

# Edexcel Biology GCSE

## Topics 5.16 to 5.22B - Treating disease

### Flashcards

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# What is an antibiotic?



## What is an antibiotic?

- A substance that kills or inhibits the growth of bacteria (no effect on viruses)
- No effect on cells in the host organism
- Produced by living organisms e.g. fungi



Describe how 'target' molecules for new medicines can be identified



## Describe how 'target' molecules for new medicines can be identified

- Comparisons of the genomes of unaffected individuals and those who are affected by a disease to identify potential disease-causing alleles
- The alleles themselves or the proteins that they code for can be used as a target



# Outline the stages of drug development



# Outline the stages of drug development

1. Screening for potential drugs
2. Preclinical trials
3. Clinical trials
4. Approval by a medical agency



# Describe the process of screening





# Describe the process of screening

- Uses a machine to test large libraries of chemical substances
- Enables identification of pre-existing chemicals which may affect the target molecule
- Chemicals may be altered, allowing scientists to produce a drug that reacts with target molecules in a specific way



# What do preclinical trials involve?



# What do preclinical trials involve?

- Drug tested on cultured human cells and using computer models to determine its toxicity (potential to cause damage) and efficiency
- Drug then tested on live animals to establish a safe dose for humans and observe any side effects



# What happens during clinical testing?



# What happens during clinical testing?

- The drug is first tested on healthy human volunteers to ensure that it is safe to use and has no other unwanted effects on the body
- Drug then tested on patients with the disease to determine its efficacy. Dosage is slowly increased until an upper limit is established. Optimum dosage is found.



# What are placebos?



# What are placebos?

A substance that appears just like the real drug but has no effect on the recipient



# What is a blind trial?





## What is a blind trial?

- Where the participants don't know whether they are receiving the new drug or the placebo
- Prevents the patient's bias affecting the results



# What is a double-blind trial?



## What is a double-blind trial?

- Neither the participants nor the doctors know who is receiving the new drug or the placebo
- Prevents bias from doctors when analysing the results



What is the problem associated with using placebos on patients with a disease?



What is the problem associated with using placebos on patients with a disease?

Is it ethical to prescribe a sick patient with a placebo knowing that it will not help their condition improve?



What are monoclonal antibodies  
(mAbs)? **(biology only/higher)**



# What are monoclonal antibodies (mAbs)?

(biology only/higher)

- Antibodies that are clones from one parent cell
- Specific to one type of antigen



Describe how monoclonal antibodies are produced (biology only/higher)





# Describe how monoclonal antibodies are produced (biology only/higher)

1. Specific antigen injected into an animal
2. B-lymphocytes producing complementary antibodies extracted
3. B-lymphocytes fuse with myeloma cells to form **hybridoma** cells
4. Hybridoma cells cultured
5. Monoclonal antibodies collected and purified



# What are myeloma cells? (biology only/higher)



What are myeloma cells? (biology only/higher)

Type of tumour cell



Outline the uses of monoclonal antibodies (biology only/higher)



# Outline the uses of monoclonal antibodies (biology only/higher)

- Detection of pathogens
- Location of cancer cells and blood clots
- Treatment of cancer
- Used in pregnancy test kits



# What do pregnancy kits test for? (biology only/higher)



What do pregnancy kits test for?  
(biology only/higher)

hCG in urine



What does a pregnancy test consist of?  
(biology only/higher)





# What does a pregnancy test consist of? (biology only/higher)

A stick containing monoclonal antibodies (mAbs) specific to hCG:

- mAbs attached to a blue bead (free to move)
- mAbs fixed to the test stick

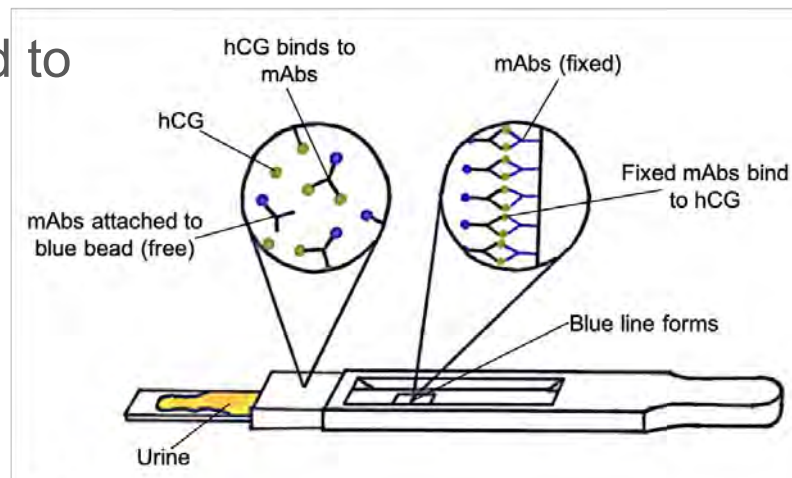


Describe what happens to the test stick if  
a woman is pregnant  
**(biology only/higher)**



# Describe what happens to the test stick if a woman is pregnant (**biology only/higher**)

- hCG in urine binds to mAbs attached to a blue bead
- mAbs with hCG diffuse up dipstick
- mAbs fixed to the stick bind to hCG
- Blue line forms



Describe what happens to the test stick if  
a woman is not pregnant  
(biology only/higher)



Describe what happens to the test stick if the pathogen is not present (biology only/higher)

No hCG in urine so a blue line is not formed



What is the advantage of using monoclonal antibodies to test for pathogens? (biology only/higher)



What is the advantage of using monoclonal antibodies to test for pathogens?

(biology only/higher)

- Specific to one particular antigen
- Very accurate
- Quick results



Why can monoclonal antibodies be used  
to target cancer cells?  
(biology only/higher)





## Why can monoclonal antibodies be used to target cancer cells? (biology only/higher)

- Cancer cells have specific antigens called ‘tumour markers’ on their membranes
- mAbs are specific to one type of antigen so can be targeted to ‘tumour markers’ without damaging other cells



Describe how monoclonal antibodies can  
be used to diagnose cancer  
(biology only/higher)



## Describe how monoclonal antibodies can be used to diagnose cancer (biology only/higher)

- mAbs tagged to a radioactive substance
- mAbs injected into the patient's bloodstream
- mAbs bind to 'tumour markers' on cancer cells
- Emitted radiation is detected using a specialised scanner enabling doctors to determine the location of cancer cells



How can monoclonal antibodies be used  
to target drugs to cancer cells?  
(biology only/higher)



# How can monoclonal antibodies be used to target drugs to cancer cells? (biology only/higher)

- mAbs attached to an anti-cancer drug
- mAbs injected into the patient's bloodstream
- mAbs bind to 'tumour markers' on cancer cells
- Anti-cancer drug destroys cancer cells



Why are cancer treatments that use monoclonal antibodies favoured over traditional treatments?  
(biology only/higher)



# Why are cancer treatments that use monoclonal antibodies favoured over traditional treatments?

(biology only/higher)

- Radiotherapy and chemotherapy target rapidly dividing cells
- Healthy cells (e.g. hair follicle cells, bone marrow cells) are damaged as a consequence, producing unpleasant side effects
- mAbs only target cancer cells, reducing damage to normal cells



How can monoclonal antibodies be used  
to locate blood clots?  
(biology only/higher)





## How can monoclonal antibodies be used to locate blood clots? (biology only/higher)

- mAbs tagged to a radioactive substance
- mAbs target and bind to specific proteins in blood clots
- Radiation emitted by mAbs is detected, enabling the location of blood clots to be identified

