



Biology Topic B5 + B6

Communicable Diseases

KNOWLEDGE

ORGANISER

Section 1: Pathogens and Diseases

Disease	Pathogen	How it is spread	Effect	Prevention/Control
Measles	Virus	Droplets from sneezes and coughs	Can be fatal	Vaccination of children
HIV	Virus	Sexual contact, needle exchange	Damages some white blood cells	Antiretroviral drugs when infected
Tobacco Mosaic Virus	Virus	Direct contact	Mottling of leaves, reduces photosynthesis	
Salmonella	Bacteria	Infected food	Fever, abdominal cramps, diarrhoea, vomiting	Vaccination of poultry (chickens).
Gonorrhoea	Bacteria	Sexual contact	Discharge from penis/ vagina, pain when urinating	Controlled by antibiotics. Spread prevented by condoms.
Rose Black Spot	Fungus	Spores carried by water or wind	Leaves turn yellow, fall early. Photosynthesis reduced.	Treated by fungicides or destroying affected leaves.
Malaria	Protist	By a vector – mosquito	Fever, can be fatal.	Preventing mosquitos from breeding, using mosquito nets.

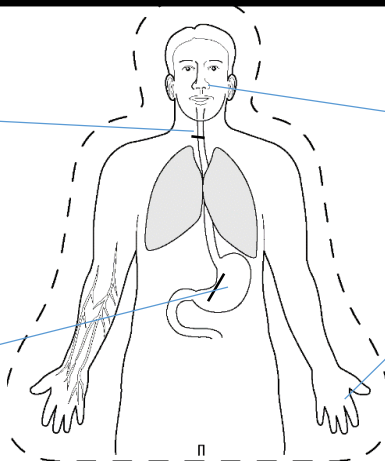
Section 2: Non-Specific Defences

Trachea and Bronchi

Produces **mucus** to **trap pathogens**. Contains **cilia** to **move mucus** for swallowing

Stomach

Contains **hydrochloric acid** to destroy pathogens.



Nose

Contains **hairs** and **mucus** to **trap pathogens**

Skin

A **physical barrier** to pathogens.

Section 3: Key terms

Pathogen	A microorganism that causes disease .
Bacteria	A type of pathogen that produces toxins that damage tissues .
Viruses	A type of pathogen that lives and replicates within cells and causes cell damage . It is difficult to kill viruses without damaging cells .
Antibodies	Some white blood cells (lymphocytes) produce antibodies. These bind to pathogens and destroy them or stick them together .
Antitoxins	Some white blood cells (lymphocytes) produce antitoxins. Antitoxins neutralise toxins .
Antibiotics	Antibiotics kill bacteria . Specific antibiotics should be used for specific bacteria . Some bacteria are resistant to antibiotics. Do not kill viruses .
Painkillers	Painkillers relieve symptoms but don't kill pathogens .
Phagocytosis	Some white blood cells (phagocytes) engulf pathogens .

Section 4: Preventing Infections

Hygiene	Hand washing, disinfectants on work surfaces, keeping raw meat away from food
Isolation of infected individuals	Infected individuals kept separate from healthy individuals
Destroying and controlling vectors	By killing or controlling vectors e.g. mosquitos, aphids, rodents etc the spread of disease is reduced
Vaccination	Body is injected with a small amount of inactive pathogen. If you are infected your body has developed immunity to the pathogen.


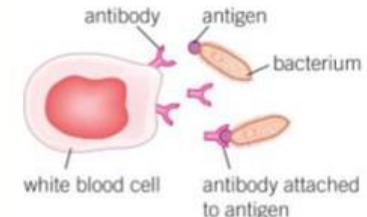
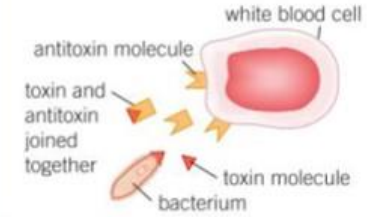
Section 6: Clinical Trials

Trial Stage	Purpose
Preclinical – cells, animals	Test for toxicity and efficacy before testing humans
Healthy volunteers	Very low doses to test for toxicity .
Patients	Larger groups. Test for toxicity, efficacy and dose . Placebos may be used in a double-blind trial .

Clinical Trial Key Terms

Placebo	A drug with no active ingredients , designed to mimic a real drug . Used to test if the effects of a drug on a patient are just psychological .
Double-blind trial	The volunteers do not know which group they are in, and neither do the researchers, until the end of the trial
Toxicity	How harmful the drug is. May have dangerous side effects .
Efficacy	How effective the drug is.
Dose	The amount of the drug given to the patient.

