Outline

• Cell division
• Cell differentiation
• Stem cells
• Cancer

• Mitosis - somatic cells
• Meiosis - gametes

History of Cytology

• Robert Hooke
• Light microscope
• Electron microscope
  — transmission
  — scanning

Mitosis

• Division of one cell into two identical “daughter” cells

Interphase (Fig 3.31)

• G0: normal “daily” functions
• G1: duplication of organelles & cytosol
• S: DNA & centrosome replication (Fig 3.26 & 3.32)
  Inaccuracy => mutation
• G2: last minute preparations

End of Interphase

• 46 chromosomes => 46 pairs of chromatids
• Chromatid = newly formed strand of DNA
• Chromatids connected by centromere
Mitosis (Fig. 3.33)

• Early Prophase: 46 visible chromosomes
• Late prophase: no nuclear envelope; mitotic spindle
• Metaphase: “equator”
• Anaphase: centromeres split; chromatids separate; cleavage
• Telophase: chromatids = chromosomes reach opposite poles

• Cytokinesis => formation of two identical cells

Cell differentiation

• Process of cell specialization
• Biochemical signals/changes => genes turn on/off

Stem cells

• Totipotent
• Pluripotent (embryonic)
• Multipotent (adult)

www.nih.gov/news/stemcell/

Abnormal Cell Division

• Excess tissue growth: tumor=neoplasm
• Benign
• Malignant
• Primary tumor
• Secondary tumor
• Angiogenesis

Grading & staging tumors

• Grade I -> grade IV
• TMN:
  —Size of Tumor
Nodes

Metastasis

Types of cancer

• Based on tissue type
• (oma = tissue)

Causes

• Hereditary predisposition
• Oncogene activation
• Environmental factors/carcinogens