

Diseases and immunity

IGCSE Biology 0610 · Topic 10 revision notes

Everything from the 2 lessons of this topic on a few pages: the key idea of each lesson, the diagram to remember, the points to learn and the traps examiners set. Read it, cover it, test yourself.

1. Pathogens and body defences

2. Antibodies and vaccination

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1 Pathogens and body defences

Syllabus 10.1

A **pathogen** is a disease-causing organism. A **transmissible disease** is one in which the pathogen can be passed from one host to another, either by **direct contact** (including blood and other body fluids) or **indirectly** (from contaminated surfaces, food, animals and air). The body keeps most pathogens out with skin, nose hairs, mucus and stomach acid, and white blood cells deal with those that get in. Clean water, hygienic food preparation, personal hygiene, waste disposal and sewage treatment break the routes of transmission.

How a transmissible disease passes between hosts

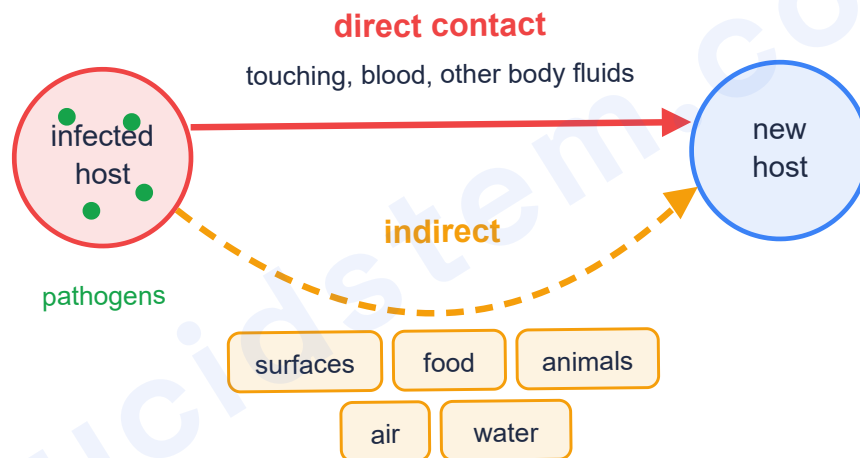


Fig. 1: a pathogen reaches a new host either directly or indirectly, by way of something contaminated

Organism, route, barrier.

- ✓ **Pathogen:** a disease-causing organism.
Transmissible: it can pass from one host to another.
- ✓ **Direct** = contact, blood, body fluids.
Indirect = surfaces, food, animals, air.
- ✓ **Defences:** skin, nose hairs, mucus, stomach acid, white blood cells; say what each one does.
- ✓ **Cholera (Extended):** toxin → chloride ions into gut → water follows by osmosis → diarrhoea, dehydration, loss of ions.

Watch out!

A pathogen is the organism that causes the disease, not the disease itself. Cholera is the disease; the cholera bacterium is the pathogen.

Stomach acid kills pathogens; it does not "digest" them like food. And skin is a barrier only while it is unbroken, which is why a cut must clot quickly.

