



UNIVERSIDADE FEDERAL DO PIAUÍ
CENTRO DE CIÊNCIAS DA SAÚDE
DEPARTAMENTO DE MEDICINA COMUNITÁRIA
CENTRO DE INTELIGÊNCIA EM AGRAVOS TROPICAIS, EMERGENTES E NEGLIGENCIADOS



Vacinas e COVID-19

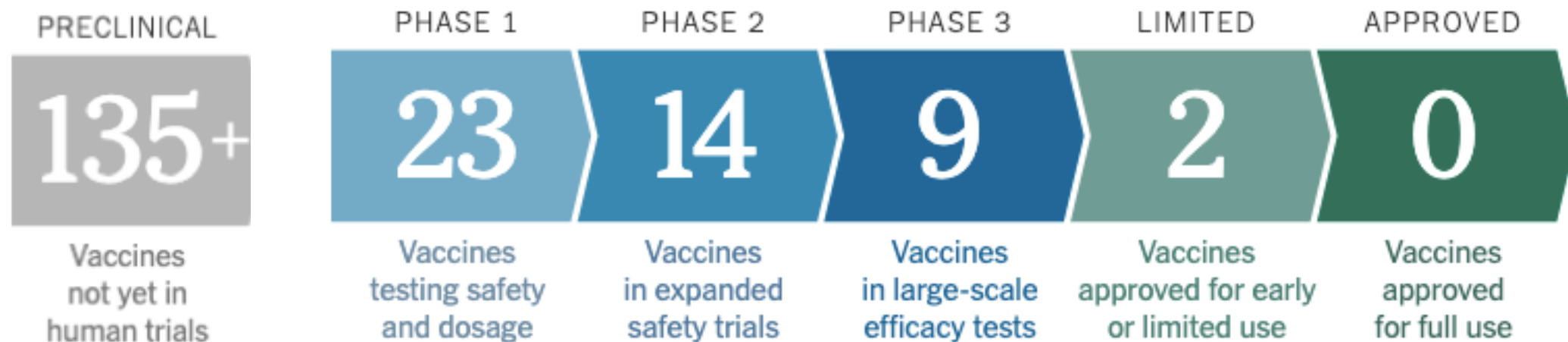
Bruno Guedes Alcoforado Aguiar, Ph.D.

31 de agosto de 2020
Teresina - PI

The New York Times

Coronavirus Vaccine Tracker

By Jonathan Corum, Denise Grady, Sul-Lee Wee and Carl Zimmer Updated August 28, 2020



Vacinas

- Quais os objetivos de uma vacina?
- Como fazer uma vacina?
- Quais fases para aprovar uma vacina?
- Quais vacinas estão na corrida?
- Qual o futuro esperado com vacinas?
- Perigos vs benefícios vs Fakenews.



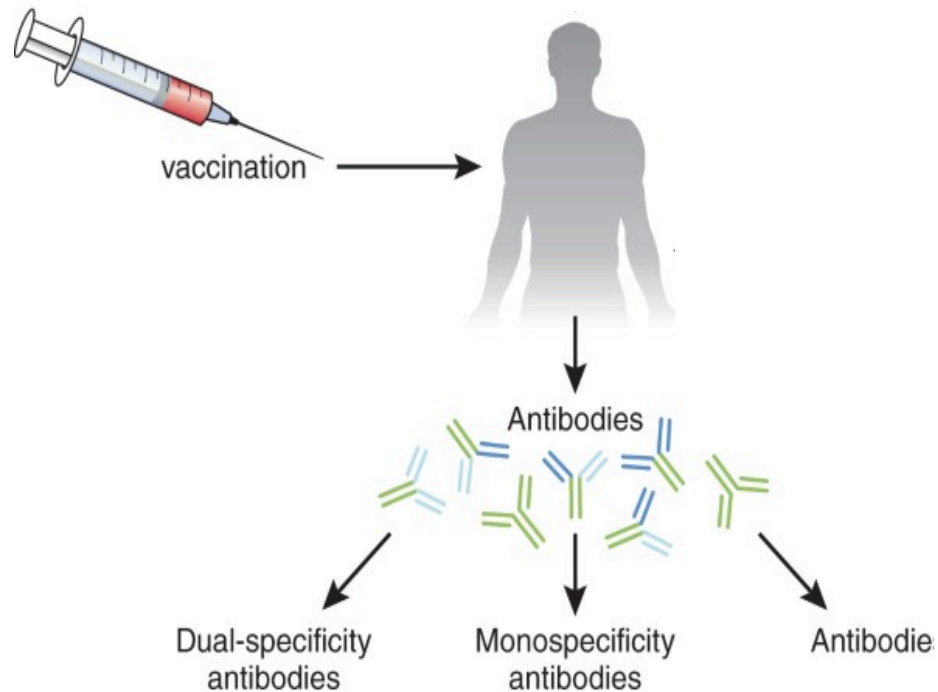
(Kurzgesagt – In a Nutshell)

Vacina ideal

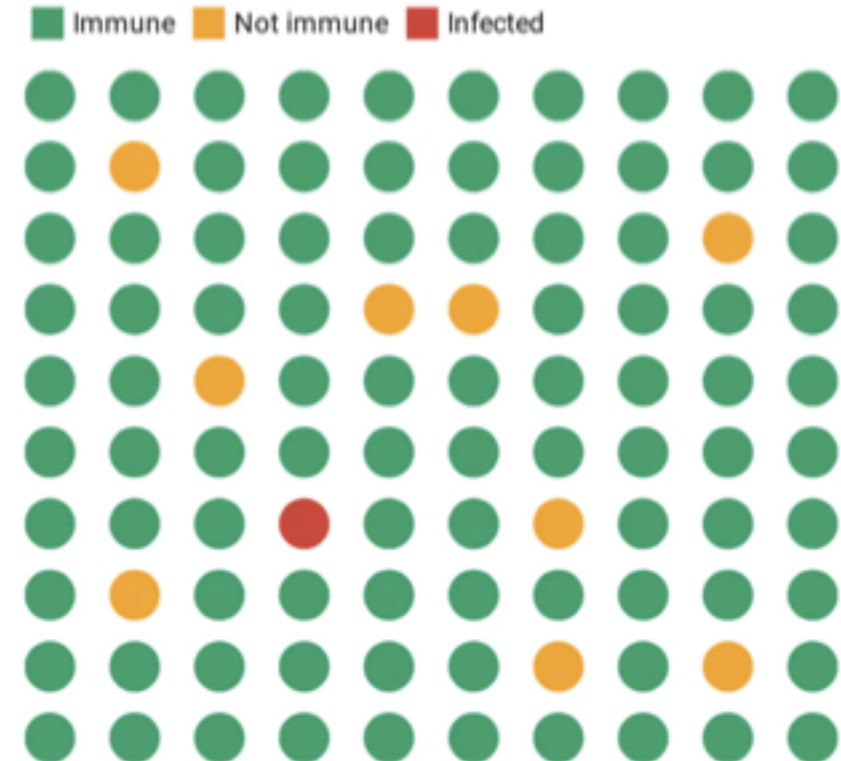
- Ser **segura** (Fase 1)
- Ativar o **sistema imune** sem causar a doença (Fase 2)
- **Proteger** contra infecção (Fase 3)

- Prevenir o espalhamento/transmissão

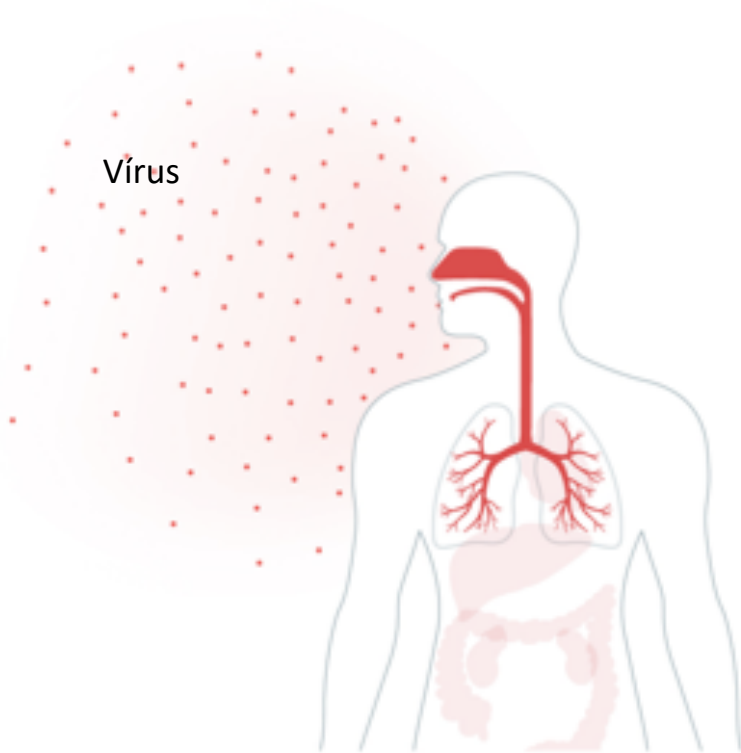
Imunidade Individual



Imunidade Coletiva



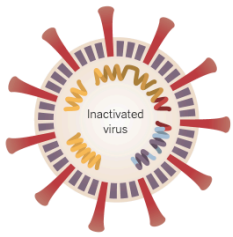
Como fazer uma vacina?



