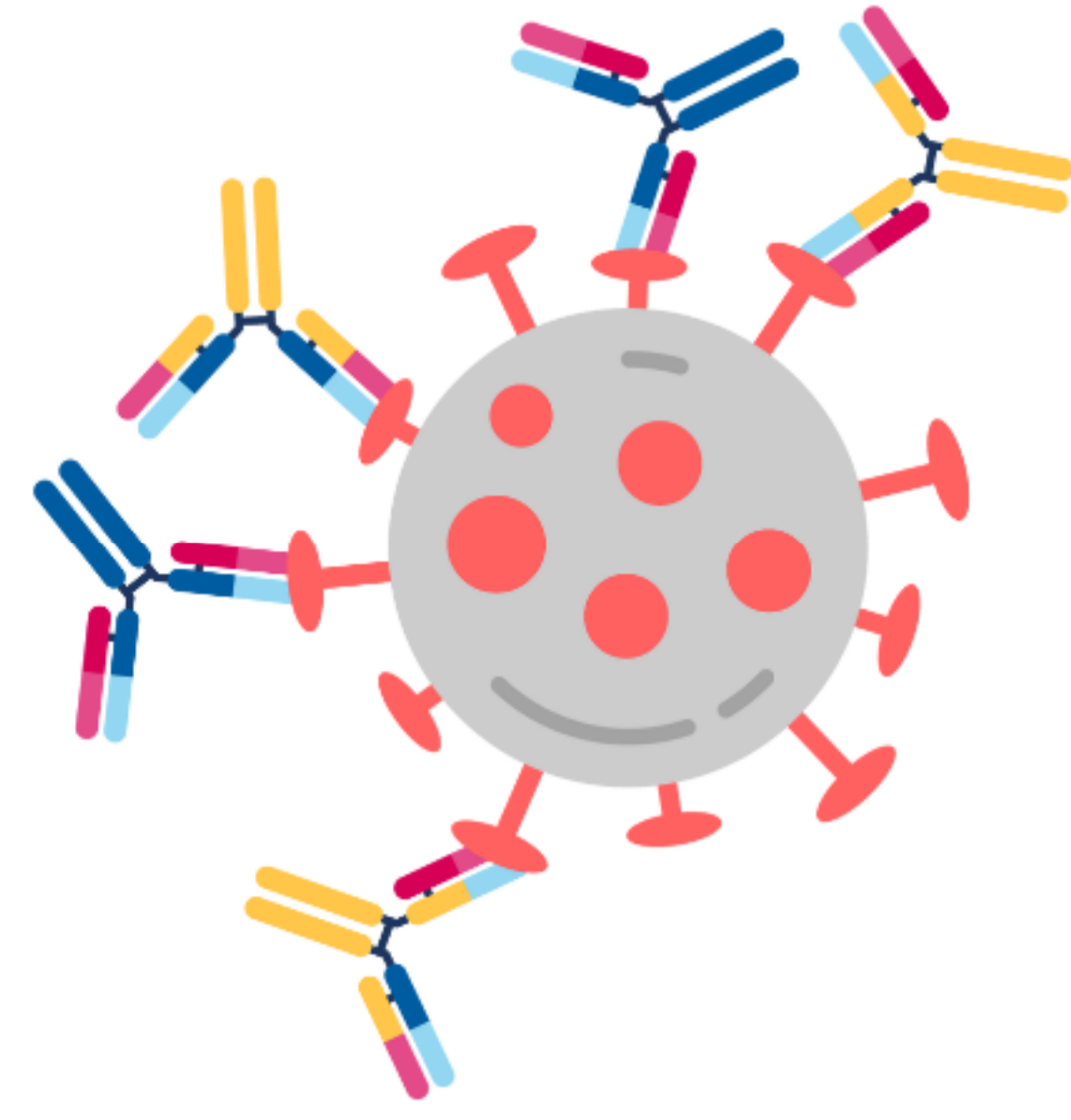


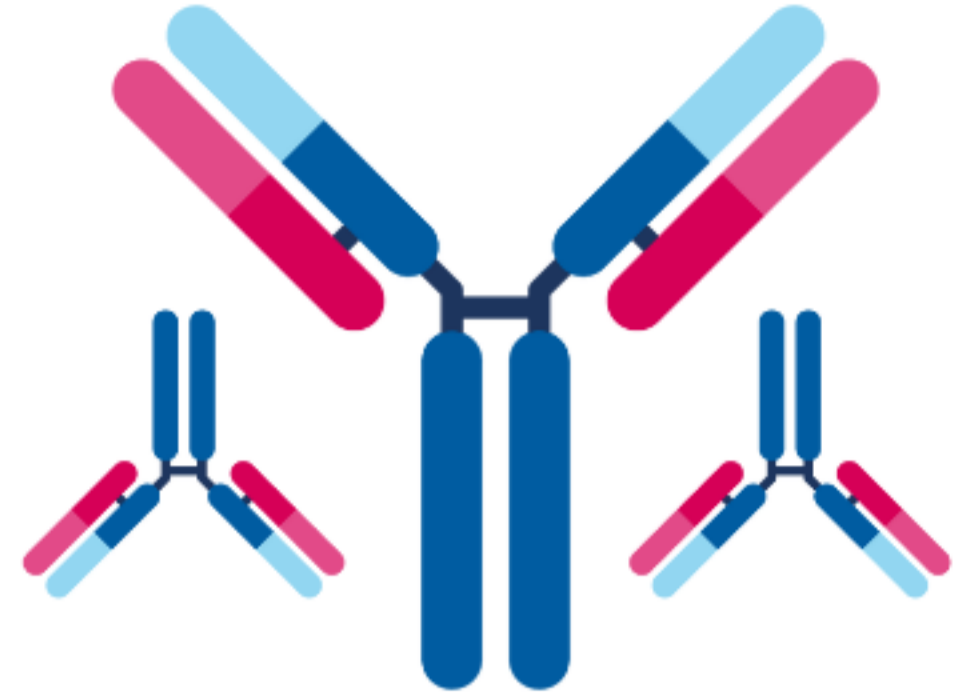
# LIKE VACCINES, ANTIBODY MEDICINES MAY HELP PEOPLE ACHIEVE IMMUNITY TO SARS-COV-2

HOW ANTIBODY MEDICINES AND VACCINES COMPARE – AND HOW BOTH MAY HELP AGAINST COVID-19.

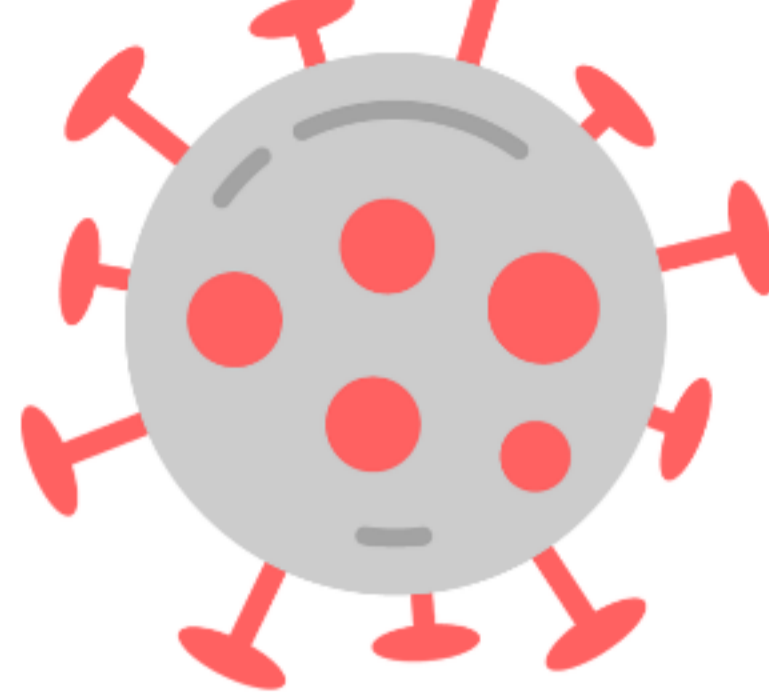


When the human body encounters **pathogens** like SARS-CoV-2, the virus that causes COVID-19, the body's immune system naturally produces **antibodies** to recognize and kill or neutralize the dangerous invaders.

The immune system typically remembers its reaction to a pathogen and can produce the same protective antibodies again in the future. This is called **IMMUNOLOGICAL MEMORY**.



