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Topic: Mitosis

Mitosis

Mitosis, a process of cell duplication, or reproduction, during which one cell gives rise to two genetically identical daughter cells.

Strictly applied, the term *mitosis* is used to describe the duplication and distribution of chromosomes, the structures that carry the genetic information.

The term mitosis was proposed by **Flemming** in 1882.

A growing cell undergoes a cell cycle that consists essentially of two periods, interphase (I –phase) and mitotic phase (M-phase).

Interphase is also called resting stage because no visible change occur in the nucleus.

During interphase the chromosomes are visible as a tangle of fine threads called **chromatin** .

Interphase comprises G1 (Gap I), S (synthesis) and G2 (Gap II).

G1 period is the interval between the end of mitosis and start of **S phase**. RNA and protein are synthesized during this phase.

Histone proteins are synthesized during S phase.

S phase is the specific part of the interphase during which DNA synthesis occurs .

G₂ period is the interval between the end of S phase and start of mitosis.

G₂ phase is signified by the synthesis of new proteins and RNA to be used for mitosis.

G₀ State is the condition of a cell whose division has been arrested at G₁.

During G₀ the cell is withdrawn from the cell cycle. The nucleus and cell have undergone differentiation and cannot divide further.

Prior to the onset of mitosis, the chromosomes have replicated and the proteins that will form the mitotic spindle have been synthesized.

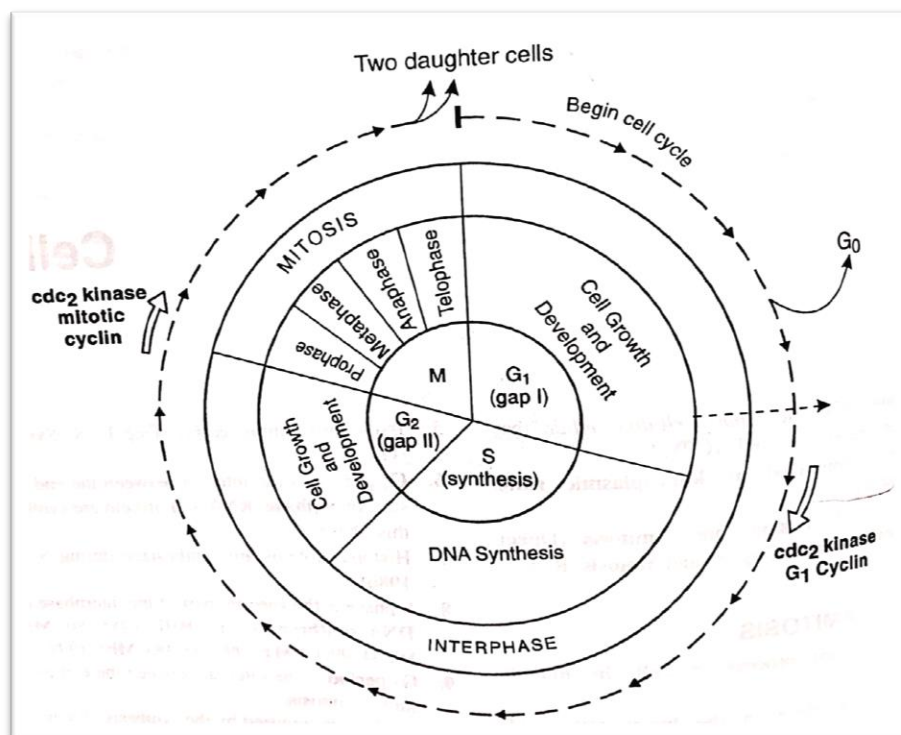


Fig. Diagrammatic view of the events and stages that comprise an arbitrary cell cycle.

Prophase

Mitosis begins at prophase with the thickening and coiling of the chromosomes. The nucleolus, a rounded structure, shrinks and disappears.

The end of prophase is marked by the beginning of the organization of a group of fibres to form a spindle and the disintegration of the nuclear membrane.

Metaphase

The chromosomes, each of which is a double structure consisting of duplicate chromatids, line up along the midline of the cell at metaphase.

Best stage to observe shape, size and number of chromosomes is metaphase.

During metaphase fibres of spindle apparatus are made of microtubules of three types: **Kinetochores microtubules**, **polar microtubules** and **aster microtubules**.

Anaphase

In anaphase each chromatid pair separates into two identical chromosomes that are pulled to opposite ends of the cell by the spindle fibres.

Separation of chromosomes takes place at anaphase.

Mitosis anaphase differs from metaphase in possessing same number of chromosomes and half number of chromatids.

Anaphase is shorter of four phases in duration.

