A Tour of the Cell, Part 2
Lecture 2, Part 2
Fall 2008

Cytoskeleton
Network of fibers extending throughout the cytoplasm

Three types:
• Microtubules
• Microfilaments
• Intermediate filaments

Microtubules
• Hollow rods
• Protein: tubulin
• Largest diameter (25 nm)
• Actively assembled & disassembled
• Function
  – Maintain cell shape
    • Compression-resisting
  – Cell division (centrioles)
  – Tracks for organelle movement
  – Cell motility (cilia & flagella)

Table 6.3

Cilia & Flagella
Microtubular containing extensions from a cell

Flagella
• Typically one or two, long
• Undulating motion

Cilia
• Typically many, short
• Back & forth motion

Functions:
• Mobility of cell
• Movement of fluid past a cell
• Attachment (some cilia)
• Signal-receiving (specialized cilia)

Table 6.3

Microfilaments
• Solid rods
• Protein: actin
• Smallest diameter (7 nm)
• Actively assembled & disassembled
• Function
  – Maintain cell shape
    • Tension bearing
  – Change cell shape
  – Cell motility (pseudopodia)
  – Cell division (cleavage furrow)
  – Muscle contraction
  – Cytoplasmic streaming

Table 6.3

Intermediate filaments
• Supercoiled cables
• Proteins: keratin family
• Intermediate & variable diameter (8-12 nm)
• Permanent structures
• Function:
  – Maintain cell shape (tension bearing)
  – Anchor nucleus, some organelles
  – Forms nuclear lamina

Table 6.3
Extracellular Matrix (ECM): Animal Cells

- **Collagen**
  - Glycoproteins (protein + carbohydrate)
- **Proteoglycan complex**
  - Core protein with many carbohydrate chains

Intercellular Junctions: Animal Cells

- **Tight junctions**
  - Continuous seal around cell
  - Prevent fluid leakage
- **Desmosomes**
  - Attach cells together
- **Gap Junctions**
  - Cytoplasmic channels
- **Proteins**

Cell Walls in Plants

- **Matrix of cellulose, other polysaccharides & proteins**
- **What is cellulose?**

Carbohydrates

- **Function**
  - Energy source
  - used in cellular respiration to create ATP
  - Carbon skeleton “building block” for other organic molecules
  - Cell identity
  - Fibrous structural material
  - Cellulose, chitin, peptidoglycan
Carbohydrates

Monomer
• small molecule

Polymer
• large molecule made up of many smaller monomers

Macromolecules
• “Big molecule”

Synthesis & Breakdown of Polymers
• Dehydration reaction
• Hydrolysis

Monosaccharides
• Simple sugar (CH₂O)
  – E.g., glucose, fructose

Disaccharides
• Double sugar (complex carbohydrate)
  – E.g., sucrose, maltose, lactose

Polysaccharides
• Complex carbohydrates
• Long chains of sugar
  – E.g., glycogen, starch, cellulose, chitin
• Storage molecules

Cellulose
• Structural polysaccharide
• Polymer of glucose
• Most abundant organic compound on earth
• Not digestible by most organisms
  – Beta glucose
• Unbranched & straight
  – Forms microfibrils

Intercellular Junctions – Plant Cells

Plasmodesmata
• Channels between adjacent cells
• Cytosol is continuous between connected cells