

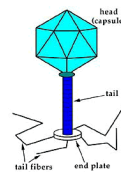
4.3 Infection and Response

Knowledge Organiser

Pathogens make us feel ill by releasing toxins and damaging our tissues/cells

Four types of micro organism:

- Fungi (biggest)
- Bacteria
- Protist
- Virus (smallest)



Communicable disease – A disease that can be transmitted

Non communicable disease – A disease that cannot be transmitted

Pathogen – Microorganism that cause disease

Infectious – Microorganism that can be passed on.

Bacteria are **living cells** and, in favourable conditions, can multiply rapidly. Once inside the body, they release poisons or **toxins** that make us feel ill.



Viruses can only reproduce **inside host cells**, and they damage the cell when they do this. A virus can get inside a cell and, once there, take over and make hundreds of thousands of copies of itself. Eventually the virus copies fill the whole host cell and burst it open.

Fungi are, tiny living microorganisms found in soil, air, and water,. They produce toxins which can make us feel unwell.



Protist- single celled organisms . They are mainly parasites and live off other living organisms.

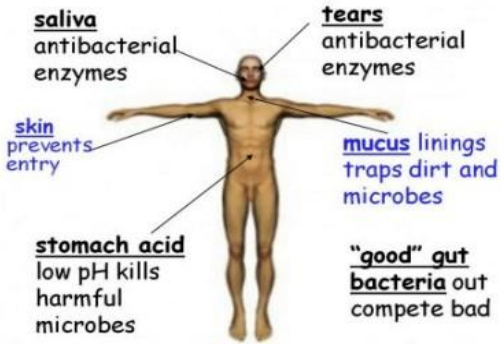
Name of disease	Type of Pathogen	Transmission / how to prevent spread	Symptoms	Treatments
Salmonella	Bacteria	Food undercooked or mad in an unhygienic area. Many poultry are vaccinated	Fever, abdominal pains, cramps vomiting and diarrhoea	none
Gonorrhoea	Bacteria	Sexually transmitted disease. Barrier methods of contraception i.e. condoms	Thick yellow /green discharge from penis/vagina. Pain when urinating	Antibiotic –penicillin. can be difficult as some resistant strains have appeared.
Rose black spot	Fungi	Spread by water and wind	Purple and black spots appear on leaves. They turn yellow and drop early	Fungicides ad removing effected leaves.
Malaria	Protist	Carried by mosquitos (vectors). Controlled by mosquito nets and preventing mosquitos from breeding.	Recurrent episodes of fever which can be fatal.	None
TMV (tobacco mosaic virus)	Virus	By humans to plants or contaminated equipment. Controlled by washing equipment used on plants	Discolours leaves and gives them a 'mosaic 'look. Photosynthesis is reduced.	None
HIV	Virus	Any exchange of body fluids. E.g. sexual contact or drug uses sharing needles. Controlled by barrier methods-condom or not sharing needles	Flu like illness – attacks the bodies own immune system. Becomes AIDS when the body immune system cannot cope with infections.	Antiretroviral drugs
Measles	Virus	Inhalation of droplets from sneezes. Vaccinations are available	Fever and skin rash	none

TIPS – MMR = Measles Mumps Rubella, To reduce spread of disease hygiene is hugely important, Vaccination stops spread of disease/less likely to be in contact with someone who has it – epidemic = 1 country, pandemic = more than 1 country

Non Specific Defence

Specific Defence

First Lines of Defence



Once pathogens enter the body, the **immune system** destroys them. **White blood cells** are important components of the immune system.

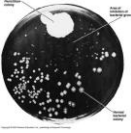
White blood cells can:

1. **INGEST and DIGEST** pathogens and destroy them – **phagocytes** by **phagocytosis**
2. Produce **antibodies** to destroy pathogens- **lymphocytes**
3. Produce **antitoxins** that counteract the toxins released by pathogens- **lymphocytes**



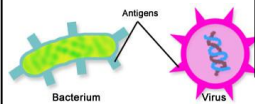
Antibiotics are substances that kill bacteria or stop their growth.

They do not work against viruses: it is difficult to develop drugs that kill viruses without damaging the body's tissues.



Vaccinations

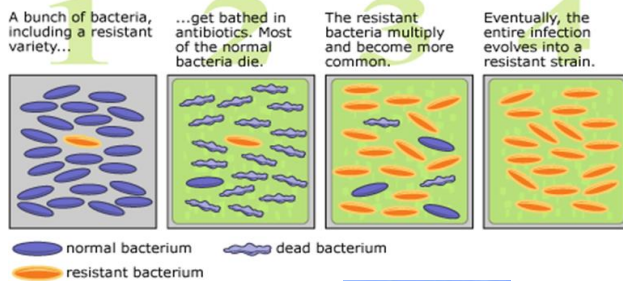
Dead or weakened pathogen (B or V) this has an **antigen** on surface, WBC recognise this and produce antibodies to kill the pathogen. WBC have memory and are able to produce antibodies rapidly if you become infected with real disease



The first antibiotic - **penicillin** - was discovered in 1928 by **Alexander Fleming**. He noticed that some bacteria he had left in a petri dish had been killed by naturally occurring penicillium mould

Antibiotic Resistance

Painkillers and other medicines are used to relieve symptoms of a disease.



