y144DEL

D614G

D796H

D796H IS AN ADAPTIVE MUTATION THAT HELPS TO ESCAPE FROM CONVALESCENT PLASMA ANTIBODIES

B.1.351 variant : Mostly predominant in **SOUTH AFRICA**

E484K

N501Y

K417N

D614G

K417N MUTATION REDUCES SENSITIVITY OF THE VIRUS TOWARD THE ANTIBODIES AND INCREASE THE BINDING AFFINITY TO ACE 2 RECEPTORS

L452R

S13I

W152C

D614G

L452R MUTATION ALTERS THE DYNAMIC IN THE RECEPTOR BINDING OF RBC

E484K

Y144DEL

F888L

F888L MUTATION HAS UNKNOWN EFFECT

P.1 variant : Mostly predominant in **BRAZIL**

E484K

N501Y

K417T

D614G

B.1.617 variant : Mostly predominant in **INDIA**

E484Q

L452R

- **E484Q MUATION IS DIFFERENT FROM E484K IN ONLY ONE AMINO ACID SUBSTITUTE**

Does the vaccine still effective against the new variants?

Thank you...