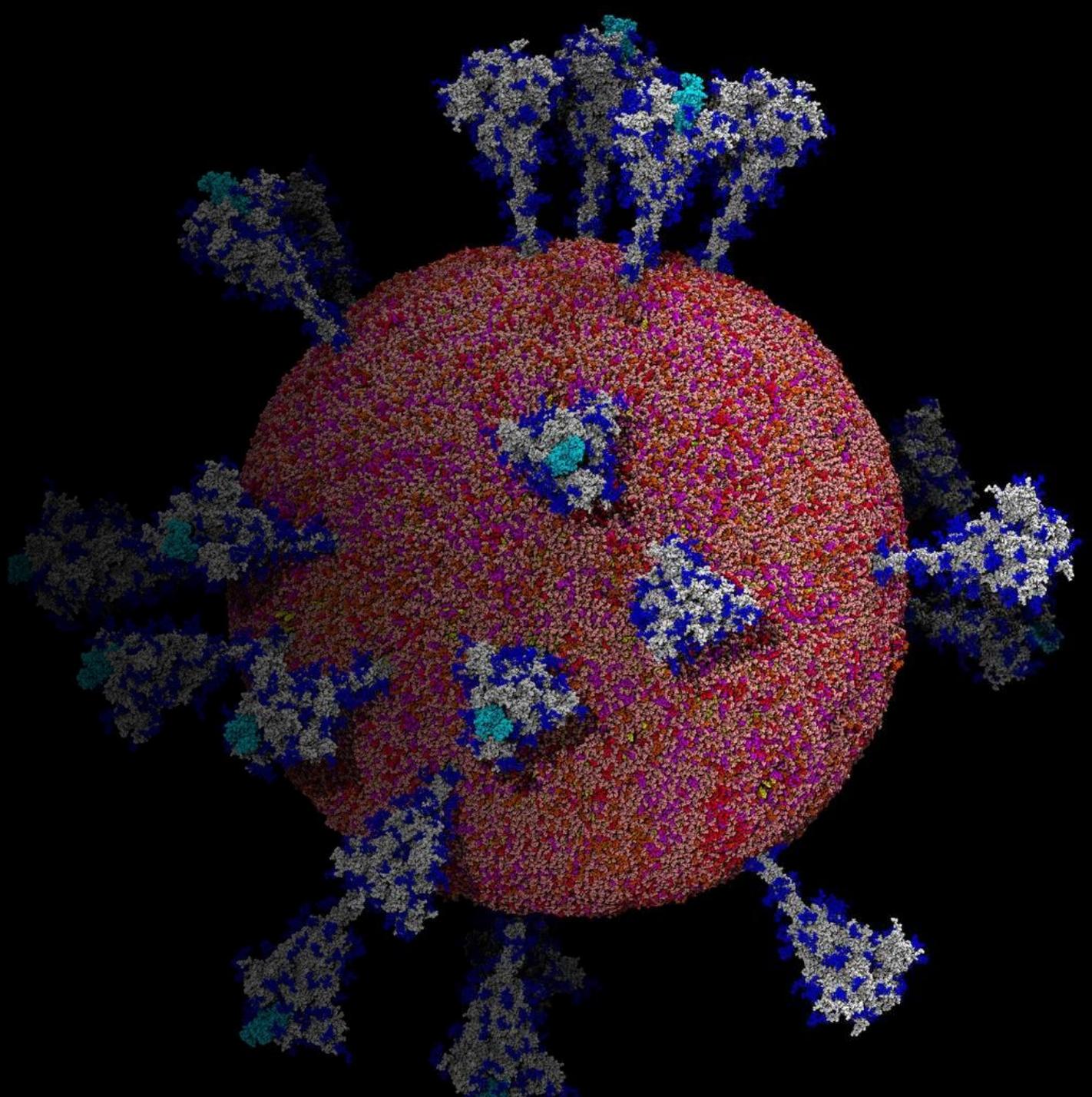




# SARS-CoV2 Vaccines

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Nyaradzo Chigorimbo-Tsikiwa Ph.D

