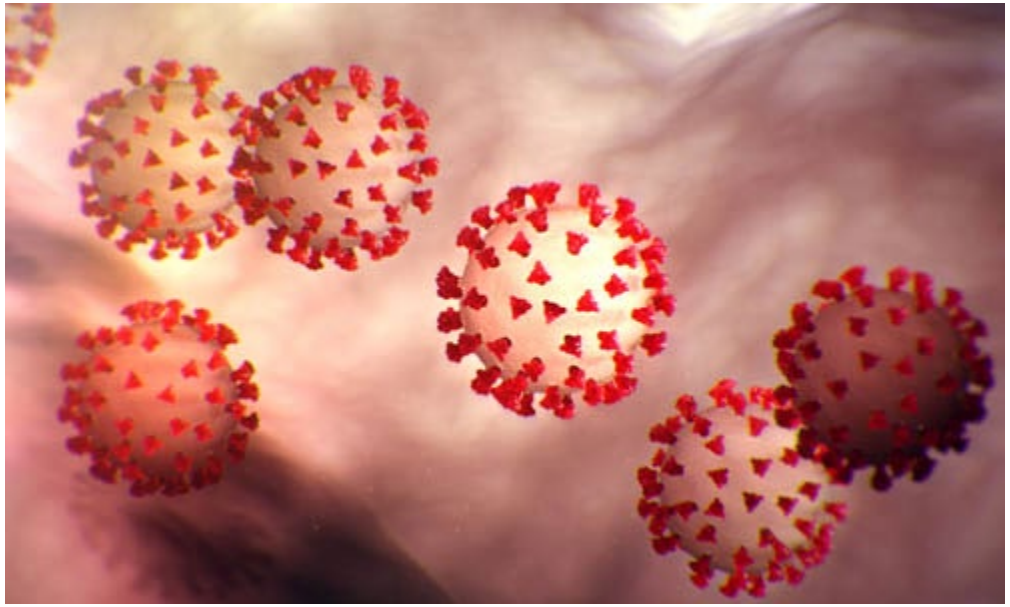
COVID-19

Wednesday, 01 April 2020



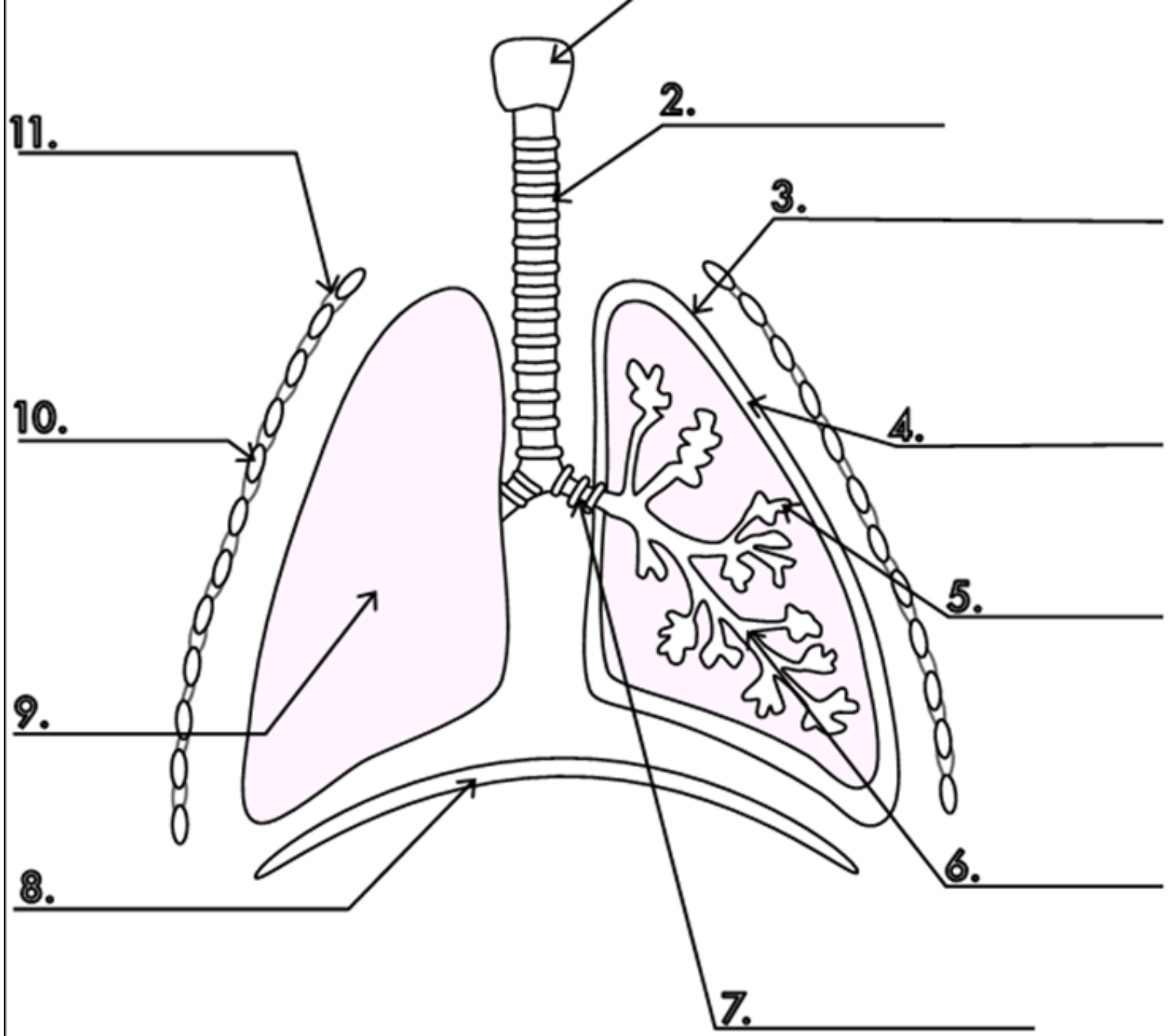
Learning outcomes

- ✓Explain how the respiratory system allows gas exchange to take place
- ✓Describe how COVID-19 damages lung tissue
- ✓Explain how a hyper-sensitive immune response can damage lung tissue further

