6.2 The Human Digestive System

In this section, you will:
• Identify the main structures and functions of the digestive system
• Describe the physical and chemical processing of food through the digestive system and into the bloodstream
• Explain the action of enzymes in chemical digestion
• Identify and describe, in general terms, how digested molecules enter the bloodstream

The small intestine
• Digesting and absorbing nutrients
• 4 times the length of the large intestine
• Segmentation – physical digestion
• Main function – to complete digestion of macromolecules (hydrolyzes them)
• Three parts:
  • Duodenum, jejunum and ileum

Continued...

• Duodenum – U-shaped, contains channels from the pancreas and liver
  Receives chyme from the stomach
  – Contains villi and microvilli – conduct absorption of substances to the bloodstream and the lymphatic system
• Jejunum
  – Continues to break down food
• Ileum
  – Absorbs nutrients and pushes remaining material to the large intestine

Villi in the Small Intestine
Accessory Organs

- Pancreas – delivers fluid to the duodenum:
  - Trypsin and chymotrypsin – digest protein
  - Pancreatic amylase – digests starch
  - Lipase – digests fat
- Liver – largest internal organ in the body
  - Bile – contains bile pigments and salts. Pigments do not take part in digestion. Salts help to digest fat (breaking it down to help lipases out)
- Gall Bladder – stores bile between meals

Chemical Digestion
Selected Enzymes of the Digestive System

<table>
<thead>
<tr>
<th>Enzyme</th>
<th>Where enzyme acts/pH</th>
<th>Substrate (food) digested</th>
<th>Products of digestion</th>
<th>Origin of enzymes</th>
</tr>
</thead>
<tbody>
<tr>
<td>salivary amylase</td>
<td>mouth/7</td>
<td>starch, glycogen</td>
<td>maltose (disaccharide)</td>
<td>salivary glands</td>
</tr>
<tr>
<td>pancreatic amylase</td>
<td>small intestine/8</td>
<td>starch, glycogen</td>
<td>maltose</td>
<td>pancreas</td>
</tr>
<tr>
<td>carboxypeptidase</td>
<td>small intestine/8</td>
<td>sucrose, maltose</td>
<td>glucose</td>
<td>small intestine</td>
</tr>
<tr>
<td>peptidase</td>
<td>small intestine/8</td>
<td>lipids</td>
<td>fatty acids, glycerol</td>
<td>pancreas</td>
</tr>
<tr>
<td>proteases (pepsin)</td>
<td>stomach/1–2, small intestine/8</td>
<td>protein, peptide, smaller peptides</td>
<td>stomach, pancreas</td>
<td></td>
</tr>
<tr>
<td>peptidases</td>
<td>small intestine/8</td>
<td>peptides</td>
<td>smaller peptides, amino acids</td>
<td>pancreas and small intestine</td>
</tr>
<tr>
<td>nucleases</td>
<td>small intestine/8</td>
<td>nucleic acids</td>
<td>nucleotides and components</td>
<td>pancreas</td>
</tr>
<tr>
<td>nucleosidases</td>
<td>small intestine/8</td>
<td>nucleotides</td>
<td>bases, sugars, phosphates</td>
<td>small intestine</td>
</tr>
</tbody>
</table>
Regulation of processes by the small intestine

- Coordinated by the nervous and endocrine systems
- When food arrives in the stomach, Gastrin stimulates HCl release
- The inhibitions of stomach contractions are aided by GIP, secretin and CCK.
- Enabling fatty meals to remain in the stomach longer

The large intestine

- Shorter, 1.5m long
- Each day receives about 500ml of indigestible food that needs to be passed
- Water and salts are still absorbed
- Chyme is further broken down – feces
- Finally passed to the rectum and anal canal (20 cm in length)
- Opening of anus controlled by two sphincters, one under voluntary control and the other is involuntary

Video

- [The Digestive System](#) - 11:52
Assignment

• The Pathway of a Sandwich
  – Handout
  – Work alone or in partners