

Gastrointestinal System

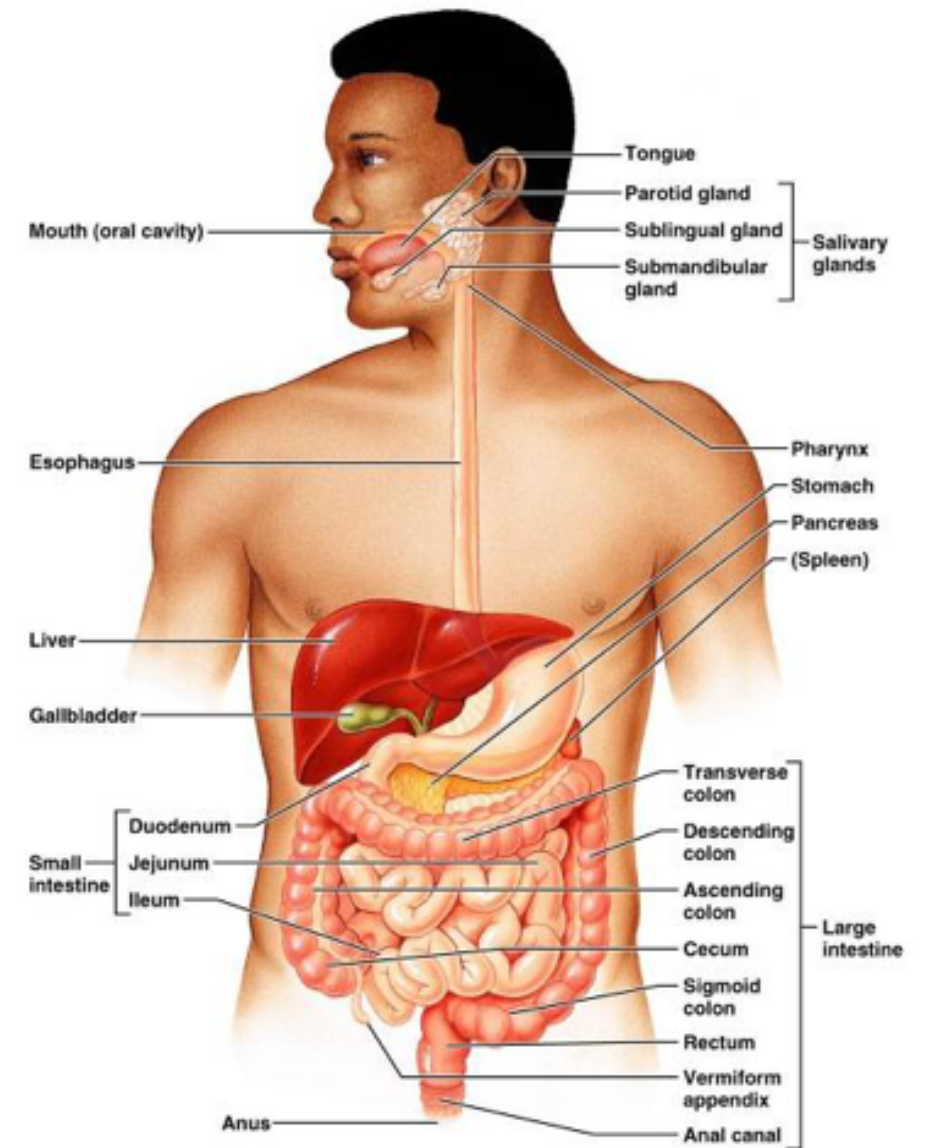
Anatomy and function

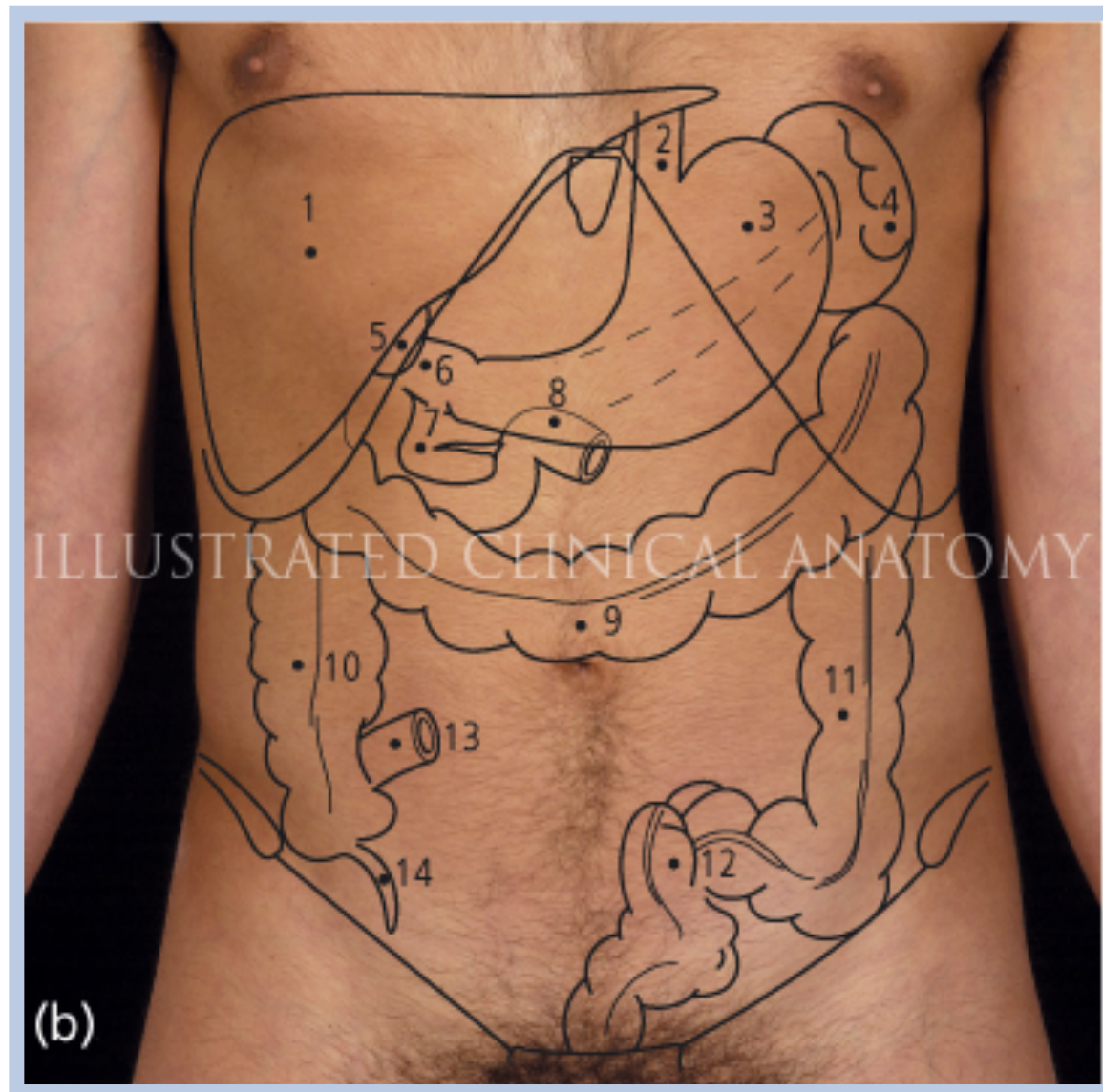
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GI tract anatomy

- 30 ft. long from mouth to anus.
- Consists of
 - mouth,
 - esophagus,
 - stomach,
 - small intestine,
 - large intestine,
 - rectum, anus.
- Associated organs: liver, pancreas, gallbladder.



