Cell Division 11/03/2014

This is Part 2 of the course

Key concepts:

- Asexual cell division results in genetically identical
- 3 phases of life cycle of a cell are:
  - Interphase (G1, S, G2)
  - Mitosis (nuclear division)
  - Cytokinesis
- The cell cycle is regulated by regulatory (kinase active) proteins and passes through checkpoints

Genetics And Development

- Cell Division:
  - Physical basis of inheritability
  - Mechanisms of cell reproduction: egg cells and sperm cells
  - Cells reproduce identically but with variations (new traits)
  - All cells arise from pre-existing cells
- Genetics ask how?
  - What are the mechanisms at cellular and molecular level for physical basis of inheritability?
- Development
  - Looks at mechanisms of the Life cycle of organisms

    - 1. Cell mechanisms of reproduction in organisms
    - 2. Growth of organism from zygote to adult
        - cell differentiation: how one cell becomes different from another cell
        - differential gene activity: genes are active at different times
        - totipotency and cloning: exact genetic copies of cells
    - Zygote = embryo

Methods Of Cell Reproduction

- 1. Fission
    - binary
    - 2 equal halves
    - 1. Chromosome replication begins
    - 2. One copy of the origin is now at each end of the cell
    - 3. Replication finishes
    - 4. Result: two daughter cell produced
    - Occurs in cyanobacteria, protozoans, Sheldon)
- 2. Budding
    - outgrowths detach = new organism
    - unequal split
    - occurs in hydra
    - asexual reproduction

    - portion of cell body is thrust out and splits off
    - plants, fungi, yeast, hydra
    - new organism is identical to primary one (clone)
    - Yeast bud: one cell becomes two cells
    - Sponge bud: part of sponge falls off and begins to grow into new
- 3. Mitosis
    - asexual
    - identical genetic copies
    - genetically equal somatic cells
    - Mitosis (cell DNA duplicates in order to generate two identical daughter cells) and then cytokinesis occurs
    - Cytokinesis: Divides cytoplasm and cell membrane
        - Results in two daughter cells with roughly equal distribution of organelles and other cell components
        - Cytoplasm is divided by cleavage furrow that pinches cell into two domains
    - Mitosis + cytokinesis = define M mitotic phase of cell cycle
- 4. Meiosis
    - sexual
    - produces sperm and egg cells with ½ chromosome number and new gene combos
    - sperm penetrates egg

Mitosis

- asexual reproduction of cell cycle