Chapter 6
Digestion and Human Health

6.1 The Molecules of Living Systems
6.2 The Human Digestive System
6.3 Health and the Digestive System

Chapter 6: Digestion and Human Health

In this chapter, you will learn about:

• Macromolecules
  – Carbohydrates
  – Lipids
  – Proteins
  – Nucleic acids
• Enzymes
• The digestive tract
• Mechanical and chemical digestion
• Absorption
• Diseases and disorders
6.1 The Molecules of Living Systems

In this section, you will:

• **Describe** the chemical nature of carbohydrates, lipids, and proteins

• **Explain**, in general terms, how carbohydrates, lipids, and proteins are synthesized and how they are broken down (hydrolyzed)

• **Explain** enzyme action and factors influencing their action

• **Understand how to perform** standard tests to identify macromolecules

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**Organic vs. Inorganic**

- Ex. Organic
  - Organic compounds always contain carbon while mostly inorganic compounds do not contain carbon.
  - Organic compounds contain carbon-hydrogen or C-H bonds.

- Ex. Inorganic

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**Macromolecules**

<table>
<thead>
<tr>
<th>Macromolecule</th>
<th>Example(s) of subunits</th>
<th>Main functions</th>
<th>Examples of macromolecules</th>
</tr>
</thead>
<tbody>
<tr>
<td>carbohydrates</td>
<td>sugars (such as glucose) and polymers of glucose</td>
<td>energy storage</td>
<td>sugars, starches, and glycogen</td>
</tr>
<tr>
<td>lipids</td>
<td>glycerol and three fatty acids or glycerol and two fatty acids</td>
<td>energy storage and cell membranes</td>
<td>fats, oils, and phospholipids</td>
</tr>
<tr>
<td>proteins</td>
<td>polymers of amino acids</td>
<td>transport, blood clotting, support, immunity, catalysis, and muscle action</td>
<td>hemoglobin, fibrin, collagen, antibodies, enzymes, actin, and myosin</td>
</tr>
<tr>
<td>nucleic acids</td>
<td>polymers of nucleotides</td>
<td>transfer and expression of genetic information</td>
<td>DNA and RNA</td>
</tr>
</tbody>
</table>
Macromolecules

- Carbohydrates: Contain C, H & O. Divided into monosaccharides (glucose), disaccharides (sucrose) and polysaccharides (glycogen). They provide energy for the body’s metabolism.
- Lipids: Contain C, H & O. Insoluble in water. Divided into triglycerides (fats/oils), phospholipids (cell membranes) and steroid (cholesterol, vitamins and hormones). Many used for energy storage.
- Proteins: Contain C, H, N & N. Subunits are called amino acids. Used for structural support, enzymatic catalysis, transport, movement, immune protection, hormonal regulation and sensory perception.
- Nucleic Acids: Contain a five-carbon sugar, nitrogen-containing base and a phosphate group. Subunits are called nucleotides. Used for protein synthesis and govern the process of heredity in the cells of organisms.

Assembling macromolecules

- All macromolecules are assembled the same basic way.
- A hydroxyl group is removed from one subunit and a hydrogen is removed from the other.
- Positioning and breaking chemical bonds is carried out by special proteins – enzymes

Disassembling Macromolecules

- Disassembling macromolecules into their components subunits - hydrolysis
- Water is put into a macromolecule to split it up (hydrolysis)
- Hydrolysis Reaction
Carbohydrates

- Macromolecules that always contain oxygen, hydrogen and carbon and almost always in the same proportion
- Provide short term or long term energy storage.
- 1C: 1O: 2H
- Two main types:
  - Simple Sugars – monosaccharide’s (3-7 carbon atoms)
  - Polysaccharides – consist of two or more linked simple sugars

Monosaccharides

- Simple sugars that are broken down quickly by the body.
- Building blocks of complex carbohydrates.
- Ex. Glucose, Fructose, Galactose.
- Mono- one
- Saccharide- sugar

Disaccharides

- Composed of two simple sugars formed by dehydration.
- Ex. Sucrose, Lactose, Maltose
- Di- two

Synthesis of a Disaccharide
Polysaccharides

Note: All three polysaccharides consist of glucose subunits.

Demo

- Test for Starch
- Test for Sugars
- Pg. 212-213

Homework

- Read pg. 205-216