



Faculty of Science



Department of Medical Technology

((General plant sciences))

1st stage

Lab (4)

Plant Cell Division

By

Mm. Ali Al-Awadi

Lab4: Plant Cell Division

Cell Division:

- All cells are derived from **pre-existing cells** (Cell Theory)
- **Cell division** is the process by which cells produce new cells
- Cell division **differs** in **prokaryotes** (bacteria) from **eukaryotes** (protists, fungi, plants, & animals)
- **Some tissues must be repaired often** such as the lining of gut, white blood cells, skin cells with a short lifespan.
- Other cells **do not divide** at all after birth such as muscle & nerve

Reasons for Cell Division:

- **Cell growth**
- Repair & replacement of damaged tissue parts
- Reproduction of the species

Cell Cycle:

- Cells go through phases or a **cell cycle** during their life before they divide to form new cells
- The cell cycle (Figure 6.1) includes 2 main parts --- **interphase**, and **division**

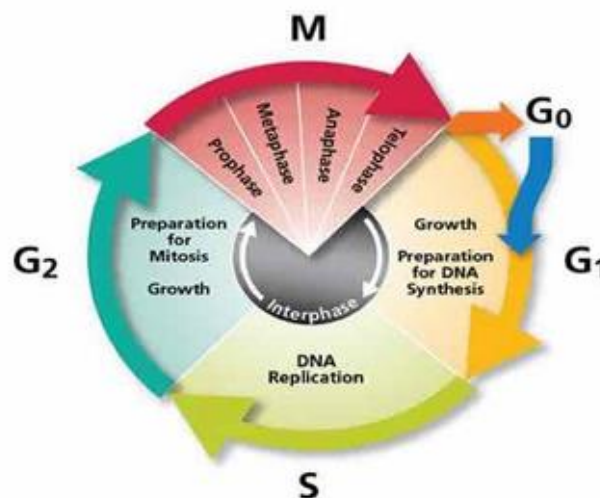


Figure 6.1: The cell cycle



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- Cell division includes **mitosis** (nuclear division) and **cytokinesis** (division of the cytoplasm)
- **Interphase** is the longest part of a cell's life cycle and is called the "resting stage" because the cell isn't dividing
- Cells grow, develop, & carry on all their **normal metabolic functions** during interphase
- **Interphase** consists of 3 parts --- G_1 , S, & G_2 phases

Interphase:

- **G_1 or 1st Growth Phase** occurs after a cell has undergone cell division
- Cells **mature & increase in size** by making more cytoplasm & organelles while carrying normal metabolic activities in G_1
- **S or Synthesis Phase** follows G_1 and the genetic material of the cell (**DNA**) is **copied** or replicated
- **G_2 or 2nd Growth Phase** occurs after S Phase and the cell makes all the **structures needed to divide**

Cell Division in Eukaryotes:

- **Eukaryotes** have a **nucleus & membrane-bound organelles** which must be copied exactly so the 2 new cells formed from division will be exactly alike
- The **original parent cell & 2 new daughter cells** must have **identical** chromosomes
- **DNA is copied in the S phase** of the cell cycle & organelles, found in the cytoplasm, are copied in the Growth phases
- Both the **nucleus (mitosis)** and the **cytoplasm (cytokinesis)** must be divided during cell division in eukaryotes

Stages of Mitosis:

- Division of the nucleus or **mitosis** occurs first
- Mitosis is an **asexual method** of reproduction
- Mitosis consists of 4 stages --- 1) **Prophase**, 2) **Metaphase**, 3) **anaphase**, & 4) **Telophase** (Figure 6.2)

- **Prophase:**

- Chromosomes become **visible** when they **condense** into sister chromatids
- Sister chromatids attach to each other by the **centromere**
- **Centrioles** in animal cells move to opposite ends of cell
- **Spindle forms** from centriole (animals) or microtubules (plants)
- **Kinetochores** of spindle attach to centromere
- **Polar fibers** of spindle extend across cell from pole to pole
- **Nuclear membrane** dissolves
- **Nucleolus** disintegrates
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- **Metaphase:**