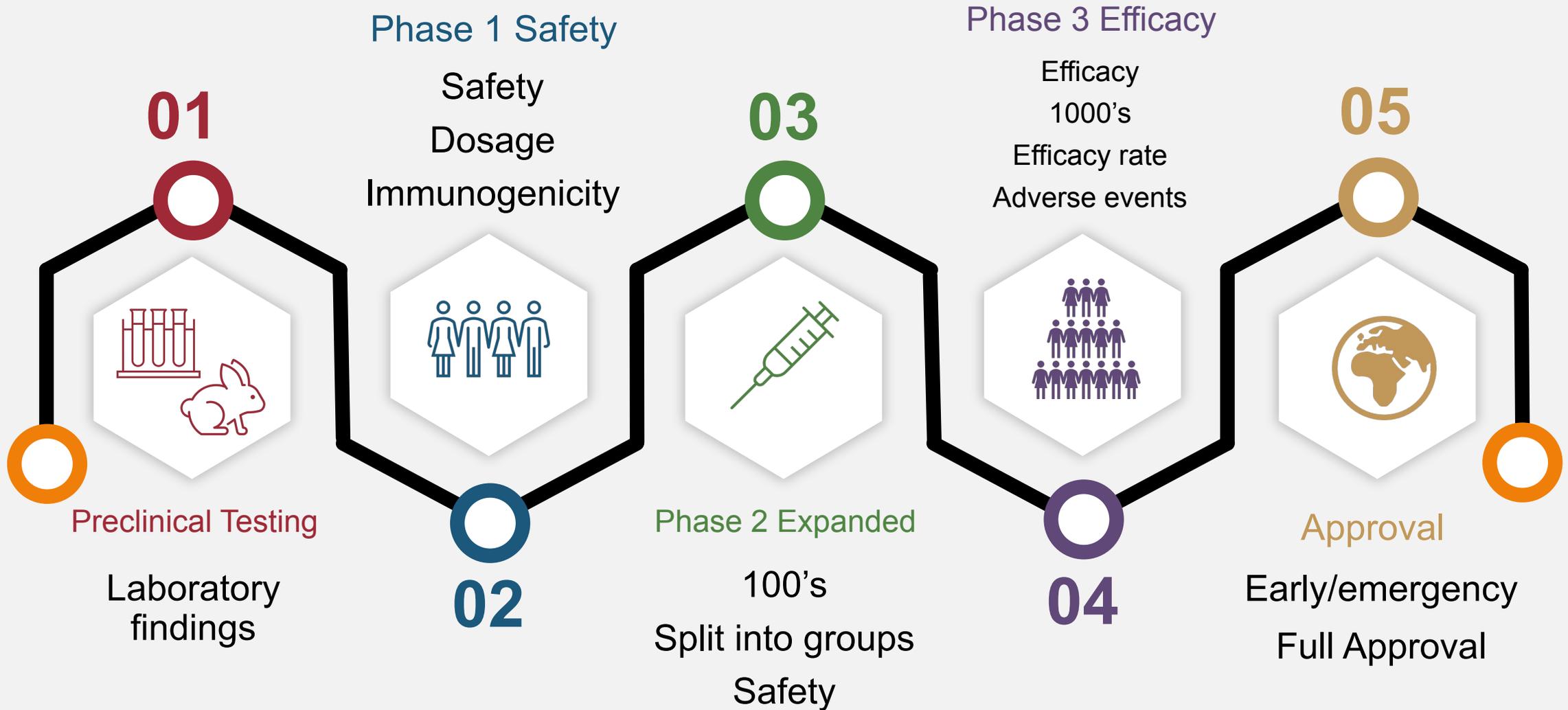


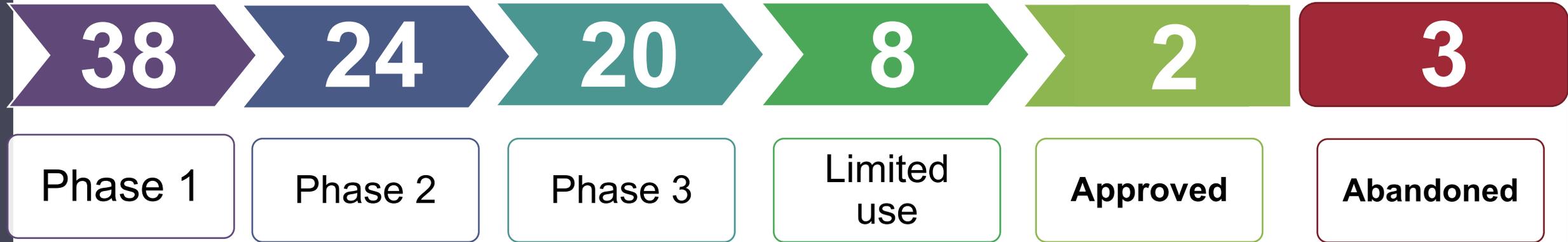
# Talk Contents

1. SARS-CoV2 Vaccine Landscape
2. Approved Vaccines
3. Basic Immunology and Biology
4. Types of Vaccines
5. Herd Immunity, virus variants
6. Concluding thoughts discussion