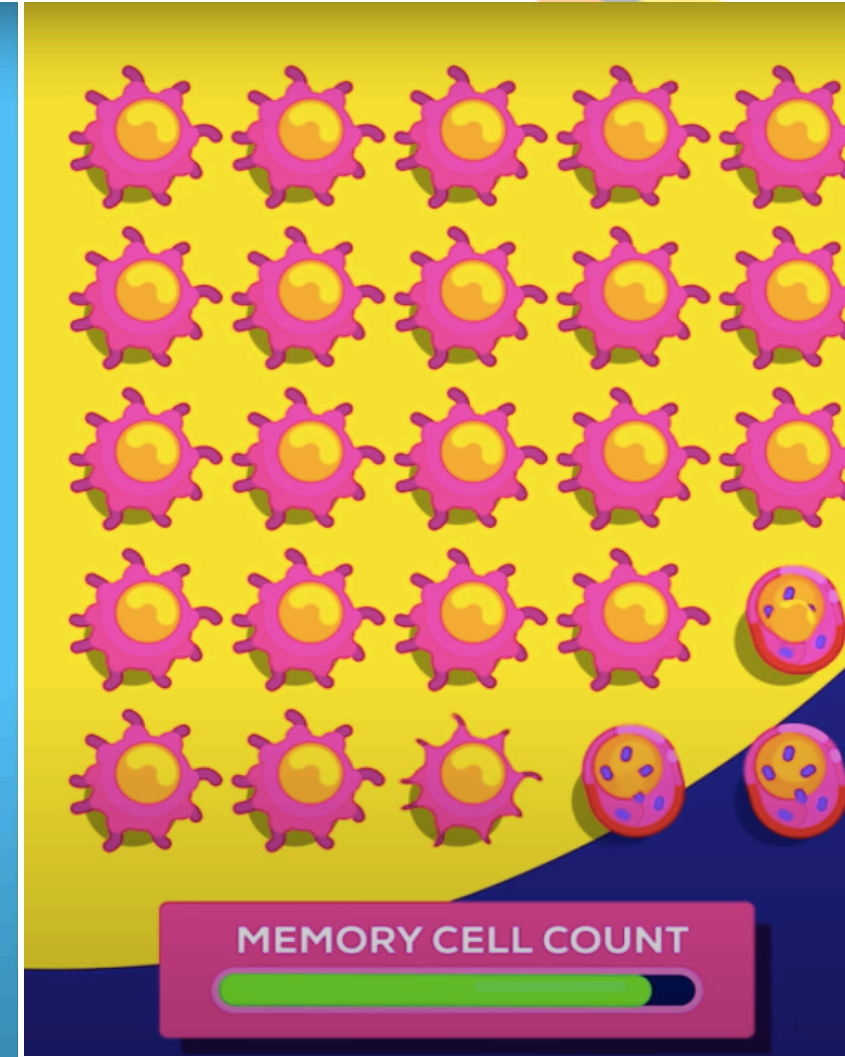
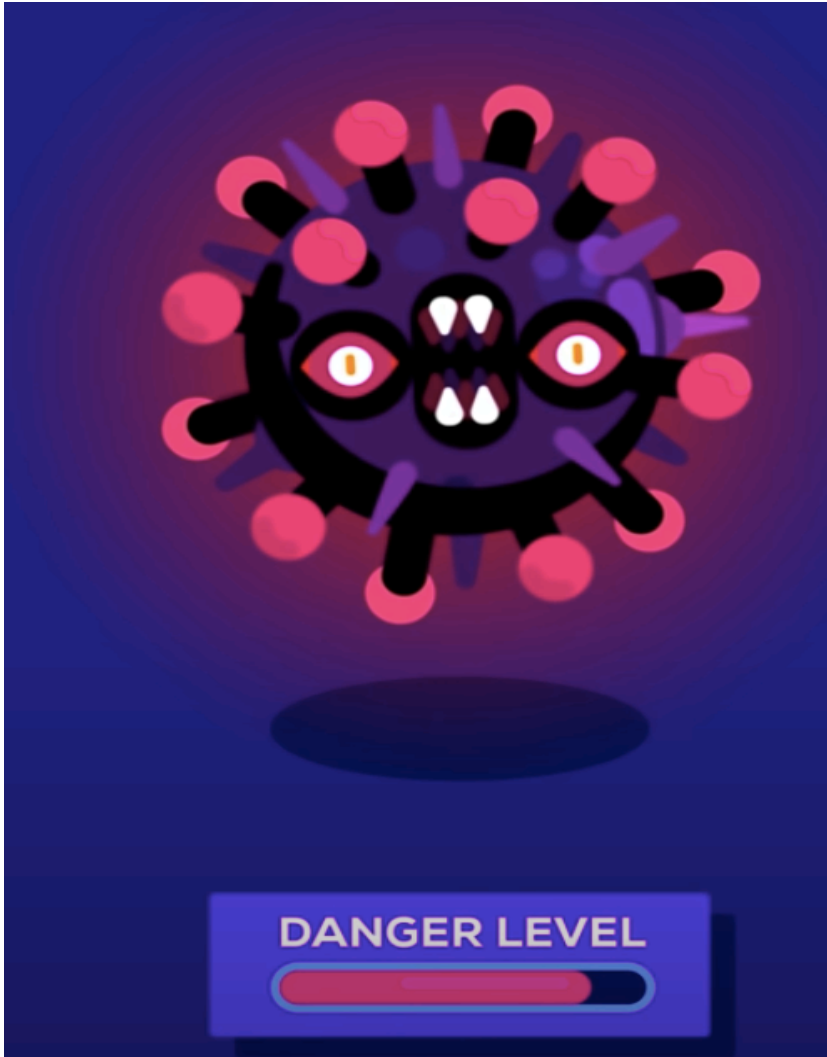
- Óbito
- Curada/Sequelas e **imune!**?

E Se...



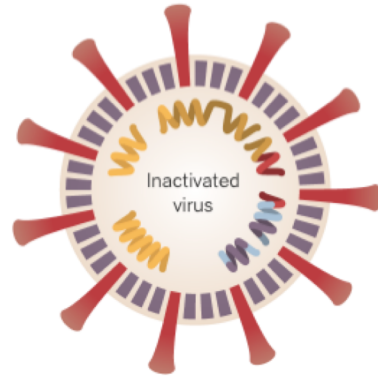


Vacina Atenuada



Whole-Virus Vaccines

Vaccines that use weakened or inactivated viruses to provoke an immune response.



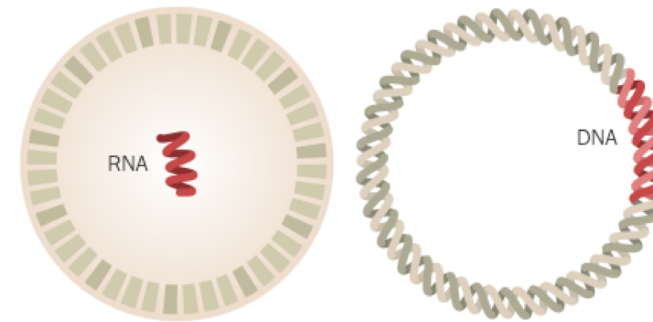
Protein-Based Vaccines

Vaccines that use a coronavirus protein or a protein fragment to provoke an immune response.