Section 5: Ways in which white blood cells destroy pathogens

Role of white blood cell	How it protects you against disease
Ingesting microorganisms 	Some white blood cells ingest (take in) pathogens, digesting and destroying them so they cannot make you ill.
Producing antibodies 	Some white blood cells produce special chemicals called antibodies. These target particular bacteria or viruses and destroy them. You need a unique antibody for each type of pathogen. When your white blood cells have produced antibodies once against a particular pathogen, they can be made very quickly if that pathogen gets into the body again. This stops you getting the disease twice.
Producing antitoxins 	Some white blood cells produce antitoxins. These counteract (cancel out) the toxins released by pathogens.

Section 7:

Drugs from plants	Traditionally drugs were extracted from plants
Penicillin	Discovered from penicillium mould

Section 1: Monoclonal antibodies

Monoclonal Antibodies

Monoclonal antibodies are identical copies of **one** type of **antibody** produced in a laboratory.

How to produce monoclonal antibodies:

1. A mouse is **injected** with a pathogen
2. White blood cells called **lymphocytes** produce **antibodies**
3. Lymphocytes are removed from the mouse and **fused** with rapidly dividing mouse **tumour cells**
4. The new cells are called **hybridomas**.
5. The hybridomas divide rapidly and release lots of **antibodies** which are then collected

Uses of Monoclonal Antibodies

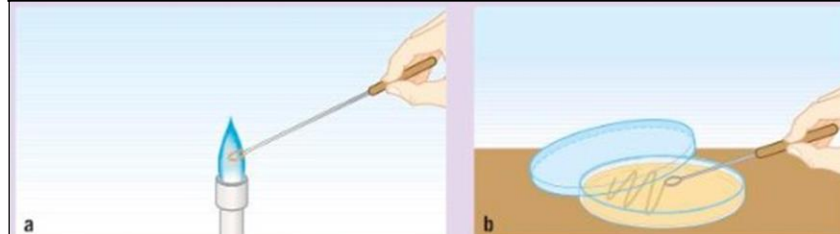
Used in treatment of diseases and monoclonal antibodies have been developed against the antigens on cancer cells.

Monoclonal antibodies are bound to radioactive substances (or toxic drugs and chemicals) that stop cells growing and dividing.

Monoclonal antibodies have side effects and are not as widely used in cancer treatment.

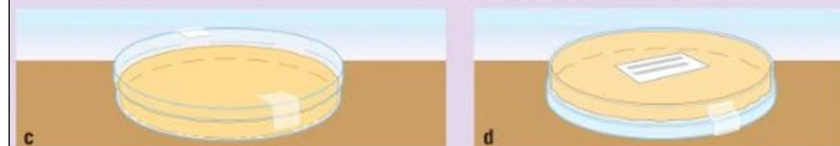
Monoclonal antibodies are used for diagnosis in pregnancy tests, in labs to measure levels of hormones and other chemicals in the blood to detect pathogens and to identify molecules in cells or tissues.

Section 2: Culturing microorganisms in the laboratory



a
 Sterilise the inoculating loop used to transfer microorganisms to the agar by heating it until it is red hot in the flame of a Bunsen and then letting it cool. Do not put the loop down or blow on it as it cools.

b
 Dip the sterilised loop in a suspension of the bacteria you want to grow and use it to make zigzag streaks across the surface of the agar. Replace the lid on the dish as quickly as possible to avoid contamination.



c
 Fix the lid of the Petri dish with adhesive tape to prevent microorganisms from the air contaminating the culture – or microbes from the culture escaping. Do not seal all the way around the edge – as oxygen needs to get into the dish to prevent harmful anaerobic bacteria from growing.

d
 The Petri dish should be labelled and stored upside down to stop condensation falling onto the agar surface.

Section 3: Preventing Bacterial Growth

Bacteria multiply by simple cell division if they have enough nutrients and a suitable temperature

You can investigate the effects of disinfectants and antibiotics on bacterial growth using agar plates and calculating the cross-sectional area of colonies grown or of clear areas of agar

Section 4: More about Plant Diseases

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

We cant detect a plant is diseased by looking for unusual growths, spots or discoloured leaves and malformed leaves and stems.

- If a plant disease is suspected then it can be identified by:
- Gardening manuals
 - Gardening websites
 - Test kits containing monoclonal antibodies
 - Taking infected plants to a laboratory to identify the pathogen

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Section 6: Deficiency of Mineral Ions

Nitrate ions	Needed by plants for protein synthesis and growth. Lack of nitrate ions results in stunted growth of plants.
Magnesium ions	Needed by plants to produce chlorophyll. Lack of magnesium ions results in chlorosis (yellowing of leaves due to lack of chlorophyll)

Section 7: Plant defence responses

Type of plant defence used (mechanical, physical or chemical)	What is the plant being defended against?	Describe the defence being used
Mechanical	Herbivores eating it	Thorns or hairs
Chemical	Pathogens/bacteria Herbivores/animals	The chemical released is antibacterial or poisonous
Physical	Herbivores and pathogen entry	Dead bark coating which falls off
Physical	Insects such as aphids	Waxy cuticle/cellulose cell walls are hard to penetrate



The presence of pests



Stunted growth



Chlorosis



Thorns