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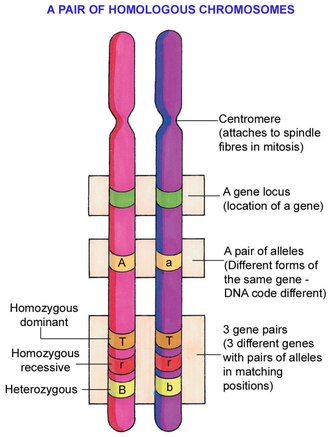
2.3 Cell Continuity & Cell Division

Cell Continuity

All cells develop from pre-existing cells

Chromosomes



- Structures in Nucleus, made of DNA & Protein
- Not dividing = Chromatin (long thin threads)
- When dividing = Chromatin forms a numbers of clearly distinguishable chromosomes
- Each species has a definite no. of chromosomes, Humans= 46 chromosomes
- Each chromosomes has 1000's of genes

Haploid

A Haploid cell has one set of chromosomes (n), e.g. Egg cell and sperm are haploid, n = 23

Diploid

A Diploid has two sets of chromosomes (2n), e.g. somatic cells, 2n = 46

Chromosomes are in pairs (homologous pairs) in diploid cells. One chromosome of each pair comes from the mother and the other comes from the father.

Cell Cycle

Describes the life of a cell. It includes the period between divisions when the cell is not dividing, called Interphase.

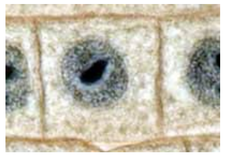
Nucleus divides = Mitosis

Cytoplasm divides = Cell division

Mitosis

- Mitosis is a form of nuclear division in which one nucleus divides to form two nuclei, each containing identical sets of chromosomes
- Two new IDENTICAL daughter cells are produced

Interphase



- Longest phase in cell cycle
- Chromosomes elongated = chromatin
- Cell very active in Interphase, produces new mitochondria, chloroplasts, etc. and chemicals needed for growth

Prophase

- Chromosomes contract and become visible
- Each chromosome appears as a duplicated strand
- Fibres appear in cytoplasm
- Nuclear membrane starts to break down

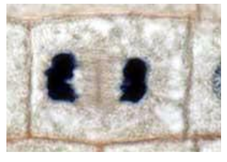
Metaphase

- Chromosomes line up across the equator of cell
- Fibres attach to chromosomes at centromere

Anaphase

- Fibres contract, chromosomes pulled apart
- Chromosomes pulled to opposite ends of cell.
- Hence, identical set of genes pulled to each end of the cell

Telophase



- Nuclear membrane forms around each of the two sets of chromosomes
- Chromosomes elongate within each nucleus

Mitosis is complete

Once complete, original cell divides* to form two cells

* By constriction in an animal cell or cell plate develops in a plant cell

Function/Role of Mitosis

<u>In Unicellular Organisms</u> it is a method of reproduction

<u>In Multicellular Organisms</u> it is responsible for growth, renewal and repair of cells

Cancer

Rate of cell division (mitosis) is carefully controlled.
Sometimes a cell or group of **cells lose the ability to control the rate of cell division.**
They form a mass of cells called a tumour which can be benign (harmless) or malignant (cancerous).

Causes of Cancer

Caused when normal genes are altered to form cancer-causing genes called oncogenes.
Brought about by cancer causing agents called <u>carcinogens,</u> e.g. cigarette smoke, asbestos fibres, x-rays & ultraviolet radiation and some viruses.
Most cancers can be cured with Radiation (burn out cancer), Chemotherapy (Chemicals slow down mitosis) and surgery.

Meiosis – Reduction division

Is a form of nuclear division in which the number of chromosomes is halved.
Diploid cell (2n) ÷ meiosis → 4 haploid cells (n) all genetically different

Meiosis occurs in the ovaries and testes to produce **gametes** called eggs and sperm so there are 23 chromosomes in each egg and sperm

Function/Role of Meiosis

<u>In Multicellular Organisms</u>
Allows sexual reproduction by producing haploid gametes
Allows new combinations of genes – variations

Where does Meiosis occur?
In the human – in the testes and ovaries
In the flowering plant – in the anthers and ovules