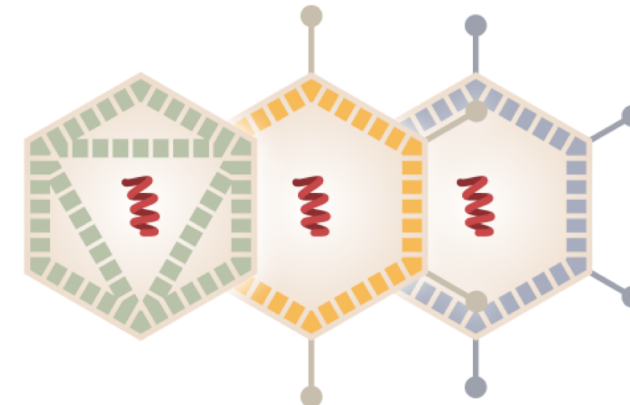
Genetic Vaccines

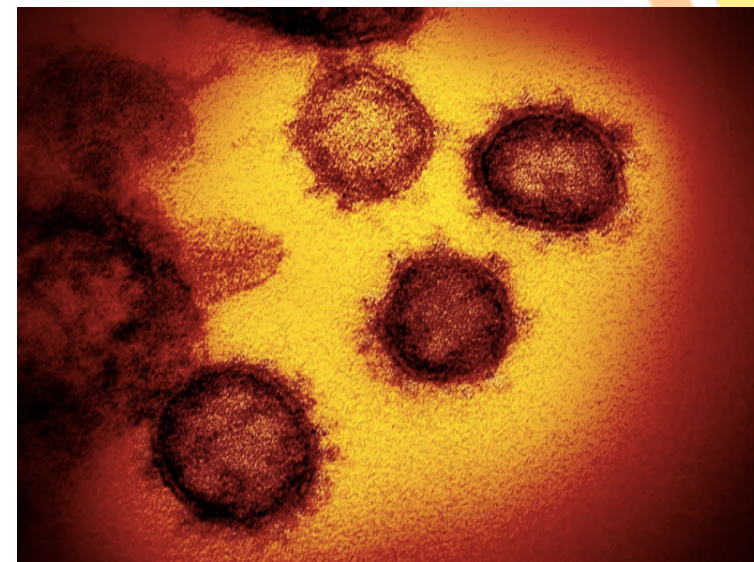
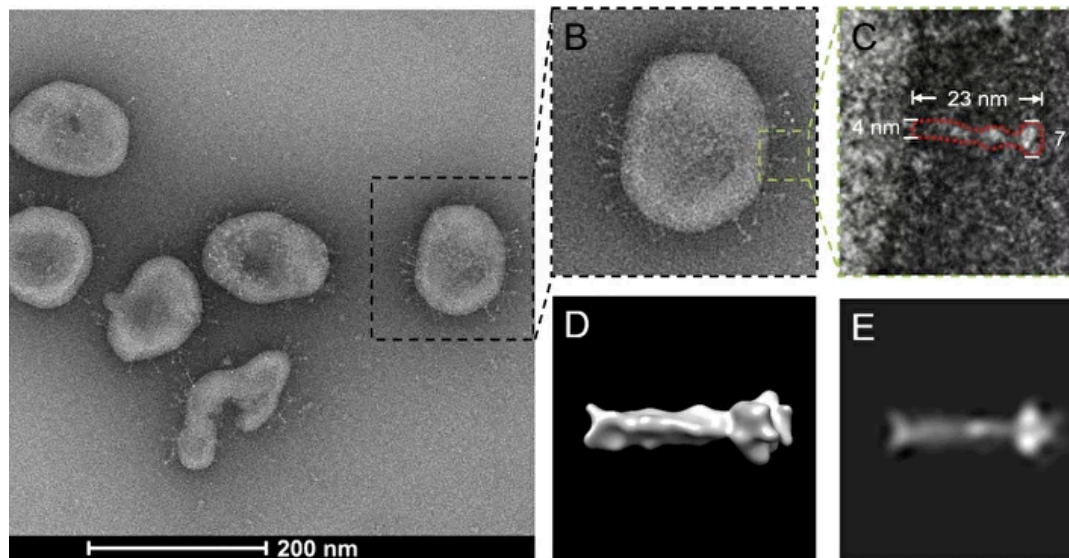
Vaccines that use one or more of the coronavirus's own genes to provoke an immune response.



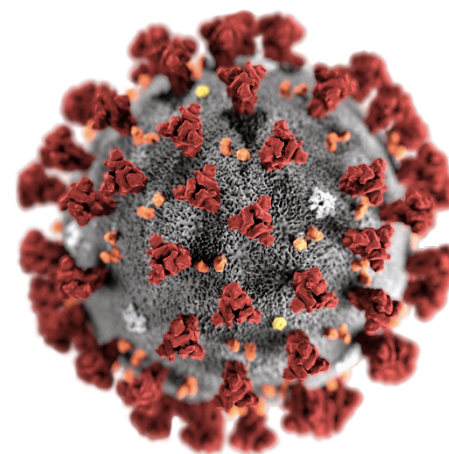
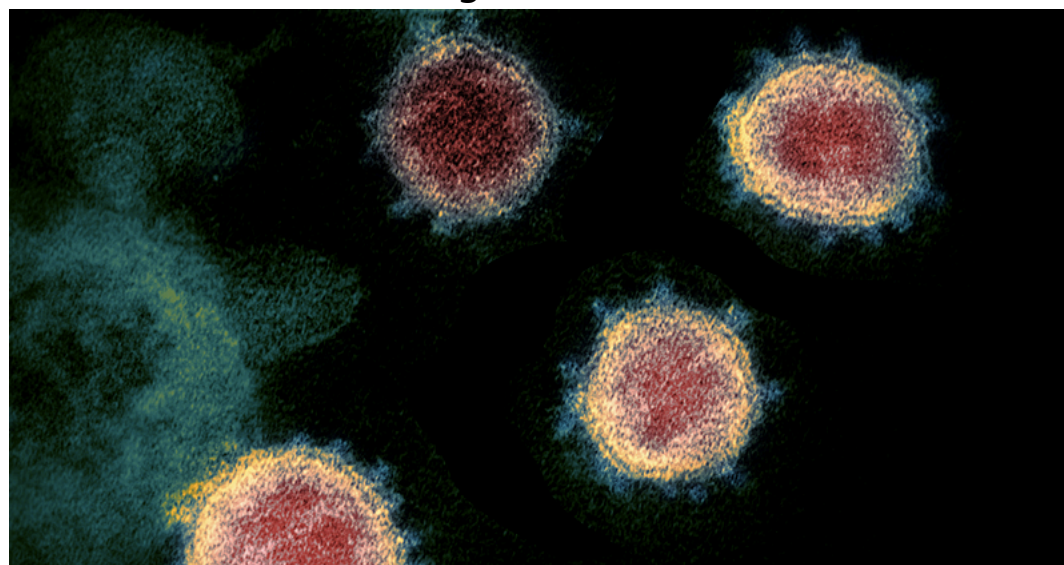
Viral Vector Vaccines

Vaccines that use a virus to deliver coronavirus genes into cells. The cells make viral proteins, provoking an immune response, but the virus cannot replicate.