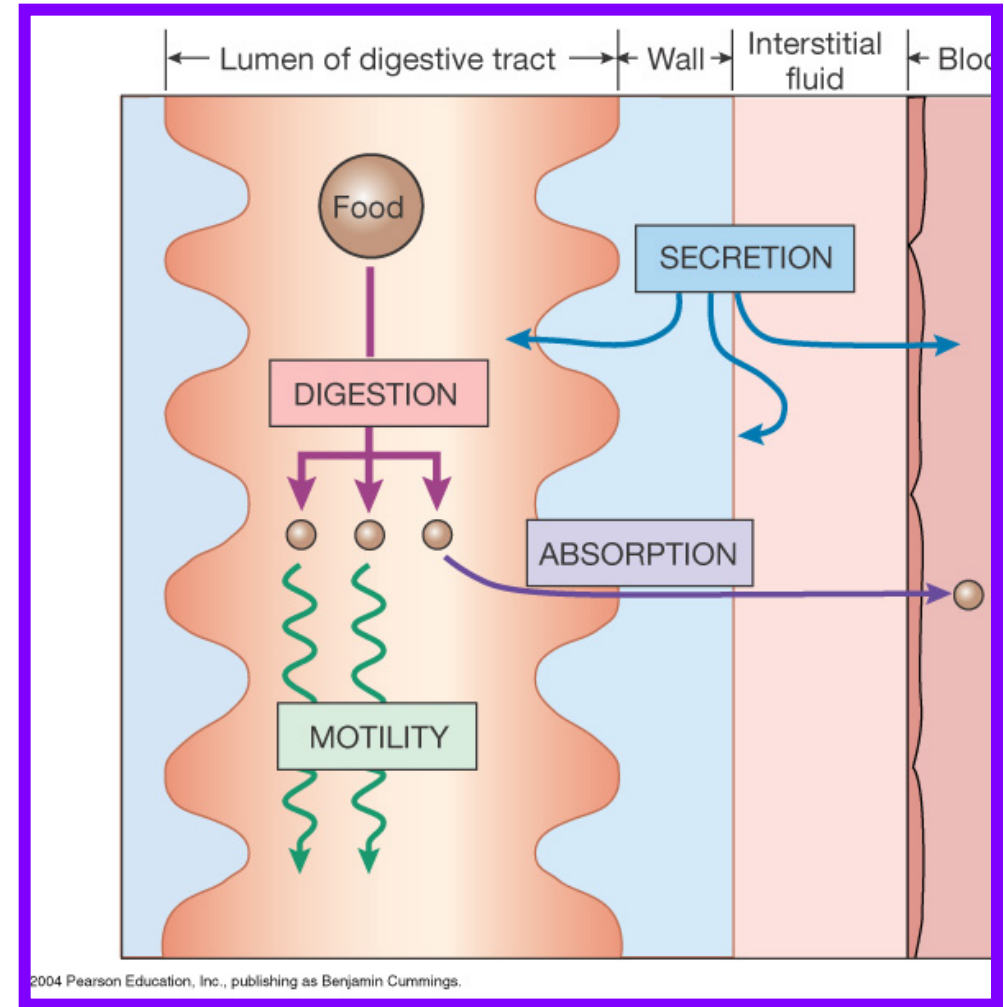


Surface anatomy of the abdominal wall, showing abdominal viscera:

1, liver; 2, oesophagus; 3, stomach; 4, spleen; 5, gallbladder; 6, first part of duodenum; 7, head of pancreas; 8, duodenojejunal flexure; 9, transverse colon; 10, ascending colon; 11, descending colon; 12, sigmoid colon; 13, terminal ileum; 14, appendix

Digestion Phases

1. Ingestion
2. Movement
3. Mechanical and Chemical Digestion
4. Absorption
5. Elimination

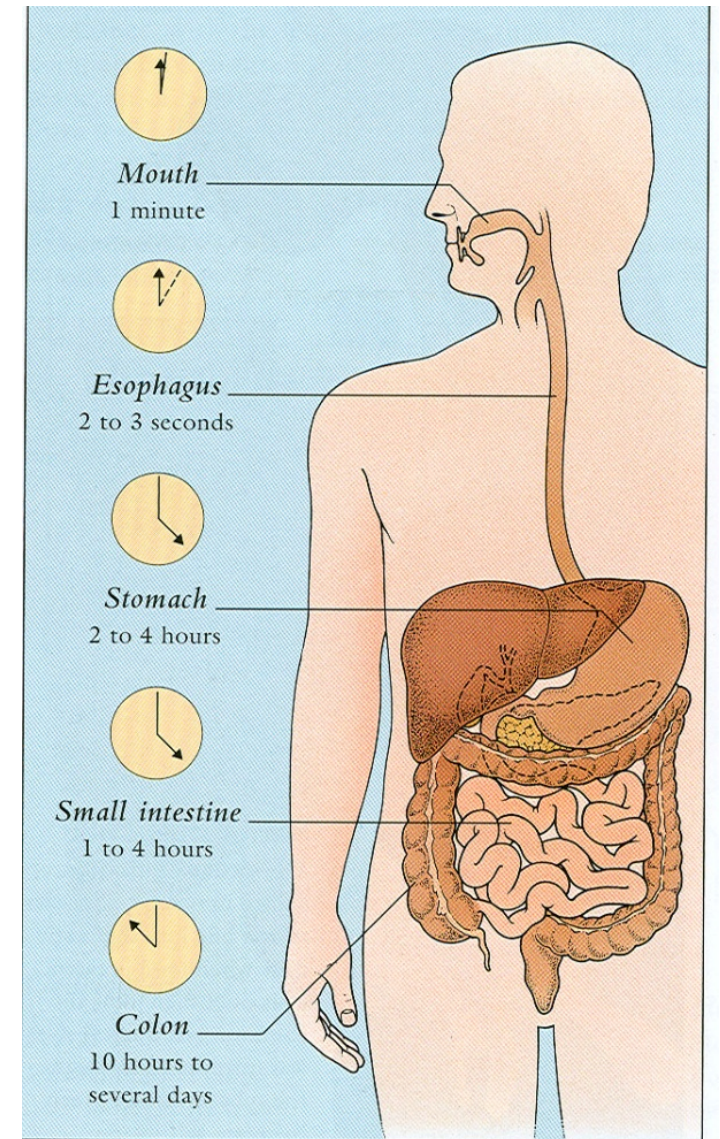


Digestion

- Types
 - Mechanical (physical)
 - Chew
 - Tear
 - Grind
 - Mash
 - Mix
 - Chemical
 - Enzymatic reactions to improve digestion of
 - Carbohydrates
 - Proteins
 - Lipids

Function of GI tract

- Each part of system performs different activities.
- **Ingestion** and **propulsion** of food: mouth, pharynx, esophagus.
- **Digestion** and **absorption**: mouth, stomach, small intestine.
- **Elimination**: large intestine



Design of the Four Layers in the GI System

changes

#1 Mucosa

- Epithelium
- Lamina propria
- Muscularis mucosae

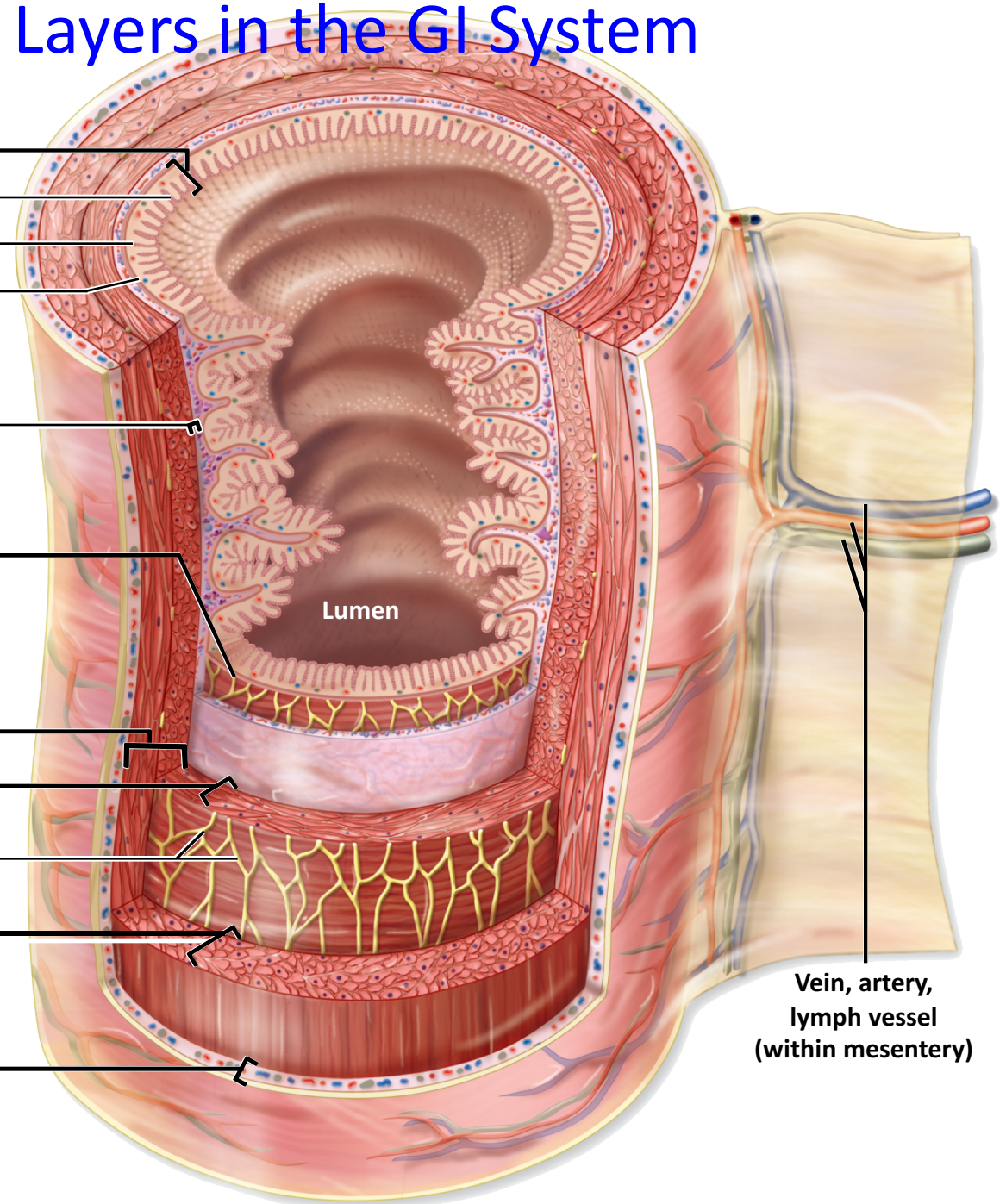
#2 Submucosa

- Submucosal nerve plexus

#3 Muscularis

- Inner circular layer
- Myenteric nerve plexus
- Outer longitudinal layer

#4 Serosa or Adventitia



Vein, artery,
lymph vessel
(within mesentery)

