Third stag **Medical Genetics**

Aamal.M.AL-Shemari

Lab 7

Cell Division

Cell division: is the process by which a parent cell divides into two or more daughter cells., cell division usually occurs as part of a larger cell cycle.

Depending on the type of cell, there are two ways cells divide—mitosis and meiosis. Each of these methods of cell division has special characteristics. One of the key differences in mitosis is a single cell divides into two cells that are replicas of each other and have the same number of chromosomes. This type of cell division is good for basic growth, repair, and maintenance. In meiosis a cell divides into two cells that have half the number of chromosomes. Reducing the number of chromosomes by half is important for sexual reproduction and provides for genetic diversity.

Mitosis

Mitosis is how somatic—or non-reproductive cells—divide. Somatic cells make up most of the body's tissues and organs, including skin, muscles, lungs, gut, and hair cells. Reproductive cells (like eggs) are not somatic cells. In mitosis, the important thing to remember is that the daughter cells each have the same chromosomes and DNA as the parent cell. The daughter cells from mitosis are called diploid cells. Diploid cells have two complete sets of chromosomes. Since the daughter cells have exact copies of their parent cell's DNA, no genetic diversity is created through mitosis in normal healthy cell.

Meiosis

Meiosis is the other main way cells divide. Meiosis is cell division that creates sex cells, like female egg cells or male sperm cells. What is important to remember about meiosis? In meiosis, each new cell contains a unique set of genetic information. After meiosis, the sperm and egg cells can join to create a new organism, Meiosis is why we have genetic diversity in all sexually reproducing organisms. During meiosis, a small portion of each chromosome breaks off and reattaches to another chromosome. This process is called **"crossing over"** or "genetic recombination." Genetic recombination is the reason full siblings made from egg and sperm cells from the same two parents can look very different from one another.

the stages of the cell cycle can be divided into certain stages:

Interphase, Prophase, Metaphase, Anaphase, Telophase

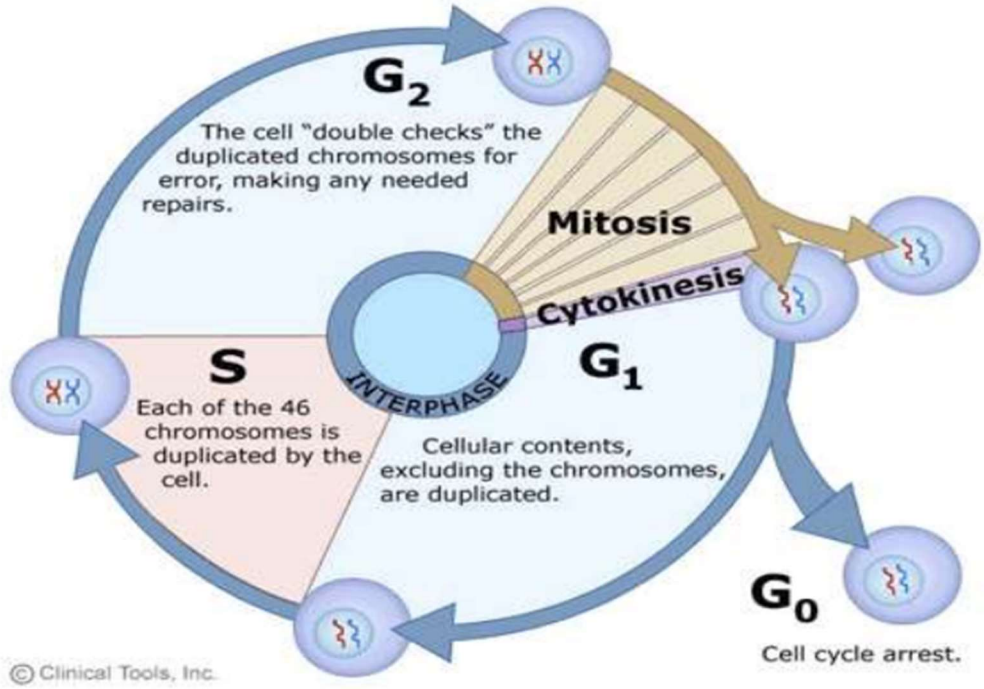
Cytokinesis: Divides the Cytoplasm

In animal cells, cytokinesis occurs by a process known as cleavage

• First, a cleavage furrow appears o cleavage furrow = shallow groove near the location of the old metaphase plate. Mitotic spindle:

- Mitotic spindle fibers are the railroad tracks for chromosome movement.
- Spindle fibers are made of microtubules.
- Microtubules are lengthened and shortened by the addition and loss of tubulin subunits.