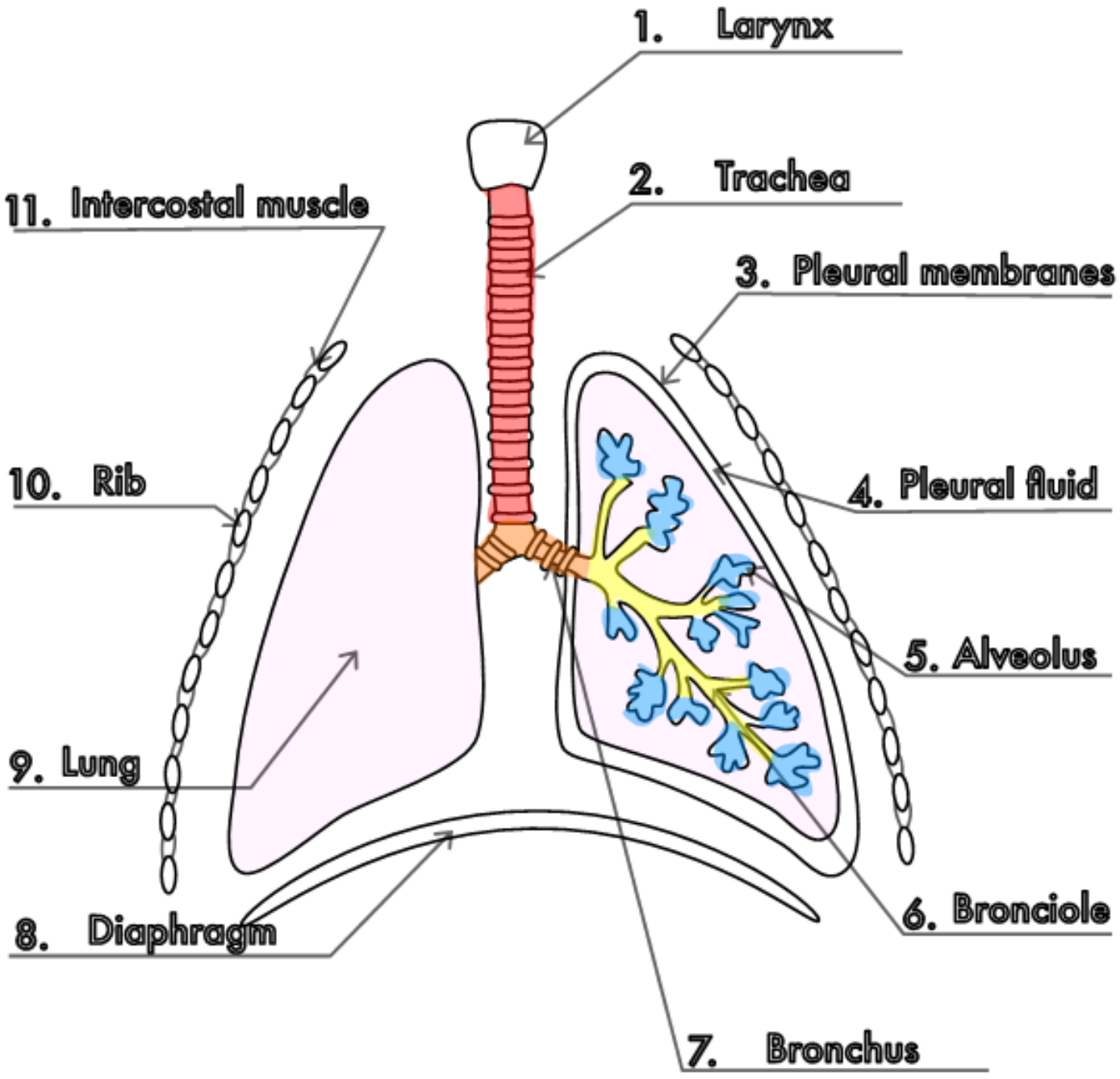
Task – Label the parts of the lung

- 5 minutes

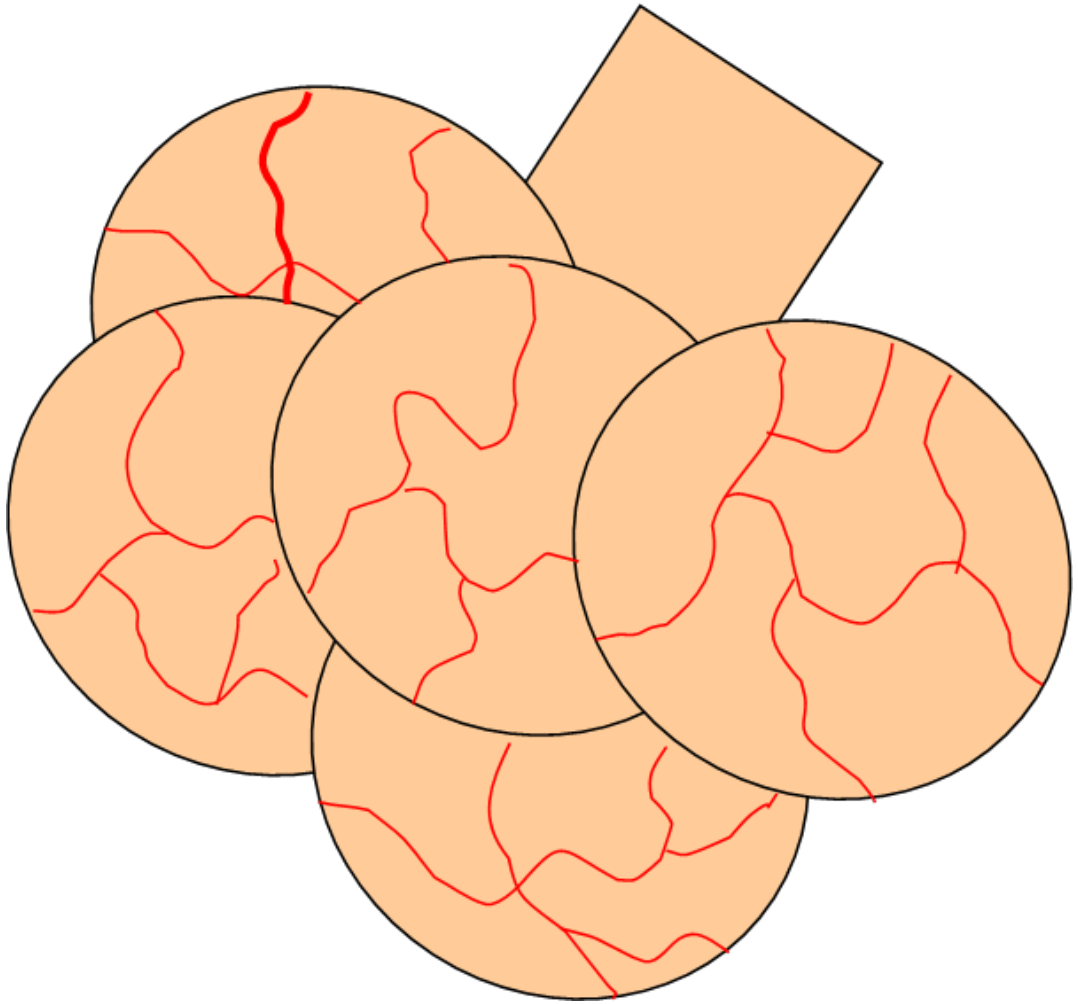
- Extension – describe the role of (5) in gas exchange



Checkpoint


1. Larynx
2. Trachea
3. Pleural membranes
4. Pleural fluid
5. Alveolus
6. Bronciole
7. Bronchus
8. Diaphragm
9. Lung
10. Rib
11. Intercostal muscle

Gas Exchange



- The lungs allow oxygen to enter the body and carbon dioxide to leave the body.
- The site of **gas exchange** is at the alveoli.
- There are millions of alveoli in the lungs and they have a large blood supply of **capillaries**.
- Oxygen diffuses into the capillaries so it can be transported to every cell in the body to allow **respiration** to occur.