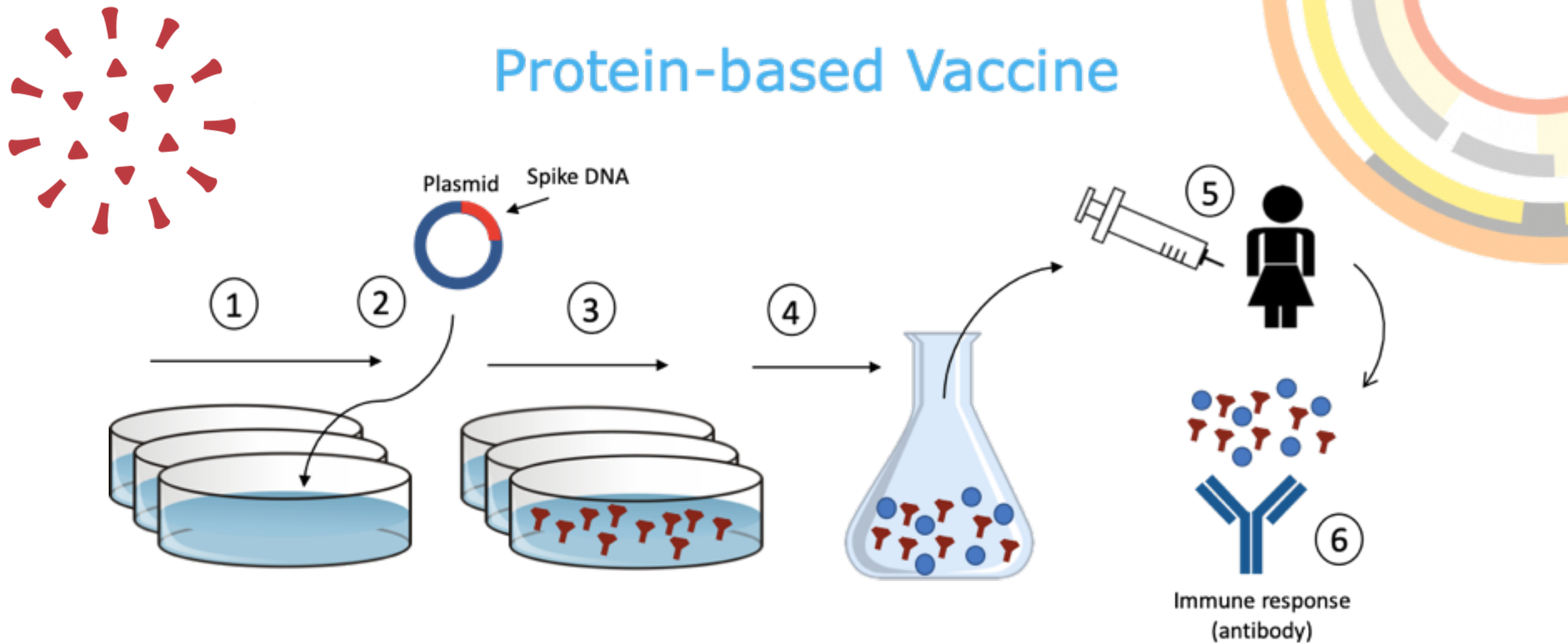




Imagens do SARS-CoV-2 obtidas com microscópio eletrônico

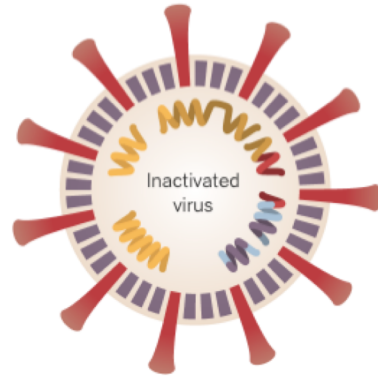


Protein-based Vaccine



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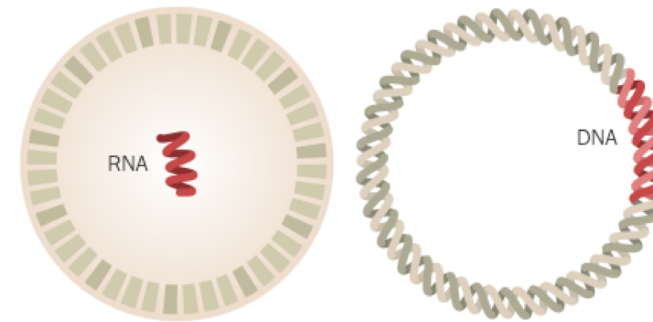
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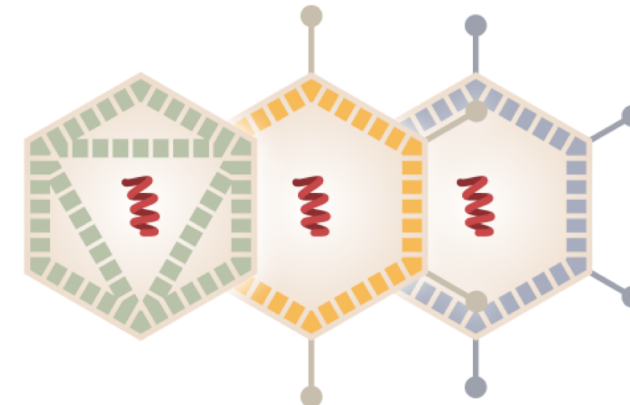
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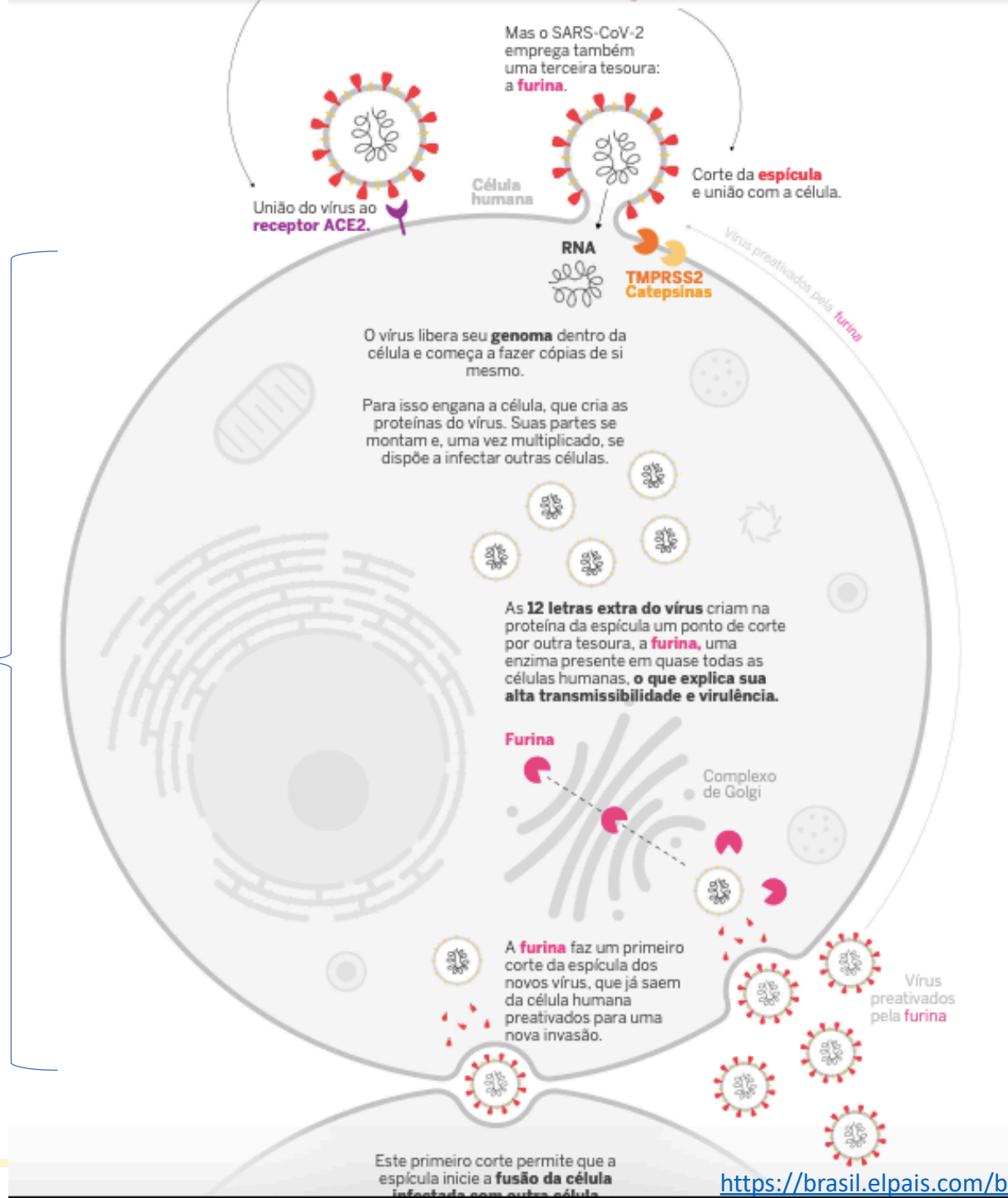
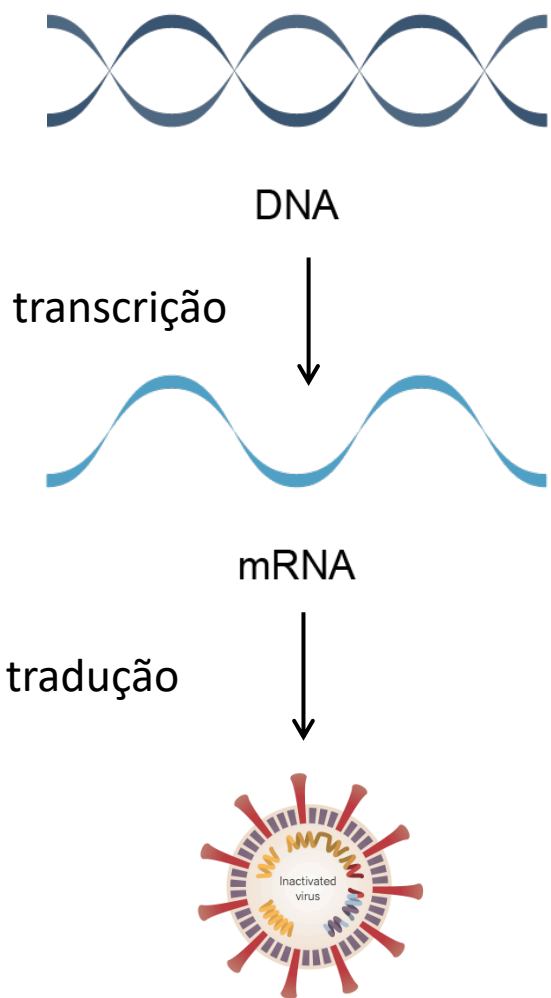


