

I. The Cell Cycle

II. Function of Division

- A. Making new Cells
- B. Continuity of life
  - 1. Asexual reproduction
  - 2. Unicellular organism
- C. Growth
- D. Repair of cell life cycle

Interphase

- E. 90% of cell life
- F. Cell doing its everyday job
  - 1. Produce RNA synthesize protein enzymes
- G. Prepares for duplication if triggered

III. Cell has a life cycle

- A. Cell is formed from a mitotic division
  - 1. Cell grows and matures to divide again
  - 2. G1, S, G2, M
  - 3. Epithelial cells, blood cells
- B. Cell grows and matures to never divide again
  - 1. G1—G0
  - 2. Brain/nerve cells muscle cells\

IV. Interphase

- A. Divided into 3 phases
  - 1. G1 = 1st Gap
    - a) *Cell doing its "everyday job"*
    - b) *Cell grows*
  - 2. S = DNA Synthesis
    - a) *Copies chromosomes*
  - 3. G2 = 2<sup>nd</sup> Gap
    - a) *Prepares for division*
    - b) *Cell grows*
    - c) *Produces organelles, proteins, membranes*

- B. Nucleus well defined
  - 1. DNA loosely packed in long chromatin fibers

- C. Prepares for mitosis
  - 1. Replicates chromosome
    - a) *DNA & Proteins*
  - 2. Produces proteins and organelles

## V. Mitotic Chromosome

- A. Duplicated chromosome
  - 1. 2 sister chromatids
  - 2. Narrow at centromeres
  - 3. Contain identical copies of original DNA
    - a) *\*\*homologous chromosomes-same information*

## VI. Mitosis

- A. Dividing cell's DNA between 2 nuclei
  - 1. "dance of the chromosomes"

- B. 4 phases
  - 1. Prophase
  - 2. Metaphase
  - 3. Anaphase
  - 4. Telophase

VII. Prophase

- A. Chromatin condenses
  - 1. Visible chromosomes
    - a) *Chromatids*
- B. Centrioles move to opposite poles of cell
  - 1. Animal cell
- C. Protein fibers cross cell to form mitotic spindle
  - 1. Microtubules
    - a) *Actin, myosin*
  - 2. Coordinates movement of chromosomes
- D. Nucleus disappears
- E. Nuclear membrane breaks down

VIII. Transition to Metaphase = Prometaphase

- A. Spindle fibers attach to centromeres
  - 1. Creating kinetochores
- B. Microtubules attach at kinetochores
  - 1. Connect centromeres to centrioles
- C. Chromosomes begin moving

IX. Metaphase

- A. Chromosomes align along middle of cell
  - 1. Metaphase plate
    - a) *Meta = middle*
  - 2. Spindle fibers coordinate movement
  - 3. Helps ensure chromosomes separate properly
    - a) *So each new nucleus receives only 1 copy of each chromosome*

X. Anaphase

- A. Sister chromatids separate at the kinetochores
  - 1. Move to opposite poles
  - 2. Pulled at centromeres
  - 3. Pulled by motor proteins “walking” along microtubules
    - a) *Actin, myosin*
    - b) *Increased production of ATP by mitochondria*
- B. Poles move farther apart
  - 1. Polar microtubules lengthen
- C. Separation of chromatids
  - 1. In anaphase, proteins holding together sister chromatids are inactivated
    - a) *Separate to become individual chromosomes*

XI. Chromosome movement

- A. Kinetochores use motor proteins that “walk” chromosome along attached microtubule
  - 1. Microtubule shortens by dismantling at the kinetochore (Chromosome) end

XII. Telophase

- A. Chromosomes arrive at opposite poles
  - 1. Daughter nuclei form

2. Nucleoli form

3. Chromosomes disperse

*a) No longer visible under light microscope*

B. Spindle fibers disperse

C. Cytokinesis begins

Animals

Constriction belt of actin microfilaments around equator of cell

Cleavage furrows form

Splits cell in two

Like tightening a draw string