Task – Adaptations of the Alveoli

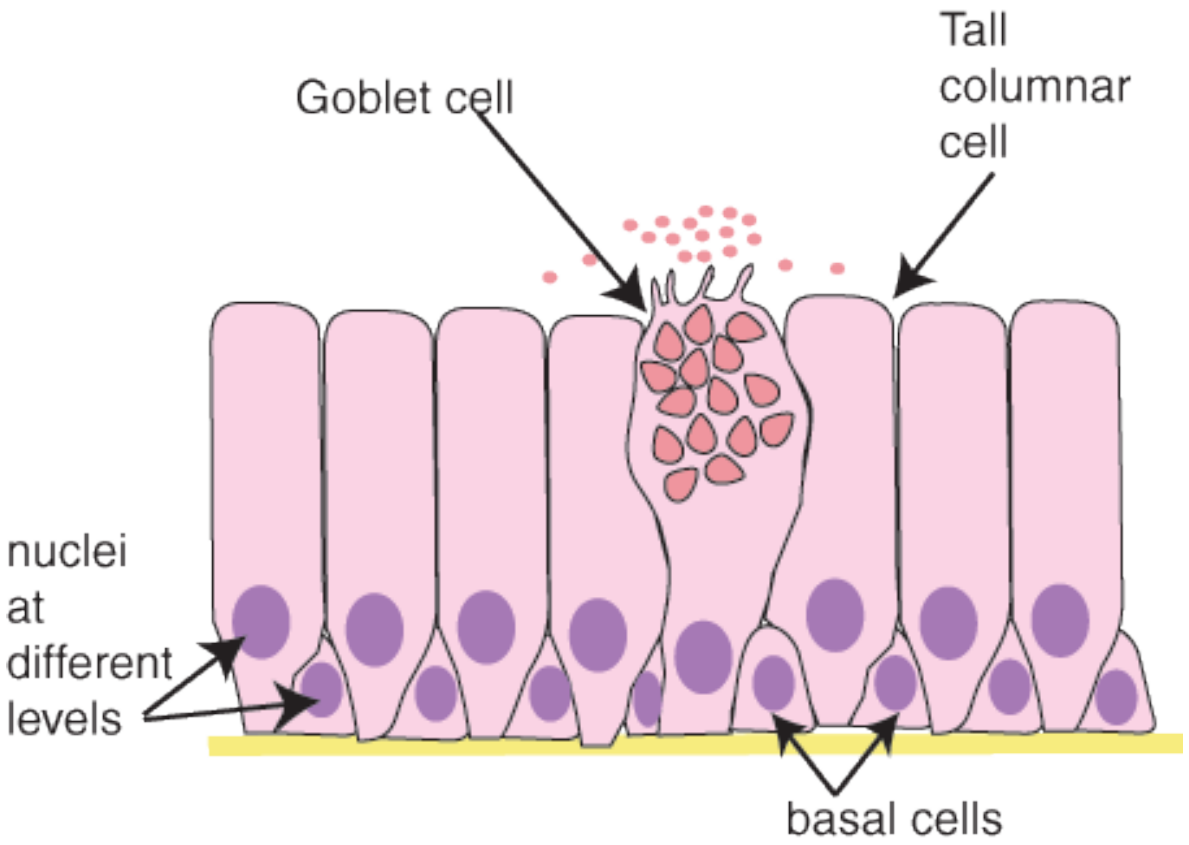
- How do the following adaptations allow efficient exchange of gases?

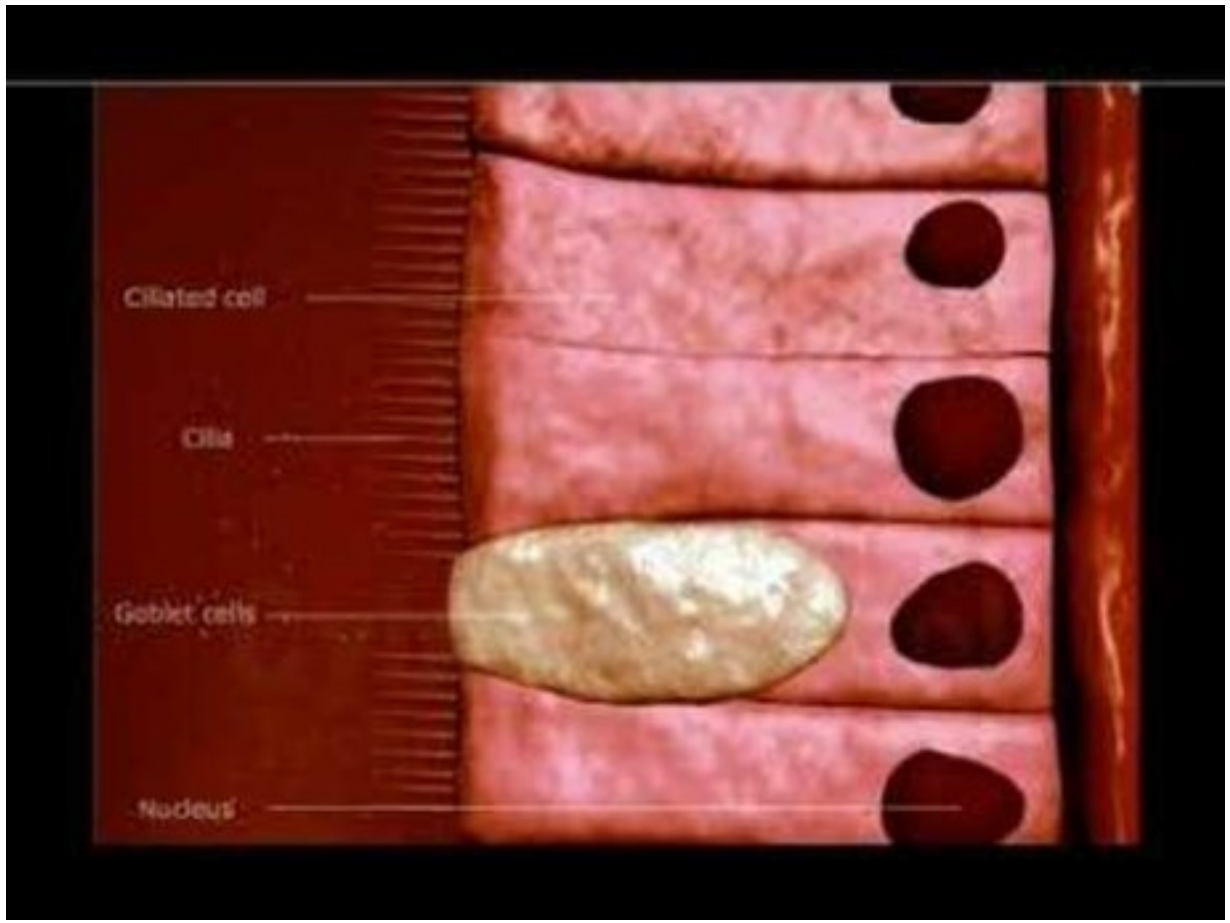
- Large surface area
- Blood supply moving to maintain concentration gradient
- Thin layer of cells
- Short diffusion distance
- Moist lining

