

AQA BIOLOGY UNIT 3: INFECTIOUS DISEASES

Pathogens - microorganisms that cause disease

	Bacteria	Virus	Fungi
Size	1000nm	20-40nm	2-10µm
Method of reproduction	Grow then divide in two	Invade host cells and tell nucleus to make copies	They release spores which travel through the air
How they make you feel ill	Produce toxins that travel around the body	Make cells burst open	Produce toxic chemicals

Malaria

Caused by a protist called **Plasmodium**. Vector = mosquito



- Mosquito bite injects sporozoites into blood.
- Sporozoites invade liver cells.
- Sporozoites turn into merozoites and burst open liver cells.
- Merozoites invade red blood cells, digest haemoglobin, replicate and burst open red blood cells.
- Merozoites taken back up into mosquito.

Prevention:

- Eggs laid in stagnant water - drain pools, spray them with insecticide, spray with oil to prevent oxygen getting to the eggs,
- Mosquito nets and repellent spray.
- Chloroquine

Name of disease	Type of pathogen	Transmission/how to prevent spread	Symptoms	Treatments
Salmonella	Bacteria	Uncooked poultry, dirty work surfaces Cook food thoroughly	Nausea, diarrhoea	Antibiotics
Gonorrhoea	Bacteria	Unprotected sex Wear condoms	Discharge, painful genitals	Antibiotics
Malaria	Protist	Mosquito bites Mosquito nets, drain pools, chloroquine	Tired, headache, vomiting	N/A
HIV	Virus	Blood contact, exchange of bodily sexual fluids, sharing needles Condoms, don't do heroin	Symptoms from various diseases caused by developing AIDs	N/A
Measles	Virus	Droplet infection, sneezes MMR vaccine	Red rash on skin	Painkillers to reduce the symptoms

White Blood Cells

- Phagocytes - Engulf (phagocytosis, non-specific)
- Lymphocytes - Make antibodies (specific proteins that bind to antigens)
- Lymphocytes - Make antitoxins (counteract toxins made by bacteria)

Vaccines

Contain dead or inactive pathogens

- White blood cells make **antibodies**
- Antibodies remove dead/inactive pathogen
- If exposed to real pathogen, antibodies are made **quickly** before they can multiply.

MMR Vaccine = Measles, Mumps and Rubella

Drug Trials

Stage 1: Tested on animals, cells and tissue
Check for toxicity

Stage 2: Tested on human volunteers
Check dosage and side effects

Stage 3: Tested on patients to see if it is effective

Double blind - no one knows who gets the real drug - no bias

Placebo - fake drug (looks same, taken same way) It is a control.

Thalidomide

- Tested as sleeping pill
- Not tested on pregnant women
- Given to pregnant women for morning sickness
- Babies have limb deformities
- Only given now for leprosy

Medicines - A drug is a chemical that alters how the body works. They alter the normal chemical reactions in the body.

Antibiotics - kill **bacteria** or prevent them from multiplying.

THEY DON'T KILL VIRUSES because viruses live inside cells.

Painkillers - relieve the **symptoms** only

Antivirals - target specific viruses and slow down replication.

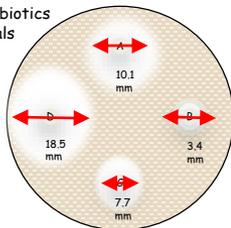
Antibiotic Resistance

- Mutation occurs when bacteria multiply
- Mutation makes bacteria resistant to antibiotic
- Antibiotic kills all the others
- No competition for food or space
- New colony of resistant bacteria grows

e.g. MRSA

Causes: Incorrect use of antibiotics
Not completing the full course of antibiotics
Over-sterile environments e.g. hospitals

To calculate clear zone: πr^2



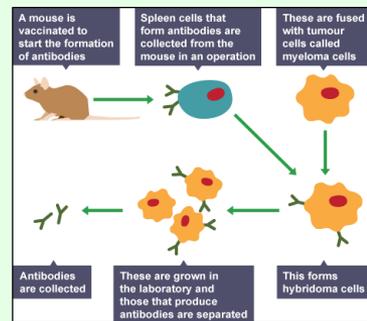
Resistant: 6mm or less
Intermediate: 7-11 mm
Susceptible: 12 mm or more

Monoclonal Antibodies

Monoclonal antibodies are identical copies of antibodies that have been made in laboratories.

TRIPLE ONLY

- Pregnancy test kits** to identify the small levels of a hormone called hCG, which is present in the urine of pregnant women.
- Locate blood clots** as they bind to clots.
- Diagnose and then treat some cancers.** They can bind to the cancerous cells and help the person's immune system attack them.



Advantages: Monoclonal antibodies only bind to the specific cancer cells that need treatment. Healthy cells are not affected at all. In contrast conventional drug treatment is carried all around the body in the blood and can have a devastating effect on healthy cells as well as cancer cells.

Disadvantages: Monoclonal antibodies create more side effects, the most common being an allergic reaction to the drug. An allergic reaction can include these symptoms: chills, fever, an itchy rash, feeling sick, breathlessness, wheezing, headaches, flushes and faintness, changes in blood pressure.

Plant Diseases

Some plant diseases are caused by bacteria, fungi and also by vectors e.g. aphids.

TRIPLE ONLY

Name of disease	Type of pathogen	How it is spread	Symptoms	Prevention/Treatment
Tobacco Mosaic Virus	Virus	Direct contact with diseased plant material and by insects	Mosaic pattern damaging cells preventing photosynthesis	Field hygiene and pest control
Rose Black Spot	Fungi	Spores carried by wind and spread by rain from leaf to leaf	Purple spots on leaves, dead leaves, poor flowers	Remove and burn affected leaves, fungicides

Aphids - penetrate phloem and take products of photosynthesis. Also act as vectors transferring pathogens to the plants.

Mineral Deficiencies - Soil lacking nitrates = less protein so less growth.
- Soil lacking magnesium = chlorosis = less chlorophyll so less photosynthesis - yellow leaves

Detecting Diseases

- Fast detection - discoloration, visible pests, stunted growth.
- Compare growth with normal plants or data online
- DNA analysis to identify pathogens (monoclonal antibodies)