Your notes

GCSE Biology: revision notes

Selective breeding and genetic engineering

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Selective breeding

- **Selective breeding** (artificial selection) is when humans breed plants and animals for particular genetic characteristics. People have done this for thousands of years.
- Choose parents with the desired characteristic and breed them together. Then choose the offspring with the desired characteristic and breed them. Repeat over many generations until all the offspring show the characteristic.
- Examples: disease resistance in crops, animals that produce more meat or milk, gentle domestic dogs, and large or unusual flowers.
- Problem: it can lead to **inbreeding**, so some breeds are prone to disease or inherited defects, and there is less variation.

Genetic engineering

- **Genetic engineering** modifies the genome of an organism by introducing a gene from another organism to give a desired characteristic.
- Bacteria have been engineered to make human insulin to treat diabetes.
- Genetically modified (GM) crops can be resistant to insect attack or to herbicides, or produce bigger, better fruit. **GM crops** generally give bigger yields.
- Concerns: effects on populations of wild flowers and insects, and some people feel the effects of eating **GM crops** on health have not been fully explored.
- Scientists are researching gene therapy to overcome some inherited disorders.

How genes are transferred (Higher)

- Enzymes are used to cut out (isolate) the required gene.
- The gene is inserted into a **vector**, usually a bacterial **plasmid** or a virus.
- The **vector** inserts the gene into the required cells.

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- Genes are transferred to animals, plants or microorganisms at an early stage of development, so they develop with the desired characteristic.

Cloning (separate sciences)

- **Tissue culture**: small groups of cells are grown into identical new plants. It is used to preserve rare plant species and in commercial nurseries.
- Cuttings: gardeners take pieces of a plant and grow them into new identical plants.
- **Embryo transplants**: cells from an early animal embryo are split apart before they specialise, and the identical embryos are transplanted into host mothers.
- **Adult cell cloning**: the nucleus is removed from an unfertilised egg cell and replaced with the nucleus from an adult body cell, such as a skin cell. An electric shock makes the egg divide to form an embryo, which is put into the womb of a female. Dolly the sheep was cloned this way.

Key terms

Selective breeding	Breeding plants or animals with desired characteristics over many generations.
Genetic engineering	Changing the genome of an organism by adding a gene from another organism.
GM crop	A crop plant that has had genes from another organism added.
Inbreeding	Breeding closely related organisms, which reduces variation and can increase inherited defects.
Vector	Something, such as a plasmid or virus, used to carry a gene into a cell.
Plasmid	A small ring of DNA in bacteria, often used as a vector.
Tissue culture	Growing new plants from small groups of cells.
Embryo transplant	Splitting an early embryo and transplanting the identical cells into host mothers.
Adult cell cloning	Putting the nucleus of an adult body cell into an empty egg cell to make a clone.

Quick questions

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

1. What is selective breeding?
2. What is a problem caused by selective breeding?
3. What is genetic engineering?
4. What useful substance do genetically engineered bacteria make?
5. Give one benefit of GM crops.

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6. Give one concern about GM crops.
7. What is used to cut out a gene in genetic engineering? (Higher)
8. What is a plasmid used for in genetic engineering? (Higher)

Answers

1. Humans choosing parents with desired characteristics to breed
2. Inbreeding, which can increase inherited defects
3. Adding a gene from another organism to change a genome
4. Human insulin
5. Bigger yields
6. Effects on wild flowers and insects
7. Enzymes
8. As a vector to carry the gene into cells

What to do next

Practise 11 questions on this topic

Try 7 exam questions, with mark schemes

Read the lesson, one step at a time

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