# Vaccine Clinical Trials Process

*The development cycle of a vaccine, from lab to clinic.*

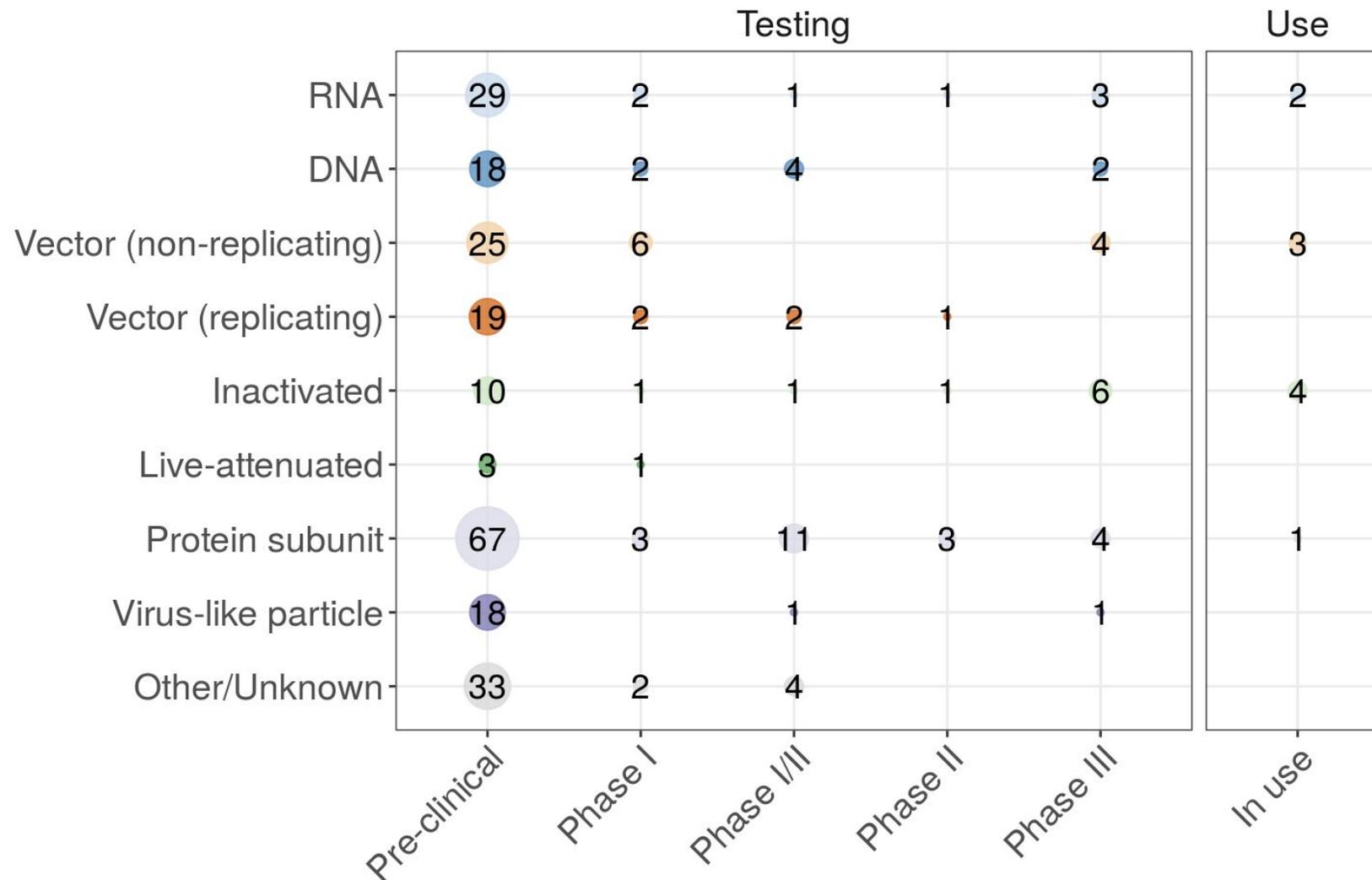




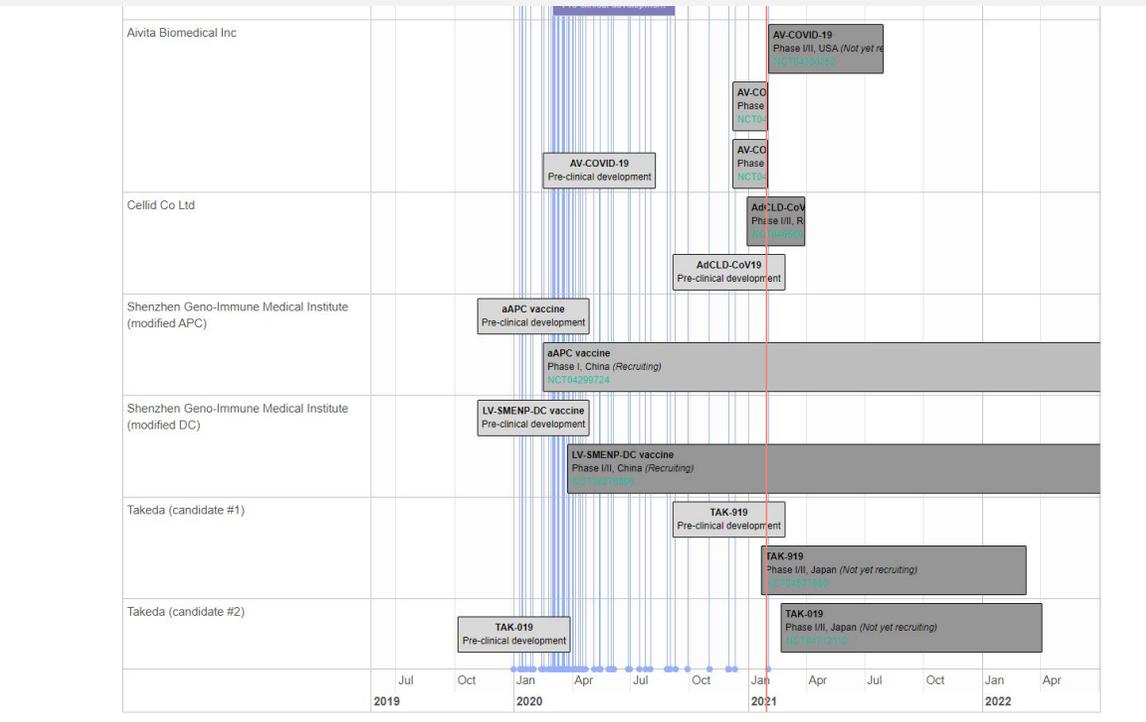
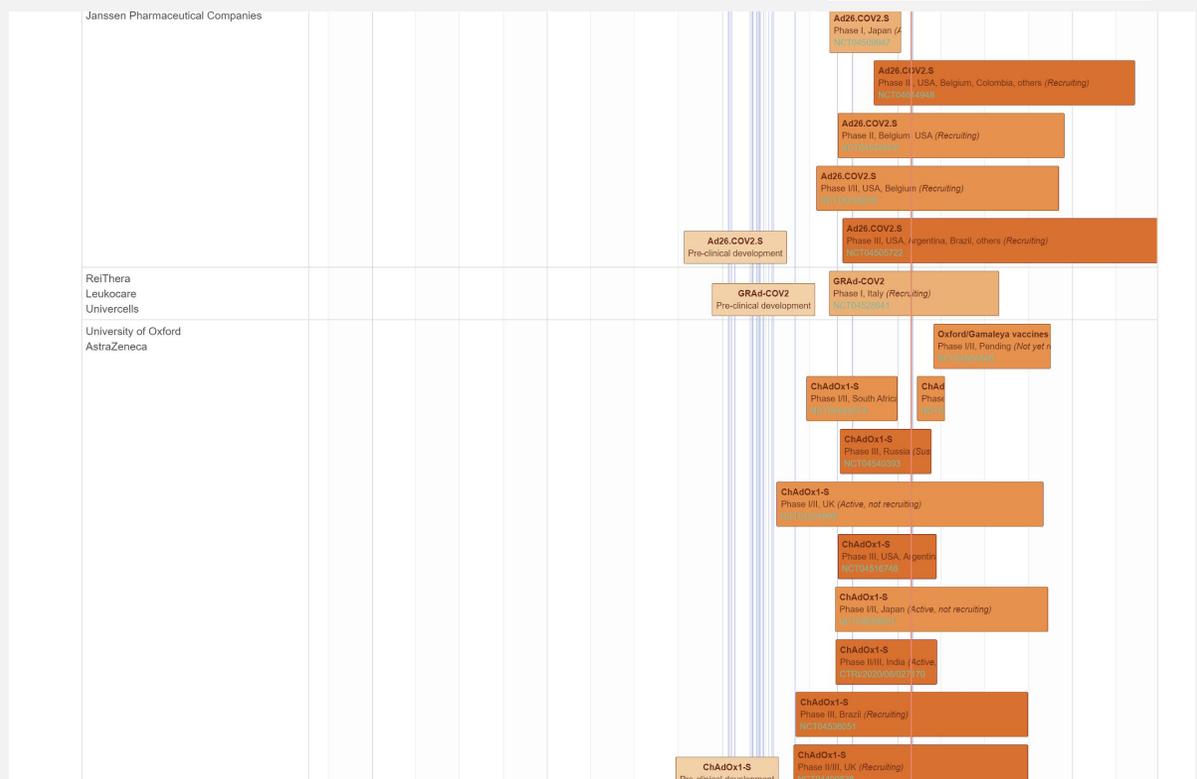
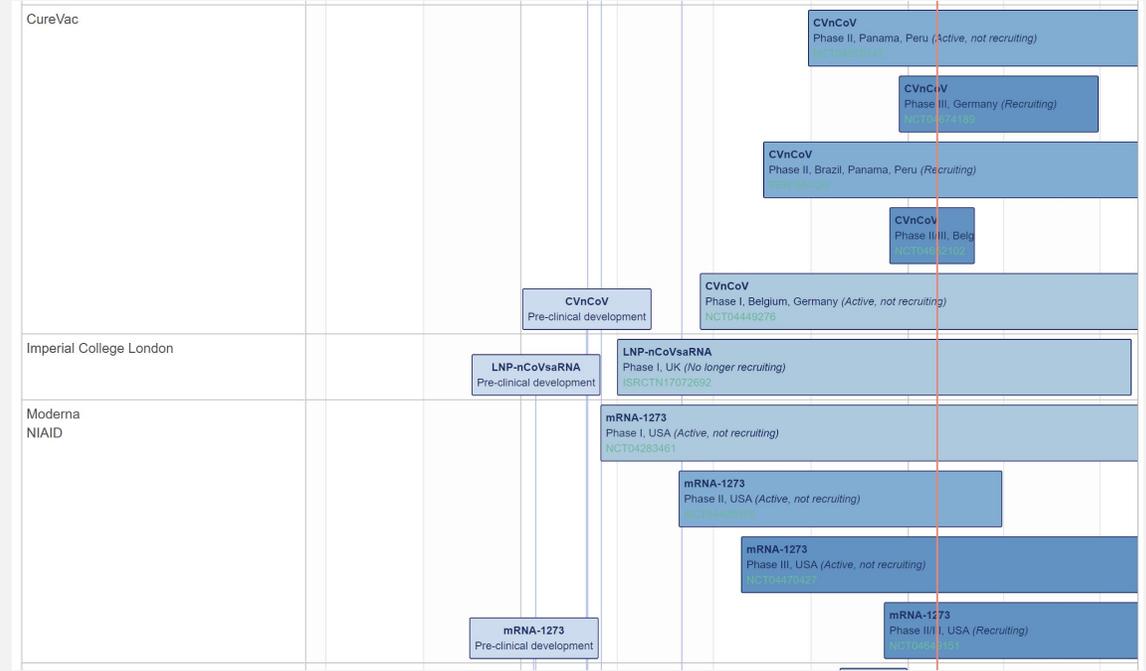
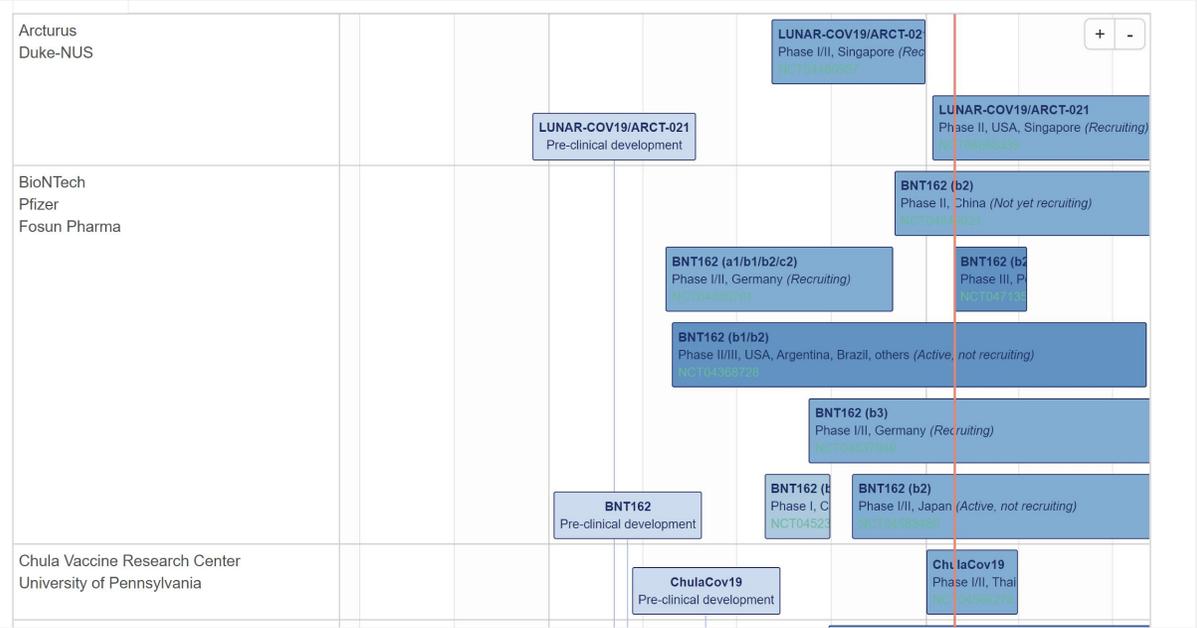
# Current Vaccine Stats