- Mitotic spindle shortening during anaphase is a result of the loss of tubulin subunits.
- A kinetochore motor is the engine that drives chromosome movement. o the kinetochore contains motor proteins that can walk along the spindle fiber during anaphase.
- These proteins presumably remove tubulin subunits, shortening spindle fibers and facilitating the chromosome movement.



Cell cycle

Materials required

1. Onion plant with root
2. Feulgen stain
3. 1 N HCl
4. Scissors
5. Forceps
6. Razor blade
7. Pasteur pipette
8. 1.5 ml microfuge tubes
9. Dissection probe with wooden back
10. Microscopic slides and cover slips
11. Water bath
12. Light microscope

Procedure

1. Take the onion plant with newly sprouted roots and cut two root tips using scissors and transfer them into a plastic microfuge tube.

2. Fill 2/3 of the tube with 1N HCl using a dropper.

3. Place the tube in a 60°C water bath and incubate the tube for 12- 15 minutes.

4. Remove the tube from the water bath after the incubation.

5. Discard the HCl from the tube using a Pasture pipette to the running tap water.

6. Add some drops of distilled water into the tube and rinse the root. Then remove the water from the microfuge tube using the Pasture pipette. (Rinse the roots at least three times).

7. After the washing step add 2-3 drops of Feulgen stain into the tube with root tips and incubate the roots for 12-15 minutes. (During the incubation, the very tip of the root will begin to turn red as the DNA stains the numerous small actively dividing cells at the time).

8. After the incubation remove the stain using a Pasture pipette.

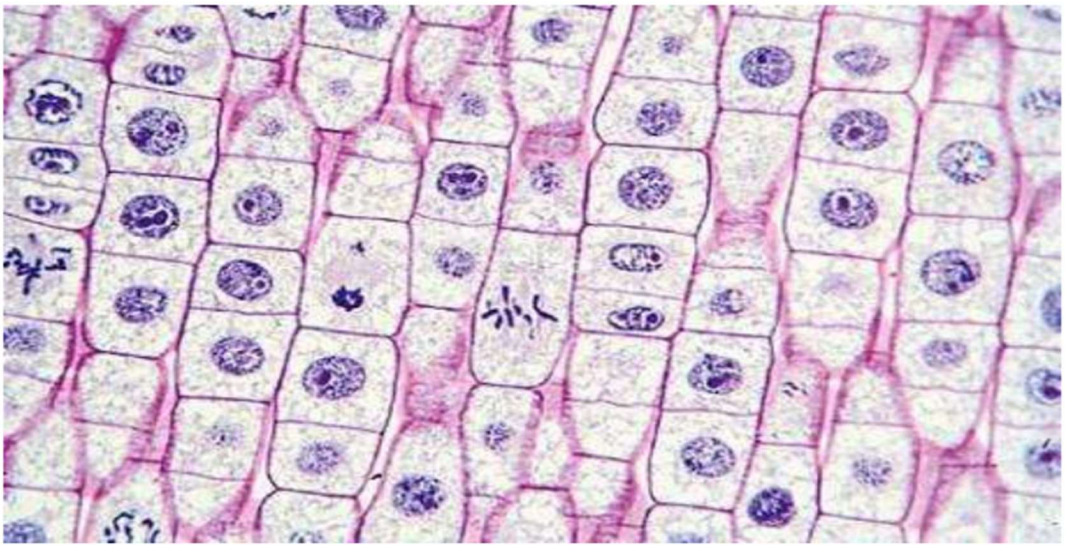
9. Again rinse the root tips with distilled water. (Rinse the roots at least three times).

10. Transfer a root from the tube to the centre of the microscopic slide and add a drop of water over it.

11. Take a razor blade and cut most of the unstained part of the root.

12.Cover the root tip with a cover slip and then carefully push down on the cover slide with the wooden end of a dissecting probe. (Push hard, but do not twist or push the cover slide sideways). The root tip should spread out to a diameter of about 0.5- 1cm.

13. Observe it under a compound microscope in 10x objective. Scan and narrow down to a region containing dividing cells and switch to 40x for a better view.



Phase of cell division type in Ilium root