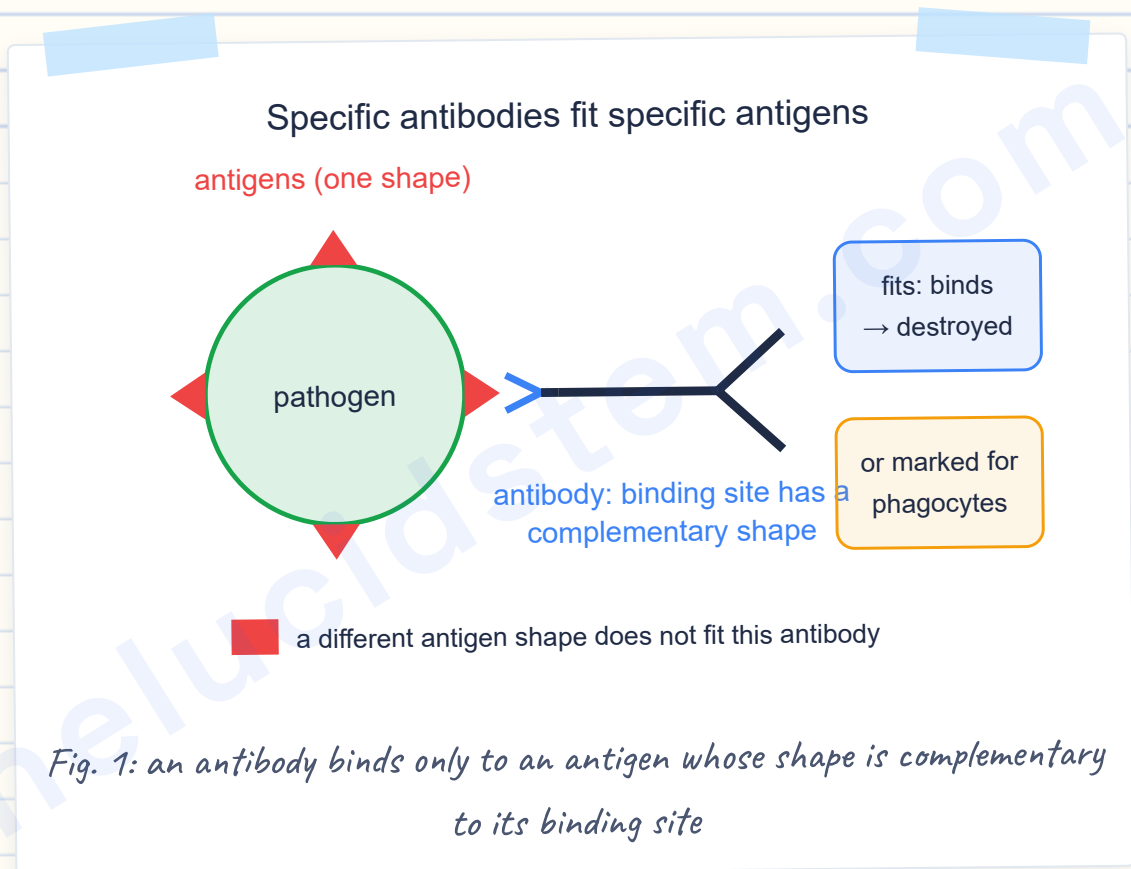
The toxin does not pump water directly. It moves chloride ions into the gut, and water follows by osmosis. Mention both steps in an explanation.

Hygiene measures stop pathogens reaching people. They do not make anyone immune, so they must be kept up all the time.

2 Antibodies and vaccination

Syllabus 10.1

Extended: **active immunity** is defence against a pathogen by antibody production in the body. Each pathogen has its own **antigens** with specific shapes, and specific **antibodies** are proteins with **complementary shapes** that bind to them, leading to direct destruction of the pathogen or marking it for destruction by phagocytes. Active immunity follows infection or **vaccination** and produces **memory cells** for long-term protection. **Passive immunity** is short-term: antibodies come from another individual (across the placenta, in breast milk) and no memory cells are made.



Active remembers, passive borrows.

- ✓ **Antigen** = specific shape on the pathogen. **Antibody** = protein with a complementary shape.
- ✓ **Antibodies** destroy pathogens directly or mark them for phagocytes.
- ✓ **Active immunity:** your own antibodies, after infection or vaccination; memory cells, long-term.
- ✓ **Passive immunity:** antibodies from another individual (placenta, breast milk); no memory cells, short-term.

Watch out!

Say the antibody has a complementary shape to the antigen, not "the same shape". And antibodies are made by lymphocytes; phagocytes engulf pathogens but do not make antibodies.

Passive immunity gives no memory cells. Do not say breast milk "gives the baby memory cells" or long-term immunity; the antibodies work at once but only for a short time.

Herd protection depends on the proportion of the population vaccinated. If too few are vaccinated the disease still spreads through the unvaccinated people.