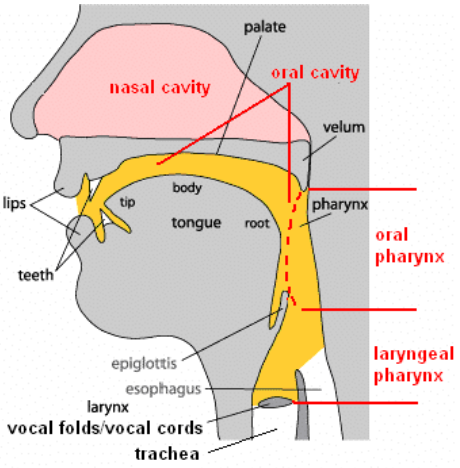
Topic 17: GI System Study Guide

Overview of the GI System



Function:

- Ingestion → Digestion → Absorption → _____

Organs:

- Alimentary _____: mouth → pharynx → esophagus → stomach → small intestine → large intestine
- Accessory organs: salivary glands, liver, gallbladder, pancreas

Mouth → Pharynx → Esophagus

Mouth

- Teeth → mechanical digestion
- Tongue → manipulation + taste
- Saliva (amylase, lipase)

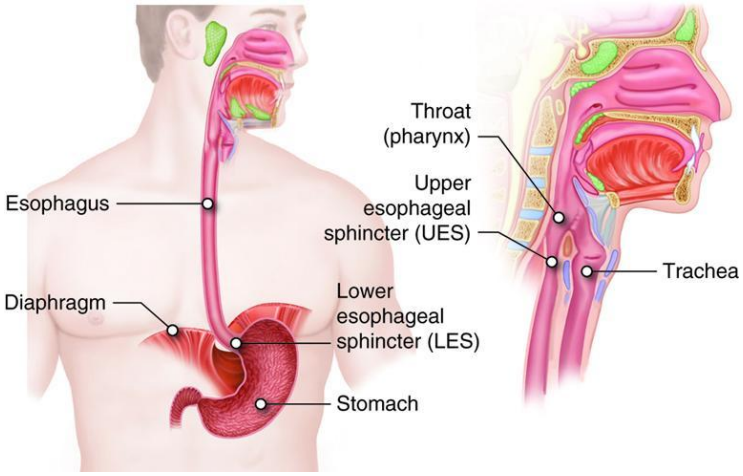
Pharynx

- Shared pathway (air + food)
- Swallowing (deglutition)

Esophagus

- Peristalsis moves food
- Upper ES (UES): skeletal muscle
- Lower ES (LES): smooth muscle

Clinical: LES dysfunction → _____ (acid reflux)

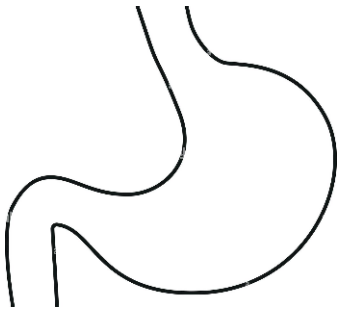


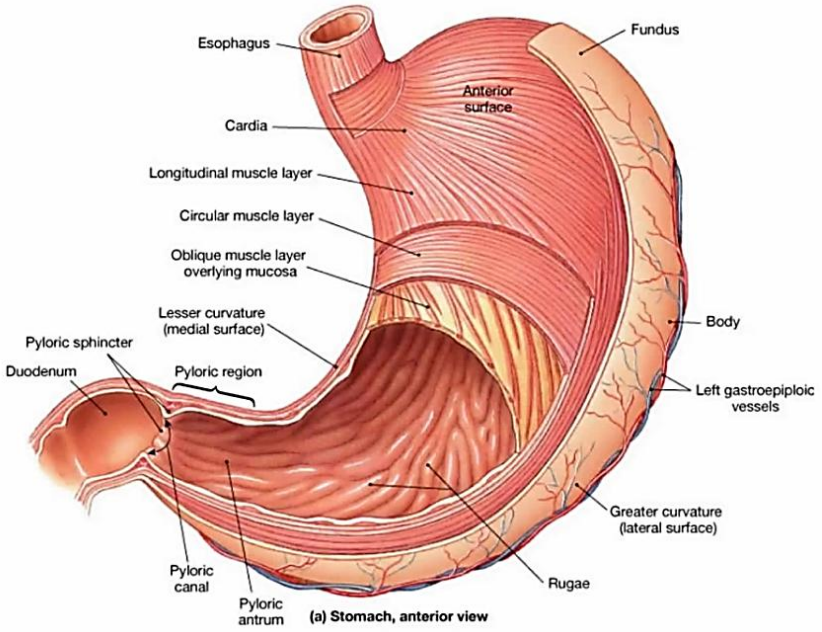
Stomach Regions:

- Esophagus → brings food into stomach
- Cardia → entry region (near LES)
- Fundus → dome-shaped superior region
- Body → main central region
- Pyloric region → distal portion leading to intestine
    - Pyloric antrum → wider part;
    - Pyloric canal → narrow passage;
    - Pyloric sphincter → controls emptying → duodenum

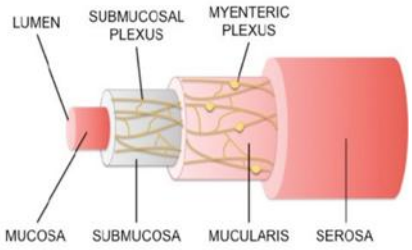
Unique feature:

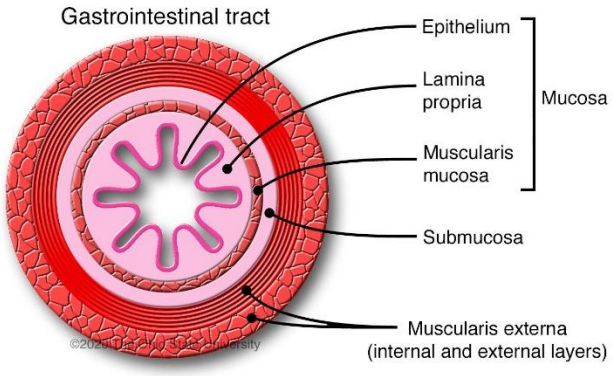
- Longitudinal layer (outer): shortens the stomach
- Circular layer (middle): constricts lumen (important for pyloric sphincter)
- Oblique layer (inner): extra mixing/churning power (only in stomach)





Layers of the GI Tract (HISTOLOGY)

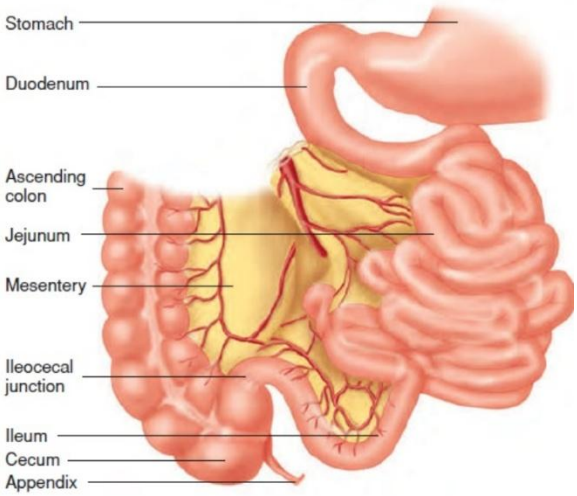




From lumen outward:

1. _____
    - Epithelium (absorption/secretion)
    - Lamina propria (immune support)
    - Muscularis mucosae (local movement)
2. _____mucosa
    - Blood vessels, glands, lymphatics
    - Submucosal plexus (Meissner) → controls secretion
3. Muscularis externa
    - Inner circular + outer longitudinal
    - Myenteric plexus (Auerbach) → controls motility
4. Serosa (or adventitia)
    - Outer covering

INTESTINES



Small Intestine Sections:

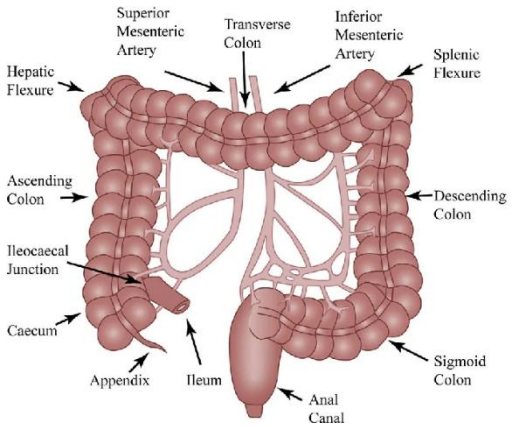
1. Duodenum: Receives bile + pancreatic enzymes
2. Jejunum: Most nutrient absorption
3. Ileum: Absorbs B12 + bile salts

