

TOPIC 3.5: CLONING

Clones

Clones are groups of genetically identical organisms, derived from a single original parent cell

- Various methods of cloning exist for animals and plants, while humans can also clone organisms or tissues artificially

Animal Cloning

Binary Fission

- The parental organism divides equally into two clones
- Occurs in flatworms (also used by bacteria and protists)

Budding

- Cells split off from parent, generating smaller clones
- Occurs in Hydra, but is also common to yeast

Fragmentation

- New organisms grow from separated fragments of parent
- Common to starfish and some species of annelid worm

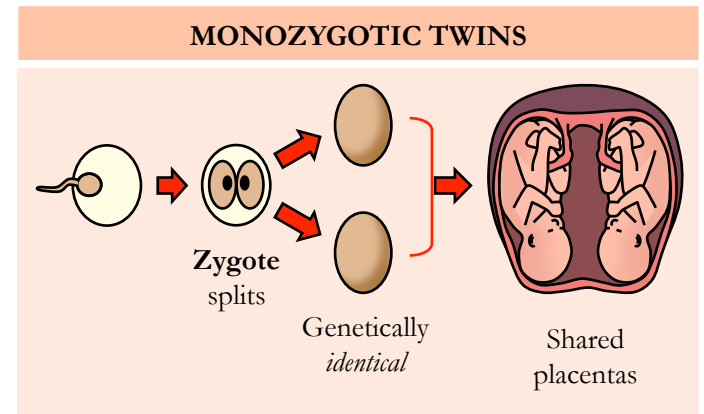
Parthenogenesis

- Embryos formed from an unfertilised (diploid) ova
- Occurs in some species of fish, insect, reptile, amphibian

Human Cloning

Humans can also produce clones via natural mechanisms

- Identical twins (monozygotic) are created when fertilised eggs split in two, forming two identical embryos



Plant Cloning

Plants have the capacity for vegetative propagation, whereby small pieces of plant can be induced to grow independently

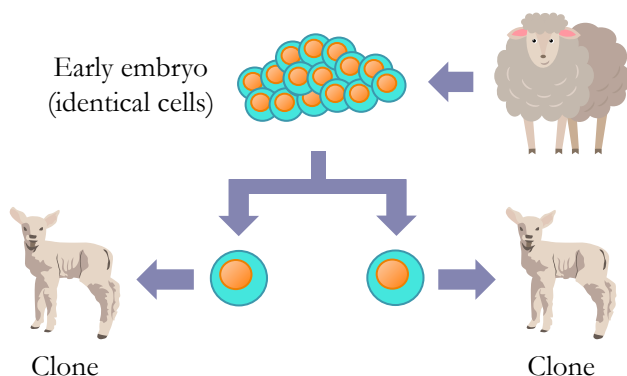
- This is because adult plants possess totipotent meristematic tissue capable of cellular differentiation

A **stem cutting** is a separated portion of a plant stem that is used to regrow a new clone via vegetative propagation

Artificial Cloning

Embryo Cloning

- Animals can be cloned from an embryo by separating the embryonic cells into groups
- As embryonic stem cells are pluripotent, each cell can potentially form a cloned offspring
- As this method occurs after random fertilization, it is not possible to control the genetic features of potential clones



Adult Cloning

- Adults can be cloned via the process of somatic cell nuclear transfer (SCNT)
- The nucleus is removed from an adult body cell (diploid) and fused with an enucleated egg cell
- An electric shock stimulates division of the egg cell and the growing embryo is implanted into a surrogate