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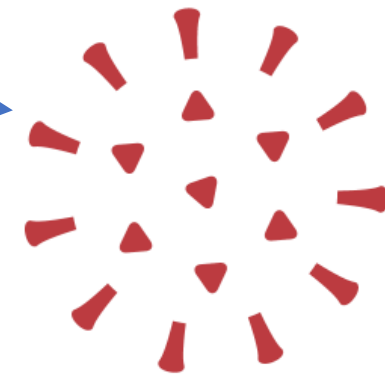
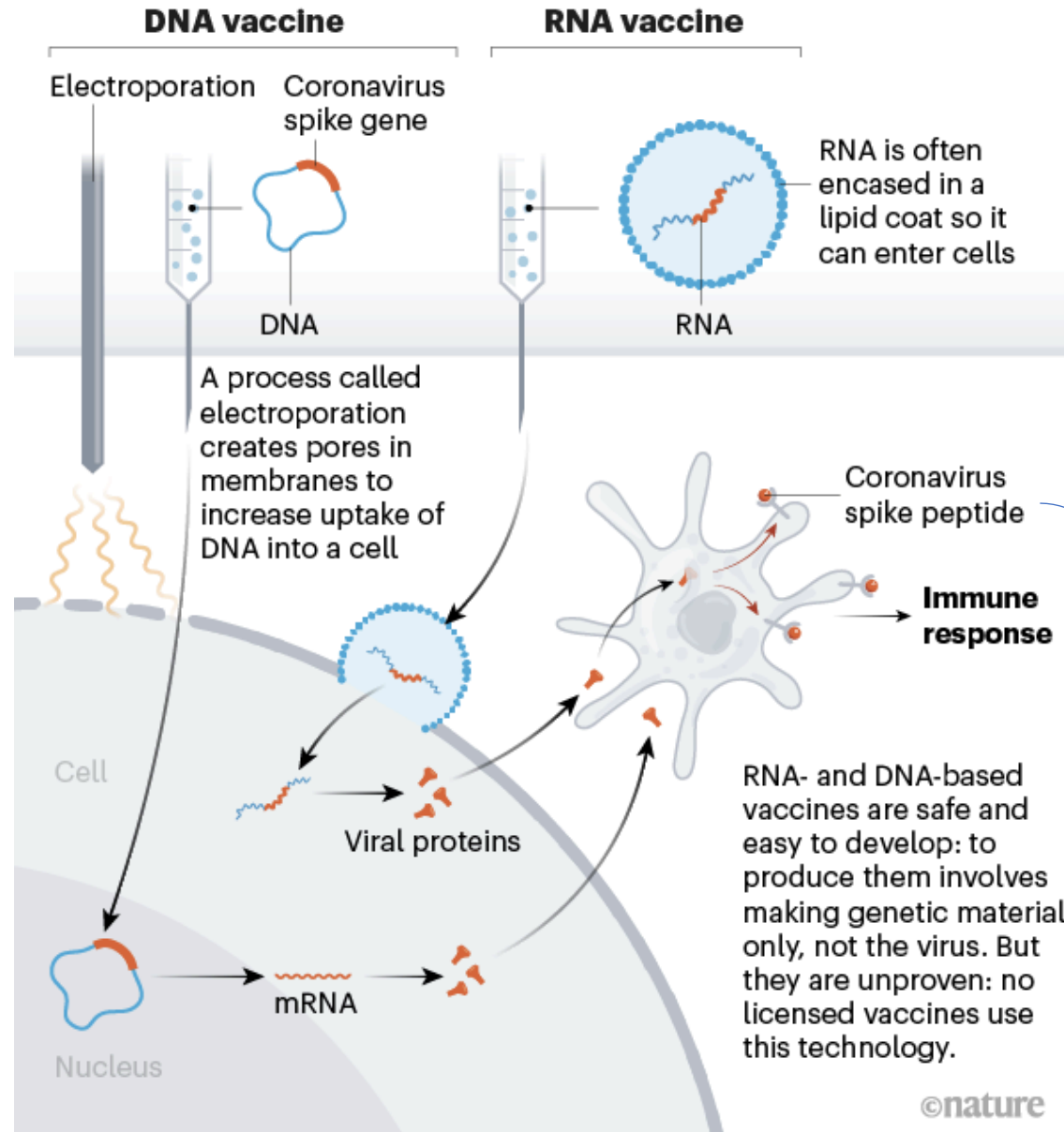
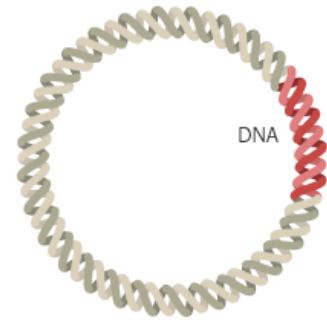


Dentro da célula...



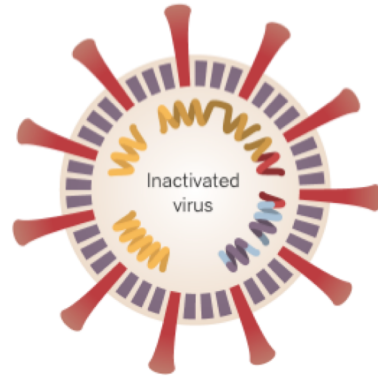
- Como fazer uma vacina?