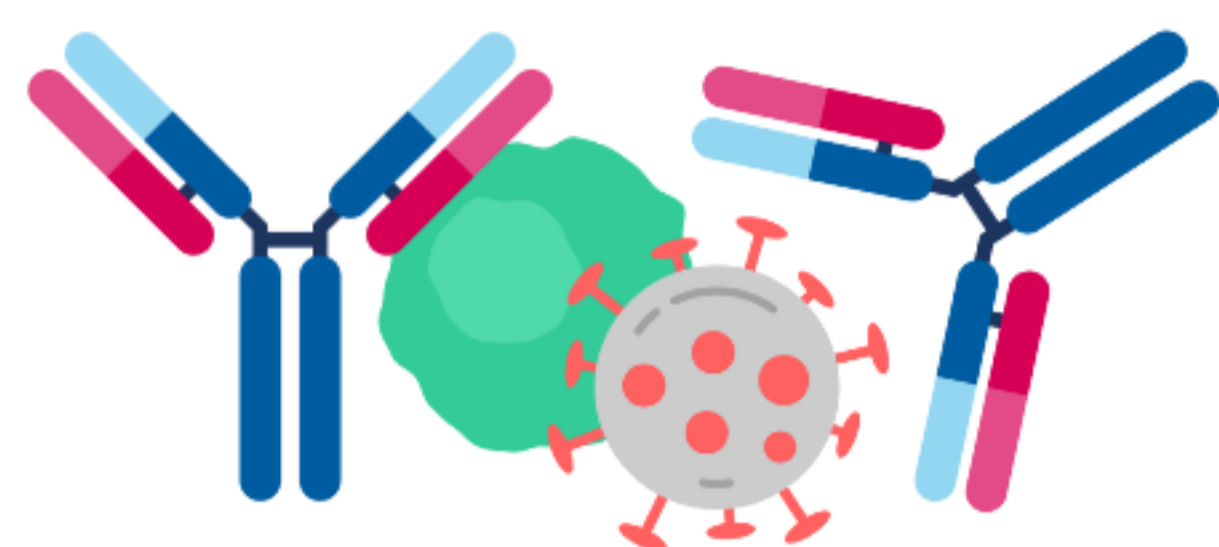
**Antibodies** are Y-shaped proteins produced by the human body as part of a normal immune response to foreign molecules. Antibodies then go to work to defend you against the harmful invader.



**Pathogens** are harmful organisms that can invade the body, such as viruses or bacteria. Some molecules from these pathogens called **antigens** are recognized by B cells and prompt them to produce antibodies by the billions.

As the COVID-19 pandemic continues to threaten the health of people across the globe, everyone wants to know:

## HOW CAN WIDESPREAD IMMUNITY AGAINST THIS VIRUS BE ACHIEVED MORE QUICKLY?



**Innate immunity** is the immunity you're born with. But the immunity you gain during your lifetime is called **adaptive immunity**, and it has two types: **passive and active**. Both use **protective antibodies**.

People who recover from **COVID-19** are believed to acquire at least some lasting immunity against the disease, as their bodies produce **protective antibodies and immune system memory** but evidence remains limited. [1]

**THE BIOPHARMACEUTICAL INDUSTRY IS RESEARCHING WAYS TO PROVIDE PEOPLE WITH IMMUNITY – WITHOUT HAVING TO GET INFECTED AND POTENTIALLY VERY SICK FROM THE DISEASE FIRST.**



### PASSIVE IMMUNITY

Develops immediately after receiving anti-viral antibodies from an injection, infusion or plasma transfer.

#### ANTI-VIRAL ANTIBODY MEDICINES

Based on key principles of biology, these mimic the natural defenses and pathways of the immune system. Regeneron's core technologies allow for rapid and efficient generation of anti-viral antibodies outside of the body – corresponding to specific virus-neutralizing antibodies similar to those that would be elicited by a vaccine or exposure to the virus itself.

#### ANTIBODY MEDICINES ARE DERIVED FROM:

Patients who have recovered from a particular virus.

Genetically humanized animal models that are exposed to the virus or parts of the virus.

OR

The best virus-neutralizing antibodies are selected from the thousands produced by the patient or animal and then:

Put into a cell line that can produce the desired antibody at scale.

