# MUTATIONS MATTER
How Variants Work

SARS-CoV-2 (Severe Acute Respiratory Syndrome CoronaVirus 2) is the virus that causes the disease COVID-19 (coronavirus disease 2019). The spike protein covers the outside of the SARS-CoV-2 virus. This is where the name "coronavirus" comes from.

THE SARS-CoV-2 SPIKE PROTEIN
HELPS THE VIRUS GET IN VIA THE ACE-2 RECEPTORS IN YOUR BODY

Spike Protein

SARS-CoV-2 Virus

Host Cell

ACE-2 Receptor
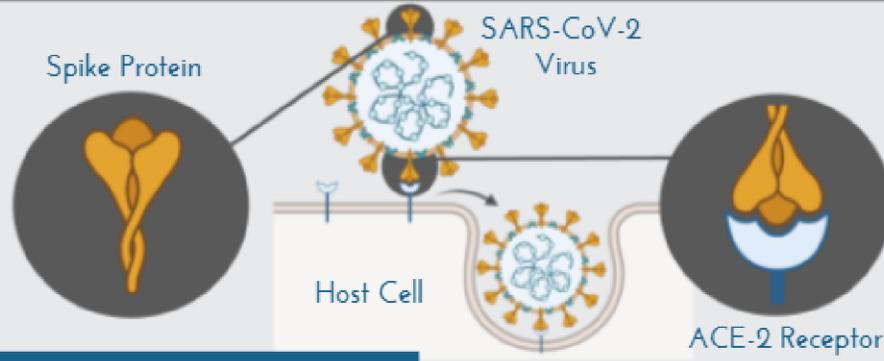
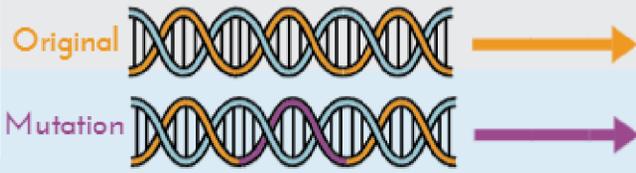Picture day! This is the spike protein visualized with electron microscopy [6]
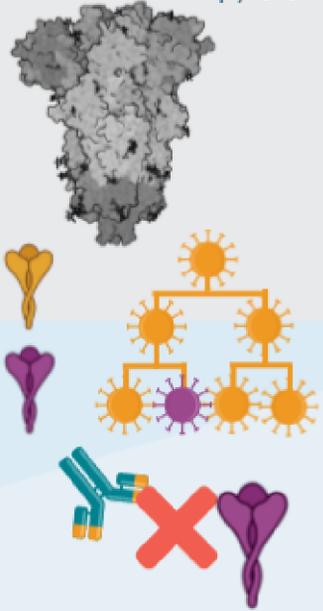
MUTATIONS
AFFECT THE IMMUNE SYSTEM'S ABILITY TO PROTECT AGAINST THE VIRUS

A MUTATION is a change in the viral genetic code

Mutations change the shape and chemistry of the proteins the virus produces

Original

Mutation

Antibodies are the immune system's soldiers.

They work by binding onto the spike protein, surrounding the virus, and blocking it from getting into your body.

If the shape or chemistry of the spike protein changes, antibodies may not be able to bind.

This means they may not provide protection.
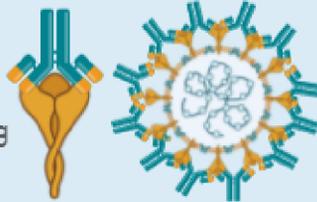
MUTATIONS

Infection-induced immunity and vaccine-induced immunity, as well as monoclonal antibody treatments, rely on shape/chemistry of viral proteins. Mutations change the shape/chemistry of the spike protein and may cause milder or more severe disease.

ANTIBODIES

The spike protein is the main target for protective antibodies against the SARS-CoV-2 virus. Antibodies may not be able to protect against certain variants, like Omicron. If you've previously had COVID-19, there is no way to know how much or how little protection you may have against getting COVID again, and whether getting the virus again might cause more severe disease. [1,2,3,4,5]

VACCINATION

Vaccination is the safest way to maintain immunity against the SARS-CoV-2 virus. Nearly all COVID-19 cases, hospitalizations, and deaths are among the unvaccinated.*

THE POINT

As long as the virus can mutate, the pandemic is not over.
COVID-19 vaccines are an effective and safe way to protect against severe disease and death from the Coronavirus. COVID-19 vaccines also reduce the risk of the virus spreading- thus reducing the chances of new, more severe variants developing.

Sources

*For more information, refer to our COVID-19 Immunity Fact Sheet
**The World Health Organization (WHO) also uses this classification system but the classifications may be different based on local epidemiology. For more information visit the CDC's website.
[1] Andreano, E., Rappuoli, R. SARS-CoV-2 escaped natur... ...-761 (2021).
[2] Chen, R.E., et al. Resistance of SARS-CoV-2 variants t... ...Med 27, 717-726 (2021).
[3] Wang, P., et al. Antibody resistance of SARS-CoV-2 v...
[4] Wang, Y., et al. The significant immune escape of pse... ...5 (2022).
[5] Zhang, X., et al. SARS-CoV-2 Omicron strain exhibits ...et Ther 6, 430 (2021).
[6] Walls, A.C., et al. Structure, Function, and Antigenicity 5VXX
[7] https://www.ecdc.europa.eu/en/covid-19/variants-concer...
Spike protein images created with BioRender.com

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