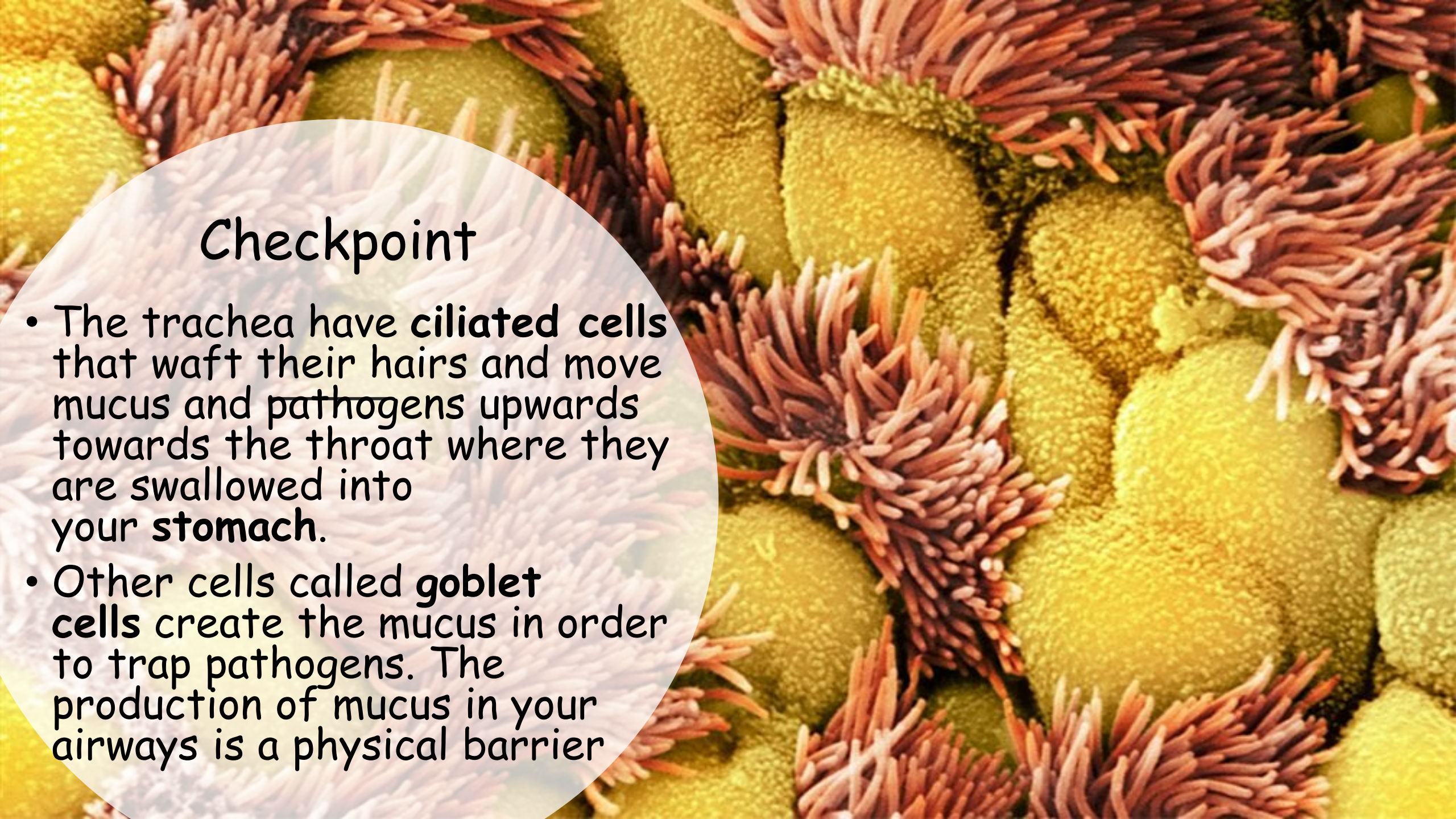
Checkpoint

- Large surface area – allows more gas exchange to occur
- Blood supply moving to maintain concentration gradient – keeping a higher concentration of oxygen in the alveoli so it diffuses quicker into the blood
- Thin layer of cells – gases pass quickly through the cell into the blood
- Short diffusion distance - gases pass quickly through the cell into the blood
- Moist lining – gases need to be dissolved in water to pass into the blood

Goblet and Ciliated Cells – how do they protect the cell?