- Chromosomes **line up in center or equator of the cell** attached to kinetochores of the spindle

- **Anaphase:**

- Kinetochores attached to the centromere **pull the sister chromatids apart**
- Chromosomes move toward opposite ends of cell

- **Telophase:**

- Nuclear membrane forms at each end of the cell around the chromosomes
- Nucleolus reform
- Chromosomes become less tightly coiled & appear as chromatin again
- Cytokinesis begins

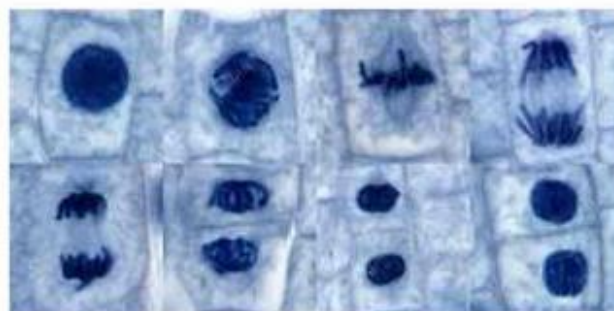
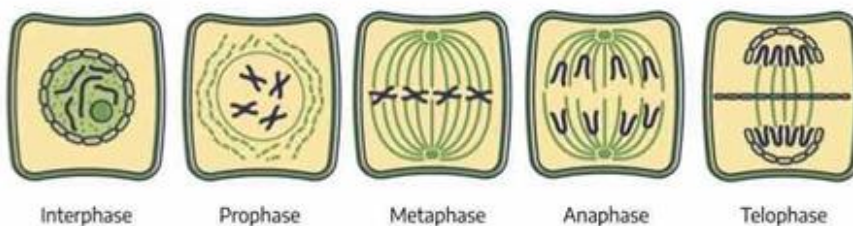


Figure 6.2: Mitosis division phases

Cytokinesis:

- Cytoplasm of the cell and its organelles separate into 2 new daughter cells
- **In plants**, a **cell plate** forms down the middle of the cell where the new cell wall will be (Figure 6.3).

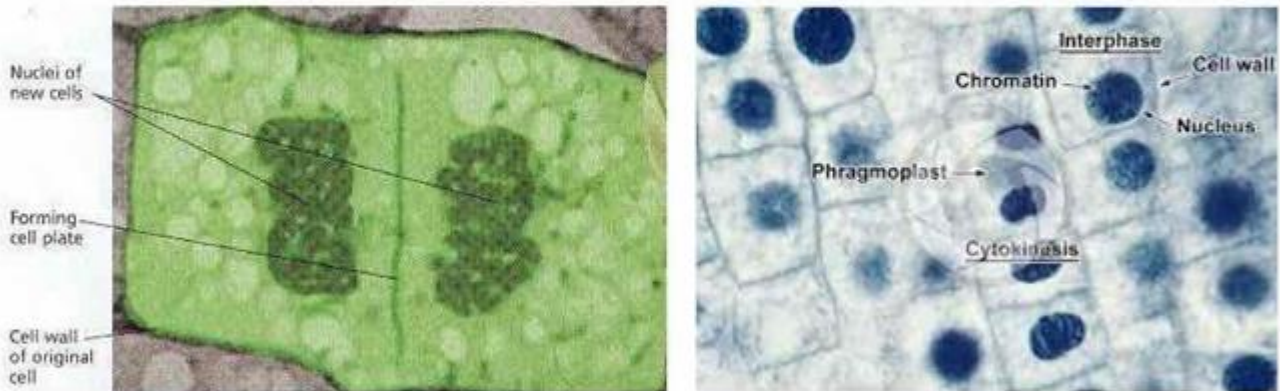


Figure 6.3: Cytokinesis of plant cell showing the formation of cell plate.