

# Biology Topic 3: Infection and response

1. Keywords	
Communicable (infectious) disease	A disease which can be spread to others.
Pathogen	Micro-organisms that cause infectious disease (eg bacteria, protists, fungi and viruses).
Bacteria	Prokaryotic cells. Some can cause disease by making toxins.
Protists	Eukaryotic cells. Some can cause disease.
Fungi	Class of organisms that includes mushrooms. Some can cause disease.
Virus	The smallest organisms. Much smaller than bacteria. They reproduce inside host cells damaging them and causing disease.
Droplet inhalation	When a disease is spread through coughs and sneezes.
Direct contact	When a disease is only spread from physical contact.
Antibiotics	A group of chemicals which can kill bacteria (eg penicillin).
Antiviral drugs	A group of chemical which can prevent viruses reproducing. Hard to develop safe ones.
Fungicides	A group of chemicals which kill fungi.
Painkillers	A type of drug that treats pain symptoms but does not kill pathogens.
Lymphocyte	White blood cell.

2. Examples of infectious disease						
	Disease	Infects	Symptoms	Spread by	Fatal	Treatment
Virus	Measles	Human	Fever Skin rash	Droplet inhalation	Yes	vaccination
	HIV	Human	Reduced immune system	Unprotected sex	Yes	Antiviral drugs
	Tobacco mosaic virus (TMV)	Plants	Discolours leaves Stunts growth	Direct contact	No	Remove infected leaves and burn
Bacteria	Salmonella	Human	Fever Stomach cramps Vomiting Diarrhoea	Food	No	Take fluids to prevent dehydration
	Gonorrhoea	Human	Thick yellow/green discharge from vagina or penis	Unprotected sex	No	Antibiotics (if not resistant)
Fungal	Rose black spot	Plants	Black spots on leaves Stunts growth	Direct contact	No	Fungicides
Protist	Malaria	Human	Fever	Mosquito bite	Yes	Drugs to kill/prevent parasite. Prevention by using nets to stop bites

3. Non-specific defence systems	
Skin	Physical barrier
Nose	Hairs trap pathogens
Trachea and bronchi	Mucus traps pathogens
Stomach	Acid destroys pathogens

4. Specific defence by white blood cells	
Phagocytosis	Ingesting (take in) pathogens digesting and destroying them
Antibody production	Target a specific pathogen. Stick them together and target them for destruction. Gives you a 'memory' of that pathogen so you can fight it more quickly next time
Antitoxin production	Cancel out toxins released by pathogens

5. Vaccination	
Vaccine	Small amount of dead or inactive pathogen to stimulate white blood cells to produce antibodies
How vaccines work:	
1	Weak or dead pathogen injected
2	White blood cells generate antibodies to destroy pathogen
3	White blood cells that make those antibodies remain and make you immune to future infections

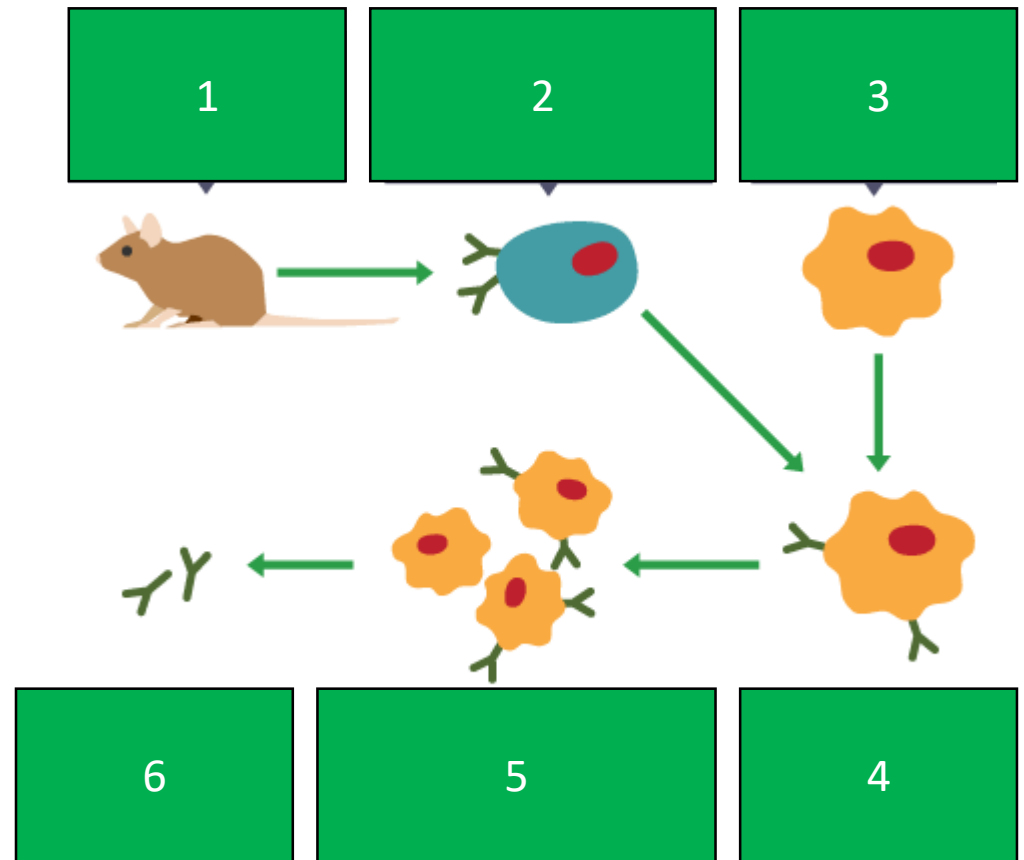
6. Drug development			
Drug/medicine	A chemical which alters the body. Often extracted from plants (eg aspirin) and microorganisms (eg penicillin)		
Toxicity	If it is toxic		
Efficacy	How well it works		
Dose	How much of a drug you need to take to make it work		
Placebo	A pill without the drug in it. Taken to check drug effectiveness		
Double blind trials	When the doctor does not know if they are giving the medicine or a placebo. Prevents bias		
Stages of drug development			Time taken (yrs)
1	Drug discovery	New possible medicines are identified	4.5
2	Preclinical trials	New drugs are tested in lab for toxicity and efficacy on cells, tissues and sometimes animals	1.5
3	Clinical trials	Low doses tested on human volunteers. Then patients suffering with the disease over 3 phases. These are double blind trials	5.5
4	Publishing results	Findings are checked by other scientists (peer review) Drug is approved by NHS	1.5