Checkpoint

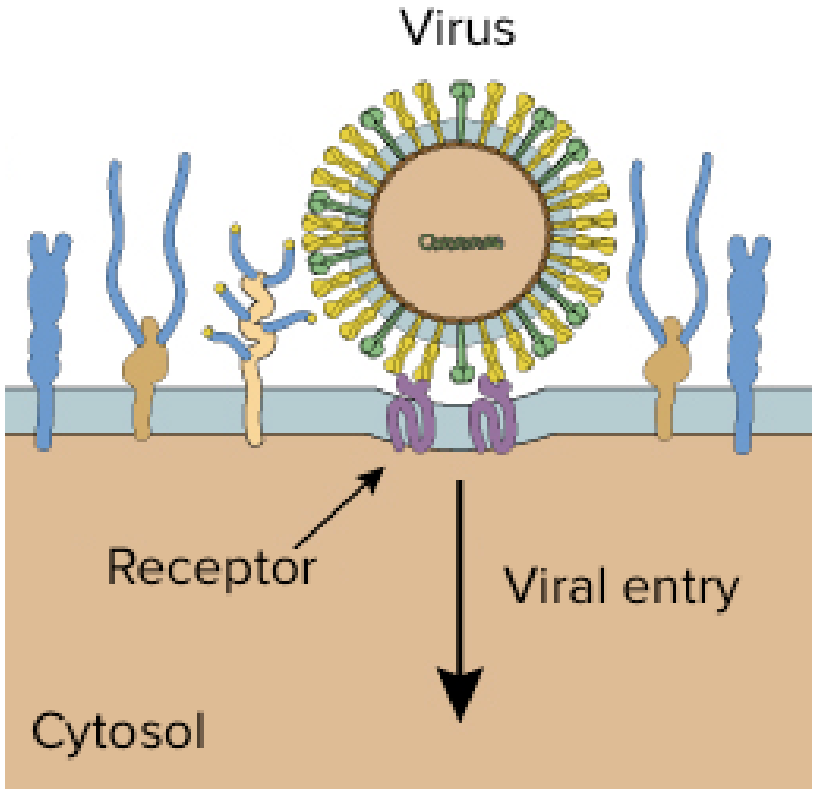
- The trachea have **ciliated cells** that waft their hairs and move mucus and pathogens upwards towards the throat where they are swallowed into your **stomach**.
- Other cells called **goblet cells** create the mucus in order to trap pathogens. The production of mucus in your airways is a physical barrier

How do Viruses infect cells?

- https://www.youtube.com/watch?v=jkNxmTrrZSk

Viruses

- **Viruses** are very small particles capable of infecting every type of living organism. They are **parasitic** and can only reproduce inside living cells.
- Viruses recognise **receptors** on cell membranes and bind to them.
- They insert their genetic material into the cell where it binds with the host DNA.
- New virus particles are assembled.
- The virus particles burst out of the cell, destroying it and affect other nearby cells.

