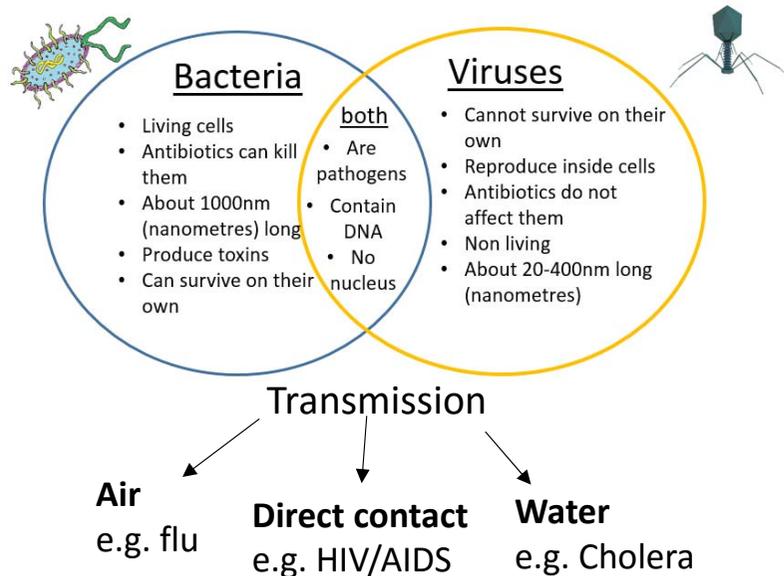


# 4.3 Infection and Response

## 1. Communicable Diseases

Communicable diseases are infectious diseases caused by pathogens.

Pathogens may be viruses, bacteria, protists or fungi. They may infect plants or animals.



The spread of diseases can be reduced or prevented by:

- simple hygiene measures
- destroying vectors
- isolation of infected individuals
- vaccination

## 2. Viral Diseases

### HIV

HIV initially causes a flu-like illness. Unless successfully controlled with antiretroviral drugs the virus attacks the body's immune cells. Late stage HIV infection, or AIDS, occurs when the body's immune system becomes so badly damaged it can no longer deal with other infections or cancers.

HIV is spread by sexual contact or exchange of body fluids such as blood which occurs when drug users share needles.

### Tobacco Mosaic Virus (TMV)

Tobacco mosaic virus (TMV) is a widespread plant pathogen affecting many species of plants including tomatoes. It gives a distinctive 'mosaic' pattern of discolouration on the leaves which affects the growth of the plant due to lack of photosynthesis

## 3. Bacterial Diseases

### Salmonella

Salmonella food poisoning is spread by bacteria ingested in food, or on food prepared in unhygienic conditions. In the UK, poultry are vaccinated against Salmonella to control the spread. Fever, abdominal cramps, vomiting and diarrhoea are caused by the bacteria and the toxins they secrete.

### Gonorrhoea

Gonorrhoea is a sexually transmitted disease (STD) with symptoms of a thick yellow or green discharge from the vagina or penis and pain on urinating. It is caused by a bacterium and was easily treated with the antibiotic penicillin until many resistant strains appeared.

Gonorrhoea is spread by sexual contact. The spread can be controlled by treatment with antibiotics or the use of a barrier method of contraception such as a condom.

## 4. Fungal Disease

### Rose Black Spot

Rose black spot is a fungal disease where purple or black spots develop on leaves, which often turn yellow and drop early. It affects the growth of the plant as photosynthesis is reduced. It is spread in the environment by water or wind. Rose black spot can be treated by using fungicides and/or removing and destroying the affected leaves.

## 5. Protist Diseases

### Malaria

The pathogens that cause malaria are protists. The malarial protist has a life cycle that includes the mosquito. Malaria causes recurrent episodes of fever and can be fatal. The spread of malaria is controlled by preventing the vectors, mosquitos, from breeding and by using mosquito nets to avoid being bitten.

## 6. Human Defence Responses

The **non-specific** defence systems of the human body against pathogens include:

**skin:** a physical barrier, produces antimicrobial secretions

**nose:** contain hairs and mucus which trap particles with pathogens

**trachea and bronchi:** produce mucus, cells lined with cilia

**stomach:** produce acids which destroy microorganisms

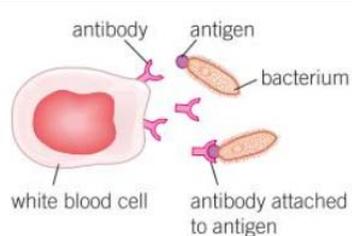
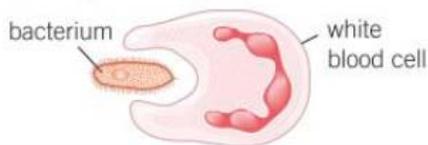
### The immune system: internal defences

If a pathogen enters the body the immune system tries to destroy the pathogen.

#### The three ways white blood cells destroy pathogens:

#### 1. Phagocytosis

Some white blood cells ingest (take in) pathogens, digesting and destroying them

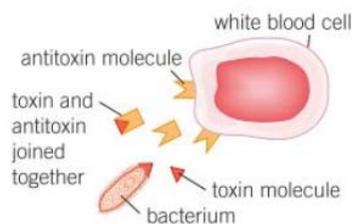


#### 2. Produce Antibodies

Some white blood cells produce chemicals called antibodies. These target particular pathogens and destroy them.

#### 3. Produce antitoxins

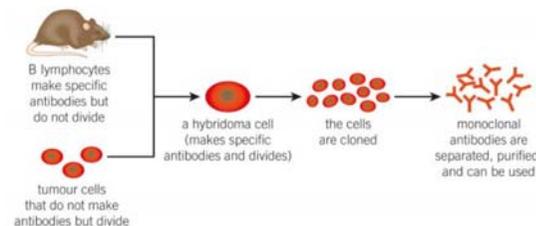
Some white blood cells produce antitoxins. These counteract (cancel out) the toxins released by pathogens (e.g. bacteria).



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## 7. Monoclonal Antibodies

**Monoclonal antibodies** are produced from a **single clone of cells**. The antibodies are **specific to one binding site on one protein antigen** and so are able to **target a specific chemical or specific cells** in the body.



- Mouse **lymphocytes** (white blood cells) are stimulated to make a particular **antibody**.
- The **lymphocytes** are combined with a particular kind of **tumour cell** to make a cell called a **hybridoma cell**.
- The hybridoma cell can both **divide** and **make the antibody**.
- Single hybridoma cells are **cloned** to produce **many identical cells** that **all produce the same antibody**.
- **A large amount of the antibody can be collected and purified**.

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## 8. Uses of Monoclonal Antibodies



Examples of where monoclonal antibodies can be used include:

- for diagnosis such as in pregnancy tests
- in laboratories to measure the levels of hormones and other chemicals in blood, or to detect pathogens
- in research to locate or identify specific molecules in a cell or tissue by binding to them with a fluorescent dye
- to treat some diseases: for cancer the monoclonal antibody can be bound to a radioactive substance, a toxic drug or a chemical which stops cells growing and dividing. It delivers the substance to the cancer cells without harming other cells in the body.

