COVID 19 VACCINE RESEARCH

RESEARCH BY

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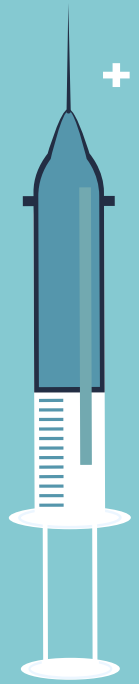

01.

INTRODUCTION

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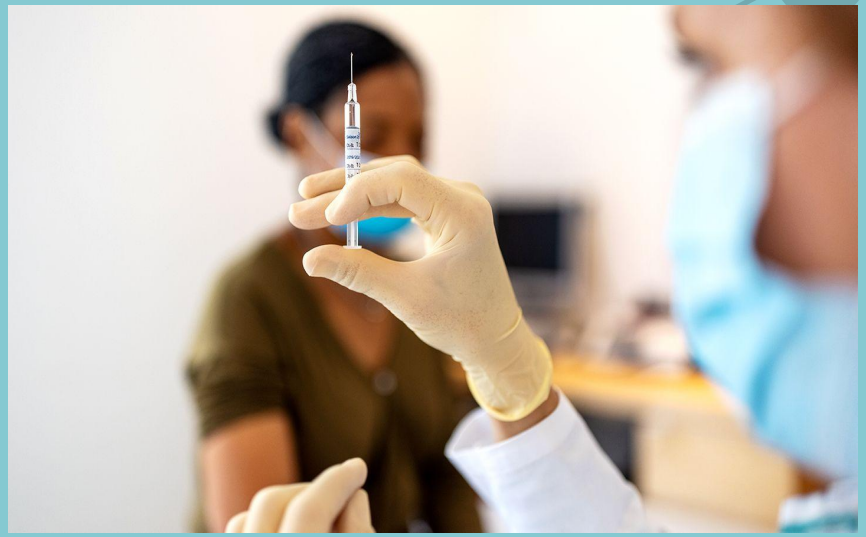
A COVID-19 vaccine is a vaccine intended to provide acquired immunity against severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the virus that causes coronavirus disease 2019 (COVID-19).



A PICTURE IS WORTH A THOUSAND WORDS.

02.

COVID VACCINE

TYPES OF COVID-19 VACCINE

Currently, there are three main types of COVID-19 vaccines that are authorized and recommended or undergoing large-scale (Phase 3) clinical trials in almost every country.

01.

m-RNA VACCINE

Here,i will describe about m-RNA vaccine.

02.

PROTEIN SUBUNIT VACCINES

Here,i will talk about this vaccine.

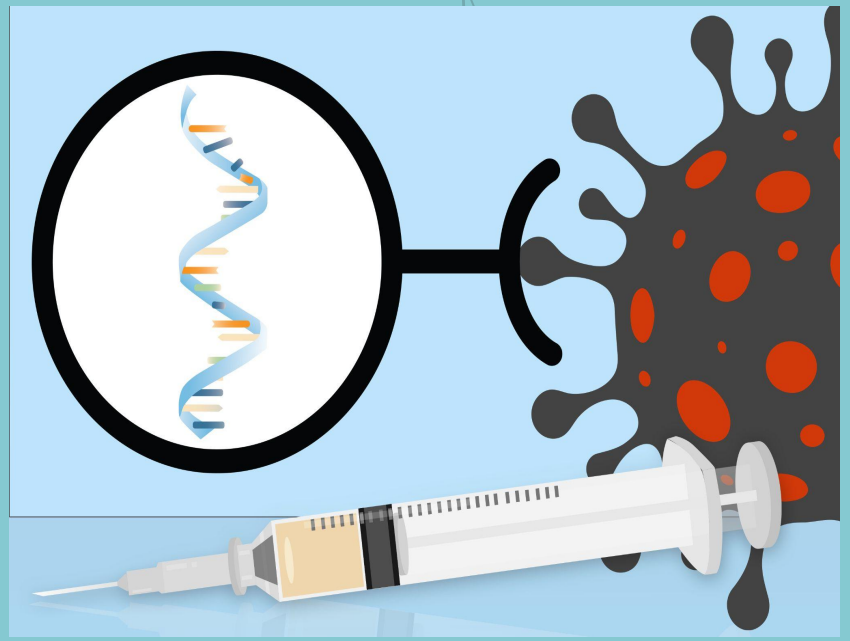
03.