66 Vaccines

# Vaccine landscape



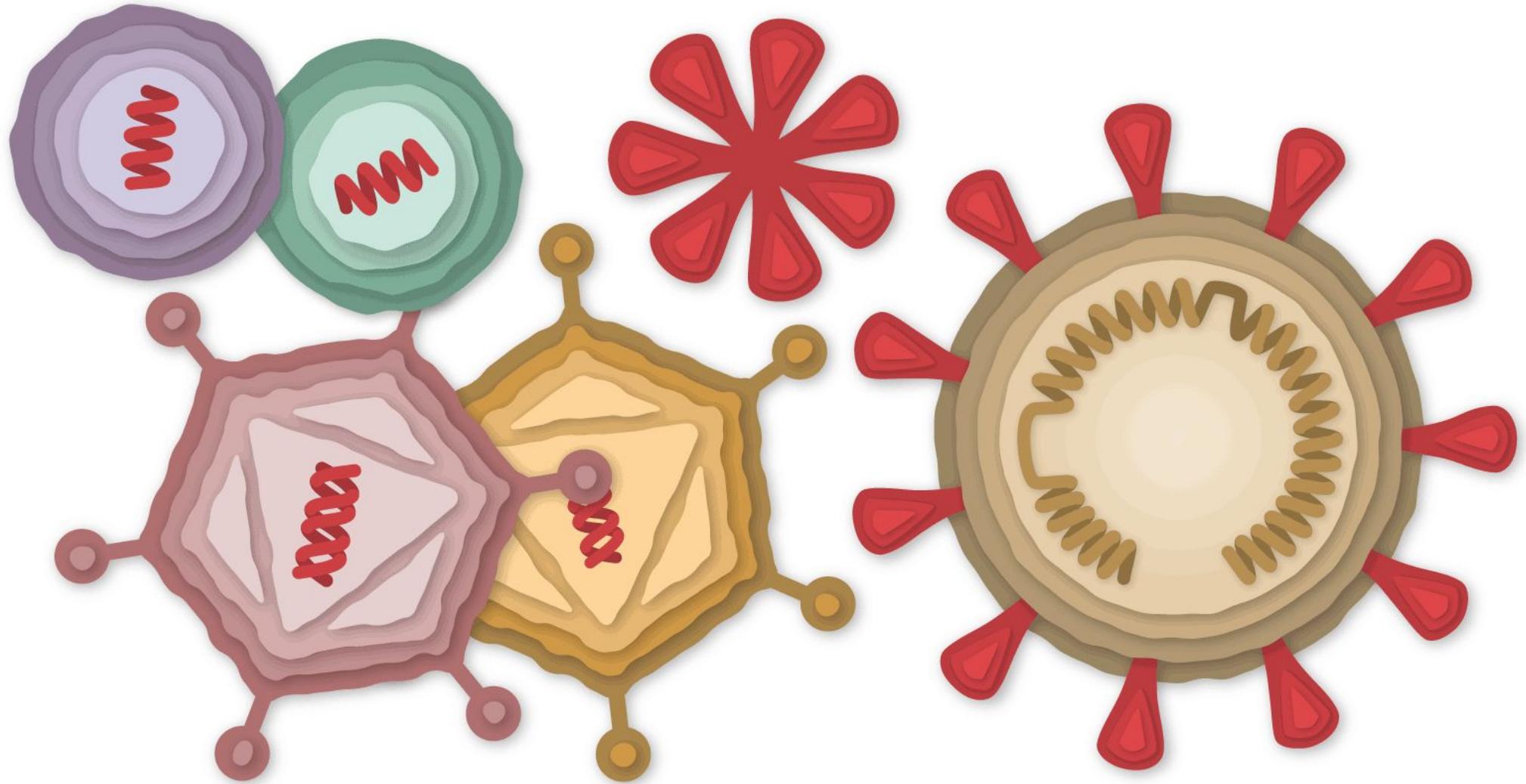
Candidates listed above as being in phase III include several undergoing combined phase II/III trials.



## Leading vaccines

Developer	How It Works	Phase	Status
 Pfizer-BioNTech	mRNA	<b>2</b> <b>3</b>	Approved in Saudi Arabia, Bahrain, Switzerland. Emergency use in U.S., E.U., other countries.
 Moderna	mRNA	<b>3</b>	Emergency use in U.S., U.K., E.U., other countries.
 Gamaleya	Ad26, Ad5	<b>3</b>	Early use in Russia. Emergency use in other countries.
 Oxford-AstraZeneca	ChAdOx1	<b>2</b> <b>3</b>	Emergency use in Britain, India, other countries.
 CanSino	Ad5	<b>3</b>	Limited use in China.
 Johnson & Johnson	Ad26	<b>3</b>	
 Vector Institute	Protein	<b>3</b>	Early use in Russia.
 Novavax	Protein	<b>3</b>	
 Sinopharm	Inactivated	<b>3</b>	Approved in China, U.A.E., Bahrain. Emergency use in Egypt, Jordan.
 Sinovac	Inactivated	<b>3</b>	Emergency use in China, Brazil, other countries.
 Sinopharm-Wuhan	Inactivated	<b>3</b>	Limited use in China, U.A.E.
 Bharat Biotech	Inactivated	<b>3</b>	Emergency use in India.

