Your notes

GCSE Biology: revision notes

Monoclonal antibodies

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What monoclonal antibodies are

- **Monoclonal antibodies** are identical antibodies produced from a single **clone** of cells.
- They are specific to one binding site on one protein **antigen**, so they can target a particular chemical or specific cells in the body.

How they are made

- A mouse is injected with an **antigen**, which stimulates its **lymphocytes** (a type of white blood cell) to make the matching antibody.
- The **lymphocytes** are combined with a particular kind of tumour cell to make a cell called a **hybridoma**.
- The **hybridoma** can both divide (like the tumour cell) and make the antibody (like the **lymphocyte**).
- Single **hybridoma** cells are cloned to produce many identical cells that all make the same antibody. The antibodies are then collected and purified.

Uses of monoclonal antibodies

- Pregnancy tests: antibodies stick to the hormone HCG, found in the urine of pregnant women.
- Diagnosis in hospitals and laboratories, for example measuring hormone levels or detecting pathogens.
- Research: antibodies with a **fluorescent dye** attached locate or identify specific molecules in cells or tissues.
- Treating diseases such as cancer: an antibody can carry a radioactive substance, a toxic drug or a chemical that stops cells growing and dividing, delivering it to the cancer cells without harming other cells.

Advantages and disadvantages

- Advantages: they bind only to specific cells, so healthy cells are not affected; they can be used to treat a wide range of conditions.
- Disadvantages: they have caused more side effects than expected, and they are expensive to develop. They are not yet as widely used as scientists hoped.

Key terms

Monoclonal antibodies	Identical antibodies made from a single clone of cells, all specific to the same antigen.
Lymphocyte	A white blood cell that makes antibodies.
Hybridoma	A cell made by fusing a lymphocyte with a tumour cell; it divides and makes one kind of antibody.
Clone	A group of genetically identical cells.
Antigen	A protein that an antibody binds to.
HCG	A hormone found in the urine of pregnant women, detected by pregnancy tests.
Fluorescent dye	A chemical that glows, used to show where antibodies have bound.

Quick questions

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

1. What are monoclonal antibodies?
2. Which cells are injected with an antigen to make monoclonal antibodies?
3. What is a hybridoma?
4. Why is a tumour cell used to make a hybridoma?
5. Which hormone do pregnancy tests detect?
6. How can monoclonal antibodies help treat cancer?
7. Why can monoclonal antibodies target specific cells?
8. What is a disadvantage of monoclonal antibodies?

Answers

1. Identical antibodies made by a single clone of cells
2. Mouse lymphocytes (via injecting a mouse)
3. A lymphocyte fused with a tumour cell
4. Tumour cells divide rapidly
5. HCG
6. They carry drugs or radioactive substances to cancer cells
7. They only bind to one specific antigen
8. They caused more side effects than expected

Your notes

What to do next

Practise 10 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.

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