(a) Tunics

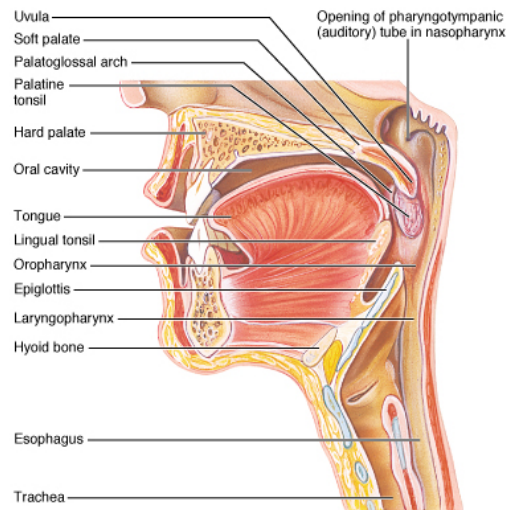
Factors affecting GI tract:

- **Emotional factors**: stress, anxiety..
- **Physical factors**: diet, alcohol, caffeine, cigarette smoking, fatigue, organic diseases.
- Emotional and physical factors may be manifested by **anorexia**, epigastric and abdominal **pain, diarrhea, constipation**.

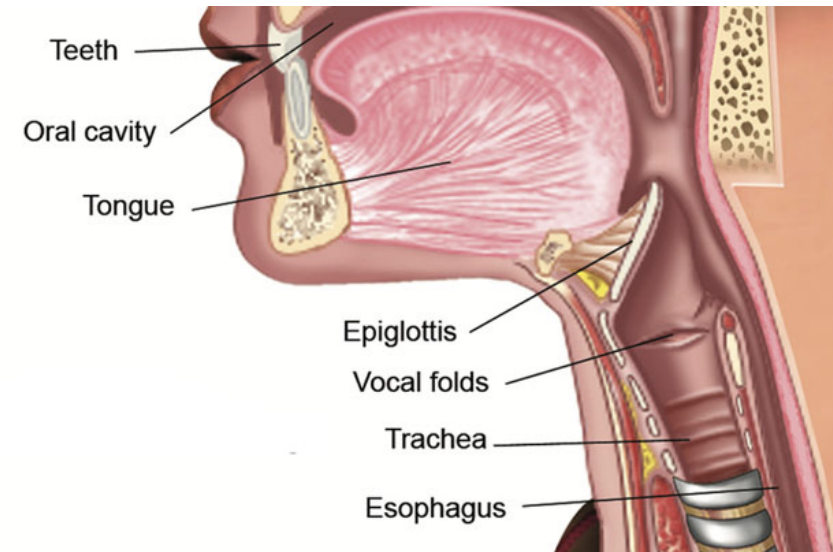
Mouth

- Teeth mechanically break down food into small pieces. Tongue mixes food with **saliva** (contains **amylase**, which helps break down **starch**).

- **Epiglottis** is a flap-like structure at the back of the throat that closes over the trachea preventing food from entering it. It is located in the Pharynx.

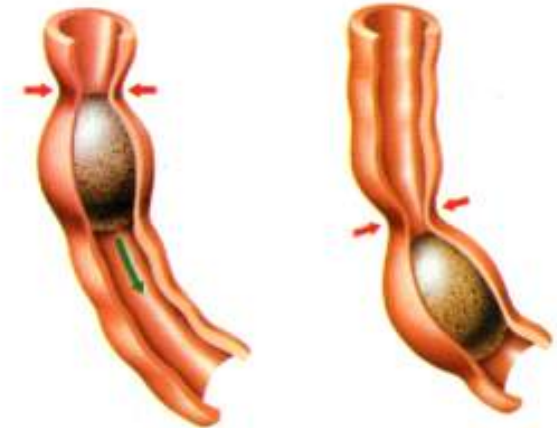
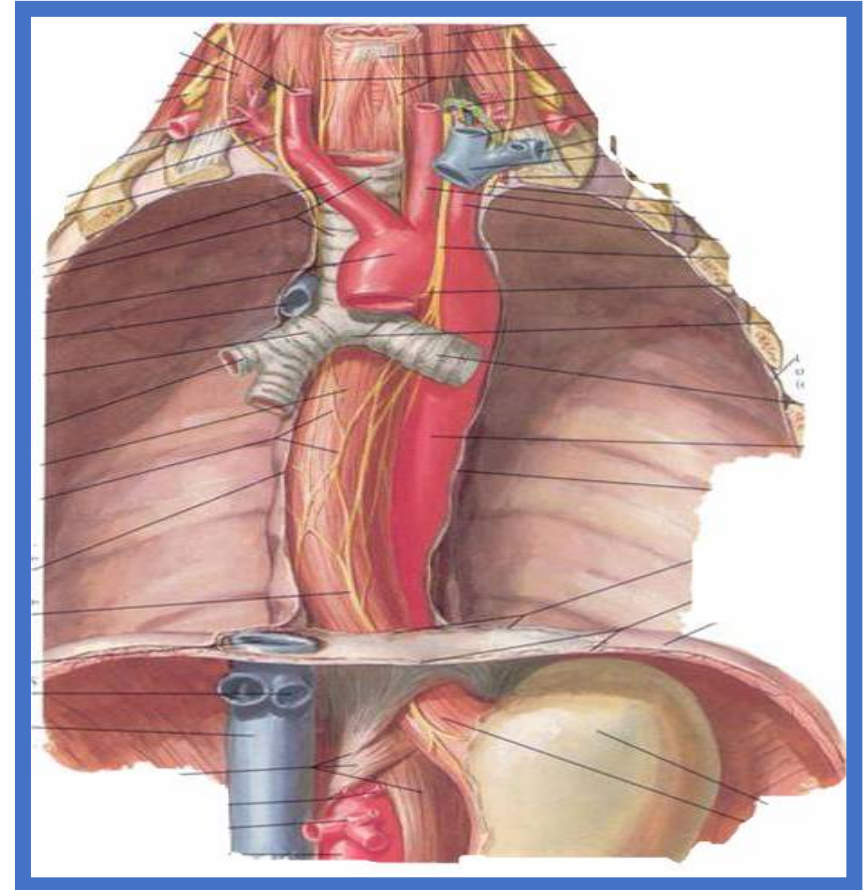


(a)
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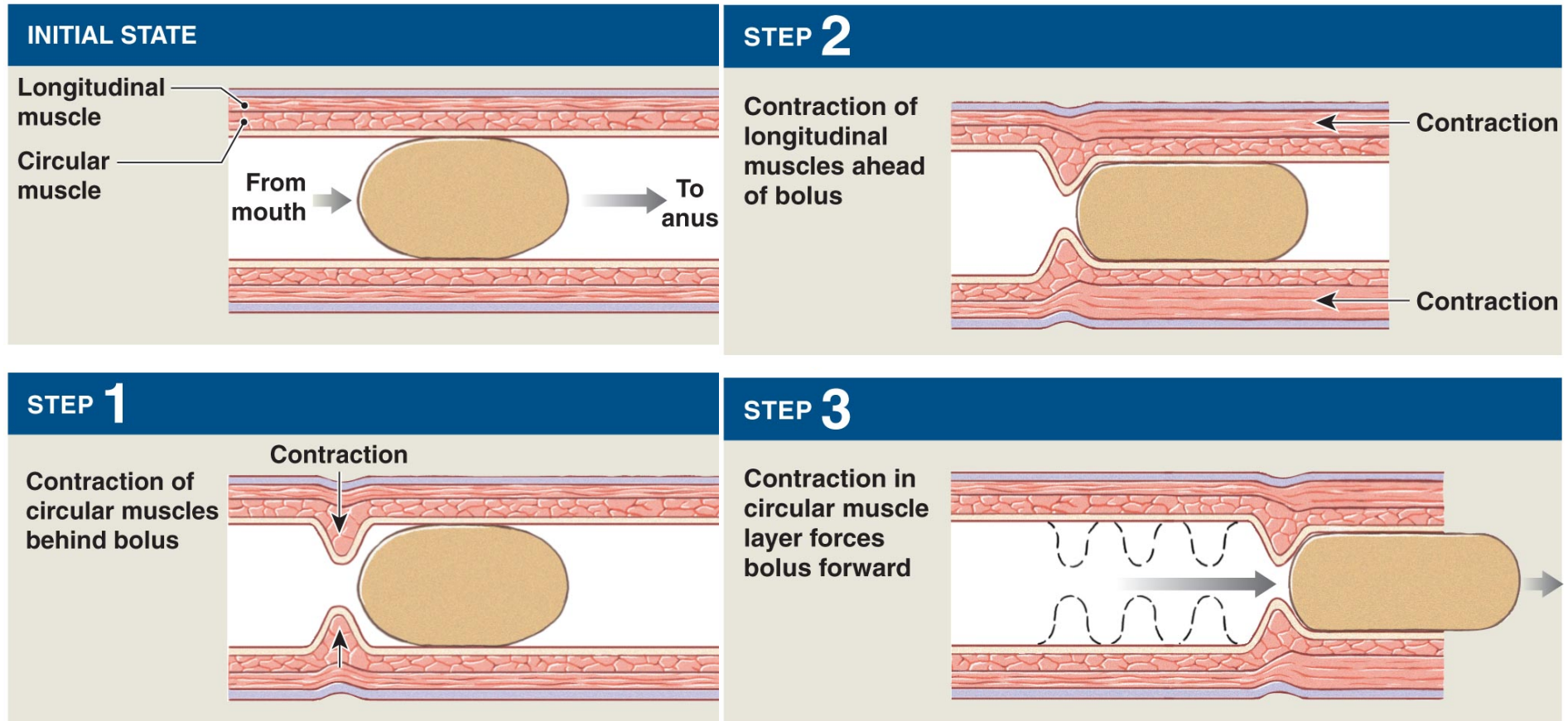