Telophase

During telophase, the chromosomes begin to decondense, the spindle breaks down, and the nuclear membranes and nucleoli re-form.

The cytoplasm of the mother cell divides to form two daughter cells, each containing the same number and kind of chromosomes as the mother cell.

The stage, or phase, after the completion of mitosis is called interphase.

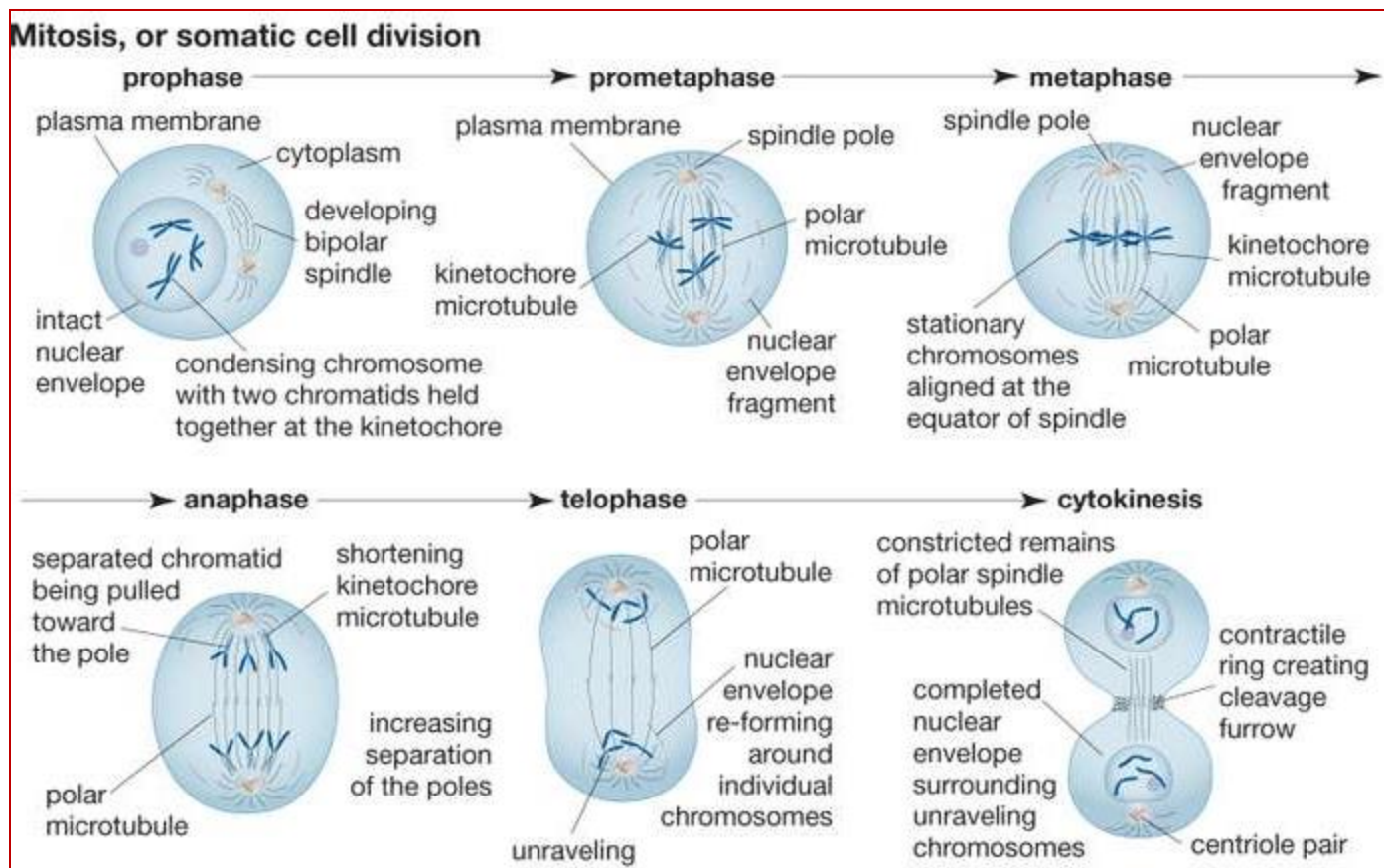


Fig: Mitosis

Significance of Mitosis:

- ❖ Mitosis is absolutely essential to life because it provides new cells for growth and for replacement of worn-out cells.
- ❖ Mitosis may take minutes or hours, depending upon the kind of cells and species of organisms. It is influenced by time of day, temperature, and chemicals.
- ❖ Mitosis is the basis of asexual reproduction.
- ❖ The major significance of mitosis is the production of genetically identical cells.