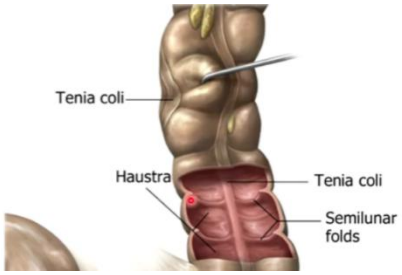
Surface area adaptations:

- Circular folds, Villi, Microvilli

Large Intestine Sections:

1. Cecum is the first part of the large intestine
2. Descending colon
3. Transverse colon
4. Ascending colon





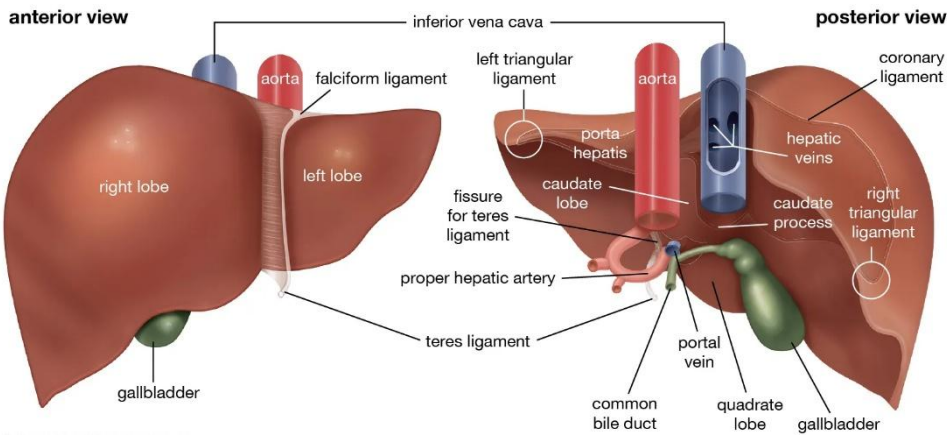
Large Intestine Key features:

5. Haustra (pouches)
6. Taenia coli (muscle bands)

Accessory Organs

Liver

- Bile production → emulsifies fats; Detoxification → drugs, alcohol, toxins; Metabolism: carbs, lipids, proteins;
- Storage → glycogen, vitamins (A, D, B12), iron; Synthesis → albumin, clotting factors,
- *Portal triad:* Hepatic artery; Portal vein; Bile duct



Gallbladder

- Stores bile and concentrates bile (removes water); Releases bile → duodenum (via bile duct);

Pancreas

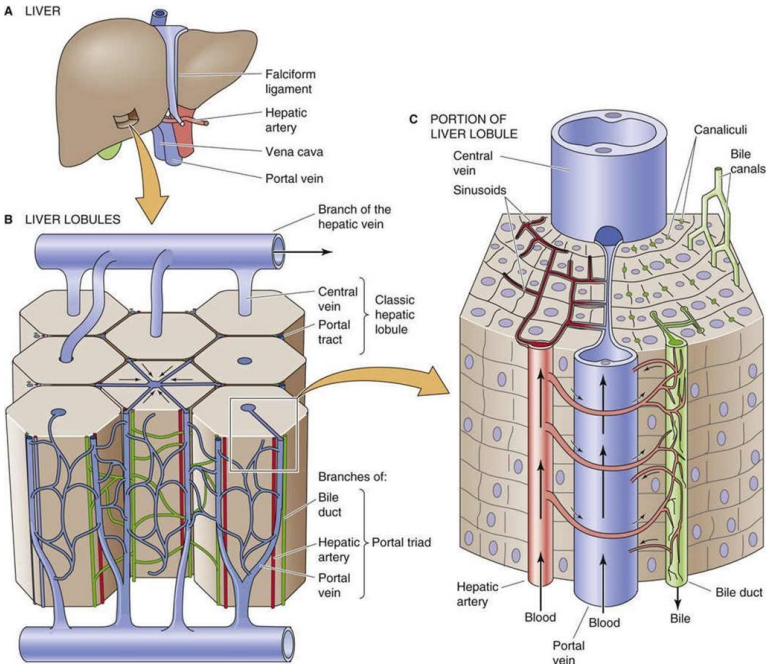
- Exocrine: digestive enzymes "pancreatic juices"
- Endocrine: insulin, glucagon