VECTOR VACCINES

Here,i will talk about this vaccine.

m-RNA VACCINE

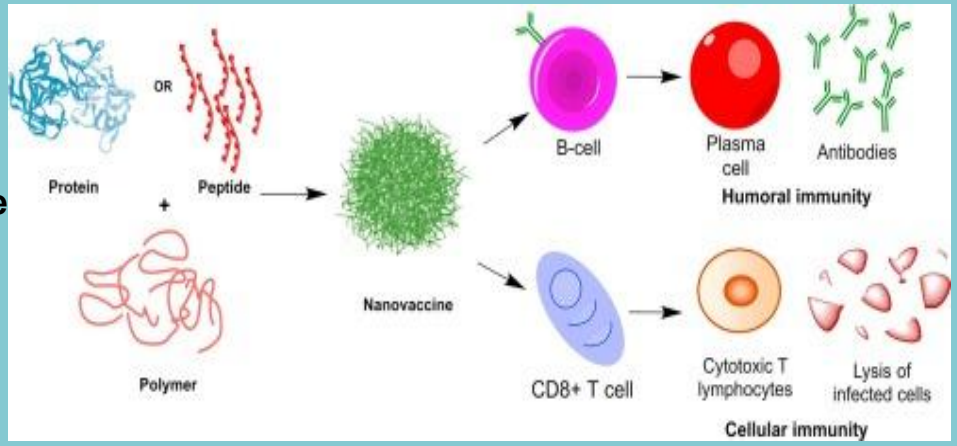
mRNA vaccines contain material from the virus that causes COVID-19 that gives our cells instructions for how to make a harmless protein that is unique to the virus. After our cells make copies of the protein, they destroy the genetic material from the vaccine



PROTEIN SUBUNIT VACCINES

Protein subunit vaccines include harmless pieces (proteins) of the virus that causes COVID-19 instead of the entire germ.

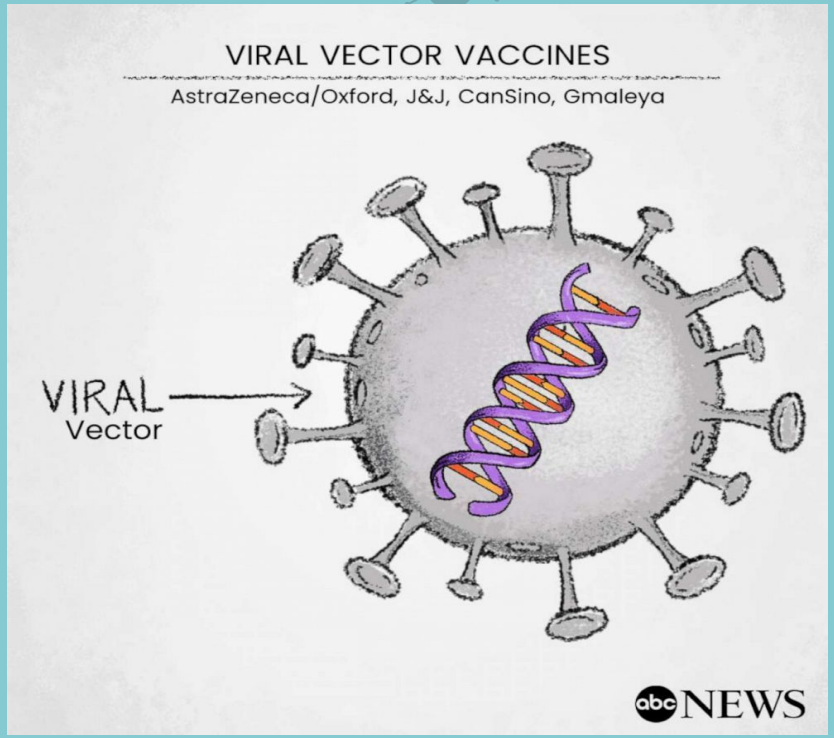
Once vaccinated, our bodies recognize that the protein should not be there and build T-lymphocytes and antibodies that will remember how to fight the virus that causes COVID-19 if we are infected in the future.