Grown at larger and larger quantities in bioreactors.

Purified and packaged into vials.

For infectious diseases, Regeneron typically pursues a **"cocktail" approach** of two or more antibodies against a pathogen combined in a single medicine. The different antibodies working in slightly different ways have a higher chance of effectively **blunting the virus should it mutate** over time.

#### ANTI-VIRAL ANTIBODY MEDICINES CAN BE GIVEN:

As treatment; For sick patients through IV to block active infection.

As protection; For healthy people through a subcutaneous injection.

With this approach, immunity is provided immediately but is temporary.

### ACTIVE IMMUNITY

Develops over time in response to an infection or vaccination.

#### VACCINES

Used to induce the body's active immune response in order to protect from an infectious viral disease, such as measles or the flu.

#### VACCINES ARE CREATED USING ANTIGENS, WHICH CAN BE:

A weakened, or attenuated, virus.

A dead, or inactivated, form of the virus.

A fragment of the virus.\*

The virus's RNA or DNA.\*

OR

\*These two approaches are primarily being explored for COVID-19. [2]

#### To make many doses of vaccines, manufacturers:

Gather needed key ingredients.

Produce the antigen in large quantities.

Package the antigen into an injection-ready form.

#### VACCINES WORK BY:

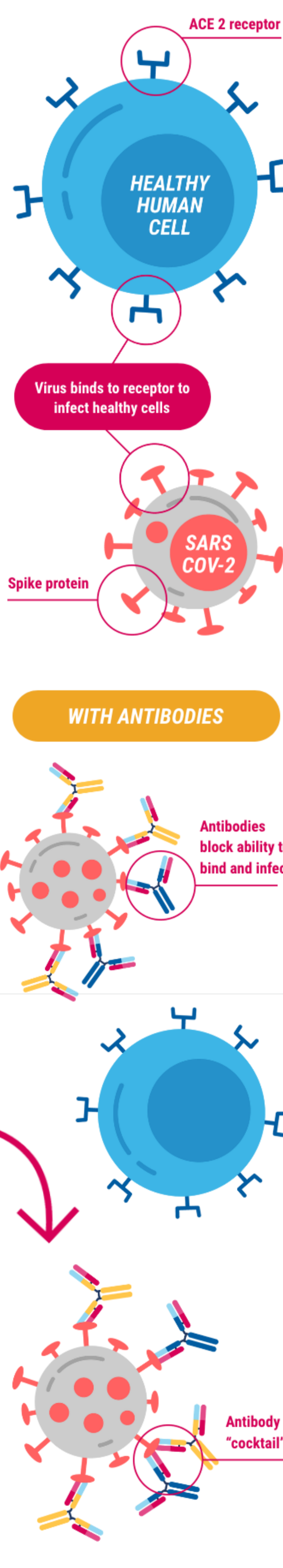
Exposing healthy patients to one of the items above via injection, which tricks the immune system into thinking it is infected and generating a response.

B cells begin producing protective anti-viral antibodies in response.

Wait. After two to three weeks, active immunity is acquired.

Immunity is delayed but usually lasts for a certain period of time. Experts don't yet know how long active immunity will last against COVID-19. Based on prior coronaviruses, patients may have antibodies against the virus for a few years, although it is not clear if those antibodies will confer lasting immunity. [1]

## HOW Antibodies Neutralize the SARS-CoV-2 Virus



Extensive testing for safety and efficacy, as well as quality control through good manufacturing practices, is critical to both approaches. Approval must then be granted by the U.S. Food and Drug Administration before widespread use can begin.

Antibody medicines could serve as an important bridge to a vaccine, and may have utility beyond for certain people, such as those who are immuno-compromised or do not respond to a vaccine. Both approaches are important and necessary to hopefully end the COVID-19 pandemic.



Learn more about Regeneron's anti-viral antibodies, technologies and COVID-19 research at [regeneron.com/covid19](https://www.regeneron.com/covid19).

#### References

[1] Kirkcaldy RD, King BA, Brooks JT. COVID-19 and postinfection immunity: limited evidence, many remaining questions. JAMA. 2020 May 11. Online ahead of print.

[2] Callaway E. The race for coronavirus vaccines: a graphical guide. Nature. 2020;580:576-577.