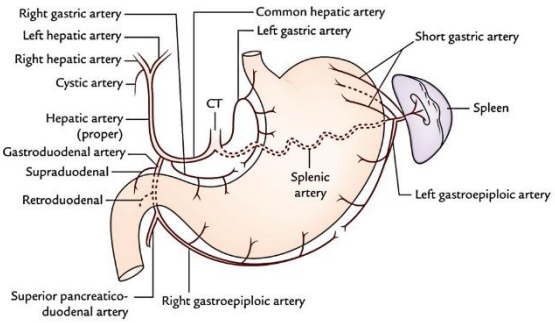
Blood Supply

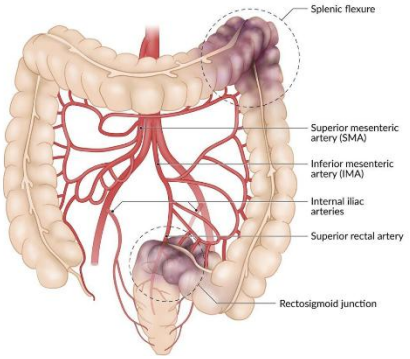
- Celiac trunk (CT):
  - Supplies: Upper GI organs; Branches: left gastric artery, common hepatic artery, splenic artery
- Superior mesenteric artery (SMA):
  - Supplies most the small intestine + right colon
- Inferior mesenteric artery (IMA):
  - Supplies left colon+rectum

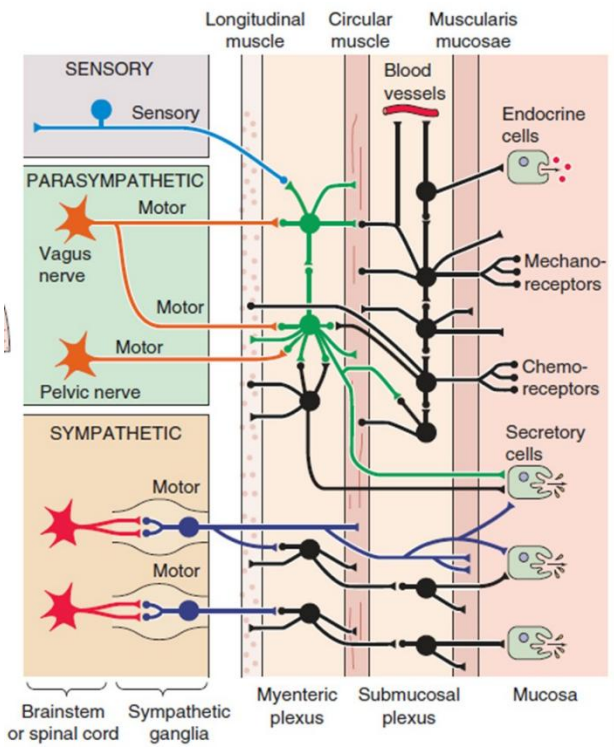
Enteric Nervous System (ENS)

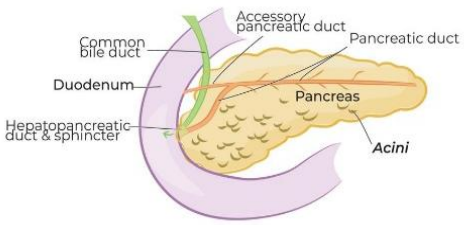
- Myenteric plexus
- Submucosal plexus
- Enteric nervous system = "brain of the gut" (can function independently of CNS)
- Works independently but modulated by:
  - Parasympathetic → ↑ digestion;
  - Sympathetic → ↓ digestion