VECTOR VACCINES

Vector vaccines contain a modified version of a different virus than the one that causes COVID-19. Inside the shell of the modified virus, there is material from the virus that causes COVID-19. This is called a “viral vector.”

Once the viral vector is inside our cells, the genetic material gives cells instructions to make a protein that is unique to the virus that causes COVID-19. Using these instructions, our cells make copies of the protein. This prompts our bodies to build T-lymphocytes and B-lymphocytes that will remember how to fight that virus if we are infected in the future.

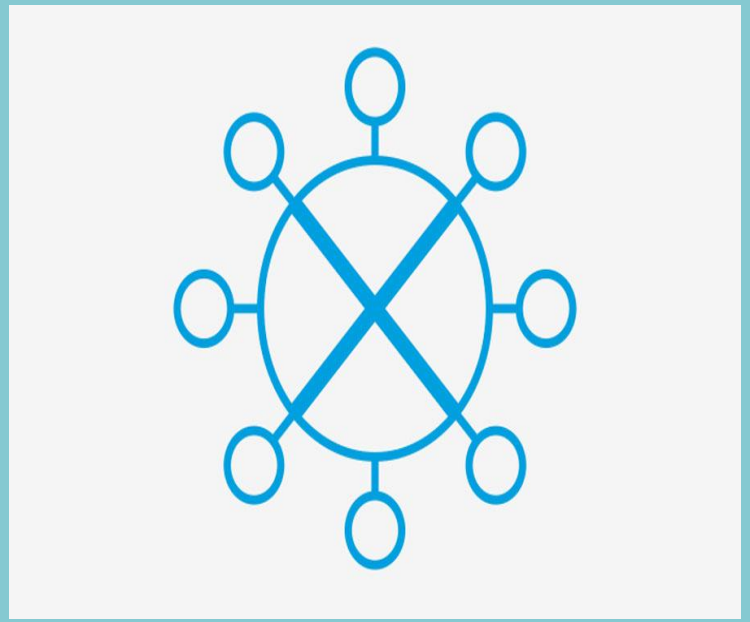


LET'S TALK ABOUT SOME IMPORTANT TYPES OF VACCINE THAT WE DID NOT MENTIONED HERE.

WHOLE VIRUS

Many conventional vaccines use whole viruses to trigger an immune response. There are two main approaches. Live attenuated vaccines use a weakened form of the virus that can still replicate without causing illness.

Inactivated vaccines use viruses whose genetic material has been destroyed so they cannot replicate, but can still trigger an immune response.



