Your notes

GCSE Biology: revision notes

The immune system and vaccination

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Start here: how the body fights pathogens

- Your body defends itself in two stages. First it tries to keep pathogens out: your skin, the hairs and mucus in your nose and trachea, and acid in your stomach.
- If pathogens do get in, white blood cells attack them in three ways: by engulfing them (**phagocytosis**), by making antibodies, and by making **antitoxins**.
- Each **antibody** only fits one **antigen**, a protein on the surface of one kind of pathogen. That is why a vaccine protects against one particular disease.

The body's first defences

- Skin is a physical barrier and makes antimicrobial secretions; scabs seal cuts.
- Hairs and mucus in the nose trap particles that could contain pathogens.
- The trachea and bronchi make mucus that traps pathogens, and **cilia** move the mucus up to the throat to be swallowed.
- The stomach makes hydrochloric acid, which kills pathogens in food and drink.

White blood cells

- If a pathogen gets into the body, the **immune system** tries to destroy it. White blood cells are the key.
- **Phagocytosis**: some white blood cells engulf and digest pathogens.
- Some white blood cells produce antibodies, which bind to specific **antigens** on a pathogen and help destroy it.
- Some white blood cells produce **antitoxins**, which neutralise toxins made by bacteria.

Antigens and antibodies

- **Antigens** are proteins on the surface of a pathogen. Each pathogen has its own **antigens**.
- Antibodies are specific: each type fits only one **antigen**.
- The first time a pathogen enters, it takes time to make enough antibodies, so you may become ill.
- **Memory cells** then stay in the blood. If the same pathogen returns, antibodies are made quickly and in large numbers, so you are immune.

Vaccination

- A vaccine contains small amounts of a dead or inactive form of a pathogen.
- It stimulates white blood cells to produce antibodies, as if the person were infected, but without making them ill.
- If the same live pathogen enters later, white blood cells respond quickly to make the right antibodies, preventing infection.
- If a large proportion of the population is vaccinated, the pathogen cannot spread easily. This protects people who cannot be vaccinated (**herd immunity**).

Exam tip

- Learn **vaccination** as a chain: a dead or inactive pathogen is injected; white blood cells make antibodies; **memory cells** remain, so the response next time is faster and larger.
- Be exact with antibodies (made by white blood cells) and **antigens** (on the pathogen).

Common mistakes

- Saying vaccines contain antibodies. They contain a dead or inactive pathogen.
- Mixing up antibodies with antibiotics.

Key terms

Immune system	The body's defence system against pathogens, mainly white blood cells.
Phagocytosis	When a white blood cell engulfs and digests a pathogen.
Antigen	A protein on the surface of a pathogen that the immune system recognises.
Antibody	A protein made by white blood cells that binds to a specific antigen.
Antitoxin	A substance made by white blood cells that neutralises bacterial toxins.

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Vaccination	Giving a dead or inactive form of a pathogen to make the body produce antibodies.
Immunity	Being able to respond quickly to a pathogen and destroy it before it causes illness.
Herd immunity	When so many people are vaccinated that a disease cannot spread easily, protecting the unvaccinated.
Cilia	Tiny hairs on cells lining the airways that move mucus.
Memory cells	White blood cells that remember an antigen and make antibodies quickly if it returns.

Your notes

Quick questions

Cover the answers and test yourself: remembering is what makes it stick.

1. What do phagocytes do?
2. What do antitoxins do?
3. What is an antigen?
4. Why does each antibody only work against one pathogen?
5. How does the stomach help defend the body?
6. What is the job of cilia in the airways?
7. What does a vaccine contain?
8. Why are you less likely to become ill after a vaccination?

Answers

1. Engulf and digest pathogens
2. Neutralise toxins made by bacteria
3. A protein on the surface of a pathogen
4. Antibodies are specific to one antigen
5. It makes hydrochloric acid that kills pathogens
6. To move mucus containing trapped pathogens up and away from the lungs
7. A dead or inactive form of a pathogen
8. White blood cells can quickly make the right antibodies

What to do next

Practise 12 questions on this topic

Try 7 exam questions, with mark schemes

Read the lesson, one step at a time

Free revision for GCSE and KS3 at lycolearn.co.uk. Some notes are for one exam board only, and say so in brackets.