# How Vaccines work



# Immune system



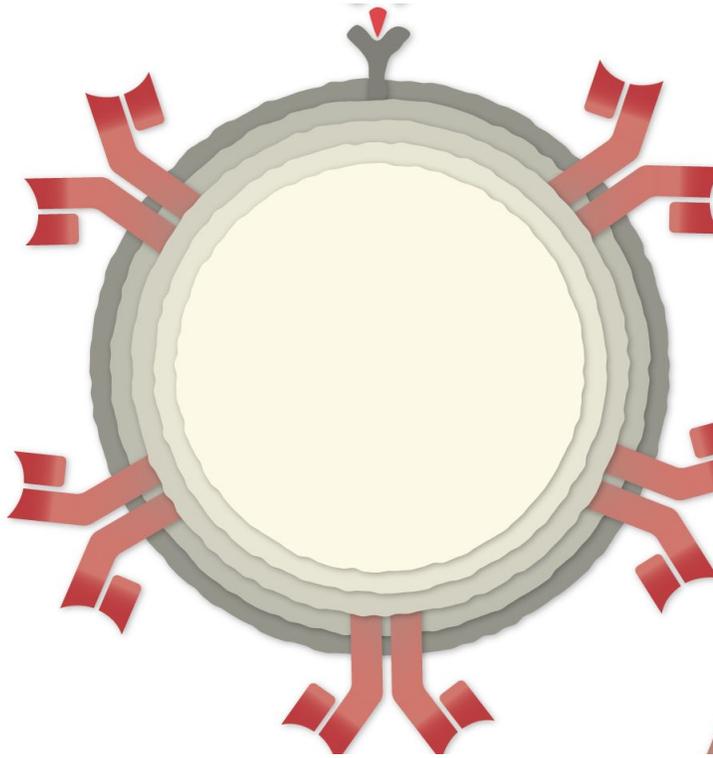
Image of Wakanda shield that hides the nation



<https://www.webmd.com/cold-and-flu/ss/slideshow-immune-system>

# Soldiers of the body

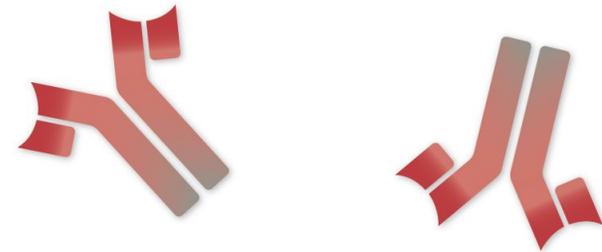
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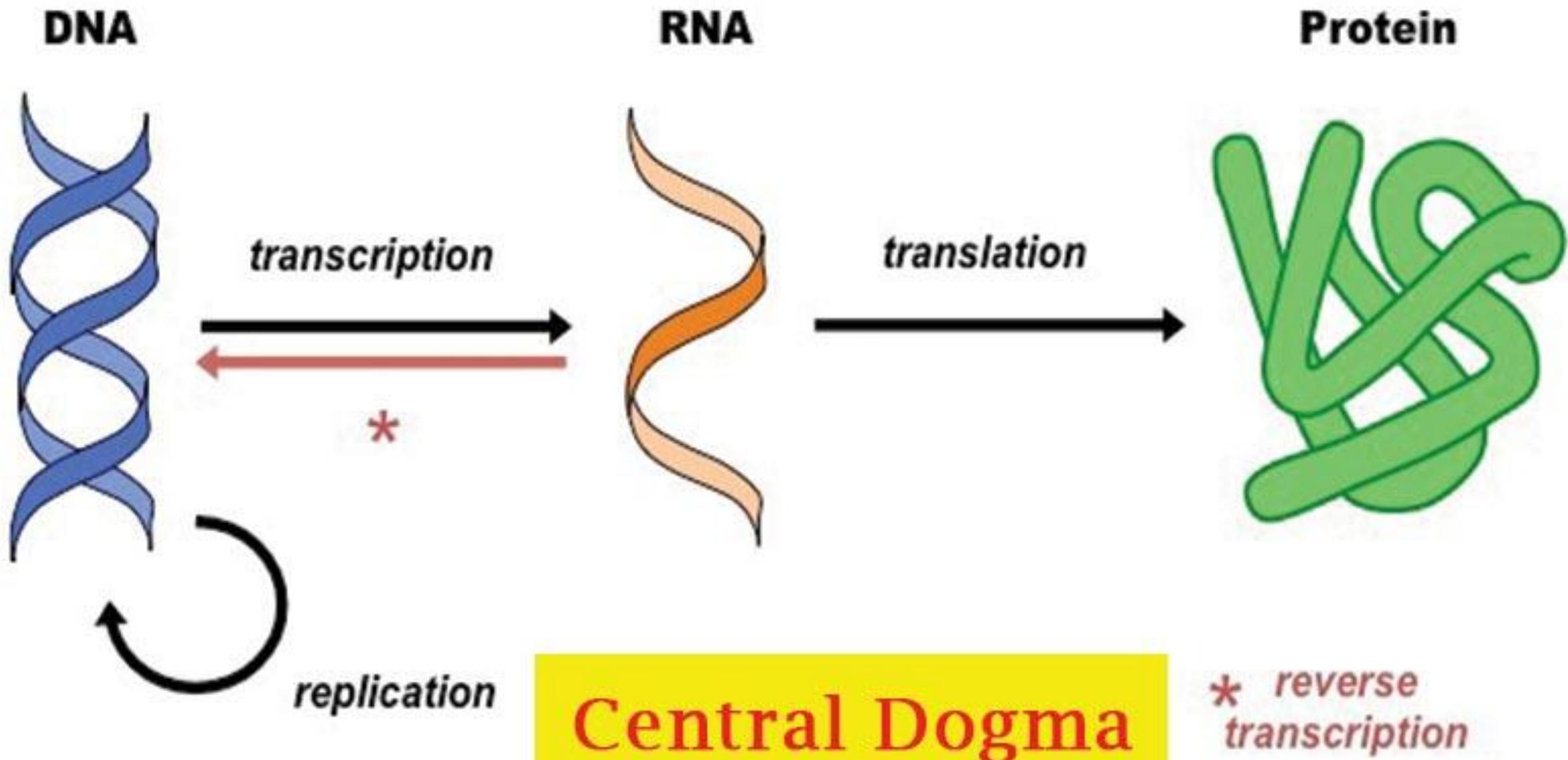
**B Cells**