Natural selection

- Mutation** – change in DNA – causing
- Variation** – some resistant meaning
- Survival of Fittest** (some don't die) less competition
- Reproduce**- pass on resistant gene

Traditionally drugs were extracted from plants and micro-organisms
Most new drugs are synthesised by chemists in the pharmaceutical industry.



Digitalis (heart drug) originates from Foxgloves

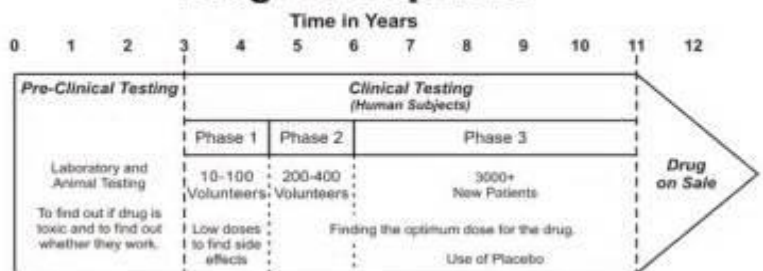


Aspirin originates from Willow Trees

New drugs are tested for many years.
1, Pre clinical trials on cells and live animals.
2, Clinical trials use health volunteers and patients – very low doses are used
 3. If the drug is safe further trials are carried out to find the **optimum** dose.
 4. **Double blind trials** are used and some patients are given **placebos**. Dr or Patient don't know who has real drug. Independent company would have to be used to avoid bias

Firstly drugs are tested to see if they are toxic, then if they work, then for side effects and finally for dosage. PLACEBO = FAKE DRUG

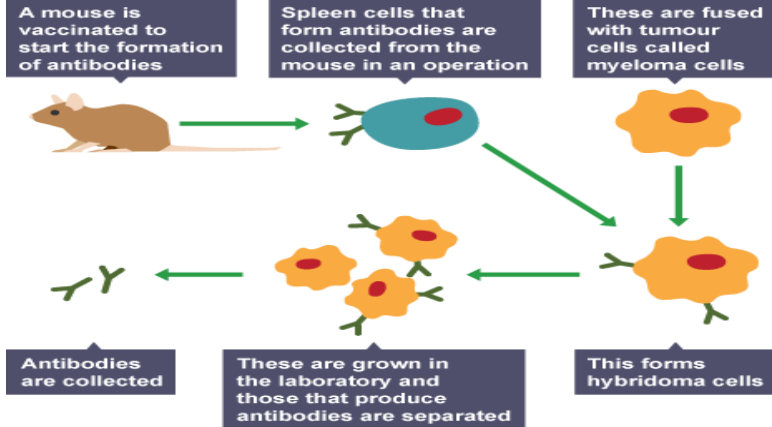
Drug Development



B3 - Infection and Response (Biology ONLY)

Monoclonal antibodies are identical copies of antibodies that have been made in laboratories. They have a number of different uses. They need to be made in large numbers to work properly. The process for making them is shown in the diagram.

Monoclonal antibodies are used in a wide variety of ways. They are used in **pregnancy test kits** to identify the small levels of a hormone called human chorionic gonadotrophin, which is present in the urine of pregnant women.



They can also be used to **diagnose and then treat some cancers**. They can bind to the cancerous cells and help the person's immune system attack them.

Plants, like humans, are also attacked by [pathogens](#). Two well-known examples of plant infections are **Black Spot Disease (Fungal)** and **tobacco mosaic virus**. Aphids also cause damage to plants

Plants can be infected by a range of viral, bacterial and fungal pathogens as well as by insects.

Plant diseases can be detected by:

- stunted growth
- spots on leaves
- areas of decay (rot)
- growths
- malformed stems or leaves
- discolouration
- the presence of pests

Identification of plant disease can be made by:

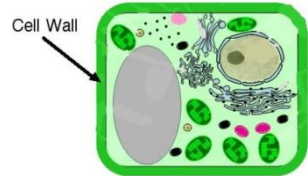
- reference to a gardening manual or website
- taking infected plants to a laboratory to identify the pathogen
- using testing kits that contain monoclonal antibodies.



Physical defence responses to resist invasion of microorganisms.

- Cellulose cell walls.
 - Tough waxy cuticle on leaves.
 - Layers of dead cells around stems (bark on trees) which fall off.
- Chemical plant defence responses.

- Antibacterial chemicals.
 - Poisons to deter herbivores.
- Mechanical adaptations.
- Thorns and hairs deter animals.
 - Leaves which droop or curl when touched.
 - Mimicry to trick animals.



Plants can be damaged by a range of ion deficiency conditions:

- stunted growth caused by nitrate deficiency- needed for protein synthesis therefore helps with growth.

Chlorosis caused by magnesium deficiency.- needed to make chlorophyll – leaves appear yellow

