Knowledge Organiser: Y8 Health and Disease

A **pathogen** is a microorganism (can only been seen through a microscope) that causes a disease. There are four main types of pathogen:

- Virus
- Bacteria
- Protist
- Fungi

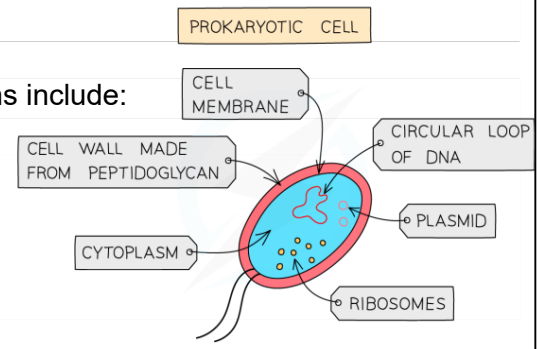
Diseases caused by pathogens are called **communicable diseases**. This means they can be **transferred** from one person to another (they are infectious).

Bacteria are unicellular organisms (a living thing that is just one cell). Bacteria cells are all **prokaryotic**. This means they do not have a nucleus or any other structures which are surrounded by membranes.

Bacterial pathogens produce **toxins** that cause damage to cells and tissues directly. This is what makes us feel ill once we have been infected.

Examples of bacterial pathogens include:

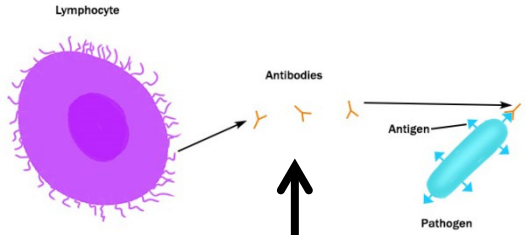
- Salmonella
- Cholera
- Tuberculosis (TB)
- Gonorrhoea



Viruses do not fulfil the **7 life processes**; therefore, they are not classified as living organisms. They can only reproduce inside living cells (e.g. human cells). They then burst out and destroy the cell which makes us ill.

Examples of viral diseases:

- Measles
- HIV
- Chickenpox
- Mumps



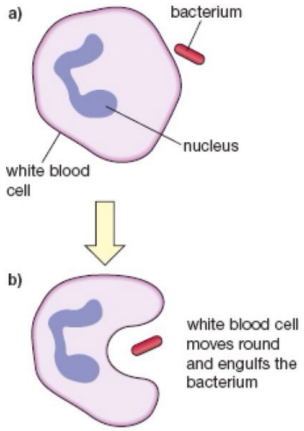
The **first line of defence** against infection stops the pathogens from entering your body, it is **non-specific** and includes:

- The skin – a physical barrier, if it gets cut it forms a scab.
- Eyes – tears contain **enzymes** to break down the pathogen.
- Nose –**mucus** traps pathogens before they can enter the lungs.
- Trachea and bronchi – lined with **ciliated** and **goblet cells**, goblet cells create the mucus in order to trap pathogen. Ciliated cells waft their hairs to move mucus and pathogens upwards.
- Stomach – **hydrochloric acid** kills pathogens.

The **second line of defence** involves the **immune system**, specifically **white blood cells**.

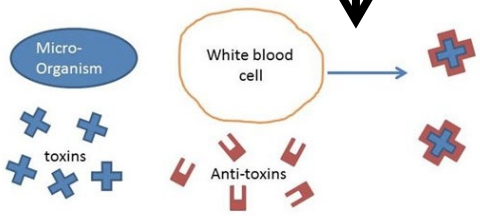
White blood cells help to defend against pathogens by:

1. Phagocytosis - some white blood cells (phagocytes) surround the pathogen and release enzymes to digest and break it down to destroy it.