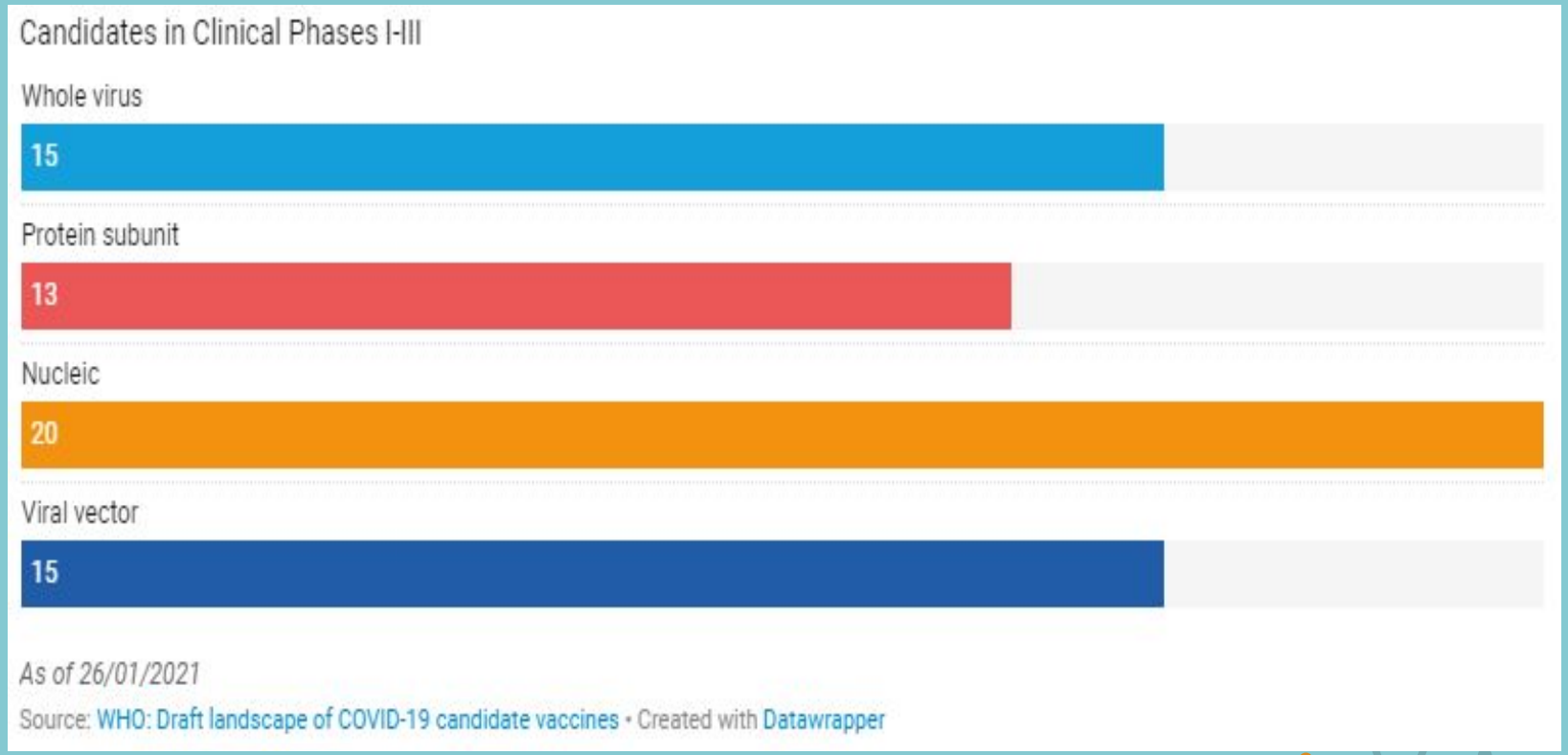
NUCLEIC ACID

Nucleic acid vaccines use genetic material – either RNA or DNA – to provide cells with the instructions to make the antigen. In the case of COVID-19, this is usually the viral spike protein. Once this genetic material gets into human cells, it uses our cells' protein factories to make the antigen that will trigger an immune response.

03.

