

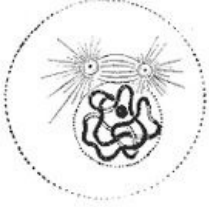
Mitosis

Mitosis is a type of the cell division. Before mitosis starts, it is necessary to replicate the chromosomes. The parts which are created during the replication are called "**sisters chromatids**". Later, they are separated by the mitotic spindle. The whole process takes about 160 minutes.

Mitosis has several phases that take place one after the other. They are called *prophase*, *prometaphase*, *metaphase*, *anaphase* and *telophase*.

Phases of the Mitosis

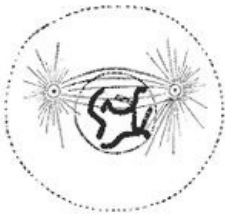
Prophase



Prophase

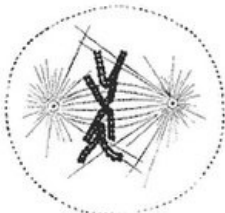
- chromosomes are the most **condensed**;
- they look like we know them from the karyotype;
- the *mitotic spindle* is being created **outside** the cell;
- the movement of the centrosomes is caused by the interaction of proteins and microtubules;
- time: 90 minutes.

Prometaphase



Prometaphase

- the cell is **losing its nuclear membrane** and chromosomes bind to the mitotic spindle;
- chromosomes are bound by the microtubules and proteins complexes called **kinetochores** (these proteins are located in the centromeres);
- microtubules are formed from the nuclear membrane;
- each sister chromatid has its own kinetochor (so there are two kinetochores on one chromosome).

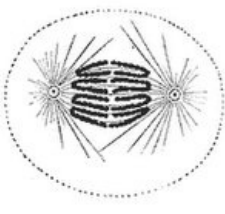


Metaphase

Metaphase

- all chromosomes move *to the equatorial line*;
- this movement is caused by creating and destroying the proteins which form the microtubules – this process is called "**dynamic instability**";
- any failure of the connecting leads to incorrect dividing of the chromatids and some chromosomal abnormality;

- time: 20 minutes.



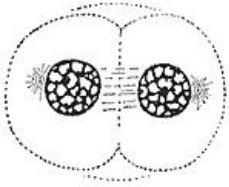
Anaphase

Anaphase

- the **sisters chromatids** are divided by the proteolytic enzymes;
- each of them is then transferred to the opposite part of the cell – this is caused by the depolymeration of the microtubules;
- sister chromatid becomes the **daughter chromosome**;
- time: 10 minutes.

Telophase

- the nuclear membrane appears again;
- the condensed chromosomes change into their interphase state;
- the transcription can now continue;
- from **one parent** nucleus **two daughter** nuclei are created;
- time: 45 minutes.



Telophase

Disturbances of Mitosis

Multinucleated Cells

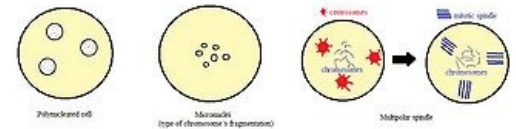
- A multinucleated cell occurs when the its nucleus has divided normally, but the cytoplasm did not divide. Such cells look giant and have several nuclei. E.g. xanthoma

Syncytial Cells

- Several cells fuse together.

Increased Rate of Mitosis

- This is typical in **tumours** – e.g. sarcoma or Hodgkin Lymphoma.



Disturbances of the Mitosis

Damage by the External Influences

1. *during mitosis* – we can find multipolar spindle;
2. *in the resting cells* – fragmentation of the chromosomes or forming of the micronuclei.

Links

Related articles

- Karyotype
- The Cell Cycle
- Meiosis

External links

- Disturbances in cell division (http://www.univet.hu/sc1/feltoltott/23_1292256889.pdf)

Bibliography

- ALBERTS,, et al. *Základy buněčné biologie*. 2.edice edition. 2007. ISBN 80-902906-2-0.