Bioglogy Project : A booklet that tells what you need to know about the vaccine.

# VACCINE For Covid-19

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Brief We want to fully explore the function of the vaccine for Covid-19 and try our best to give as much useful information to the MHS community.

## Content

- World Pandemic Status
- Function of Vaccine for Covid-19
- Real Life Example
- Should We Take it?



COVID-19 Dashboard by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University



-SIA

North Pacific Ocean

Indian Ocean

AUSTRALIA

### Due to 11/11/2020

## Now we have...

# 

Confirmed Cases









### Growth trend of the confirmed cases

https://voice.baidu.com/act/newpneumonia/newpneumonia/?from=osari\_aladin\_banner

As the climate is getting colder, the condition continues to deteriorate, which drives people to remain inside of houses.

Fatigue in fighting against with this epidemic complicates the current situation, making the use of masks and social distancing more challenging.





### WILL THE WORLD ALWAYS BE LIKE THIS?

### A WORLD-WIDE PANDEMIC

### LASTING FOR 10 MONTHS

### **DO PEOPLE HAVE ANY SOLUTIONS?**

## WHAT SHOULD WE DO?



### There is a saying: "If we have vaccine, we win the war." But why?

In fact, humans have the natural ability to defend themselves from a normal virus since they have strong immunity system that can recognize the invaders.



Unfortunately, our immune system cannot recognize a special virus like Covid-19. Therefore, the immune system will treat them as 'friends' and will allow them to destroy you body.



### ....Who are they?



The purpose of vaccination is to trigger the immune response and allow your body to know that THEY ARE INVADERS ..... But how do vaccines actually work?





- There are mainly five types of vaccines used to treat the coronavirus. Different kinds have different advantages and disadvantages. But, which type is the safest? Which type is the most recommended?
  - which type is the best to take?





# Live-Adenuele Vecine



It doesn't cause disease in people's immune system, so it can provide a lifelong immunity with only a single dose. But it's too strong and unsuitable for people who have a compromised immune system.

The advantages of the subunit vaccine are that its purity is high, the immune response is strong, and the side effects are limited. However, the cost is high and it is difficult to generate.









It doesn't cause disease in people's immune systems, but it may induce production of antibodies against the natural toxins. It has no persistence, so the patient must be vaccinated frequently.

The protein parts of the vaccine acts as the carrier of antigen, amplifying the immune response. This kind of vaccine is suitable for infants and children.

# Conjugae Vacine





The Inactivated vaccine is a vaccine that retains important information, viruses and other pathogenic microorganisms to destroy their infectious factors and retain their immunogenicity. There are lots of advantages of an inactivated vaccine. Its safety is ensured, it can be easily stored and transported, and the interference of maternal antibody is limited. However, it's difficult to produce and patients needs multiple injections, which are costly and inconvenient.

# 

Relatively, the type of *inactivated vaccines* is one of the most effective vaccines that combat with the Covid-19. They have already passed two of three clinical trials and are successfully produced into countless doses for people to get vaccinate.

## Three Clinical Trials



Making sure the vaccine is safe.



Ensuring effectiveness; exploring how can antibody produce, how much, and how long?



source 3 source 9





Processing vaccinated in endemic areasto to see if there is a substantial protective effect.





In inactivated vaccine, the pathogen of Covid-19 has been "killed", which ensures the pathogen will not develop in our body later.

Therefore, the process of vaccination is to make the inactive virus enter into your body, **mimicking viral infection.** 



### Marcrophage

• • •

As the inactive virus enters the bloodstream, it will trigger the immune system by encountering immune cells, such as macrophage.

## T-Cell



# The immune system's first action is macrophoge phagocytosis of the inactive Covid-19, breaking them into small pieces.





### Macrophage

After engulfment, macrophages display the antigen of Covid-19 on their surface, which associates with a receptor known as MHC.

MHC

### Antigen of Covid-19





Then, the macrophage activates T - cells, and the T - cells will come and bind the Covid-19 antigens on MHC.



Upon activation, T - cells proliferate into either cytotoxic T-cells, suppressor T-cells, or Helper T-Cells, which play imperative roles in the later stage and acitvate B-cells



### Helper T-Cell

### Supressor T-Cells



Meanwhile, B-cells also ingest inactive Covid-19 virus and present the antigens associated with MHC on the surface.

source 4 source 6

# After that, activated B-cells interact with Helper T-cells by expressing antigens of Covid-19, and then they will secrete lymphokines.

lymphokines



Helper T-Cell

source 4 source 6

Lymphokines will then trigger B-cell to proliferate into memory B-cell or plasma cell.



### Plasma Cell

### source 4&6

Plasma cells will produce the Covid-19 antibody specific to the strain in the vaccine, and the antibody can neutralize the pathogen.

XX

### Plasma Cell

source 4&7

Memory B-cells will aid to future immune response when people are exposed to the real active Covid-19. Your immune system will know that they are enemies!

That's how inactivated vaccine for Covid-19 works.



### They are Covid-19!

### Memory B-Cell

### Immune System

The inactivated vaccine is the most commonly used vaccine in China, and numerous citizens have already taken it. Let's look at a short interview with Betty, who got vaccinated on October, 2020.

### **BETTY'S REAL LIFE EXAMPLE OF TAKING THE SHOT**



Which type of vaccine did you take?



What was the process like?

First, the doctor gave me an instruction to follow, and I got the vaccine soon after. I stayed in a waiting room for 30 mins in case there was anything wrong. Then I left when the doctor assured my situation.



Did you have any adverse reaction?

### I got the **inactivated vaccine**.





I felt a little **sleepy** and lethargic.



This content of the page is crédit to Betty

# Should We Take it?

- Why did Betty get vaccinated?
- 1. She did not want to wear masks anymore.
- 2. She wanted to protect herself from infection.

### We may refer to Betty's experience to decide whether we should take it.

Overall, vaccination is helpful to the Covid-19, but not everyone has to get vaccinated. People need to choose the right vaccine according to the needs of our own body. Before we decide to vaccinate, we should ask the doctor, understand and learn precautions, so as to better help us reach the effect the vaccine.







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Thank you.

