Anatomy: Small intestine

Chapter 14

Goals for this class

- Be able to explain the anatomy of the small intestine and describe why it makes it good at absorbing nutrients.
- Be able to explain the anatomy and function of the accessory organs.
- Be able to discuss the chemical and mechanical digestion occurring in the small intestine.

Structure of Small Intestine

- Extends from the pyloric sphincter to the ileocecal valve
- 2 m long
- Mesentary - web like membrane that coils small intestine & holds it intact

Divisions of Small Intestine

- Duodenum - curves around the pancreas; receives chyme from stomach, enzymes from pancreas & bile from liver
- Jejunum - middle portion; bulk of digestion & absorption
- Ileum - terminal portion

Chemical Digestion

1. Pyloric sphincter controls amount of food entering from stomach
2. Pancreas produces enzymes that are secreted to small intestines through pancreatic duct
3. Bile formed in liver is secreted through bile duct
4. Pancreatic & bile ducts join to form hepatopancreatic ampulla
5. Together enzymes, bile and bicarbonate (neutralize acids) enter
Mechanical Digestion of Small Intestine

- Occurs by segmentation

Accessory Organs of Small Intestine

- Pancreas
- Liver
- Gallbladder

Pancreas

- Gland that extends across abdomen from spleen to duodenum
- Located retroperitoneal - behind parietal peritoneum
- Functions:
  - Produces digestive enzymes in alkaline fluid (enter duodenum)
  - Produces insulin (breaks down glucose) and glucagon hormone that raises glucose level

Liver

- Largest gland; 4 lobes
- Suspended from diaphragm by falciform ligament
- Produces bile - yellow/green water solution containing bile salts, bile pigments (bilirubin), cholesterol, phospholipids and electrolytes
- Bile emulsifies fat into small globules
- Right & left hepatic ducts collect bile
- Fuse into the common hepatic duct
Problems of the Liver
- Jaundice - results from blockage of common hepatic or bile ducts
- Hepatitis (inflammation of liver)
- Cirrhosis (hardening of liver)

Gallbladder
- Green sac within lobes of liver
- When not digesting food bile backs up into the cystic duct & is stored in gall bladder
- Bile becomes concentrated in gall bladder due to water absorption

Problems of Gallbladder
- Gallstones - results from too much water absorption and cholesterol crystallizes

Absorption in Small Intestine
- Large surface area allows for most of absorption to occur here
- Transport of nutrients from the lumen into the blood or lymph
- Enter cells by active or passive transport
- Peyer's Patches - collection of lymphatic tissue that increases toward end of small intestine that prevents absorption of bacteria

Large Surface Area
- Surface area increased by 3 structures:
  - Circular folds (plicae circularis)- deep folds of inner walls
  - Villi - fingerlike projections that contain by & lymphatic duct called the lacteal
  - Microvilli - “brush border”; projections of the cell membrane that give a fuzzy appearance
Key Questions

- Why is the small intestine so efficient at absorption?
- If the small intestine didn’t have the accessory organs, how would this affect chemical digestion?
- Why do the folds in the small intestine not disappear like the folds of the stomach?