## 7. Monoclonal antibodies (HT TRIPLE ONLY)

What are they?	Antibodies produced from a single clone of cells.
Why are they useful?	Bind to only on binding site on a specific chemical or cell in the body
Uses	Pregnancy tests Measure levels of hormones or other chemicals in blood Locate specific molecules in cells Treat cancer

### How are monoclonal antibodies made?

1	Mouse vaccinated to start production of antibodies
2	Lymphocyte: Produce antibodies but cant divide
3	Tumour cell: No antibodies but divides
4	Cells fused to form a single hybridoma
5	Single hybridoma cell cloned to make identical cells
6	A large amount of identical antibodies collected



## 8. Detecting plant disease (HT TRIPLE ONLY)

Symptoms:	<ul style="list-style-type: none"> <li>Stunted growth</li> <li>Spots on leaves</li> <li>Areas of decay</li> <li>Growths</li> <li>Malformed stems and leaves</li> <li>Discolouration</li> <li>Presence of pests</li> </ul>	Identified by:	<ul style="list-style-type: none"> <li>Reference to book or internet</li> <li>Taking to a lab</li> <li>Testing kits containing monoclonal antibodies</li> </ul>
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### 9. Plant disease (TRIPLE ONLY)

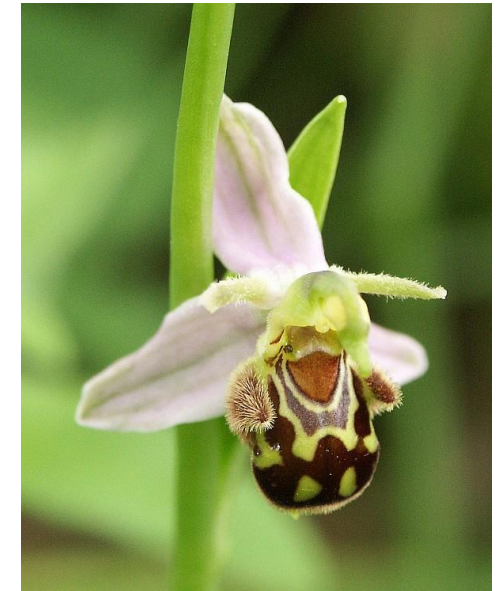
Type	Disease	How it damages plants
Pest	Aphid	A insect which injects toxins into plants as they eat them
Fungal	Black spot	Damages leaves
Virus	Tobacco mosaic virus	Damages leaves

### 10. Plant mineral deficiency (TRIPLE ONLY)

Mineral	Symptom	Reason
Nitrates	Stunted growth	Cant make enough protein
Magnesium	Chlorosis: yellow leaves	Cant make enough chlorophyll

### 11. Plant defence responses (TRIPLE ONLY)

Type	Examples
Physical	<ul style="list-style-type: none"> <li>Cellulose cell wall</li> <li>Waxy cuticle on leaves</li> <li>Layers of dead cells (bark on trees)</li> </ul>
Chemical	<ul style="list-style-type: none"> <li>Antibacterial chemicals</li> <li>Poisons to stop animals</li> </ul>
Mechanical	<ul style="list-style-type: none"> <li>Thorns and hairs stop animals</li> <li>Leaves which droop or curl when touched</li> <li>Mimicry to trick animals</li> </ul>



[Bee orchid](#) flower resembles a female bee closely enough to attract males in search of a mate