CELL CYCLE

I. Cell cycle
  A. M phase
    1. mitosis
  B. G_1 phase (gap one)
    1. Cell growth
    2. Preparation for DNA synthesis
  C. S phase
    1. DNA synthesis
  D. G_2 phase (gap two)
    1. Cell growth
    2. Preparation for mitosis
  E. G_0 phase (gap zero)
    1. Nondividing cells
      a. Resting
      b. Cells differentiation into adult cells

II. Regulation of the cell cycle
  A. Cell-cycle control system
    1. Cell-cycle checkpoints
      a. G_1, G_2, M
      b. Should the cell proceed to the next phase
      c. Signals from other sources are registered
    2. G_1 checkpoint determines if the cell goes to the S phase or to G_0 phase
    3. Molecular control system
      a. Cyclin-dependent kinases (Cdks)
        i. Activate or inactivate other proteins by phosphorylating them.
      b. Cyclins
        i. Many different types
        ii. Concentration fluctuate during different part of the cell cycle.
      c. G_2 checkpoint controls the beginning of mitosis
        i. MPF M-phase promoting factor
          • Enough cyclin is present to form MPF
          • MPF promotes mitosis by phosphorylating various enzymes need for mitosis
          • MPF breaks down its own cyclin
          • Cdks is recycled in till it is needed again
      d. Internal and external regulation
        i. Internal factors
          • Poorly understood
          • Anaphase-promoting complex
        ii. External factors
          • Growth factors – proteins that stimulate cell to divide

- Density-dependent inhibition
- Anchorage dependence

4. Cancer cells have escaped from cell-cycle controls
    a. Benign tumors
    b. Malignant tumors
        i. Metastasis