How do SARS-CoV-2 vaccines work in ending COVID-19 pandemic?



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## **INTRODUCTION**

- COVID-19 is a disease caused by SARS-CoV-2, the novel coronavirus.
- Covid-19 is an acute respiratory disease.
- It originated from bats and belongs the to Betacoronavirus genus.
- SARS-CoV-2 shows near 50% sequence identity to MERS-CoV and 79% to SARS-CoV.
- It attacks host cells in a similar manner to SARS-CoV and also has a similar receptor-binding domain.
- utilizes the ACE2 It receptor to infect humans.

# **METHODOLIGIES**

- There § are 3 common developing methods in vaccines to fight viruses.
- These include:
- VIRUS INACTIVATED USAGE
- **GENE DELIVERY**
- **PROTEIN UTILZATION**
- Each method has its benefits different researchers and take different approaches to find solutions.



### **INACTIVATED VIRUS INJECTION**

This method teaches the immune system how to fight off a foreign invader. A specific virus is inactivated either with heat or chemicals. Its then introduced to the body. This leads to a memory of an antibody to protect from the SAR-CoV-2 infection. This vaccine is very effective, but it is highly risky to produce a virus, and introduce a viral code into a body.

## **GENE DELIVERY**

 Researchers create foreign genetic material in the form of mRNA and cDNA encoded in the S-protein of SARS-coV-2. It is then used to immunize humans to express the viral S-protein inside a body. The expressed S-protein is a foreign protein, which will trigger an immune response to produce an antibody to neutralize the virus. This vaccine is easy to produce but has limited ability to induce a long period of neutralizing antibodies.

### **PROTEIN VACCINATION**

This process requires developers to target specific functions of a virus. Vaccines are developed that target unique structures of the viral S-protein that can produce antibodies neutralize to it post immunization. Usually the S-protein receptor binding domain is targeted due to an invasive ability. If successful, the virus will be unable to attach to host cells. The most common target in terms of Covid-19 is its Spike (S) protein. If a vaccine can stop the S-protein, the whole virus can be stopped. It is easy to make the vaccine, but it may not be very effective because it is a single protein vaccine.