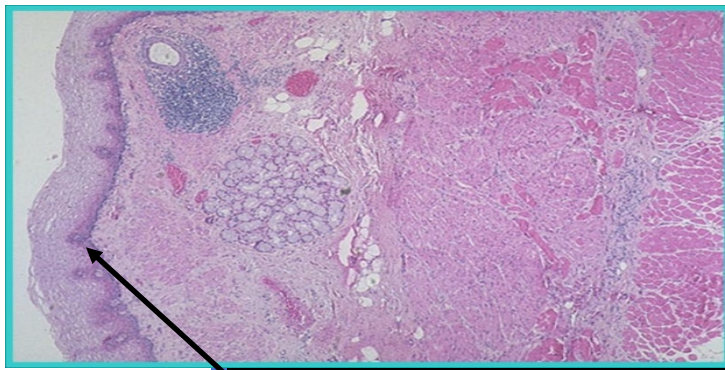
Esophagus

- Approximately 20 cm long.
- Functions include:
 1. Secrete **mucus**
 2. Moves food from the throat to the stomach using muscle movement called **peristalsis**



Peristalsis





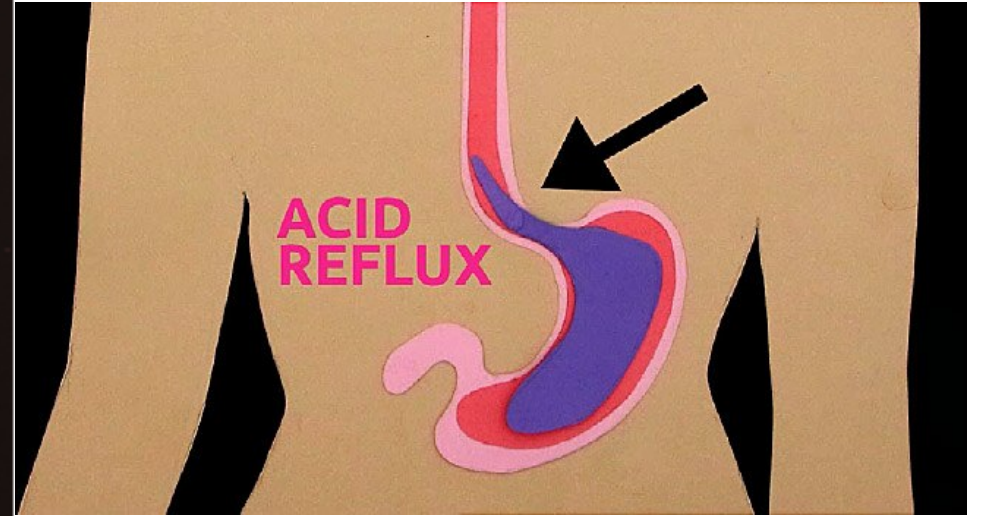
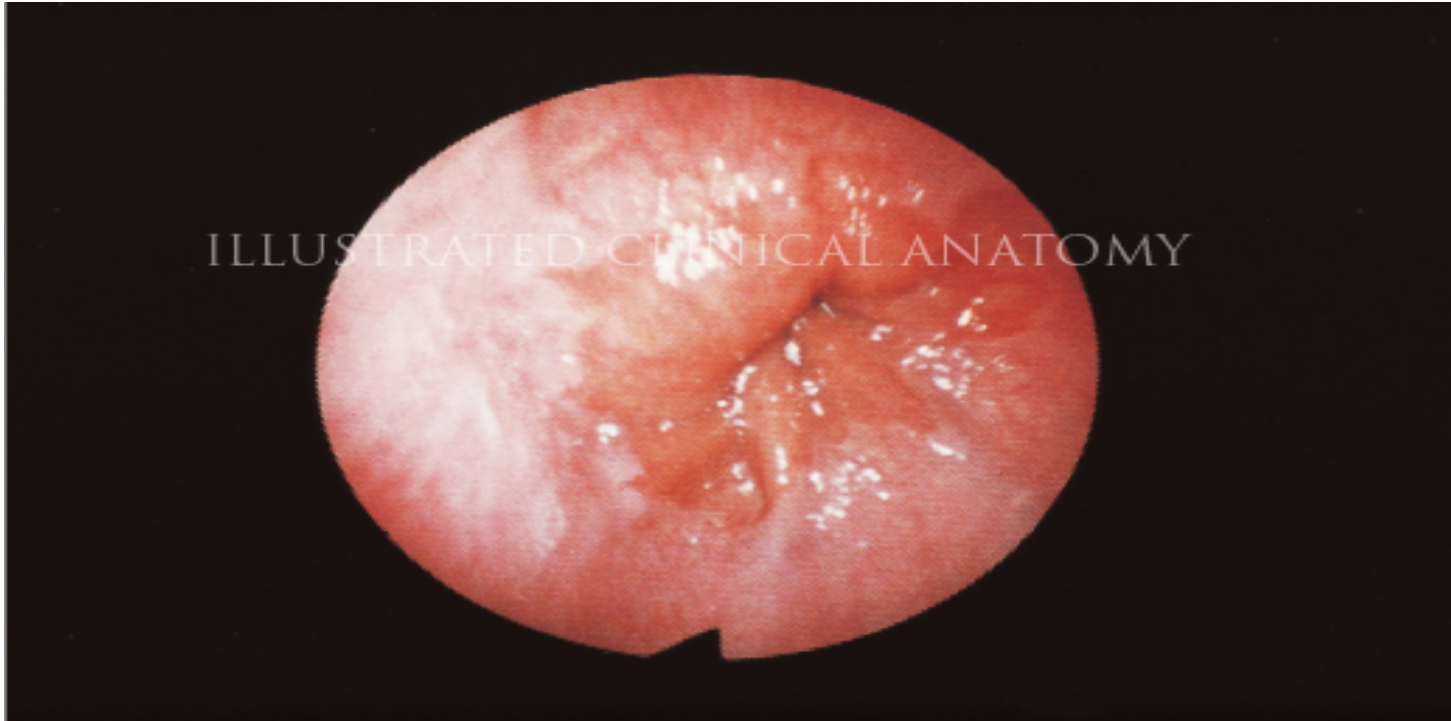
Πλακώδες επιθήλιο

Οισοφάγος

Γαστροοισοφαγική
συμβολή

Στόμαχος

This is a normal esophagus with the usual white to tan smooth mucosa seen at the left. The **gastroesophageal junction** (not an **anatomic sphincter**) is at the center, and the stomach is at the right. The upper GI endoscopic view of the transition from **squamous mucosa** to pink **columnar** mucosa is seen below.



