

Edexcel IAL Biology A-level

8.17- 8.22 - Gene Technology

Flashcards

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Give an example of a drug made by
genetically modified organisms



Give an example of a drug made by genetically modified organisms

Human insulin



Give an example of how drugs can be produced using genetically modified organisms



Give an example of how drugs can be produced using genetically modified organisms

- Bacteria used to produce human insulin.
- Working human insulin gene inserted into bacterial plasmids which are taken up by bacteria, then transcribed and translated to produce insulin.



What is a transgenic organism?



What is a transgenic organism?

An organism that contains recombinant DNA.



What is recombinant DNA?



What is recombinant DNA?

DNA that is from more than one organism.



What is needed to make recombinant DNA?



What is needed to make recombinant DNA?

DNA consisting of the desired gene, restriction endonuclease enzymes, plasmid and DNA ligase.



Describe the role of restriction endonuclease enzyme in making recombinant DNA



Describe the role of restriction endonuclease enzyme in making recombinant DNA

To recognise and cut sections of DNA either side of the desired gene, isolating it.



Describe the role of DNA ligase in making recombinant DNA



Describe the role of DNA ligase in making recombinant DNA

Forms phosphodiester linkages between two strands of DNA, making one new one.



What is a vector?



What is a vector?

Something used to transfer the desired gene into another organism.



What is used as the vector to move the desired gene into other organisms?



What is used as the vector to move the desired gene into other organisms?

Plasmids.



Why do we use plasmids as vectors?



Why do we use plasmids as vectors?

- Small
- Easy to use



Explain how the isolated DNA is placed
into the plasmid



Explain how the isolated DNA is placed into the plasmid

- The plasmid and desired gene are cut by the same restriction endonuclease enzyme creating complementary sticky ends.
- Desired gene is amplified using PCR.
- Base pairing between complementary sticky ends takes place (form hydrogen bonds).
- Sealed with DNA ligase to create phosphodiester linkages.



What are sticky ends?



What are sticky ends?

Small sections of unpaired and overhanging bases at the end of a DNA fragment.



How is recombinant DNA inserted into bacterial cells?



How is recombinant DNA inserted into bacterial cells?

Electroporation is used to stimulate bacterial cells to take up transformed plasmids.



Explain how electroporation facilitates bacterial cells to take up the transformed plasmid



Explain how electroporation facilitates bacterial cells to take up the transformed plasmid

A small electric current is applied to bacterial membranes so the membrane becomes porous and plasmids move into the cell.

This is achieved via the use of calcium salts and rapid temperature increase from 0 to 40 degrees.



What is the function of marker genes?



What is the function of marker genes?

They help identify which bacteria has successfully taken up the plasmid.



How would you check if a plasmid has taken up the antibiotic resistance gene?



How would you check if a plasmid has taken up the antibiotic resistance gene?

If it has successfully taken up the gene then the bacteria will be antibiotic resistant.

If grown on antibiotic media, only the bacteria which have successfully transformed will survive.



Outline the two types of gene therapy.



Outline the two types of gene therapy

Germ line therapy - inserting recombinant DNA by modifying fertilised egg cells. This is banned in humans.

Somatic cell - replacing only mutant body cell with healthy adult body cells and is allowed.



Outline the ways in which recombinant DNA can be inserted into host cells



Outline the ways in which recombinant DNA can be inserted into host cells

Viruses - these infect host cells and insert their RNA and DNA into their genome

Microinjection - using a very fine glass pipette to physically insert the desired DNA into fertilised egg cells

Microprojectile - inserting the DNA by firing it at very high speed into the cell

Liposome wrapping - liposomes can fuse with the cell surface membrane and release their contents inside of the cell and have been used to deliver recombinant DNA to cells



What is the function of a microarray?



What is the function of a microarray?

It determines which genes are expressed within the cells of an organism.



Outline how microarrays can be used to identify active genes



Outline how microarrays can be used to identify active genes

An array is set up containing the cDNA of the gene(s) being tested for the presence of.

The person's fragmented DNA sample is fluorescently labelled then washed over the array; if they contain the allele for any of the gene probes on the array then their DNA will hybridise to the probe and fluoresce, showing the gene is present.



Define bioinformatics



Define bioinformatics

Developing of software and computing tools to collect and analyse complex biological data such as genetic codes.



What is the function of bioinformatics?



What is the function of bioinformatics?

Build and store databases of genomes and gene sequences of thousands of organisms.

Used to compare genetic relationships between species and within species.



What are the benefits of GM?



What are the benefits of GM?

- GM crops are modified to have higher yield, increased nutritional value and pest resistance which helps reduce malnutrition in 3rd world countries.
- Pest resistant GM crops means less pesticide spraying which is good for the environment and helps poor farmers.
- GM crops are able to be grown in more adverse conditions.
- Can make medication & treatments quickly and cheaply e.g. human insulin.
- Can potentially use gene therapy for treatment of human disorders.
- Can produce large quantities of enzymes cheaply which can be used as industrial catalysts.



What are the risks of GM?



What are the risks of GM?

- Can lead to monoculture = reduce biodiversity.
- Pests may become resistant to pesticide in GM crops.
- Transferred gene may spread to wild population causing problems like superweeds.
- GM of humans is unethical and can lead to designer babies and prejudices against those with genetic disorders.
- Companies who own GM technology could seek profit of it further and limit use of technology that could save lives.

