Topic 3: Infection and response

AQA GCSE Biology 8461 · spec 4.3 · sheets 3.1–3.4

Infection and response: the war inside

- name the four types of pathogen and describe how diseases spread and can be controlled;
- describe named diseases of humans and plants;
- explain how the body's defences and **white blood cells** protect us, and how **vaccination** works;

Infection and response: the war inside (2)

- describe **antibiotics**, **painkillers** and how new drugs are tested;
- (biology only) explain how monoclonal antibodies are made and used, and how plants are affected by disease.

Pathogens and how diseases spread

- **bacteria** , which reproduce quickly and may release **toxins** (poisons) that damage tissues;
- **viruses** , which live and reproduce inside **host cells** , damaging them when they burst out;
- **protists** , single-celled organisms such as the one that causes malaria;

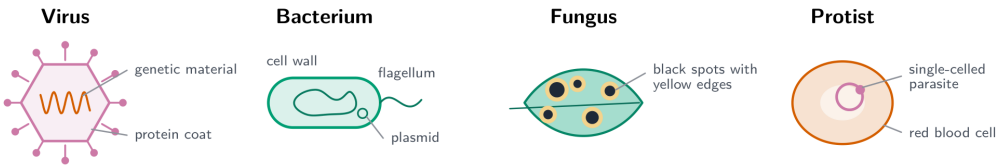
Pathogens and how diseases spread (2)

- **fungi** , some of which grow as threads or spread by spores.
- hygiene, such as washing hands and covering coughs;
- isolating infected people, animals or plants;

Pathogens and how diseases spread (3)

- destroying or controlling vectors;
- **vaccination**.

Figure: Pathogens and how diseases spread



not to scale: a virus is about a hundred times smaller than a bacterium

- The four types of pathogen: virus, bacterium, protist and fungus (not to scale)
- Match each part of the diagram to the text.

Named diseases

- In malaria, the mosquito is the **vector** and the protist is the pathogen.
- A mosquito that bites an infected person takes in the protist and can pass it on with its next bite.
- **Worked example 1. TMV** makes parts of the leaves pale.
- Explain why infected plants grow less.

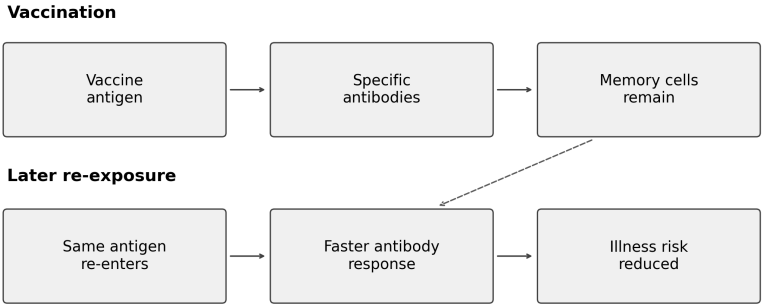
The body's defences

- The skin is a barrier, and scabs seal cuts.
- Hairs and **mucus** in the nose trap particles.
- In the trachea and bronchi, **mucus** traps pathogens and tiny hairs called **cilia** sweep it up to the throat, where it is swallowed.

The body's defences (2)

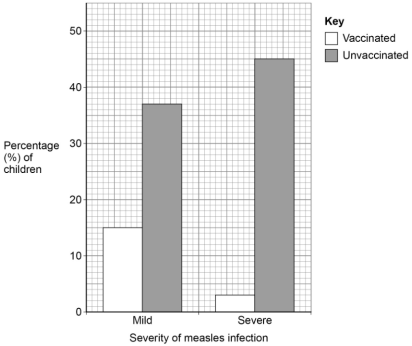
- **Hydrochloric acid** in the stomach kills most pathogens in food and drink.
- **phagocytosis** : some **white blood cells** engulf pathogens and digest them;
- **antibody production** : some make antibodies, proteins that fit a particular **antigen** on the pathogen's surface, sticking pathogens together and marking them for destruction;
- **antitoxin production** : some make antitoxins, which neutralise the **toxins** released by **bacteria**.

Figure: The body's defences



- After **vaccination**, **memory cells** make antibodies faster and in larger amounts when the pathogen returns
- Match each part of the diagram to the text.