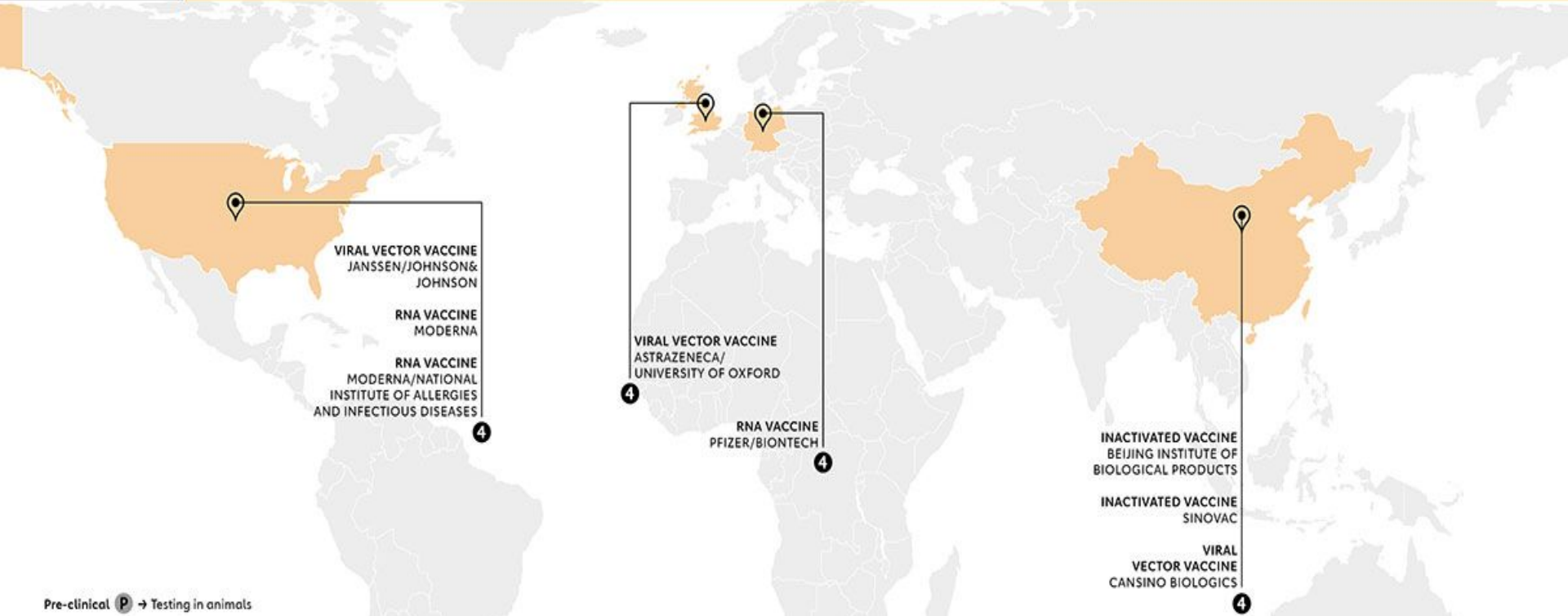
COVID VACCINE ANALYSIS(RESEARCH)

COVID-19 vaccine types in development



PHASE 4

COVID-19 vaccines in clinical development around the world



Pre-clinical (P) → Testing in animals

Phase 1 → Initial testing for safety and identifying dosage

Phase 2 → Testing for effectiveness and further safety testing

Phase 3 → Confirm and assess effectiveness

In use ✓ → Are currently being offered to the general population

Phase 4 → Monitor and assess effectiveness, and look for side effects

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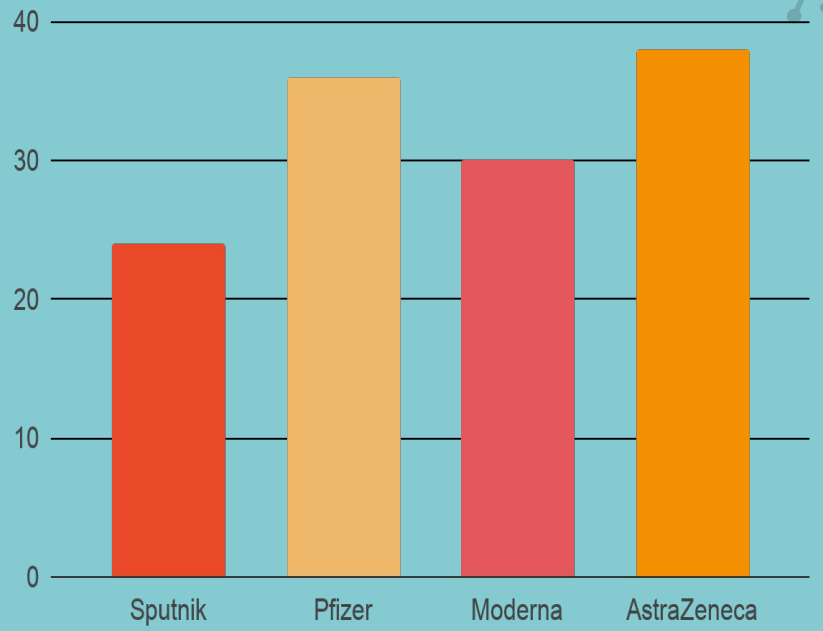
VACCINE EFFECTIVENESS



LET'S TALK ABOUT COVID VACCINE THAT ARE AVAILABLE IN THE WORLD NOW.

