Biology – Mitosis

Student Notes

**Fertilization is the start of life**

A sperm cell and an egg cell come together to form a single cell called a Zygote

**Cell Cycle**

Replication and division of the cells nucleus where the daughter cells are exact replications of the parent cells.

New body cells are produced for:

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**The Cell Cycle**

Within The Cell Cycle there is the Growth Phase, Division Phase (Mitosis) and Cell Division (Cytokinesis)

The Growth phase is called Interphase

Division Phase (Mitosis) is comprised of:

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Cell Division (Cytokinesis) causes 1 cell to become 2

**Genetic Material**

DNA - \_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Genetic Material**

All of your genetic material is packaged into 46 chromosomes

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Chromosomes are composed of DNA which is the code that makes you who you are.

**Genes**

Chromosomes are made up of proteins and a code called DNA which is made of 4 compounds (A,T,G,C)

Chromosomes are divided into sections called \_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Genes**

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The proteins are what give us our individual characteristics

Each person’s genes are different (except??)

**Human – Animal Gene Similarities**

- Genome-wide variation from one human being to another can be up to 0.5% (99.5% similarity)
- Chimpanzees are 96% to 98% similar to humans
- Cats are 90% similar to humans, 82% with dogs, 80% with cows, 79% with chimpanzees, 69% with rats and 67% with mice
- Cows are 80% genetically similar to humans
- 75% of mouse genes have equivalents in humans
- The fruit fly (*Drosophila*) shares about 60% of its DNA with humans
- About 60% of chicken genes correspond to a similar human gene

**Interphase**

* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

* Cells undergoes DNA replication and growth
* The cell spends most of its time in Interphase.

**There are 3 Stages in Interphase:**

G1 Phase – cells carry out metabolic activities to prepare for the S Phase.

S Phase – “Synthesis Phase” – DNA is replicated.

G2 Phase – organelles and molecules required for cell division are produced. Cell prepares for mitosis.

**Mitosis**

Process whereby a cell will divide to produce two new identical cells

Allows organisms to grow and replace old, damaged or dead cells

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**Prophase**

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Strands of DNA condense and thicken to form visible duplicated chromosomes (sister chromotids).

 Sister chromatids are held together by centromeres

 The nuclear membrane breaks down.

**Prophase**

 The centrioles move to opposite poles of the cell

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Chromatids become visible under the light microscope

**Metaphase**

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Spindle fibres connect the centromere of each chromosome to the poles of the spindle.

Spindle fibres help chromosomes line up across the equator (center) of the cell.

**Anaphase**

The third phase of mitosis.

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Each chromatid pair splits (each are now called daughter chromosomes).

Spindle fibres shorten and thicken, pulling one chromatid (chromosome) from each spilt pair to opposite poles.

**Telophase**

The fourth and final phase of mitosis.

Chromosomes gather at opposite ends of the cell. They begin to unwind and are less visible.

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**Cytokinesis in Animals**

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**Cytokinesis in Plants**

In plants, a structure known as the cell plate forms midway between the divided nuclei.

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**Checkpoints in the Cell Cycle**

A cell will not divide if:

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There are not enough nutrients to provide for cell growth

The DNA within the nucleus has not been replicated

The DNA is damaged

**Errors in Mitosis**

Substances such as toxic chemicals, radiation and viruses and cause MUTATIONS

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When these cells divide the mutation is passed \_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Errors in Mitosis**

One result of a mutation can cause cells to divide uncontrollably leading to CANCER

Eg. Cigarette smoke can alter the chromosomes in the lungs causing these cells to undergo mitosis much faster than normal

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**Retinoblastoma – Cancer of the Retina (back of the eye)**

Retinoblastoma is caused by a mutation to certain genes in the eye which are carried on by mitosis.