Figure: The body's defences (2)



- Measles severity in vaccinated and unvaccinated children, as percentages of all 240 children surveyed (AQA GCSE Biology Paper 1H, June 2025, Figure 1)
- Read the axes and units first.

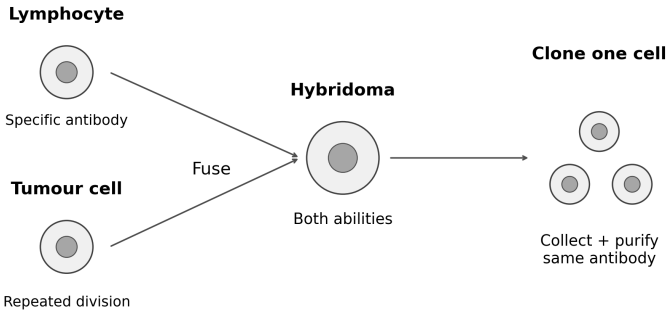
Antibiotics, painkillers and new drugs

- **Antibiotics** , such as penicillin, kill **bacteria** inside the body.
- Each one works on particular bacteria, so doctors must choose the right one.
- **Antibiotics** do not affect **viruses**, which live inside our cells, so they cannot cure a cold or flu. **Painkillers** such as paracetamol relieve symptoms but do not kill pathogens.
- **Antibiotic resistance.** A random **mutation** can make one bacterium resistant to an antibiotic.

Monoclonal antibodies (biology only, HT)

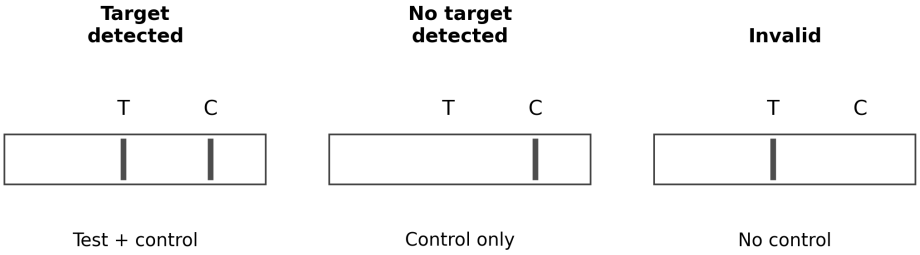
- **Diagnosis**: pregnancy tests detect the hormone HCG in urine; other tests detect pathogens or measure hormone levels in blood.
- **Research**: antibodies with a fluorescent dye attached show where a particular molecule is in a cell or tissue.
- **Treatment**: an antibody carrying a drug or radioactive substance binds to cancer cells, delivering it to them and less to normal cells.

Figure: Monoclonal antibodies (biology only, HT)



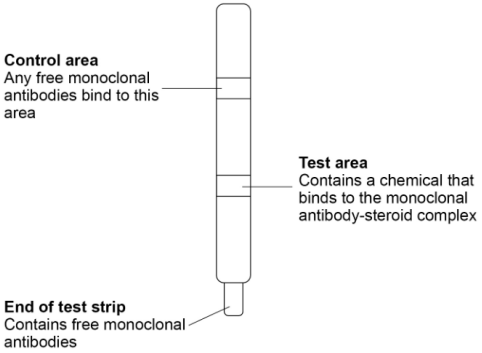
- Making monoclonal antibodies: a lymphocyte fuses with a tumour cell, and the **hybridoma** is cloned
- Match each part of the diagram to the text.

Figure: Monoclonal antibodies (biology only, HT) (2)



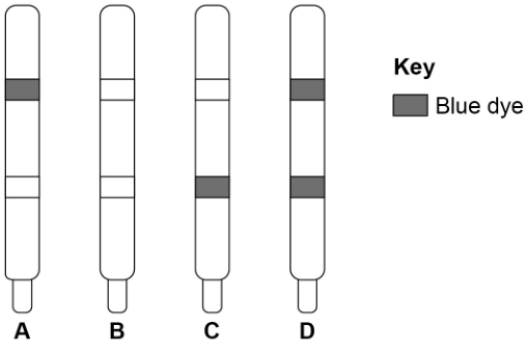
- A test strip: a line at T means the target was found; the line at C shows the test worked
- Match each part of the diagram to the text.

