Making new cells

DNA has a double helix structure.

Cell division by mitosis produces two new cells identical to each other and to the parent cell.

The cell cycle includes cell growth when the numbers of organelles increase and the chromosomes are copied when the two strands of each DNA molecule separate and new strands form alongside them.

The cell cycle finishes with mitosis during which copies of the chromosomes separate and then the cell divides.

Meiosis is a type of cell division that produces gametes.

In meiosis, it is important that the cells produced only contain half the chromosome number of the parent cell so that fertilisation can restore the correct number.

A zygote is produced when two gametes join. It contains a set of chromosomes from each parent.

Genes

The genetic code is in the cell nucleus.

Proteins are produced in the cell cytoplasm.

Genes do not leave the nucleus.

A copy of the gene is produced to carry the genetic code to the cytoplasm.

Both strands of the DNA molecule are made up of four different bases, which always pair up in the same way.

A pairs with T and G pairs with C.

The order of bases in a gene is the code for building up amino acids in the correct order to make a particular protein.

Animal development

The zygote divides by mitosis to form an embryo.

In a human embryo, up to the eight cell stage, all the cells are identical and could produce any sort of cell required by the organism.

They are called embryonic stem cells.

After this point the cells become specialised and form different types of tissue.

Although body cells in an organism contain the same genes, many genes in a particular cell are not active.

This is because it only produces the specific proteins it needs;

In carefully controlled conditions of mammalian cloning, it is possible to reactivate inactive genes in the nucleus of a body cell to form cells of all tissue types.

Adult and embryonic stem cells have the potential to produce cells needed to replace damaged tissues.

Plant development

New cells in plants specialise into cells of roots, leaves or flowers.

Unlike animal cells some plant cells remain unspecialised and can develop into any type of plant cell.

The presence of these unspecialised cells means that clones of a plant with desirable features can be produced from cuttings.

Unlike animals, most plants continue to grow in height and width throughout their lives.

Plant meristems divide to produce cells that result in increased height, length of roots, and girth of the plant.

If the hormonal conditions in their environment are changed, unspecialised plant cells can develop into a range of other tissues.

This includes xylem and phloem and organs such as leaves, roots and flowers.

Small pieces of plant tissue (explants) can be treated with hormones. They develop into whole plants. These plants are a clone of the parent plant.

Phototropism increases the plant's chance of survival.

Light affects the distribution of auxin in the shoot tip. The auxin spreads unevenly, producing uneven growth towards the light.