NUCLEIC-ACID VACCINES



Whole-Virus Vaccines

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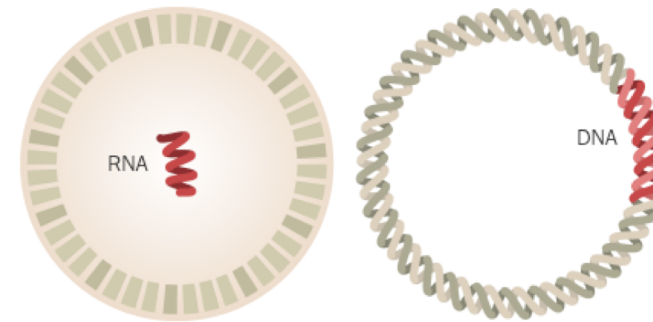
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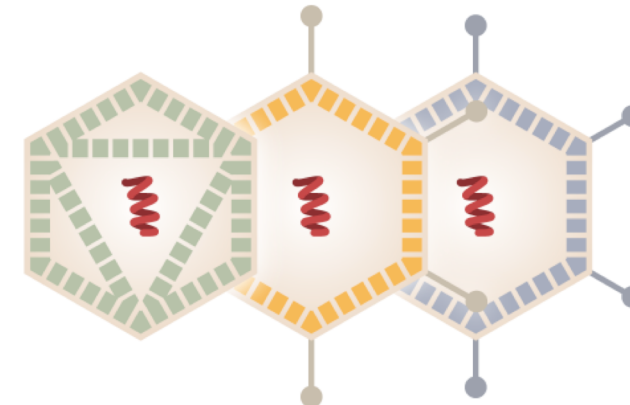
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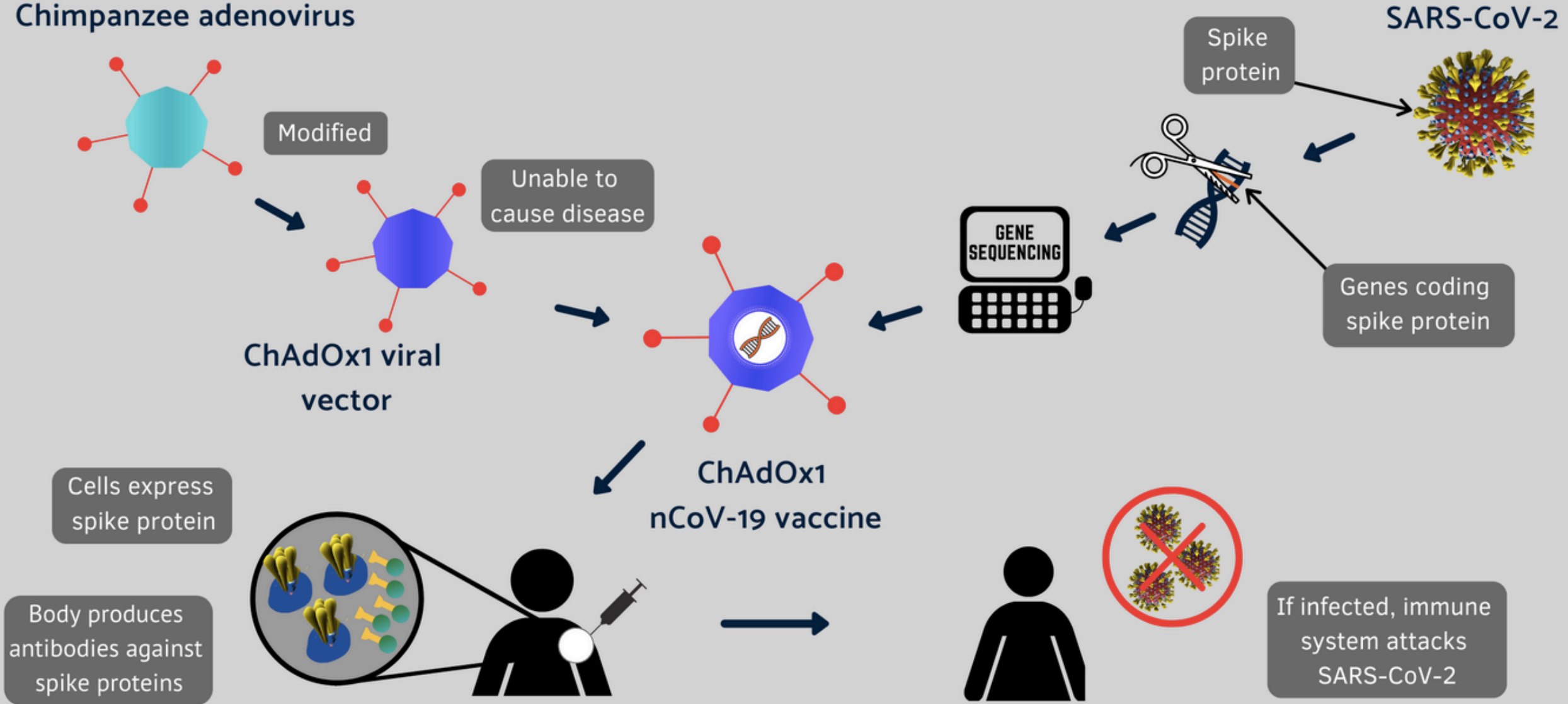


Viral Vector Vaccines

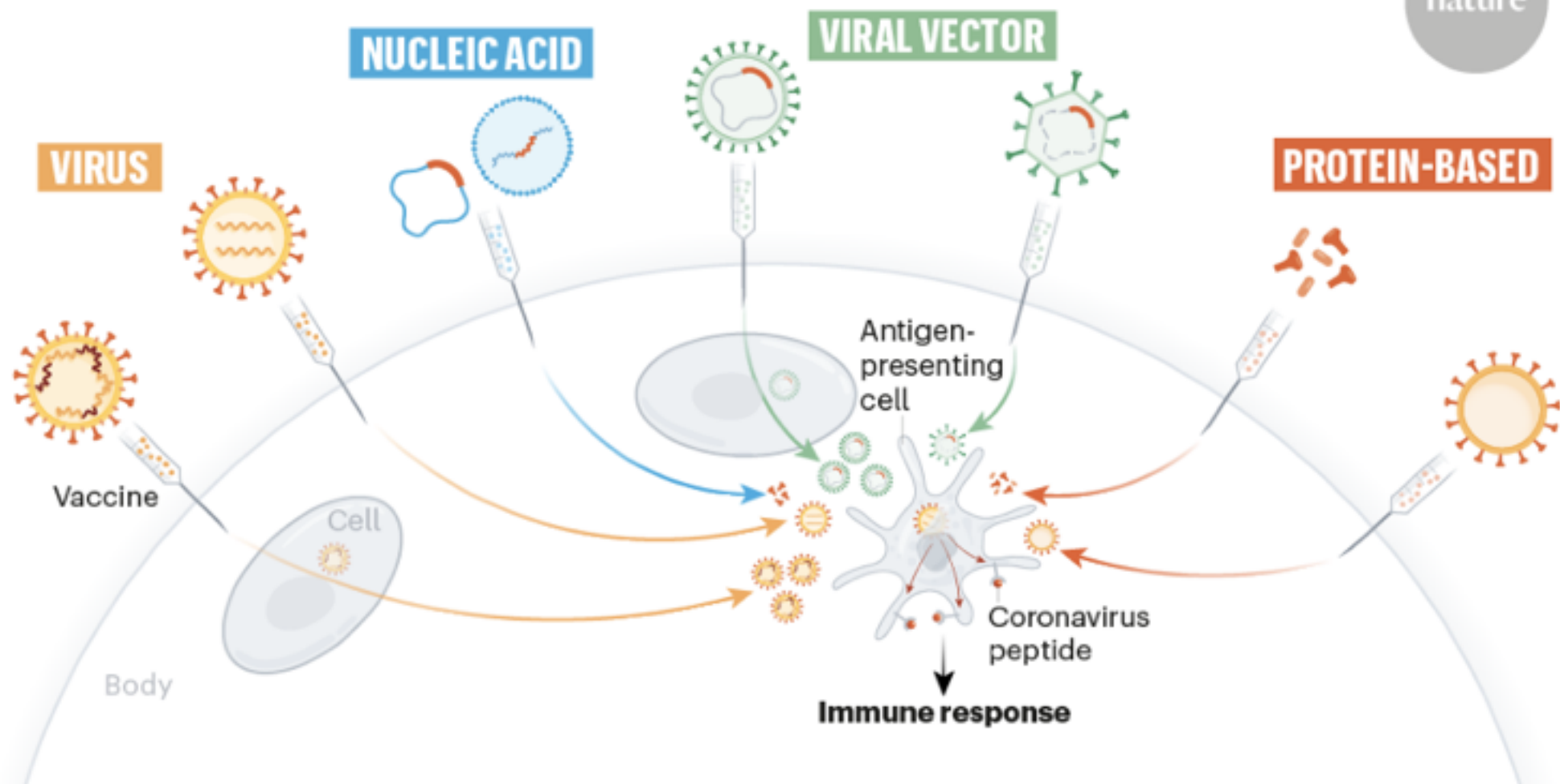
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Chimpanzee adenovirus