National regulatory authorities have granted emergency use authorizations for fifteen vaccines.

RNA VACCINE

- Pfizer–BioNTech
- Moderna

List of authorized and approved vaccines

ADENOVIRUS VECTOR VACCINES

Sputnik V

Oxford–AstraZeneca

Janssen

Convidecia

Sputnik Light

INACTIVATED VIRUS VACCINES

Sinopharm (BBIBP)

CoronaVac

Covaxin

Sinopharm (WIBP)

Others

SUBUNIT VACCINES

EpiVacCorona

Zifi Vax

Abdala

Soberana 02

Medigen (MVC)

NOW ,I WILL TALK SOME BEST VACCINE IN THE WORLD.

RNA VACCINE- MODERNA (USA)

The final trial results confirm this vaccine has a 94% efficacy, and the data has been sent to regulators around the world. As with the Pfizer vaccine, this RNA vaccine will need to be kept in ultra-cold freezers. The vaccine has been developed by Moderna, in Cambridge, Massachusetts, and funded by the National Institute of Allergy and Infectious Diseases (NIAID), which is part of the US National Institutes of Health.

The vaccine was tested in phase 1 trials on volunteers at the Kaiser Permanente Washington Health Research Institute in Seattle. Moderna has run phase 2 trials on participants of a wide range of ages and started phase 3 trials in July 2020.

VIRAL VECTOR VACCINE- ASTRAZENECA/UNIVERSITY OF OXFORD (UK)

The ChAdOx1 vaccine, developed by the University of Oxford, has a vaccine efficacy of up to 90% and has been granted emergency use authorisation by the European Medicines Agency as well as national regulators in the UK, Argentina, India, Mexico, Brazil and Pakistan.

In February 2021, a phase 4 trial was launched as part of a national cohort study in collaboration with the Danish Ministry of the Interior and Health.

In March 2021, the University of Oxford registered a further phase 1 trial in the UK with 30 adult participants to investigate the delivery of its ChAdOx1 vaccine using a nasal spray. ChAdOx1 is currently being delivered by intramuscular injection as part of the UK's national rollout

RNA VACCINE - PFIZER/BIONTECH (GERMANY)

In December 2020, the UK became the first country in the world to approve this vaccine and began rolling out an initial 800,000 doses at the start of the month. BioNTech, working together with Pfizer, started testing its BNT162 vaccine in humans in global trials, initially in Germany, and then started trials in the USA

On 27 July 2020, it announced the launch of a phase 2/3 trial with 30,000 volunteers in the USA and other countries including Argentina, Brazil and Germany.

In its final efficacy analysis, its data showed a vaccine efficacy rate of 95% (even in adults over 65 years efficacy was more than 94%, which is reassuring as older people don't always have a strong immune response to vaccines). In February, a phase 4 trial was launched.

- **CANSINO BIOLOGICS INC. (CHINA)**

VIRAL VECTOR VACCINE-CANSINO BIOLOGICS INC. (CHINA)

The Ad5-nCoV vaccine candidate uses a harmless non-replicating viral vector to carry vaccine antigens into the human body.The COVID-19 vaccine was jointly developed with the Institute of Biotechnology of the Academy of Military Medical Sciences.

On 9 August 2020, the Saudi health ministry announced that CanSino would run a phase 3 trial in Saudi Arabia;

In May 2021, the company registered a phase 4 trial with 300 adult participants who have been primed with either one or two doses of inactive SARS-CoV-2 vaccine.

VIRAL VECTOR VACCINE-JANSSEN/JOHNSON & JOHNSON (USA)

J&J has developed vaccines for Ebola and other diseases with Recombinant Adenovirus Serotype 26 (Ad26) and has now made one for the coronavirus.

In January, the company announced that the vaccine had an efficacy of 66% in Latin America, 57% in South Africa and 72% in the United States, with 100% efficacy against severe disease in all trials. In June 2021, the company launched a phase 4 trial in the Netherlands.

