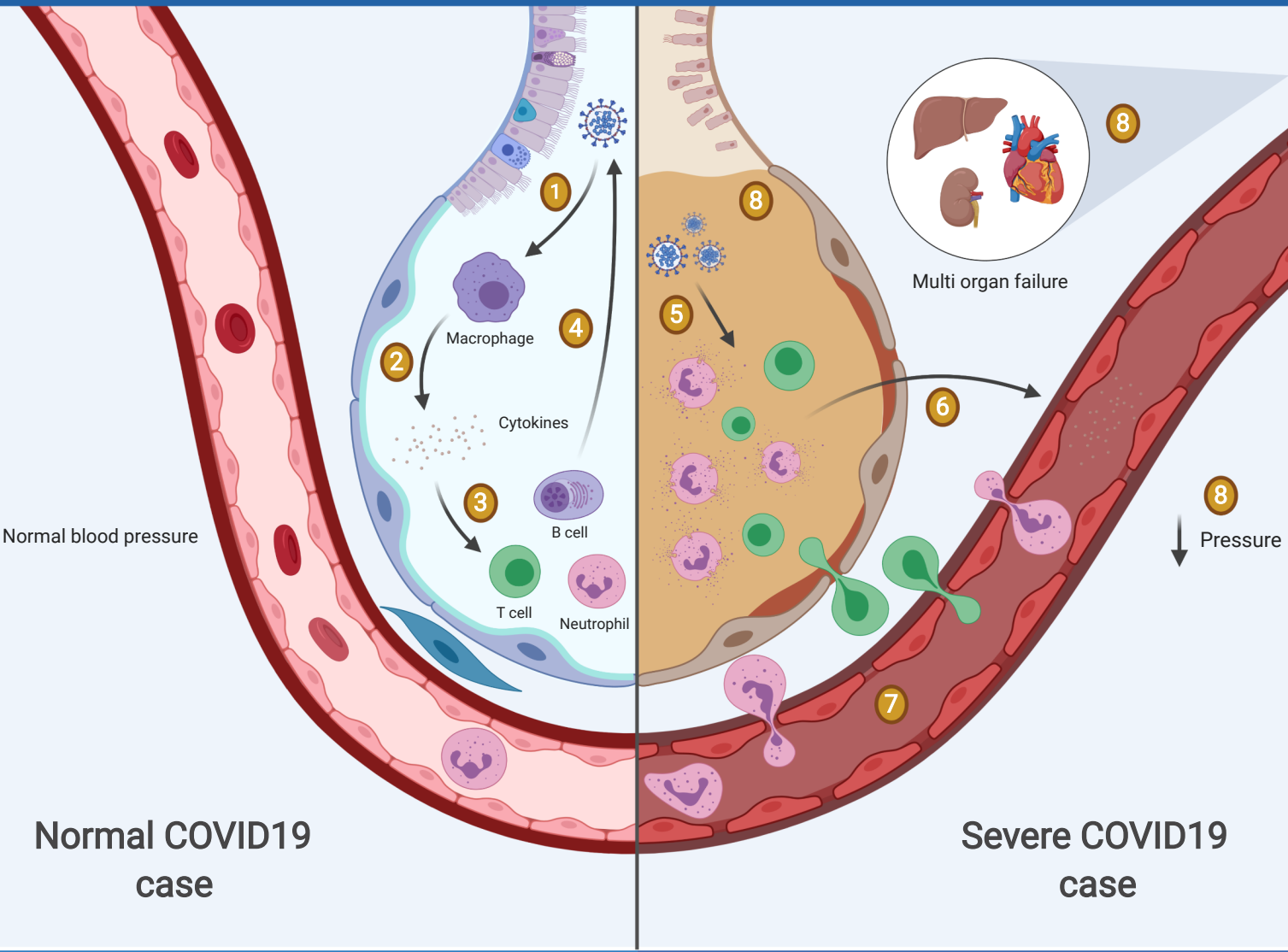
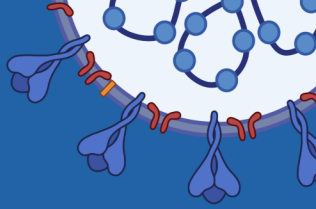


# COVID19 pathogenesis

What happens when you're infected?