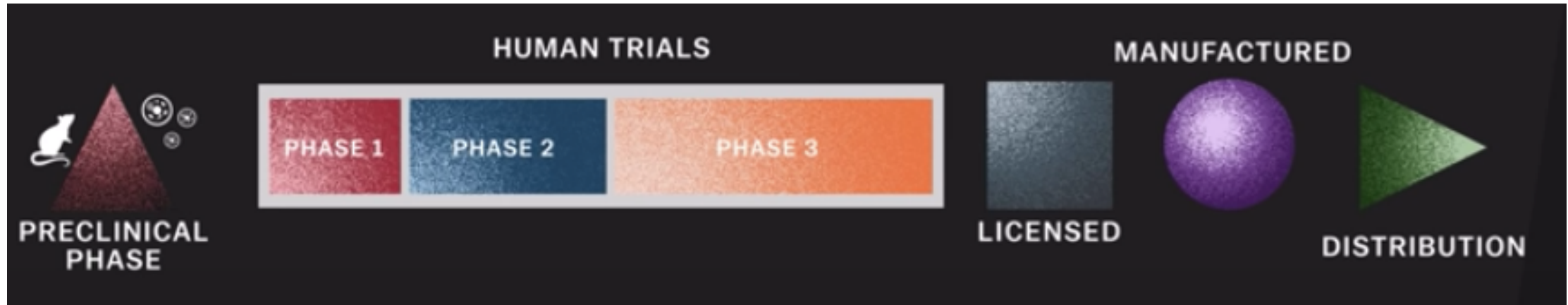


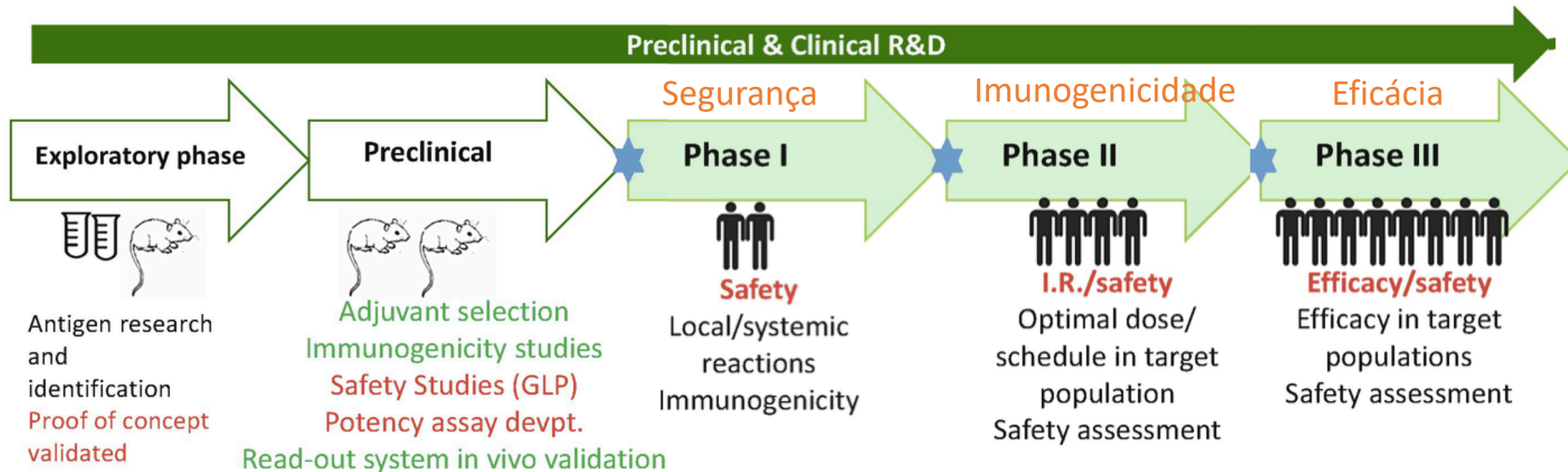
CORONAVIRUS VACCINE CANDIDATES



Quais fases para aprovar uma vacina?

Qual estratégia?
Qual alvo?
Qual proteína?



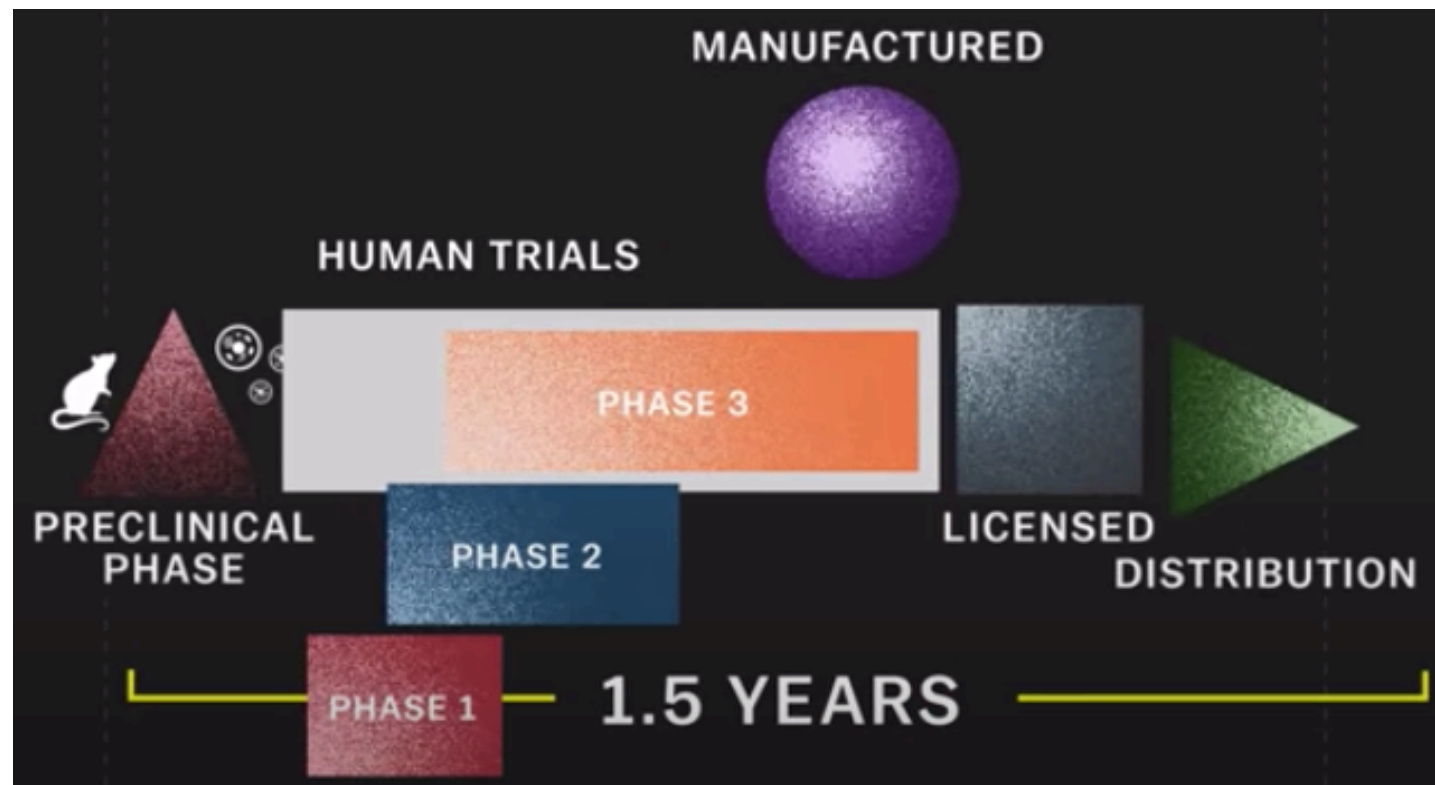


Comitê de ética;

Poucas pessoas;
Realmente **segura**?
Quais são os efeitos colaterais?

Centenas de pessoas;
Grupos diferentes;
Idosos, jovens, crianças...
Qual a **resposta imune**?
Qual a dose?
Resposta correta?
Realmente **segura**?
Quais são os efeitos colaterais?

Milhares de pessoas;
+ Exposição aos vírus (Brasil)
Protegeu?
Qual a **chance de desenvolver a doença**?
Comparação entre pessoas **vacinadas** e com **placebo**;
Realmente **segura**?
Quais são os efeitos colaterais?



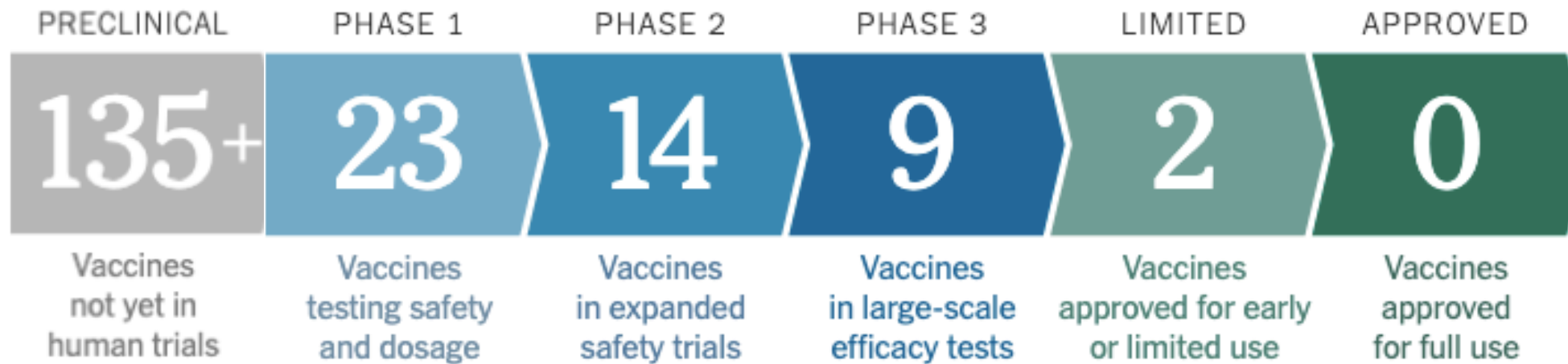
Quais fases para aprovar uma vacina?

