Edexcel (A) Biology A-level

8.16 to 8.18 - Gene Projects

Flashcards

What is genome sequencing?

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Identifying the DNA base sequence of an individual. This allows us to determine the amino acid sequence of the polypeptides coded for by that DNA.

Give some applications of genome sequencing.

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- Comparing genomes between species to determine evolutionary relationships.
- Genetic matching
- Personalised medicine
- Synthetic biology

How have the results of genome sequencing been used in the development of personalised medicine?

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Certain alleles change susceptibility to a disease/ response to a drug. Treatments can be selected & implemented earlier for best individual response.

Current applications: treating neonatal diabetes & melanoma, identifying how to safely use the drug azathioprine in rheumatology.

What social, moral and ethical issues does genome sequencing raise?

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- Data protection
- Independent regulation of testing services
- Genetic discrimination
- Informed consent
- Ensuring equal access
- Future possibility of editing the genome of humans

How can drugs be produced using genetically modified organisms?

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Use recombinant DNA technology to produce transgenic organisms that produce a required protein. Works because the genetic code is universal.

Summarise the process of using enzymes to isolate a desired gene.

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Restriction endonucleases (RE) cut DNA at specific sequences. Different REs cut at different points, but one RE will always cut at the same sequence. Therefore using particular REs allows you to cut out a certain gene of interest.

Summarise the process of inserting a DNA fragment into a vector.

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A plasmid (circular DNA from bacteria) is used as the vector, and is cut using the same restriction enzymes as the DNA, so that the ends are complementary. DNA ligase joins the fragment and plasmid together.

Summarise the process of inserting a vector into a host cell.

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Known as cell transformation. Host cells from plants, animals or microorganisms such as bacteria are mixed with the vectors in an ice-cold solution, then heat shocked to encourage cells to take up vectors. Cells can be grown. DNA fragment will be cloned.

Summarise the process of identifying transformed cells.

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- Insert marker genes into vectors e.g. coding for fluorescence.
- Disrupt the resistance gene with the fragment from the desired gene. Cells that do not survive have taken up the vector. Use replica plating to culture the strain.

Suggest the risks associated with using genetically modified organisms.

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- May reduce biodiversity so communities become more vulnerable to disease.
- Horizontal gene transmission into wild populations.
- Adverse effects on other species.
- No evidence about long-term health effects.

Suggest the benefits associated with using genetically modified organisms.

Suggest the benefits associated with using genetically modified organisms.

- Crops: increased yield, drought / pest resistance.
- Can produce large quantities of a protein for harvesting.