Figure: Monoclonal antibodies (biology only, HT) (3)



- A steroid test: the test area catches antibody bound to steroid; the control area catches free antibody (AQA GCSE Biology Paper 1H, June 2023, Figure 5)
- Match each part of the diagram to the text.

Figure: Monoclonal antibodies (biology only, HT) (4)

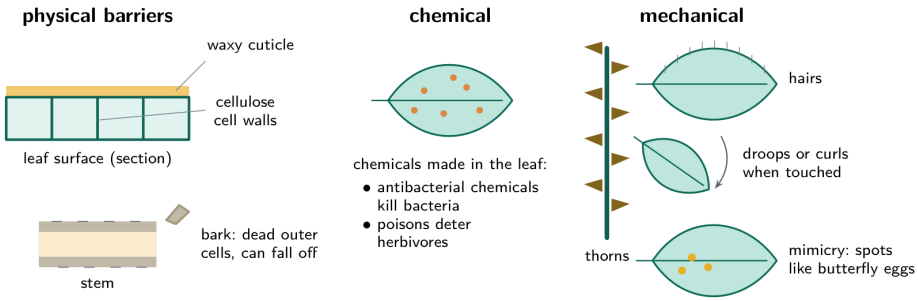


- Test results for athletes A to D; grey shows blue dye (AQA GCSE Biology Paper 1H, June 2023, Figure 6)
- Match each part of the diagram to the text.

Plant diseases and defences (biology only)

- Physical: cellulose cell walls, a tough **waxy cuticle** on leaves, and a layer of dead cells (bark) on stems, which falls off with any pathogens on it.
- Chemical: antibacterial chemicals, and poisons that put off **herbivores** .
- Mechanical: thorns and hairs that stop animals eating the plant, leaves that droop or curl when touched, and mimicry, looking like something an animal will avoid.

Figure: Plant diseases and defences (biology only)



- Physical, chemical and mechanical plant defences; schematic, not to scale.
- Match each part of the diagram to the text.

Sources for this lesson

- AQA, *GCSE Biology (8461) specification*, section 4.3 Infection and response.
- E. Jenner, *An Inquiry into the Causes and Effects of the Variolae Vaccinae* (London, 1798), Case XVII (James Phipps).
- World Health Organization, *Declaration of global eradication of smallpox*, World Health Assembly resolution WHA33.3 (8 May 1980).
- AQA, *GCSE Biology* Paper 1 Higher (June 2023 to June 2025), the measles, Salmonella and steroid-test questions, adapted.

Common errors

- Saying **antibiotics** kill **viruses**.
- Saying the mosquito causes malaria; it is the **vector**, and the protist is the pathogen.
- Writing "toxins cause the symptoms" without saying that the bacteria release them.

Common errors (2)

- Saying antibodies "kill" pathogens directly; they bind to antigens, and other **white blood cells** then destroy the pathogens.
- Saying **bacteria** "become resistant because they need to"; resistance arises by random **mutation** and natural selection.
- Reading a test strip as positive without checking that the control line appeared.
- Saying monoclonal antibody treatments harm no normal cells at all.

Key terms

- **Pathogen**: a microorganism that causes **infectious disease**.
- **Vector**: an organism that carries a pathogen from one host to another.
- **Antigen**: a molecule on the surface of a pathogen that an antibody binds to.

Key terms (2)

- **Antibody**: a protein made by **white blood cells** that binds to a particular **antigen**.
- **Vaccination**: giving a dead or inactive pathogen to make the body produce **memory cells**.
- **Placebo**: a dummy treatment with no active drug.

Key terms (3)

- **Double-blind trial**: a trial in which neither patients nor doctors know who receives the drug.
- **Monoclonal antibodies**: identical antibodies made by a **clone** of one **hybridoma** cell.

Check yourself

- 1.
- Name the type of pathogen that causes each of these: measles, malaria, gonorrhoea, **rose black spot**. 2.
- Explain how **cilia** and **mucus** protect the lungs. 3.
- Describe three ways white blood cells defend the body. 4.