**WHAT IS THE SPIKE PROTEIN?**

1. **Spike protein**
   - The spike protein binds to an enzyme (ACE2) found in cell membranes in parts of our body including the lungs. This helps the virus enter cells, initiating infection.

2. **Subunit 1**
   - The part of the protein that binds to the ACE2 enzyme.

3. **Subunit 2**
   - The part of the protein that fuses with the human cell membrane, helping the virus enter the cell.

Sugar molecules called glycans coat the spike proteins, camouflaging them from our immune system as they enter the body.

**DETERMINING THE STRUCTURE**

Cryo-electron microscopy (cryo-EM) uses the deflection of electrons to determine the structure of the protein.

- Electron source
- Electron beam
- Frozen protein sample
- Lens
- Electron detector

Thousands of 2D images are combined to make a 3D, atomic-scale image of the protein. This lets us understand how the protein helps the virus infect our cells, and how medicines might interact with it.

**HOW DID IT HELP?**

- **Vaccines**
  - Many vaccines for COVID-19 depend on the spike protein. For example, the Novavax vaccine uses nanoparticles made up of spike proteins.

- **Treatment**
  - Knowing the structure of the spike protein lets researchers identify drugs which could target it. This could lead to new treatments for COVID-19.

- **Understanding mutations**
  - Some mutations can introduce changes to the spike protein structure. Knowing its original structure lets us identify how these changes affect it.

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3D spike protein image: David S. Goodsell and the RCSB PDB