2. Production of **antibodies** – some white blood cells (lymphocytes) produce antibodies. Antibodies attach to the surface of the pathogens. Pathogens have markers on their surface called **antigens**. The antibodies are complementary to the antigens on the pathogen so fit together. Once attached, they cause several pathogens to stick together, making it easier for phagocytosis to take place.

3. Production of **antitoxins** - some pathogens (usually bacteria) can produce toxins which make you feel unwell. White blood cells produce **antitoxins** which neutralise the effects of the toxin.



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Vaccines contain a **dead or weakened** form of the pathogen. This form of pathogen is usually injected into the body.

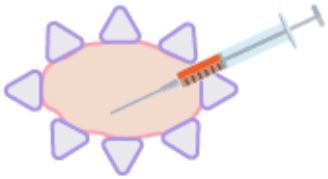
This causes white blood cells (lymphocytes) to make and then release complementary **antibodies** to the specific antigen that was injected.

The antibodies attach to and clump the antigens/bacteria together.

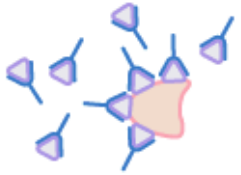
Phagocytes engulf the antigens/bacteria to remove them from the body.

Some of the **lymphocytes** remain in the bloodstream as **memory cells** which can produce the specific antibody for the antigen if the individual if infected with the real pathogen in the future.

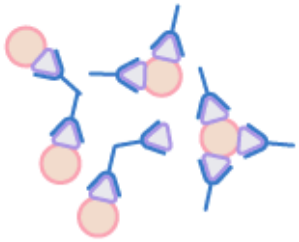
Syringe injects an altered form of the pathogen



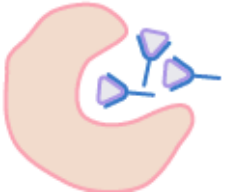
White blood cells release complementary antibodies to the specific antigen



They attach and clump pathogens together



White blood cells engulf the pathogens. Phagocytosis occurs

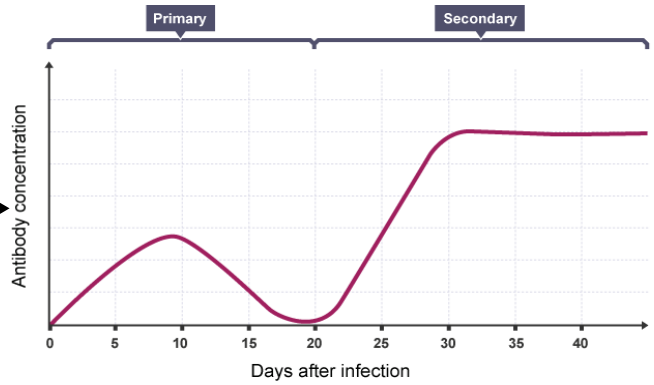


Every time the body is infected with a new pathogen, a new antibody must be made. It can take a few days to make the antibodies that are specific to a pathogen and this may give the pathogen causing the infection enough time to make you feel unwell.

This is known as the **primary response**.

During this response, the body will also make memory cells which are a type of white blood cell that remain in the body for years.

If you get infected by the same pathogen again in the future (and the antigens are the same) your memory cells allow you to **produce** more **antibodies**, and they are made much faster. Antibodies are made before the pathogen makes you ill. You will be infected with the pathogen but will show no symptoms. A common example of this is chickenpox. Most people will only show the symptoms of chickenpox once.



Vaccines reduce the likelihood that an infected individual will **spread** the pathogen they have been vaccinated against to others, even to those who have not been vaccinated.

If a large number of the population are vaccinated, it is unlikely that an unvaccinated individual will become infected with the pathogen. This is known as **herd immunity**.

How can spread of disease be reduced?

Being **hygienic** e.g. hand washing, using antibacterial sprays & disinfectants, coughing into a tissue.

Vaccines – people are less likely to get the disease and therefore pass it on.

Isolating infected individuals (stay at home if you are unwell).