## How does our immune system respond to viral infections such as SARS-CoV2?

- 1 When viral particles enter, immune cells called **macrophages** will respond to their entry by producing signalling molecules called **cytokines**
- 2 There are many different types of cytokines, with various functions. One of them is called **IFN-α**, which causes inflammation.
- 3 Inflammation is characterized by **swelling, pain and redness** and is important for the **recruitment of immune cells** that can fight the virus.
- 4 IFN-α is critical for recruiting and activating other immune cells such **T cells** and **B cells** which help to **clear the virus**.

Individuals that develop severe illness when infected with SARS-CoV2, are **unable to mount a proper immune response** that can clear the virus immediately.

## Without a proper immune response the virus replicates uncontrollably, causing a severe COVID19 case

- 5 As the virus multiplies, the immune response worsens an excessive amount of inflammatory cytokines is produced. This is termed a **cytokine storm**.
- 6 In this state, the inflammatory molecules enter the blood stream and increase the **leakiness** of the lung tissue causing massive **fluid build-up** in the lungs
- 7 The excess cytokines causes immune cells to accumulate in the lungs and cause **collateral damage to lung tissues**.
- 8 This leads to **acute respiratory distress syndrome (ARDS)** in which the lungs fail to function.
- 8 The extra leakiness in the lungs, causes a **drop in blood pressure** which prevents sufficient blood supply to other organs such as the heart, kidneys and liver, causing **multi-organ failure**.

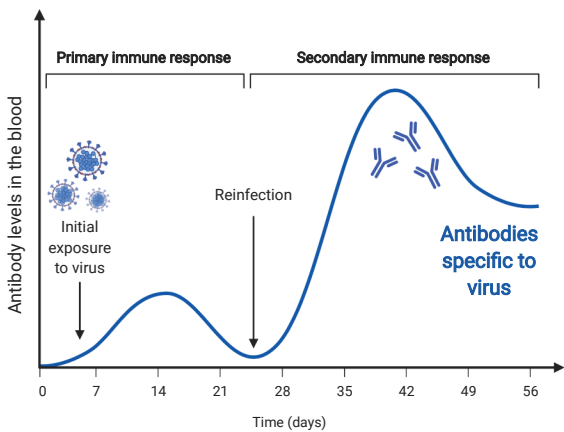
## Building Memory

To clear viruses from the body, various aspects of the immune system have to work together. One of the fundamental parts that helps immune cells cooperate are **antibodies**

Antibodies are **large, Y-shaped molecules** that are produced by **B cells**. They can **stick to viruses and bacteria** and can stop the spread of pathogens by **blocking them from infecting cells** and help other immune cells specifically **target these pathogens** to kill them more effectively. It takes time for B cells to produce antibodies upon infection, which is why it takes time to clear the virus.

After the infection is cleared, some of the B cells that produced antibodies specific to the pathogen that we were infected with survive. These **memory B cells** continue to circulate in the body giving our immune systems with a "memory" of the previous infection.

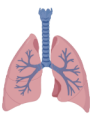
When memory B cells encounter a pathogen that they were previously infected with, they are able to produce antibodies against the pathogen immediately. This helps to alert the immune system right away so that the virus is cleared much faster, often without symptoms.



In individuals that have recovered from COVID19, antibodies against the virus. **have been detected in** their blood. However, whether they confer protection against reinfection with COVID19 is **yet to be determined**. There have been cases of reinfection but the factors that have contributed to this are also yet to be explored. That being said, please remain vigilant if you have successfully cleared the virus and **remember to socially distance** to not get others sick!

## Risk Factors

### Respiratory



Treating asthma and chronic lung disease requires the use of immunosuppressive treatment regimens which weaken anti-viral responses.

### Cardiovascular



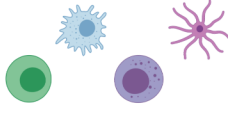
SARS-CoV2 can infect and kill cardiac tissue cells. Hence, patients with underlying heart conditions and compromised heart function are at a greater risk of heart failure.

### Metabolic



Obese and/or diabetic people have higher blood sugar levels. This can cause inflammation that can interfere with anti-viral responses and hinder viral clearance.

### Immunological



Pregnant women, infants and immunocompromised people may be unable to mount an adequate response to SARS-CoV2, putting them at risk of severe infection.