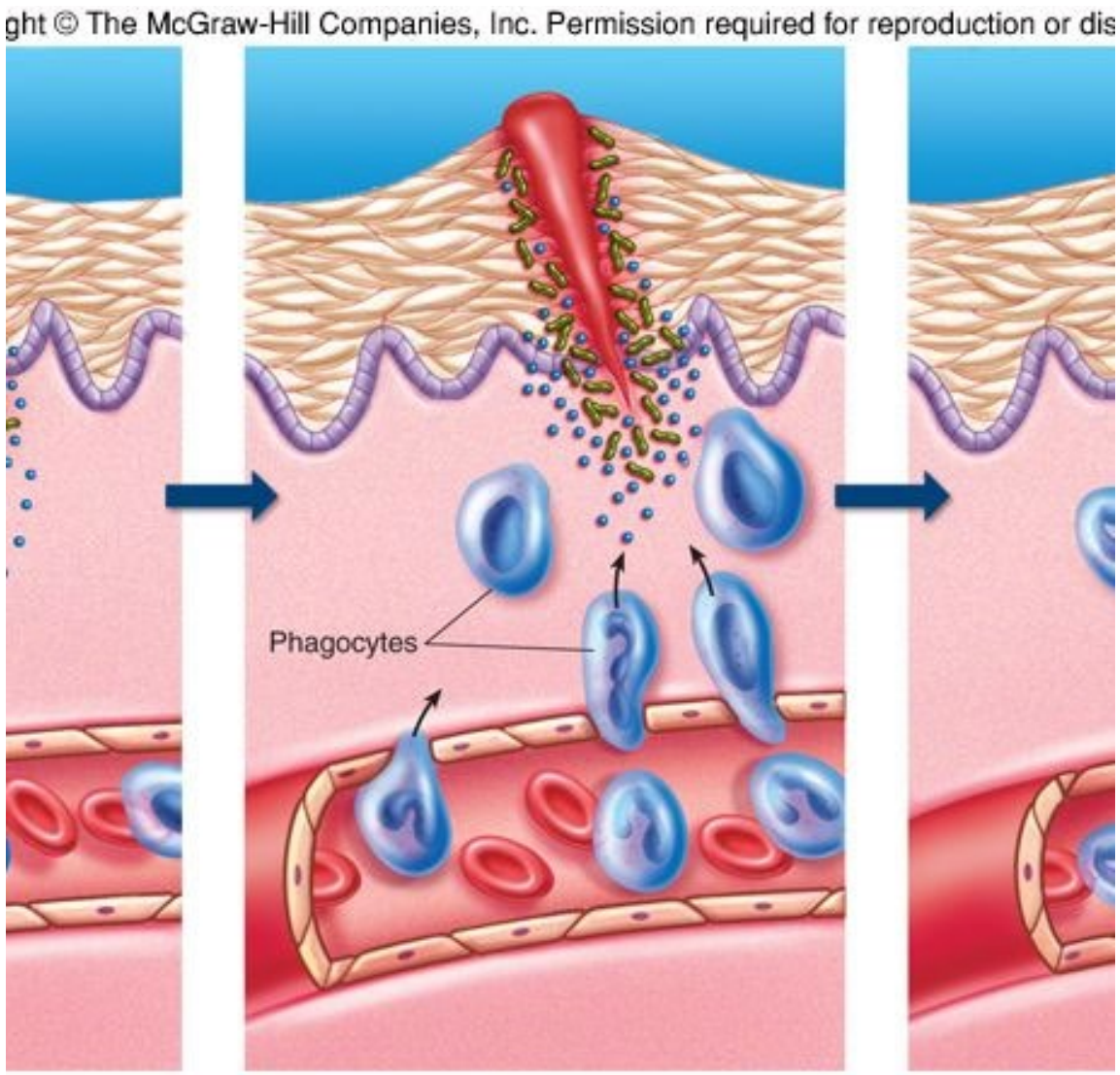


How does COVID-19 affect the lungs?

- Covid-19 binds to receptors on **ciliated cells**.
- It destroys the cell and debris enters the lung.
- Mucus also passes into the lungs.
- This makes it much harder to breathe.
- A person can develop pneumonia (inflammation of the alveoli)

Immune System

- When body tissue is damaged, a chemical called **histamine** is released.