**T Cells**



**Antibodies**



**DNA**

**RNA**

**Protein**

*transcription*

*translation*

*replication*

**Central Dogma**

\* *reverse transcription*

# Types of Vaccines: Genetic vaccines

*SARS CoV-2 genes into our cells to stimulate an immune response*

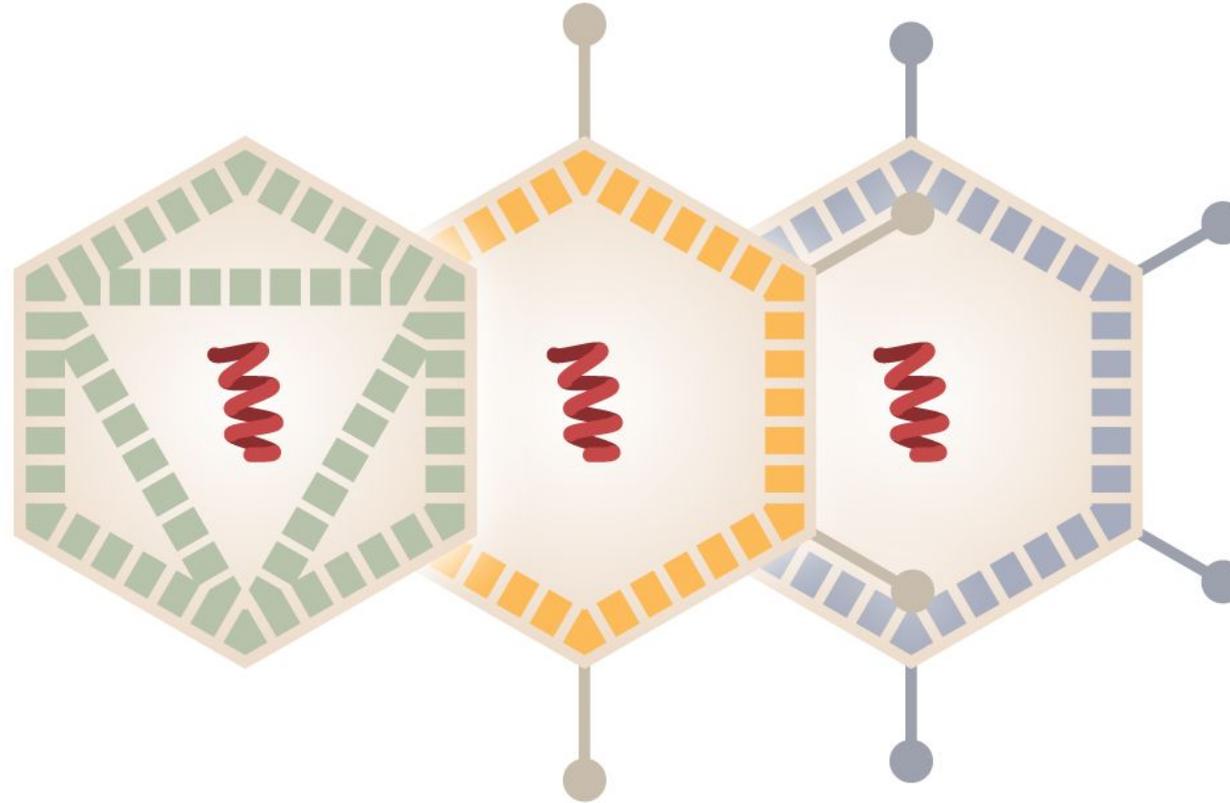


**36** RNA based

**26** DNA based

# Types of Vaccines: Viral Vector Vaccines

*SARS CoV-2 genes into our cells to stimulate an immune response*

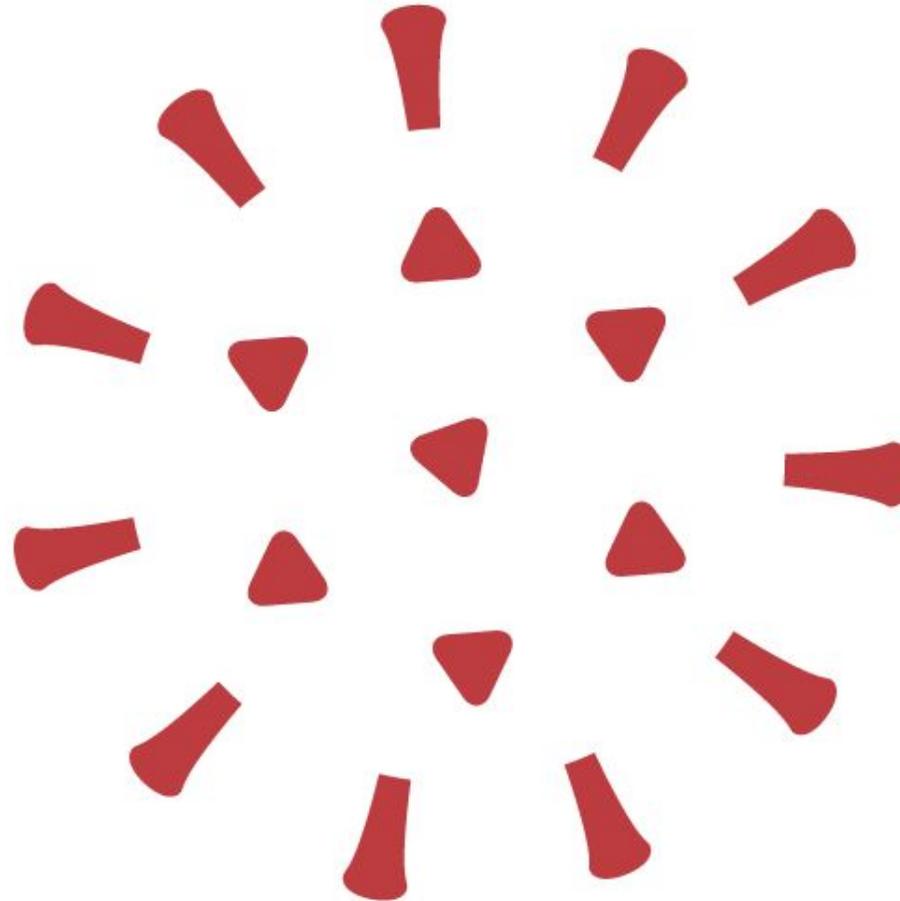


**35 non replicating**  
**24 replicating**

# Types of Vaccines: Protein Based vaccines

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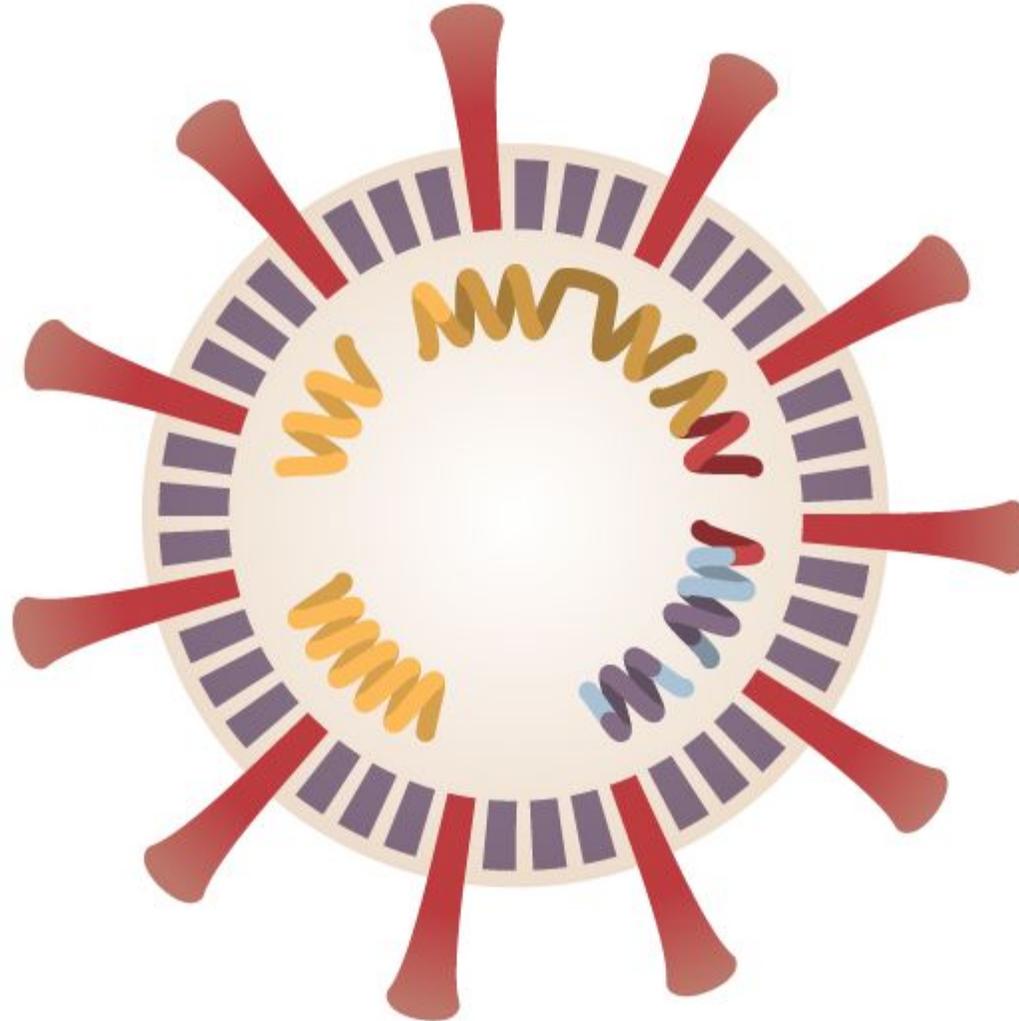
*Contain coronavirus proteins but no genetic material.*