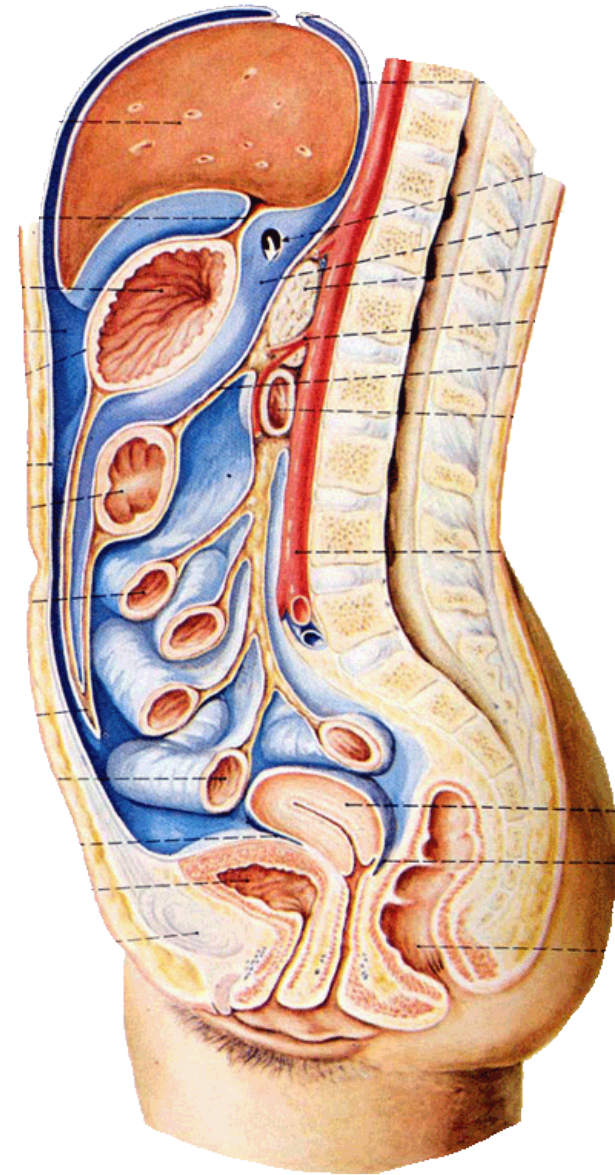
If acid from the stomach gets in here that's **heartburn**.

note the junction of the pale pink squamous epithelium of the oesophagus on the left with the redder stomach mucosa

PERITONEUM

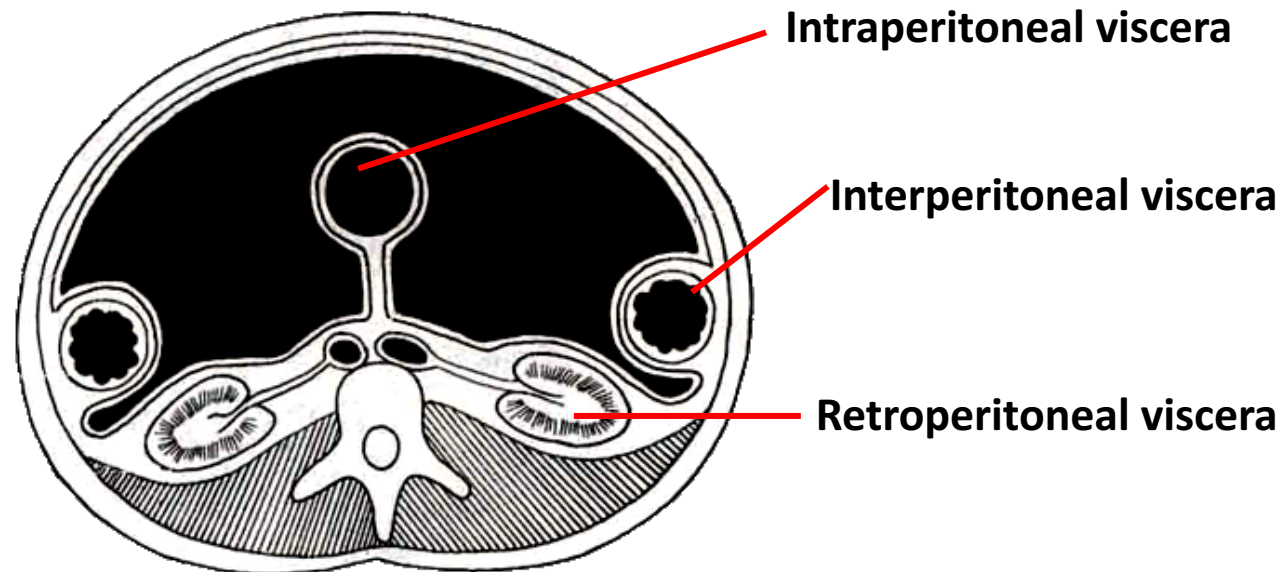
General features

- The peritoneum is a thin serous membrane that line the walls of the abdominal and pelvic cavities and cover the organs within these cavities
- **Parietal peritoneum** – lines the walls of the abdominal and pelvic cavities
- **Visceral peritoneum** – covers the organs
- **Peritoneal cavity** – the potential space between the parietal and visceral layer of peritoneum, in the male, is a closed sac, but in the female, there is a communication with the exterior through the uterine tubes, the uterus, and the vagina



The relationship between viscera and peritoneum

- **Intraperitoneal viscera** – viscera completely surrounded by peritoneum, example, stomach, superior part of duodenum, jejunum, ileum, cecum, vermiform appendix, transverse and sigmoid colons, spleen and ovary
- **Interperitoneal viscera** – most part of viscera surrounded by peritoneum, example, liver, gallbladder, ascending and descending colon, upper part of rectum, urinary bladder and uterus
- **Retroperitoneal viscera** – some organs lie on the posterior abdominal wall and are covered by peritoneum on their anterior surfaces only, example, kidney, pancreas, descending and horizontal parts of duodenum, middle and lower parts of rectum.

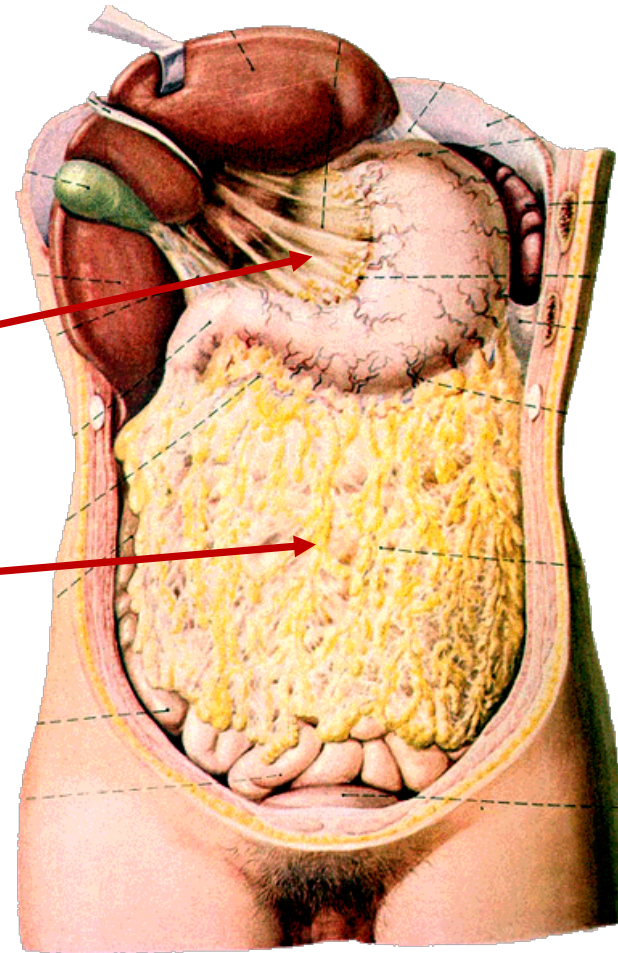


Structures which are formed by peritoneum

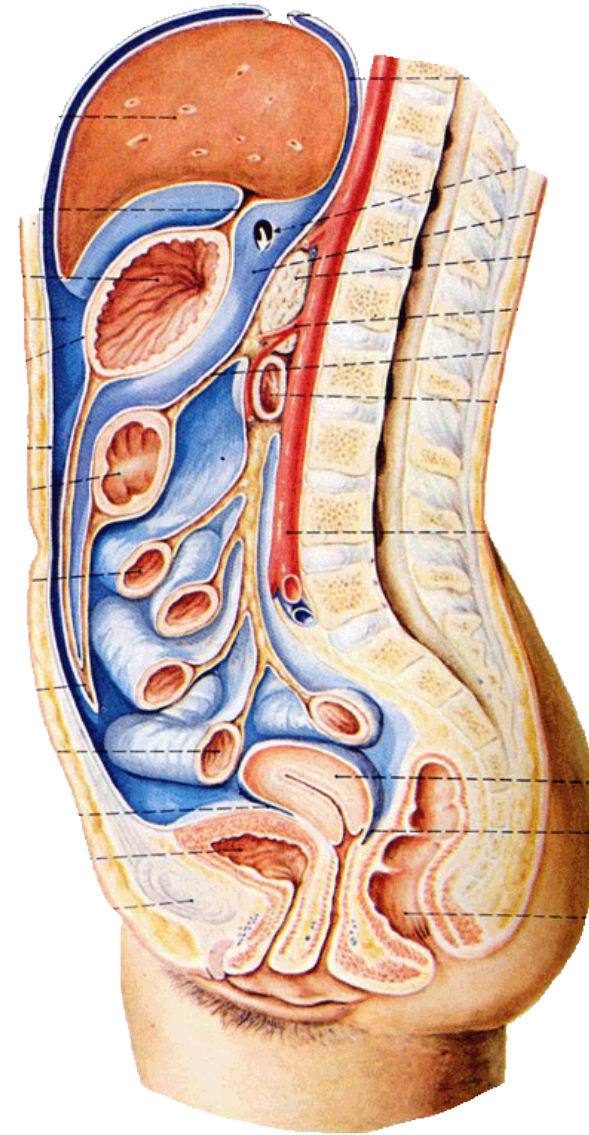
Omentum – two-layered fold of peritoneum that extends from stomach to adjacent organs