- Histamine makes blood capillaries **dilate** and become leaky, allowing white blood cells to enter the damaged area.
- The body temperature **increases** to allow the immune system to work faster.
- Viruses do not replicate quickly at higher temperatures.



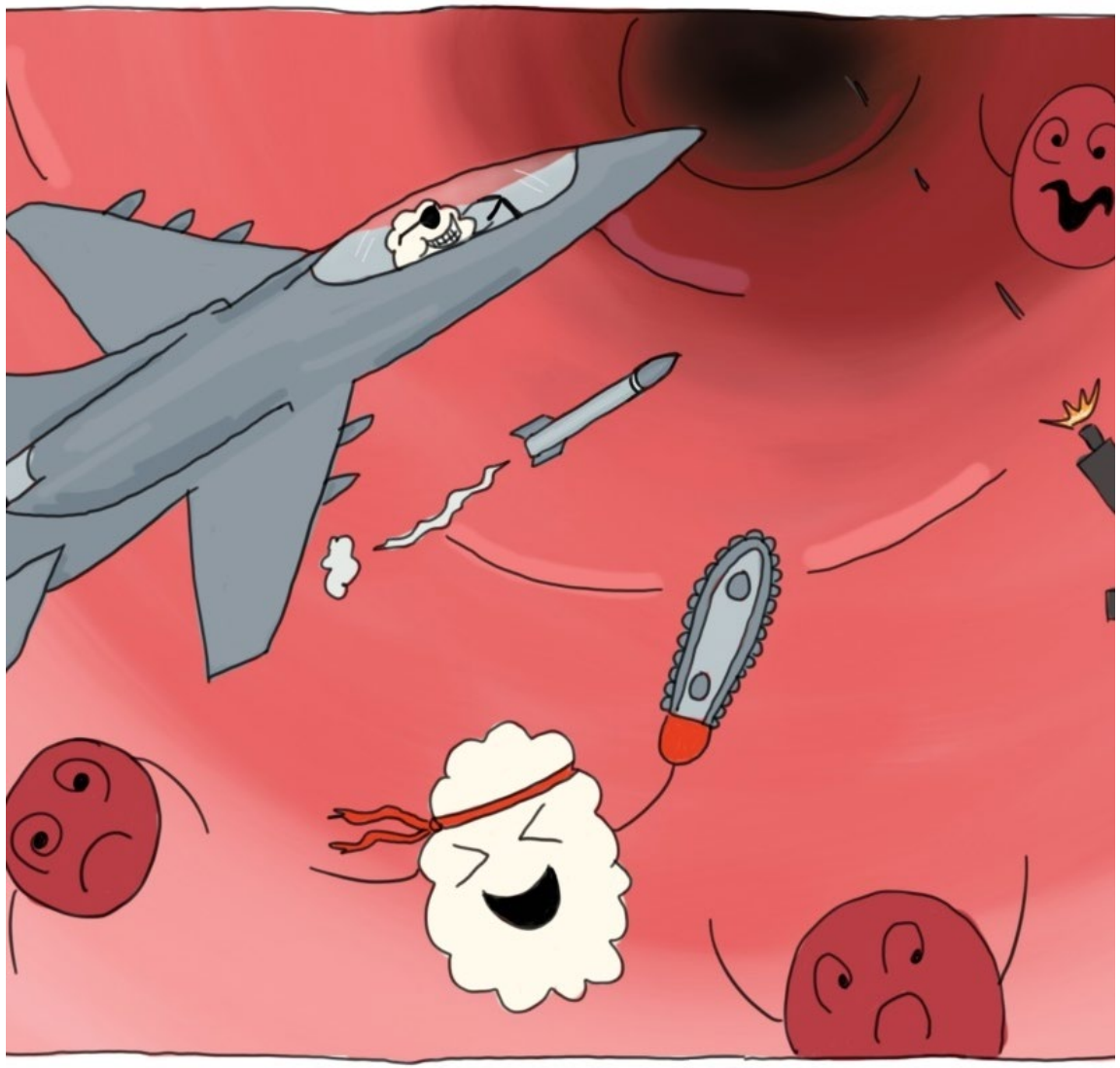
Facts

- 83% of people who are infected with COVID-19 develop a fever and a cough but recover.