**89 Protein Subunit**

# Types of Vaccines: Inactivated/Attenuated vaccines

*Vaccines created from weak*



**19 Inactivated virus**  
**4 Live attenuated**

# Efficacy of leading vaccines candidates

*Based of media release data*



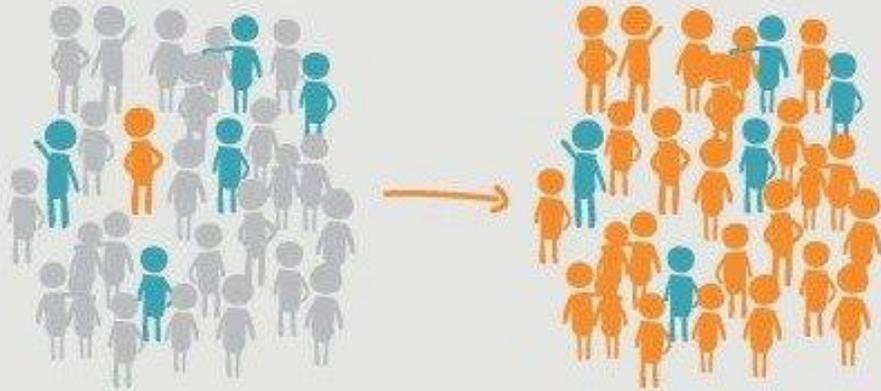
\* As of Nov 23, 2020. Phase III trials for BNT162b2 are complete.  
Other trials are ongoing and findings have not been peer-reviewed.  
Sources: Respective companies, Russian health ministry



# Herd Immunity and COVID-19

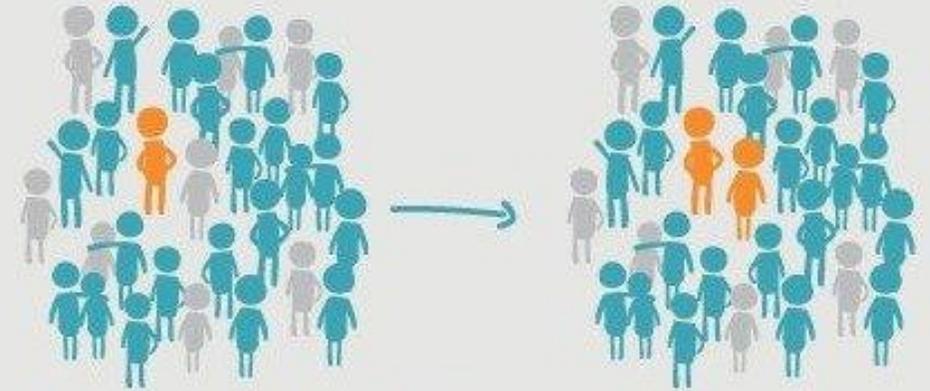
*When infection will not spread within the population*

If only a few people are **vaccinated** ...



...then one **person** is infected...  
the disease spreads very fast

But if lots of people are **vaccinated** ...



...then the **disease** can't spread very far,  
so the whole community stays safe.  
**This is 'herd immunity'**

- SARS-CoV 2,  $R_0 = 2$  to 3
- 67% of population would need immunity.

# Ways to attain herd immunity

## Natural immunity



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Search

bioRxiv is receiving many new papers on coronavirus SARS-CoV-2. A reminder: these are preliminary reports that have not been certified by peer review and should not be used to guide practice/health-related behavior, or be reported in news media as established information.

New Results

Comments (1)

### SARS-CoV-2 501Y.V2 escapes neutralization by South African COVID-19 donor plasma

Constantinos Kurt Wibmer, Frances Ayres, Tandile Hermanus, Mashudu Madzivhandila, Prudence K gagudi, Bronwen E. Lambson, Marion Vermeulen, Karin van den Berg, Theresa Rossouw, Michael Boswell, Veronica Ueckermann, Susan Meiring, Anne von Gottberg, Cheryl Cohen, Lynn Morris, Jinal N. Bhiman, Penny L. Moore

doi: <https://doi.org/10.1101/2021.01.18.427166>

This article is a preprint and has not been certified by peer review [what does this mean?].

Abstract

Full Text

Info/History

Metrics

Preview PDF

#### Abstract

SARS-CoV-2 501Y.V2, a novel lineage of the coronavirus causing COVID-19, contains multiple mutations within two immunodominant domains of the spike protein. Here we show that this lineage exhibits complete escape from three classes of therapeutically relevant monoclonal antibodies. Furthermore 501Y.V2 shows substantial or complete escape from neutralizing antibodies in COVID-19 convalescent plasma. These data highlight the prospect of reinfection with antigenically distinct variants and may foreshadow reduced efficacy of current spike-based vaccines.

#### Competing Interest Statement

## Vaccines

### As Virus Grows Stealthier, Vaccine Makers Reconsider Battle Plans

Vaccines by Moderna and Pfizer-BioNTech effectively protect recipients. But in a worrying sign, they are slightly less effective against a variant found in South Africa.



A participant in a vaccine trial in Johannesburg last month. (The New York Times)