Bamlanivimab and etesevimab

Sponsor: Eli Lilly

Q1 2021 Sales: $810.1 million

U.S. Sales: $650.6 million (80%)

Guidance (Change from Q4 2020): $1 billion to $1.5 billion, down from $1 billion to $2 billion, reflecting what Lilly said were "lower expected revenue from COVID-19 antibody sales due to lower expected demand and higher expected research and development expenses."

INACTIVATED VACCINE - SINOVAC (CHINA).

Sinovac conducted phase 3 trials involving volunteers in Brazil, Indonesia and Turkey. Although it is not yet approved by regulators, shipments have already arrived in Indonesia, ready for rollout. A report in July said that the Chinese government has given the Sinovac vaccine emergency approval for limited use. The city of Jiaxing has reportedly offered the vaccine to health workers and other high-risk groups for US$ 60. The company began phase 4 trials in February 2021.

Gamaleya Research Institute

With its Sputnik V
Adenoviruses based vaccine

The Gamaleya Research Institute is part of the Russia's Ministry of Health. It developed a COVID vaccine, namely Sputnik V or Gam-Covid-Vac, with an effectiveness of 91.6%. The vaccine is based on adenoviruses containing the gene coding for the spike protein, a similar technology as AstraZeneca and Johnson and Johnson.

https://www.avertim.com/en/news/covid-19-tracker-status-top-5-vaccines-candidates

How does the coronavirus (COVID-19) vaccines work

COVID-19 vaccines help our bodies develop immunity to the virus that causes COVID-19 without us having to get the illness.

- Different types of vaccines work in different ways to offer protection. But with all types of vaccines, the body is left with a supply of "memory" T-lymphocytes as well as B-lymphocytes that will remember how to fight that virus in the future.
- It typically takes a few weeks after vaccination for the body to produce T-lymphocytes and B-lymphocytes. Therefore, it is possible that a person could be infected with the virus that causes COVID-19 just before or just after vaccination and then get sick because the vaccine did not have enough time to provide protection.
- Sometimes after vaccination, the process of building immunity can cause symptoms, such as fever. These symptoms are normal and are signs that the body is building immunity.
- https://www.cdc.gov/coronavirus/2019-ncov/vaccines/different-vaccines/how-they-work.html#:~:text=mRNA%20vaccines%20contain%20material%20from,genetic%20material%20from%20the%20vaccine.

What are the benefits of getting a COVID-19 vaccine?

COVID-19 vaccination will help keep us from getting sick from COVID-19.

- The vaccine reduces your risk of infection.
- The combination of getting vaccinated and following CDC's recommendations to protect our self and others will offer the best protection from COVID-19.
- The more people who get vaccinated, the faster we can get back to our normal lives.

4.CONCLUSION

Equitable access to safe and effective vaccines is critical to ending the COVID-19 pandemic, so it is hugely encouraging to see so many vaccines proving and going into development. Safe and effective vaccines are a game-changing tool: but for the foreseeable future we must continue wearing masks, cleaning our hands, ensuring good ventilation indoors, physically distancing and avoiding crowds.

Being vaccinated does not mean that we can throw caution to the wind and put ourselves and others at risk, particularly because research is still ongoing into how much vaccines protect not only against disease but also against infection and transmission.

REFERENCE

- https://www.cdc.gov/coronavirus/2019-ncov/vaccines/different-vaccines/how-they-work.html#:~:text=mRNA%20vaccines%20contain%20material%20from,genetic%20material%20from%20the%20vaccine.
- https://en.wikipedia.org/wiki/COVID-19_vaccine
- **https://www.genengnews.com/a-lists/top-8-best-selling-covid-19-vaccines-and-drugs-of-q1-2021/**
- **https://www.avertim.com/en/news/covid-19-tracker-status-top-5-vaccines-candidates**
- **https://www.nhsinform.scot/covid-19-vaccine/the-vaccines/how-the-vaccines-work**
- **https://www.cdc.gov/coronavirus/2019-ncov/vaccines/different-vaccines/how-they-work.html#:~:text=mRNA%20vaccines%20contain%20material%20from,genetic%20material%20from%20the%20vaccine.**