- **Why do 17% of people have a more severe illness?**

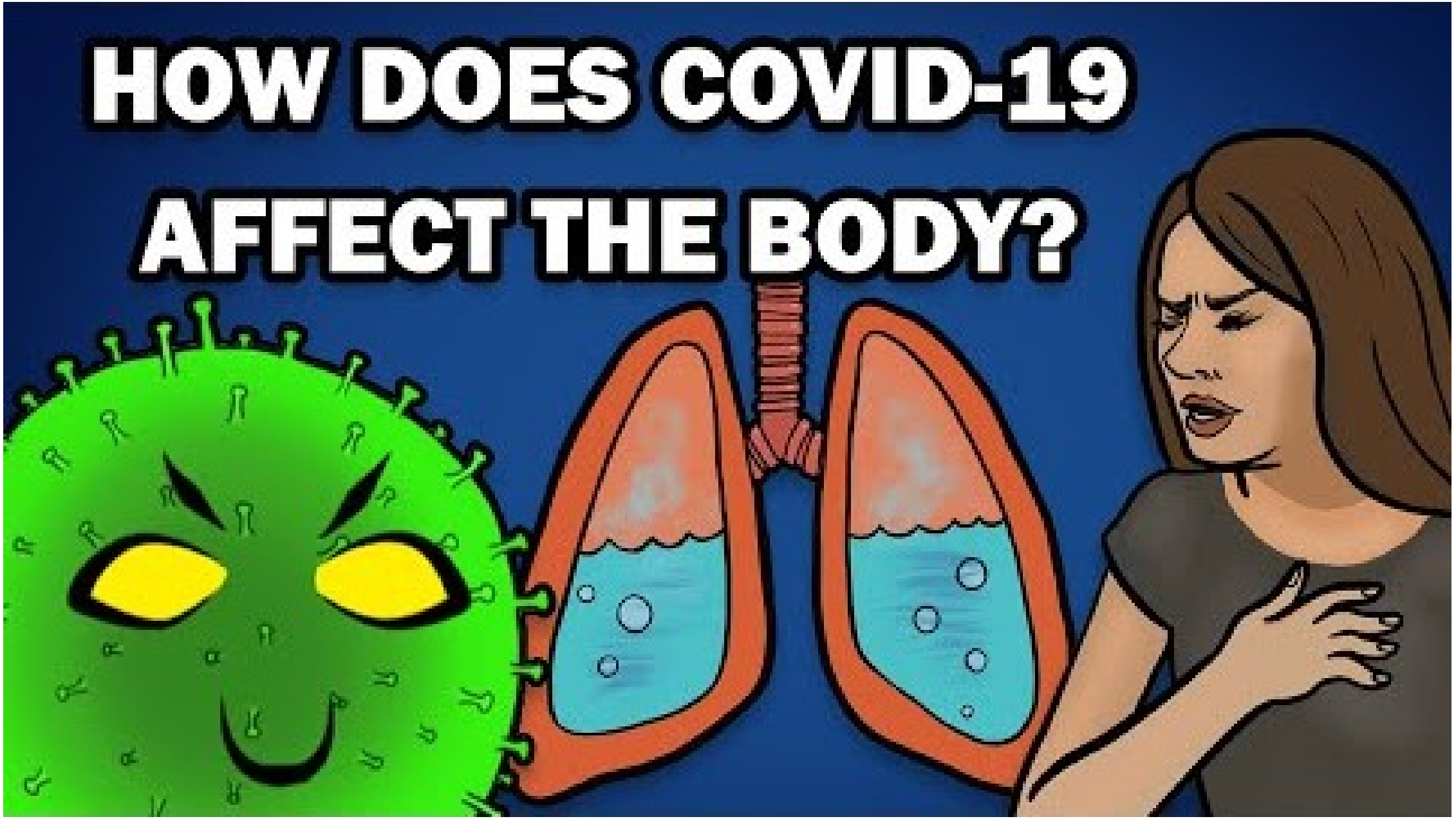
Hypersensitive Immune System

- The immune system releases chemicals called **cytokines** which attract white blood cells to the site of infection.
- The white blood cells destroy the **damaged cells** and the virus.
- Sometimes the immune system cannot tell which tissue is healthy and which is damaged.
- It destroys **all** the tissue, making it difficult for a person to breathe.



Respiratory Failure

- When the lung tissue breaks down it becomes difficult for effective gas exchange to take place.
- Other organs become **starved** of oxygen and stop working.
- This leads to **organ failure** and death.


HOW DOES COVID-19
AFFECT THE BODY?