Lesser

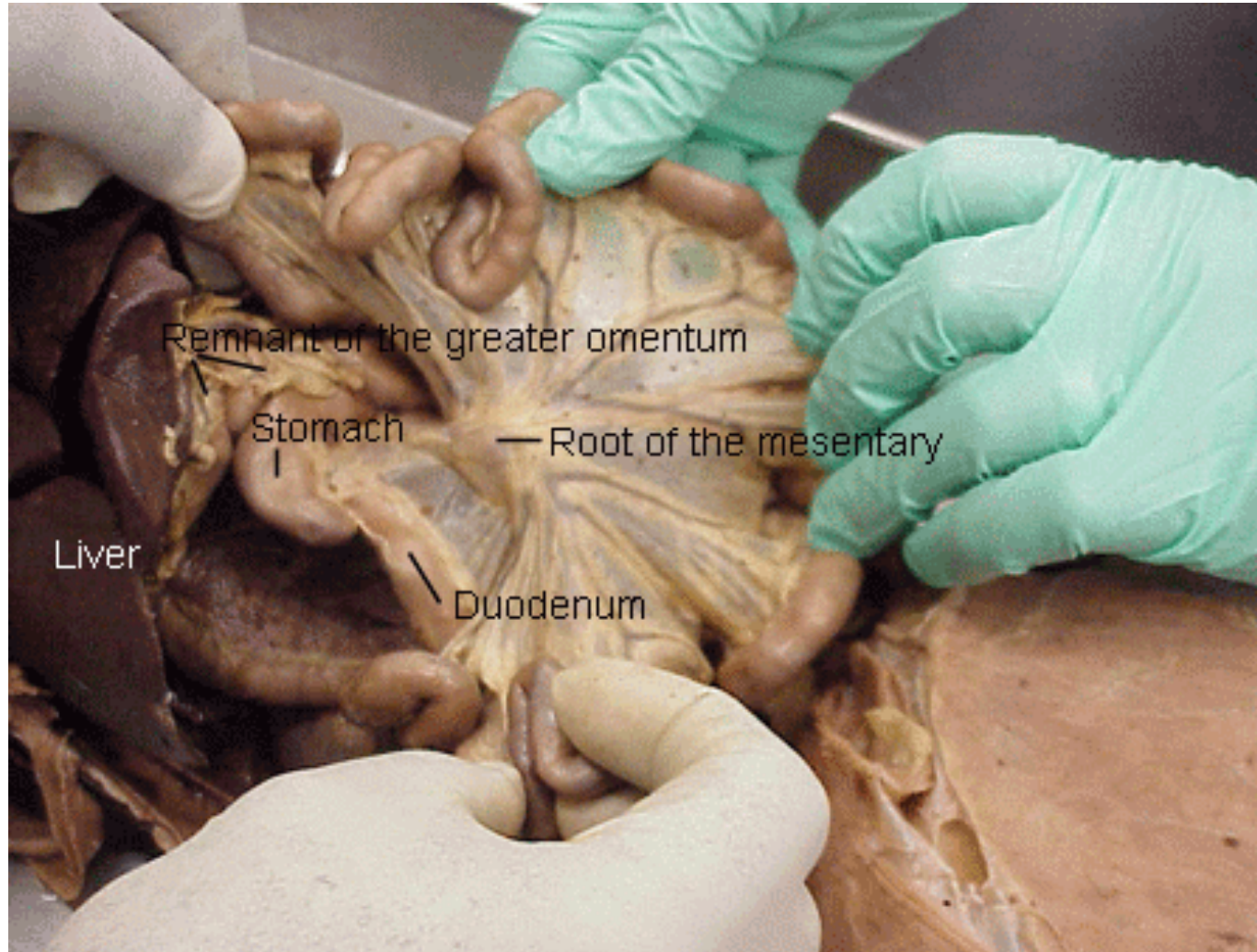
Greater



Mesenteries or mesocolons –
two-layered fold of peritoneum
that attach part of the
intestines to the posterior
abdominal wall



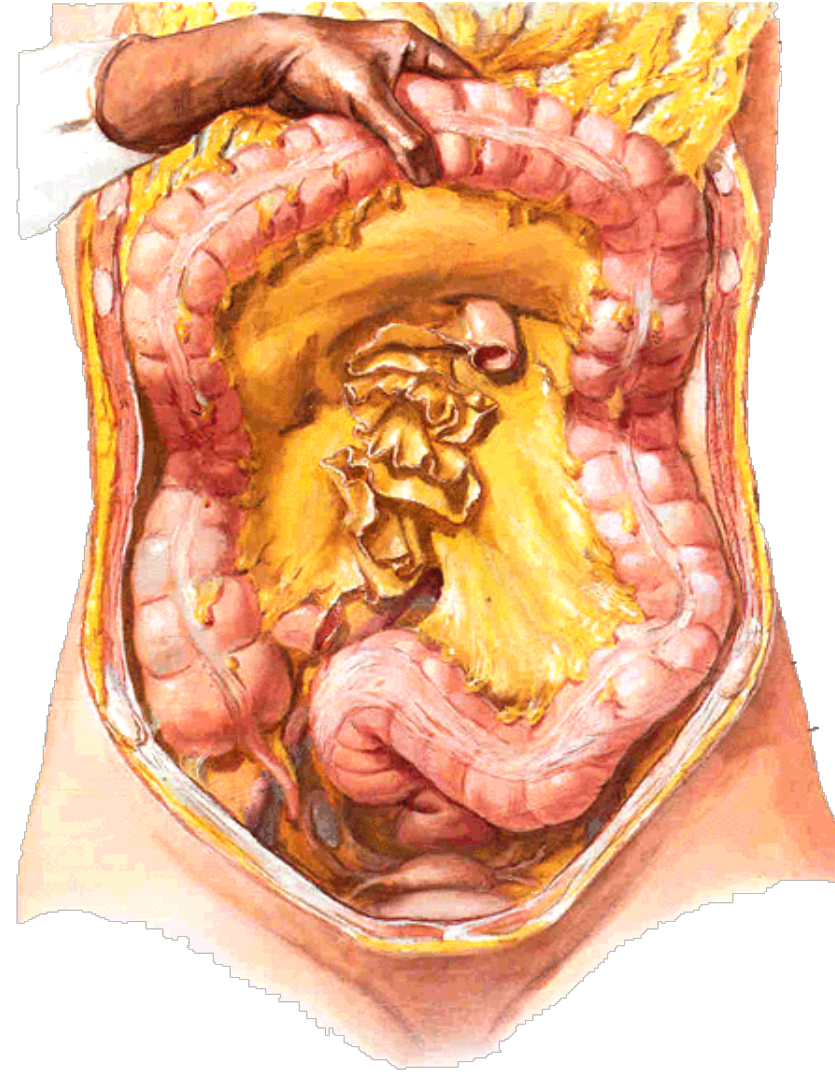
Mesentery



- Supports 20' of small intestine – hold in place yet allows movement
- Allows blood vessels and nervous system to enter and leave