By Denise Grady, Aparna Mehta and Katie Thomas

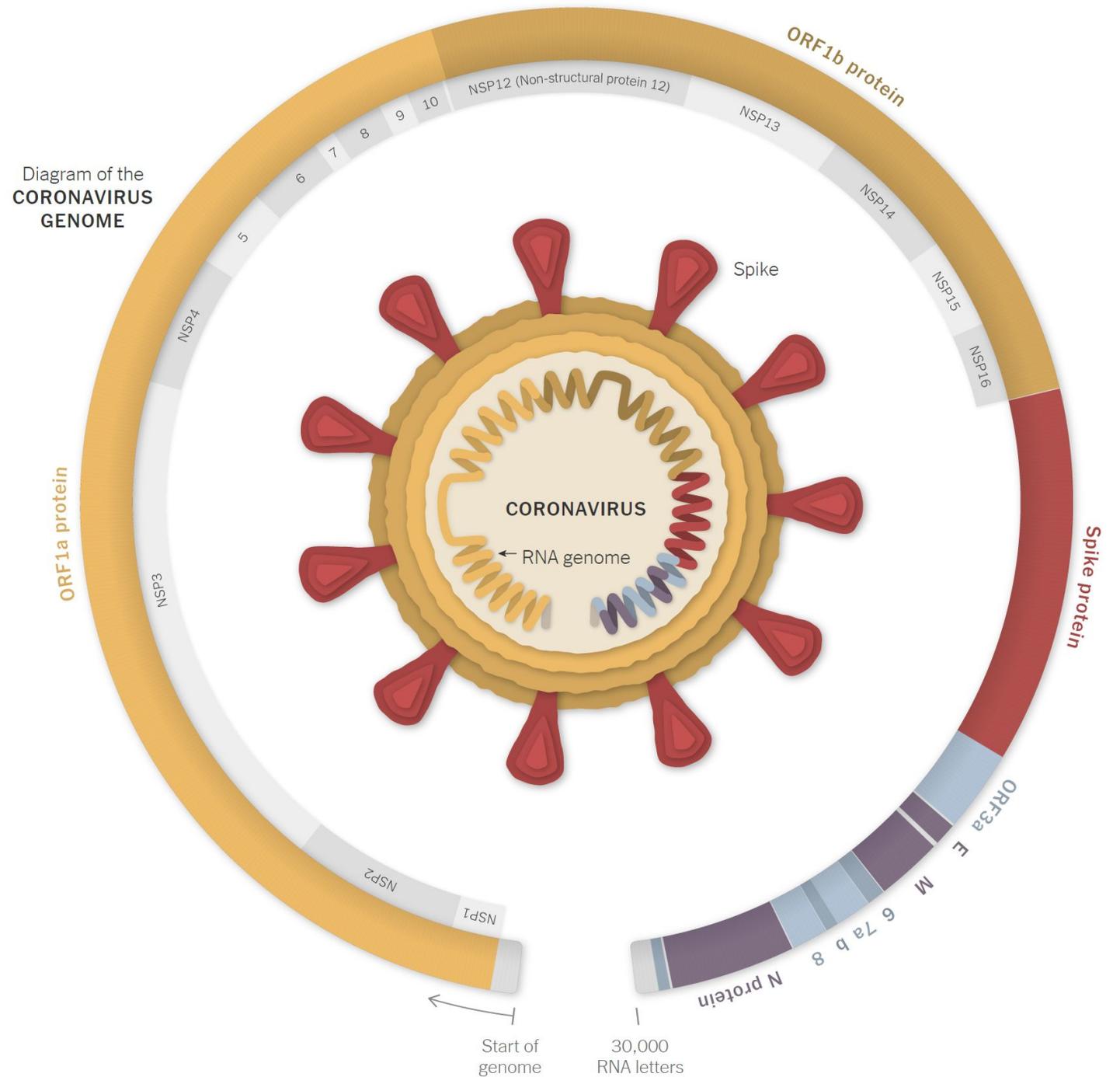
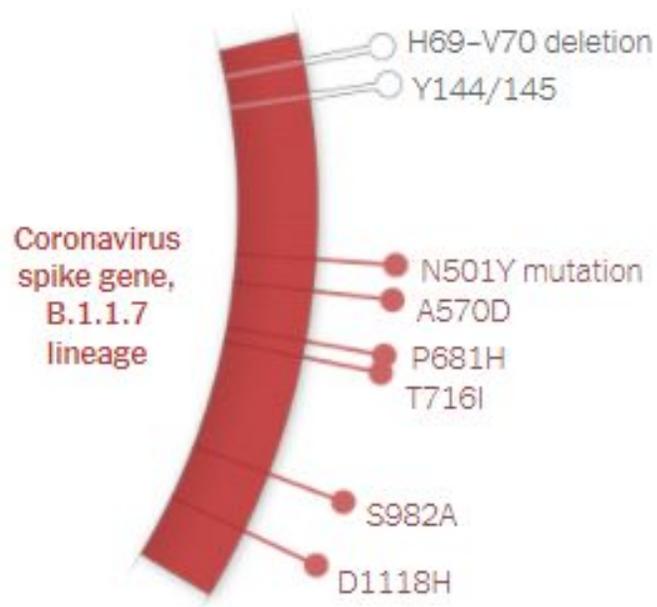
Nov. 10, 2020

As the coronavirus spreads continents, new South African variant

# SARS-CoV2 variants

*South African and UK variants*

- o 29 kinds of different proteins  
in the B.1.1.7 Lineage





# Vaccine Aversion

The screenshot shows the NPR website interface. At the top, there is a navigation bar with the NPR logo, a search bar, and links for 'SIGN IN', 'NPR SHOP', and 'DONATE'. Below this is a secondary navigation bar with categories: NEWS, ARTS & LIFE, MUSIC, SHOWS & PODCASTS, and SEARCH. The main content area features a 'Coronavirus Updates' section with a virus icon. Below that, a featured article titled 'Black People Are More Hesitant About A Vaccine. A Leading Nurse Wants To Change That' is displayed. The article includes social media sharing icons, the date 'November 24, 2020 - 5:34 PM ET', and author names 'JAMES DOUBEK' and 'DAVID GREENE'. A '6-Minute Listen' audio player is visible below the article text. The bottom of the article shows a partial image of a vaccine vial with the word 'Modern' visible in red.

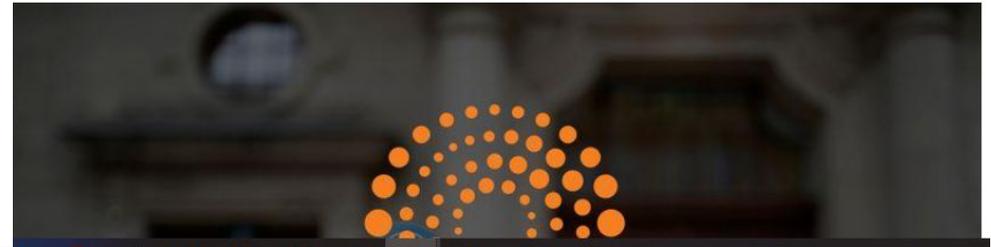
## Fact check: RFID microchips will not be injected with the COVID-19 vaccine, altered video features Bill and Melinda Gates and Jack Ma

By Reuters Staff

10 MIN READ



A video shared over 27,100 times on Facebook implies that the COVID-19 vaccine will contain a tracking microchip that will be injected in the individuals that receive the COVID-19 vaccine once it is ready. This is false.



FILE PHOTO: The Whatsapp logo and binary cyber codes are seen in this illustration taken November 26, 2019. REUTERS/Dado Ruvic/Illustration

# Concluding thoughts

- Partnerships between Biomedical Scientists, clinicians, socio-behavioural scientists, policy makers etc

# Thank you.

- <https://www.nytimes.com/interactive/2020/science/coronavirus-vaccine-tracker.html>
- [https://sacoronavirus.co.za/2021/01/12/vaccine-rollout-infographics/#iLightbox\[gallery-1\]/1](https://sacoronavirus.co.za/2021/01/12/vaccine-rollout-infographics/#iLightbox[gallery-1]/1)
- <http://www.idm.uct.ac.za/vaccine-hesitancy>
- [https://vac-lshtm.shinyapps.io/ncov\\_vaccine\\_landscape/](https://vac-lshtm.shinyapps.io/ncov_vaccine_landscape/)