## 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 = Chromatid forms a number of clearly distinguishable chromosomes
- Each species has a definite no. of chromosomes, Humans = 46 chromosomes
- Each chromosome 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

- **In Unicellular Organisms** it is a method of reproduction
- **In Multicellular Organisms** 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 carcinogens, 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) \(\div\) meiosis \(\rightarrow\) 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

- **In Multicellular Organisms**
  - 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