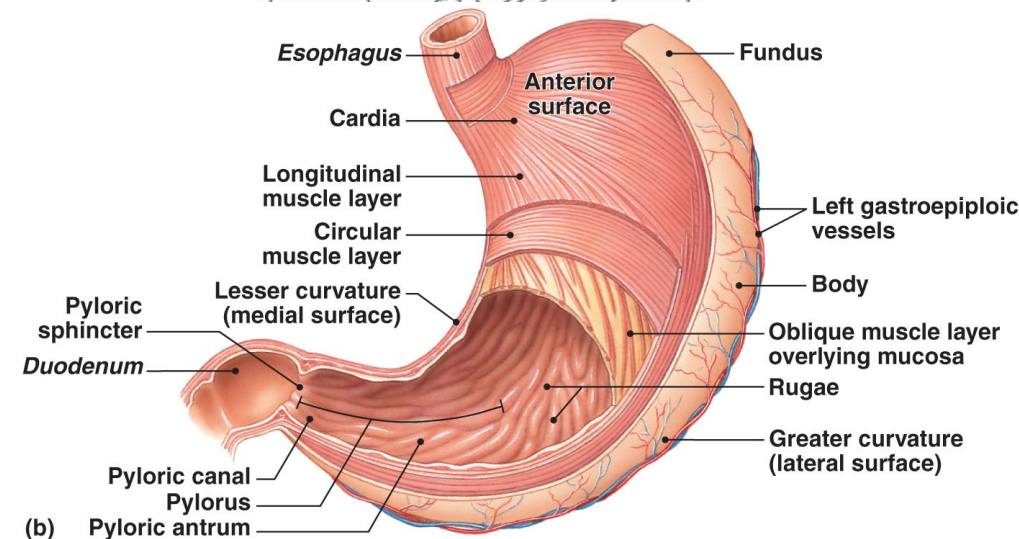
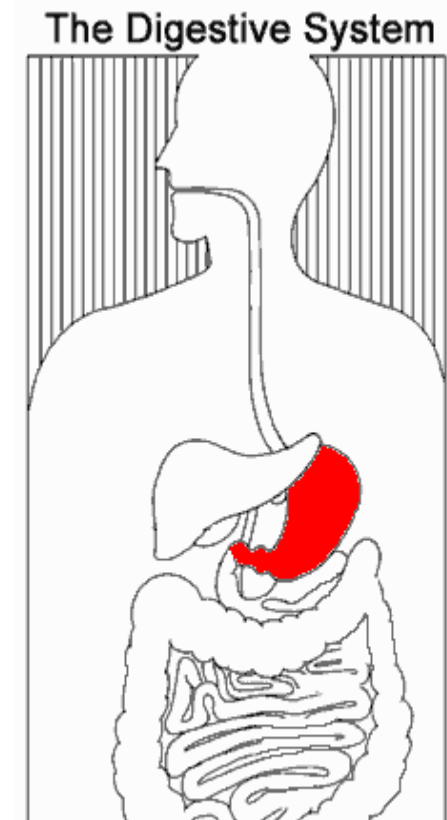
Transverse mesocolon – a double fold of peritoneum which connects the transverse colon to the posterior abdominal wall

Sigmoid mesocolon – inverted V-shaped, with apex located in front of left ureter and division of common iliac artery



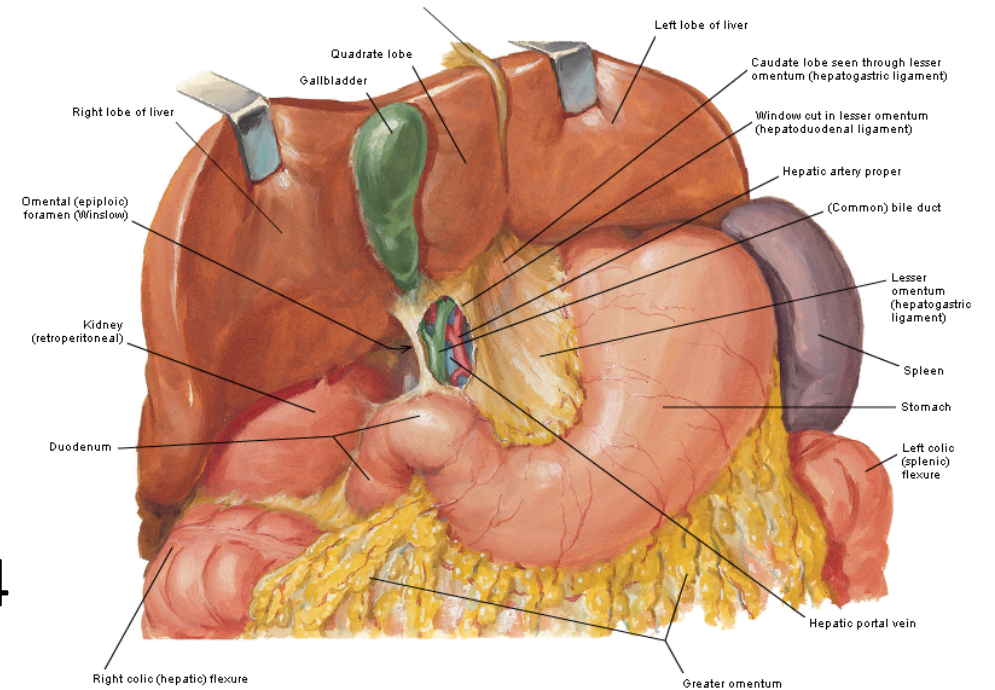
Stomach

- J-shaped muscular bag that stores the food you eat, breaks it down into tiny pieces.
- Mixes food with **Digestive Juices** that contain enzymes to break down **Proteins and Lipids**.
- **Acid (HCl)** in the stomach Kills Bacteria.
- Food found in the stomach is called Chyme.