The risky way to speed up a coronavirus vaccine; Vox, 2020.

The New York Times

Coronavirus Vaccine Tracker

By Jonathan Corum, Denise Grady, Sui-Lee Wee and Carl Zimmer Updated August 28, 2020





The German company **BioNTech** entered into collaborations with **Pfizer**, based in New York, and the Chinese drug maker **Fosun Pharma** to develop an mRNA vaccine. In May they launched a Phase 1/2 trial on two versions of the vaccine. They found that both versions caused volunteers to produce antibodies against SARS-CoV-2, as well as immune cells called T cells that respond to the virus. They found that one version, called BNT162b2, produced significantly fewer side effects, such as fevers and fatigue, and so they chose it to move into Phase 2/3 trials. On July 27, the companies announced the launch of a Phase 2/3 trial with 30,000 volunteers in the United States and other countries including Argentina, Brazil, and Germany.

inactivated vaccine called announced that Phase 1/2 adverse effects and produced launched a Phase 3 trial in the following month. In August, Sinovac reached an agreement to supply Indonesia with at least 40 million doses by March 2021.



A vaccine in development by the British-Swedish company **AstraZeneca** and the **University of Oxford** is based on a chimpanzee adenovirus called ChAdOx1. A study on monkeys found that the vaccine provided them protection. In May, the United States awarded the project \$1.2 billion in support. Their Phase 1/2 trial revealed that the vaccine was safe, causing no severe side effects. It raised antibodies against the coronavirus as

PHASE 3



The private Chinese company **Sinovac Biotech** is testing an inactivated vaccine called CoronaVac. In June the company announced that Phase 1/2 trials on 743 volunteers found no severe adverse effects and produced an immune response. Sinovac then launched a Phase 3 trial in Brazil in July and another in Indonesia the following month. In August, Sinovac reached an agreement to supply Indonesia with at least 40 million doses by March 2021.

PHASE 3



National Institutes of Health
Turning Discovery Into Health

Moderna develops vaccines based on messenger RNA (mRNA) to produce viral proteins in the body. They have yet to bring one to the market. The government has bankrolled Moderna's efforts on a coronavirus vaccine with nearly \$1 billion. In partnership with **National Institutes of Health**, they found that the vaccine protects monkeys from the coronavirus. In March, the company put the first Covid-19 vaccine into human trials, which yielded promising results. After carrying out a Phase 2 study they launched a Phase 3 trial on July 27. The final trial will enroll 30,000 healthy people at about 89 sites around the United States. On August 11, the government awarded the company an additional \$1.5 billion in exchange for 100 million doses if the vaccine proves safe and effective.



The Chinese company **CanSino Biologics** developed a vaccine based on an adenovirus called Ad5, in partnership with the Institute of Biology at the country's **Academy of Military Medical Sciences**. In May, they published promising results from a Phase 1 safety trial, and in July they reported that their Phase 2 trials demonstrated the vaccine produced a strong immune response. In an unprecedented move, the Chinese military approved the vaccine on June 25 for a year as a “specially needed drug.” CanSino would not say whether vaccination would be mandatory or optional for soldiers. On August 9, the Saudi health ministry announced that CanSino Biologics would run a Phase 3 trial in Saudi Arabia, and later in the month they also started a trial in Pakistan.

Updated Aug. 27



МИНИСТЕРСТВО
ЗДРАВООХРАНЕНИЯ
РОССИЙСКОЙ ФЕДЕРАЦИИ

The **Gamaleya Research Institute**, part of Russia's Ministry of Health, launched a Phase 1 trial in June of a vaccine they called Gam-Covid-Vac Lyo. It is a combination of two adenoviruses, Ad5 and Ad26, both engineered with a coronavirus gene. In July, the chair of the upper house of Russia's Parliament said the country might start vaccine production by the end of the year.

On Aug. 11, President Vladimir V. Putin announced that a Russian health care regulator had approved the vaccine, renamed Sputnik V, before Phase 3 trials had even begun. Vaccine experts decried the move as risky, and Russia later walked back the announcement, saying that the approval was a "conditional registration certificate," which would depend on positive results from Phase 3 trials. Those trials, initially planned for just 2,000 volunteers, were expanded to 40,000.



武汉生物制品研究所有限责任公司
WUHAN INSTITUTE OF BIOLOGICAL PRODUCTS CO.,LTD.

The **Wuhan Institute of Biological Products** developed an inactivated virus vaccine, which the state-owned Chinese company **Sinopharm** put into clinical tests. The Phase 1/2 trial showed that the vaccine produced antibodies in volunteers, some of whom experienced fevers and other side effects. They launched Phase 3 trials in the United Arab Emirates in July, and in Peru and Morocco the following month. Sinopharm's chairman said in August that the vaccine could potentially be ready for public use by the end of 2020.

Updated Aug. 21

Sinopharm is also testing a second inactivated virus vaccine, this one developed by the **Beijing Institute of Biological Products**. In Phase 3 trials in the United Arab Emirates, 5,000 people are receiving the Wuhan Institute version, while another 5,000 are receiving the Beijing Institute one.

Updated Aug. 8

PHASE 3



Repurposed Vaccines

Vaccines already in use for other diseases that may also protect against Covid-19.

The **Bacillus Calmette-Guerin** vaccine was developed in the early 1900s as a protection against tuberculosis. The **Murdoch Children's Research Institute** in Australia is conducting a Phase 3 trial to see if the vaccine partly protects against the coronavirus.



O Futuro com Vacina

- Várias vacinas no mercado;
- Poder de escolha;
- Parcerias com o Brasil;
- Produção em fábricas brasileiras;
- Histórico de vacinação.



Distribuição escalonada
Etapa 4: Farmacovigilância

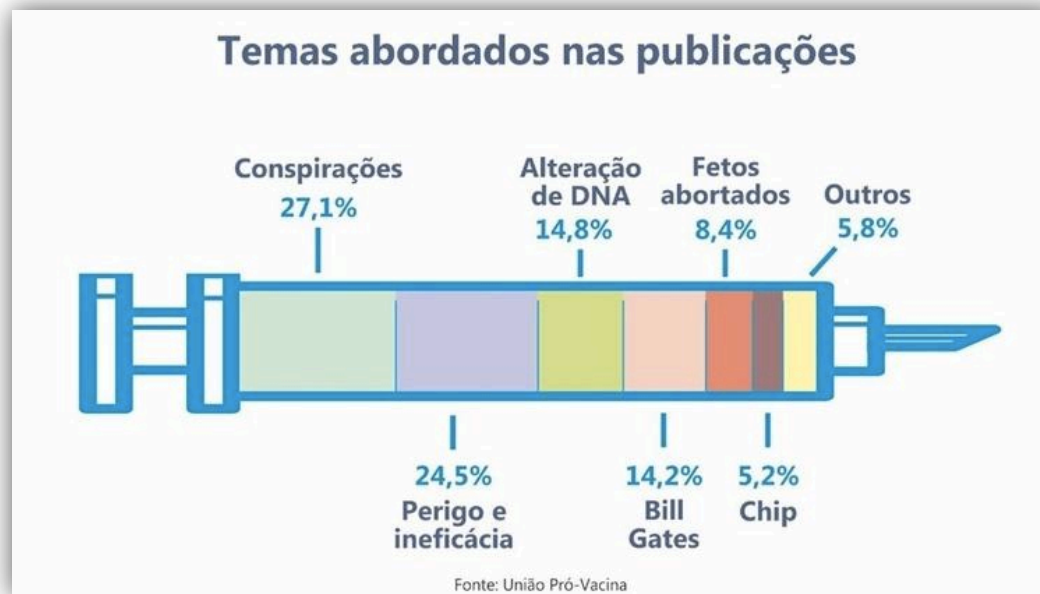


Vacinação e fakenews

- Sarampo
- Grupos e propaganda antivacinas



<https://brasil.elpais.com/ciencia/2020-06-04/movimento-antivacina-cresce-em-meio-a-pandemia.html>



<https://www.uol.com.br/vivabem/noticias/redacao/2020/08/27/covid-19-campanha-de-desinformacao-sobre-vacina-avanca-no-brasil.htm>



<https://view.genial.ly/5f23016ec2b34d0d9cf0bddf/guide-fake-news-sobre-vacinas>

- Perigos vs benefícios vs Fakenews.



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guedesaguiar@ufpi.edu.br