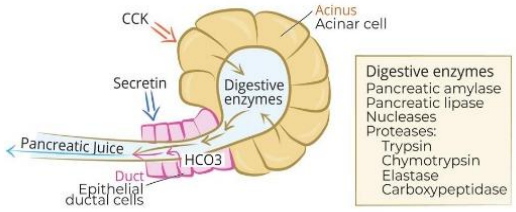


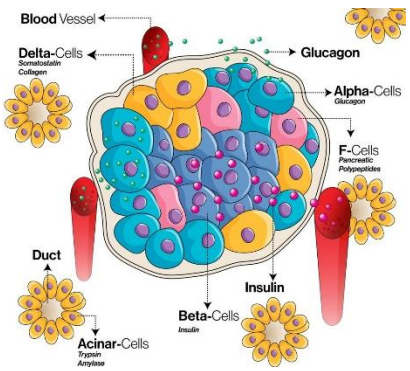






Pancreatic Juice Formation





Topic 17: Study Guide Questions

1. Which section of the small intestine is primarily responsible for the majority of nutrient absorption? A. Duodenum B. Jejunum C. Ileum D. Cecum
2. Which structure is responsible for increasing surface area for absorption in the small intestine? A. Haustra B. Taenia coli C. Villi D. Pyloric sphincter
3. Which artery supplies most of the small intestine and the right side of the colon? A. Celiac trunk B. Inferior mesenteric artery C. Superior mesenteric artery D. Hepatic artery
4. What are haustra in the large intestine? A. Circular muscle folds that increase absorption B. Pouch-like sacculations formed by the colon wall C. Finger-like projections in the small intestine D. Sphincters controlling fecal movement
5. What are taenia coli in the large intestine? A. Circular folds that increase absorption B. Three longitudinal bands of smooth muscle C. Sphincters that control defecation D. Finger-like projections for nutrient absorption
6. The contraction of taenia coli is primarily responsible for forming which structure? A. Villi B. Haustra C. Rugae D. Plicae circulares
7. In which organ are rugae primarily found? A. Esophagus B. Stomach C. Small intestine D. Large intestine
8. The celiac trunk primarily supplies which region of the GI tract? A. Small intestine only B. Upper GI organs (foregut) C. Left colon and rectum D. Entire large intestine
9. Which of the following are branches of the celiac trunk? A. Inferior pancreaticoduodenal, ileocolic, right colic B. Left gastric, common hepatic, splenic C. Superior rectal, left colic, sigmoid D. Middle colic, right colic, ileal
10. The superior mesenteric artery (SMA) supplies which structures? A. Stomach and liver only B. Left colon and rectum C. Most of the small intestine and right colon D. Esophagus and stomach
11. The inferior mesenteric artery primarily supplies which portion of the large intestine? A. Cecum and ascending colon B. Transverse colon (proximal) C. Descending colon and rectum D. Entire colon
12. The sphincter of Oddi is located at the junction of which structures? A. Esophagus and stomach B. Stomach and duodenum C. Common bile duct and pancreatic duct entering the duodenum D. Ileum and cecum
13. In a classic hepatic lobule, where is the central vein located? A. At the periphery of the lobule B. At the center of the lobule C. Within the portal triad D. Inside the bile duct
14. In the liver lobule, bile flows in which direction relative to blood? A. Same direction as blood B. Opposite direction of blood C. Random direction D. Toward the portal vein only
15. Which vessel carries nutrient-rich blood from the GI tract to the liver? A. Hepatic artery B. Portal vein C. Central vein D. Inferior vena cava
16. What are bile canaliculi in the liver? A. Large ducts that carry bile to the gallbladder B. Small channels between hepatocytes that collect bile C. Blood vessels that supply hepatocytes D. Sinusoids that allow nutrient exchange
17. The myenteric (Auerbach) plexus is located between which layers of the GI tract? A. Mucosa and submucosa B. Submucosa and serosa C. Circular and longitudinal muscle layers D. Epithelium and lamina propria
18. The gastrointestinal tract is innervated by which division(s) of the autonomic nervous system? A. Sympathetic only B. Parasympathetic only C. Both sympathetic and parasympathetic D. Neither
19. Which sequence correctly describes the flow of bile from the liver to the duodenum?
    A. Hepatocytes → bile canaliculi → bile ducts → common hepatic duct → cystic duct → gallbladder → common bile duct → duodenum
    B. Hepatocytes → central vein → bile duct → duodenum
    C. Hepatocytes → portal vein → cystic duct → duodenum
    D. Hepatocytes → hepatic artery → bile duct → duodenum

Identify: