

Chapter 5

Cell Growth & Division

I. Cell Cycle – 4 main Stages

A. **Gap 1 (G1)**

1. Cell growth
2. Normal function
3. Organelle replication

B. **Synthesis (S)** - DNA is Synthesized

C. **Gap 2 (G2)** – Additional Growth

D. **Mitosis** – The division of the Nucleus; happens in 4 Stages + Cytokinesis

II. **Cytokinesis** – Division of the Cytoplasm (includes the organelles) Visible when the cell

membrane begins to “pinch” closed in the middle of the cell

III. Cells Divide at different rates

depending on the cell type Ex. Skin cells divide every 2 weeks; Intestinal lining, every 4-5 days

IV. Cell size is limited. Cells need a large surface area to volume ratio. As a cell increases in size, the volume increases faster than the surface area. If the ratio is too small, movement of materials through the cell would be too slow. Also, the cell would lose structural integrity (too much cytoplasm to be held in by the membrane)

V. Structures/organization of DNA

- A. **Chromosome** – Highly condensed form of DNA; Made of 2 identical Sister chromatids, contains Twice the DNA because it was replicated in the S phase. (after division, a chromatid can also be called a chromosome.
- B. **Chromatin** – Loosely organized DNA; Form of DNA for normal cell functioning
- C. **Histones** – Proteins that DNA is wrapped around to prevent tangeling.
- D. **Centromere** – Region of the chromosome where the two sister chromatids are joined together
- E. **Telomeres** – Ends of the chromosomes that contain repeating nucleotides and are not used in coding for genes

VI. 4 Stages of Mitosis

A. **Prophase** – Longest phase of Mitosis

1. Nuclear Envelope Breaks Down
2. Chromatin (“loose DNA”) begins to condense into chromosomes
3. Chromosomes begin to move towards the center of the cell(metaphase plate)
4. Centrioles form & begin to migrate towards opposite poles
5. Spindle Fibers begin to grow

B. **Metaphase** – Only a moment in time where several factors are in place

1. Nuclear envelope is completely broken down (gone)

2. Chromosomes are fully formed and are all aligned vertically down the metaphase plate
3. Centrioles are at opposite poles and spindle fibers are fully grown and attached to the centromeres of each chromosome

C. Anaphase – Happens quickly. Spindle fibers retract and pull sister chromatids apart towards opposite poles of the cell

D. Telophase - Basically the opposite of Prophase

1. Nuclear envelope reforms
2. Spindle fibers and centrioles deteriorate
3. Chromosomes decondense into Chromatin

4. Cytokinesis begins.

VII. **Interphase** – Includes G1, S, and G2. Normal cell life, and also plays a role in preparing the cell to divide.