Functions of GI Organs

Essential activities of digestive process

1. Ingestion: Taking in food through mouth into GI tract
2. Propulsion: Movement of food along GI tract
3. Mechanical digestion: Physical breakdown of food by force
4. Chemical digestion: Catabolic breakdown of food molecules by digestive enzymes
5. Absorption: Movement of nutrients from GI tract to blood or lymph
6. Defecation: Elimination of indigestible wastes from GI tract

Neural control of GI tract

- Intrinsic control (by enteric nervous system with local nerve plexus ("gut brain"))
- Extrinsic control (by central nervous system)

Mouth

- Mechanical digestion (e.g. by teeth) / Chemical digestion (e.g. by enzymes in saliva)
- Regulation of salivation (e.g. by parasympathetic vs. sympathetic nervous system)

Pharynx & Esophagus

- Swallowing (deglutition) & Peristalsis (series of wave-like muscle contraction & relaxation)

Stomach

- Hydrochloric acid (HCl) activates pepsinogen to pepsin
- Regulation of gastric activities
  - Cephalic phase: to prepare stomach for arrival of food
  - Gastric phase: to homogenize & acidify chyme & to initiate protein digestion by pepsin
  - Intestinal phase: to control rate of chime entry into duodenum

Pancreas

- Acinar cells: secretion rich in enzymes (e.g. amylase, lipases, nucleases, trypsinogen, chymotrypsinogen)
- Ductal cells: secretion rich in HCO_3^- (to provide optimal pH for pancreatic enzymes to work in small intestine)
- Pancreatic secretion is regulated by duodenal hormones (secretin & cholecystokinin) and activity of vagus nerve

Liver & Gall bladder

- **Liver** produces bile; **Gallbladder** stores & concentrates bile
- Bile salts are absorbed in ileum & recycled by liver via enterohepatic circulation
- Bile salts emulsify fat globules into droplets that mix with water more readily
- Bile production & release are regulated by duodenal hormones (secretin & cholecystokinin) and activity of vagus nerve

Small intestine

- Mechanical digestion (segmentation)
- Chemical digestion (by enzymes in pancreatic juice & intestinal juice; brush border enzymes)
- Most nutrients are **absorbed** in small intestine (e.g. glucose, amino acids, fatty acids, electrolytes, water, vitamins)

Large intestine

- Water absorption
- Feces storage (in rectum)
- **Defecation**

Gut flora

- Control pathogens
- Synthesize vitamins (B & K), enzymes & neurotransmitters
- Regulate metabolism, immune system & inflammation