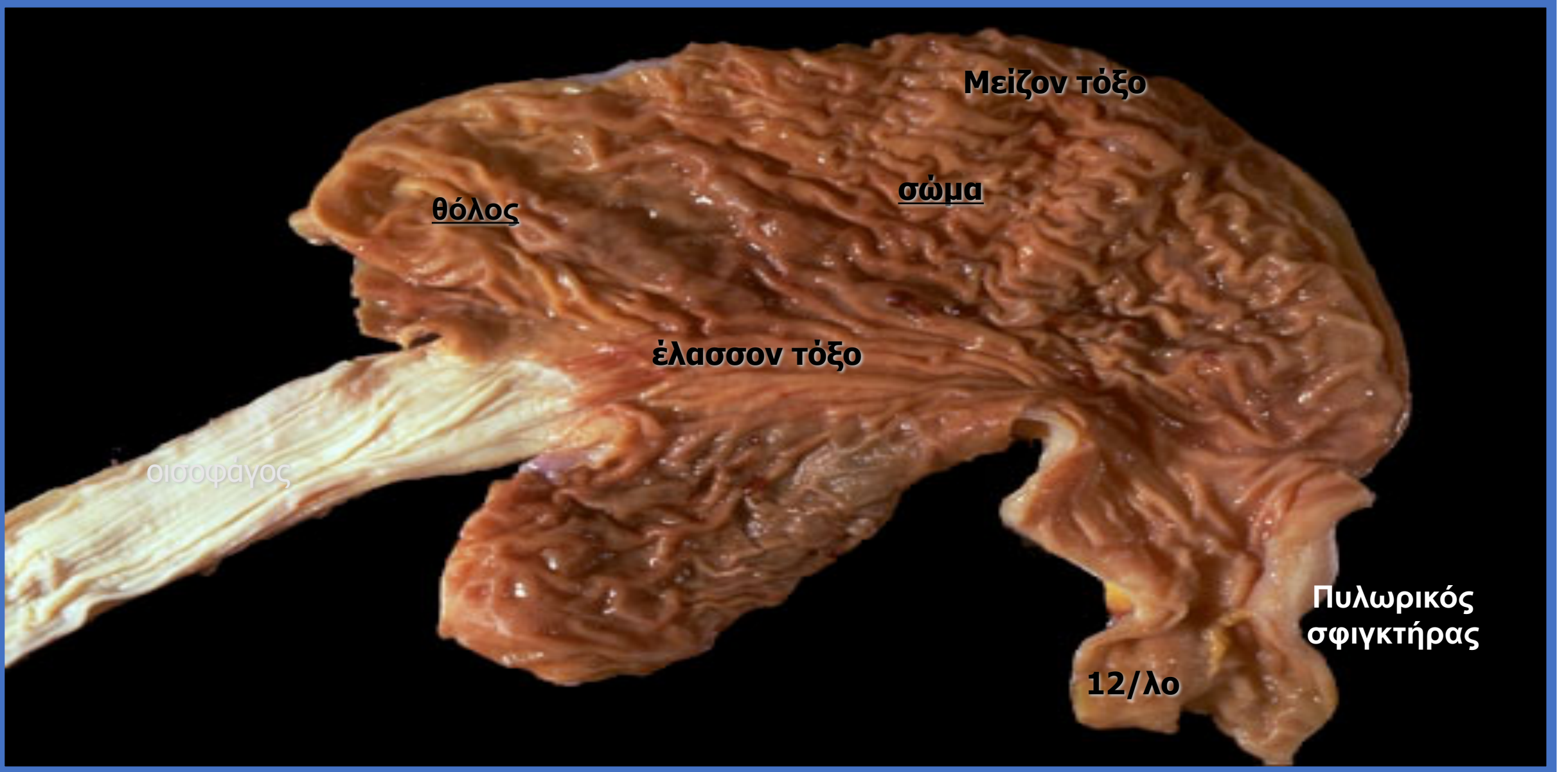


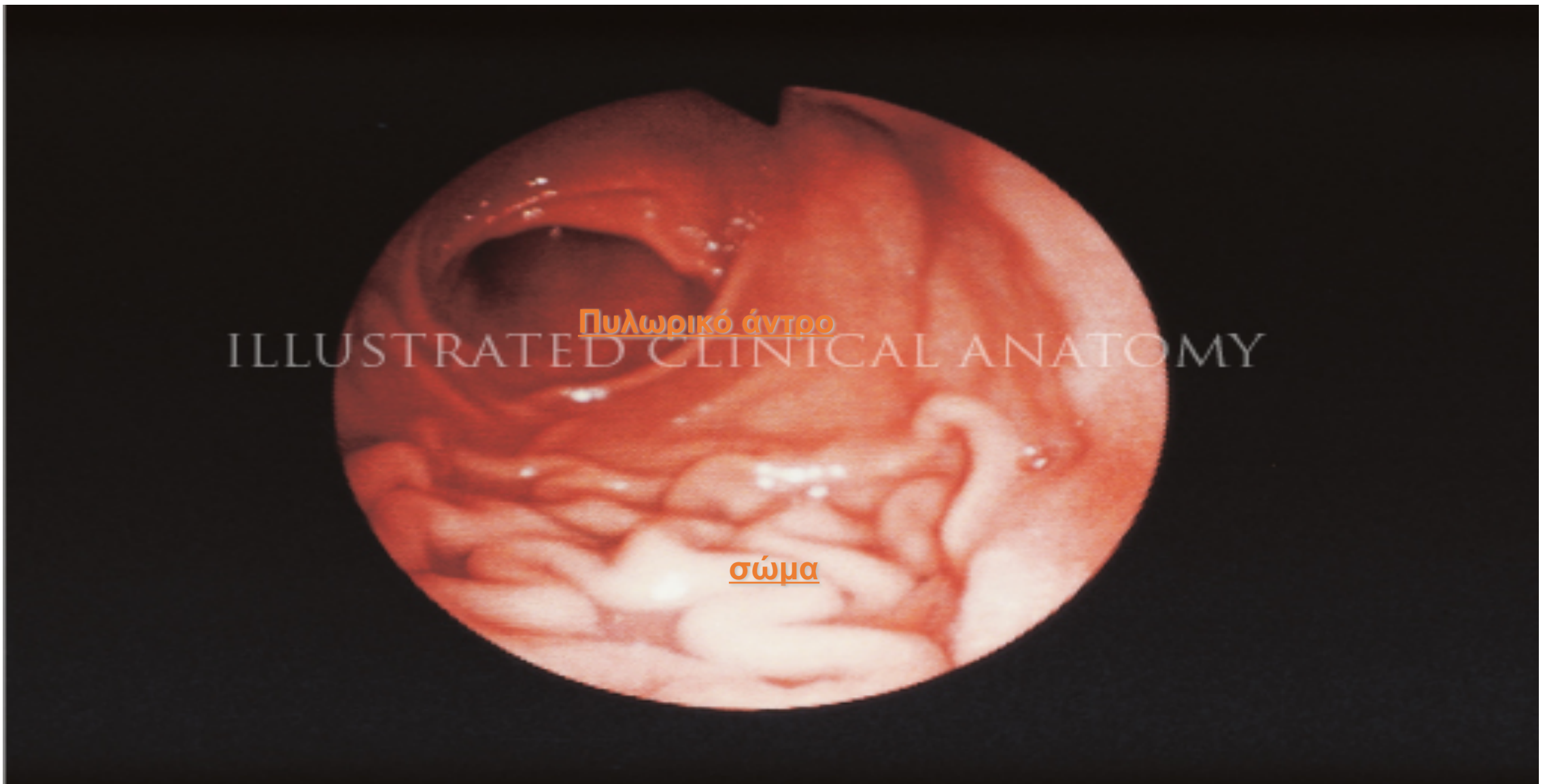
Stomach

- Function is to store food, mix food with gastric secretions, and empty contents into small intestine.
- Absorbs only small amounts of water, alcohol, electrolytes and certain drugs.
- Usual length of time food in stomach: 3-4 hrs.



STOMACH



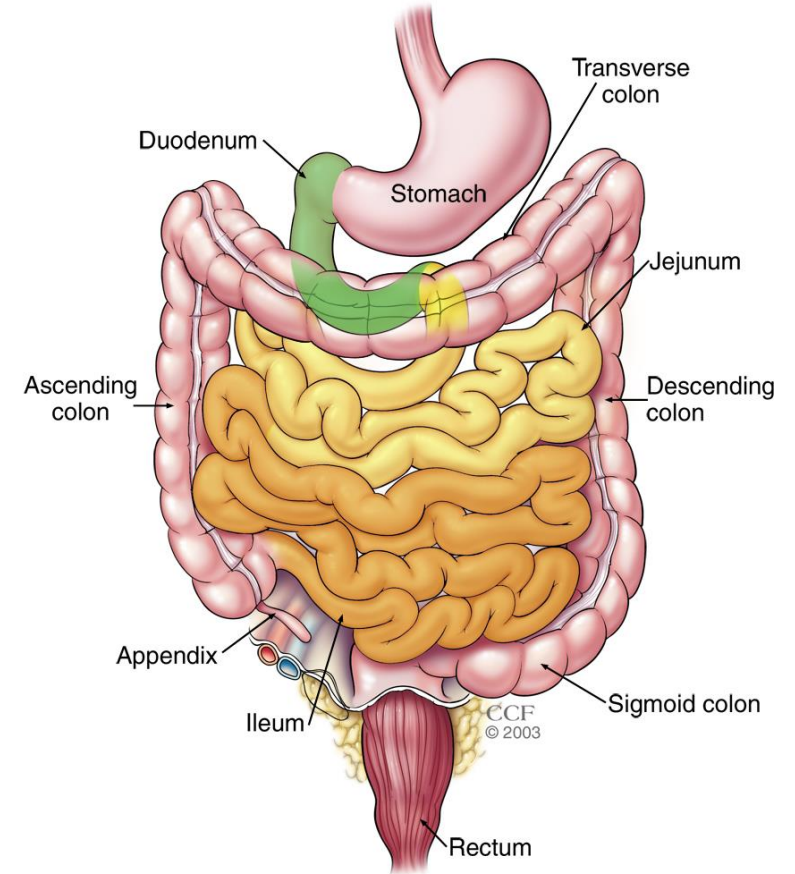


Gastric body and antrum:

**endoscopic view showing normal rugal folds in the body of the stomach –
the distal antrum is smooth**

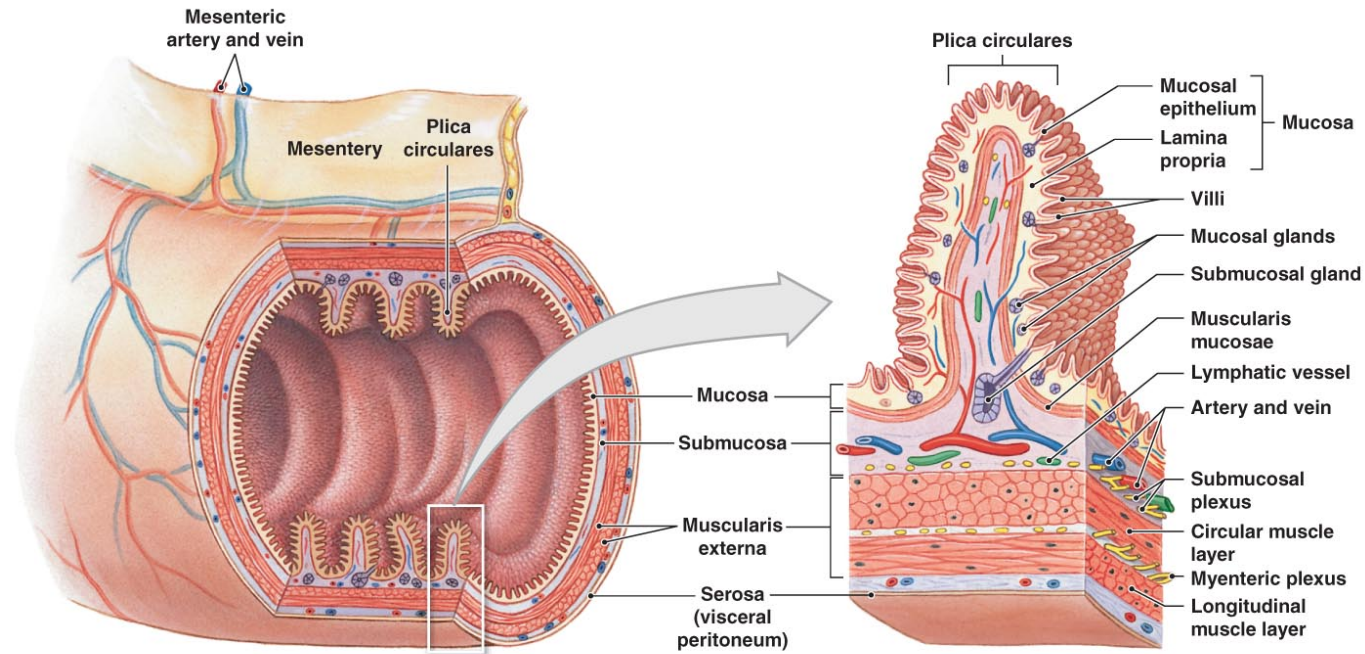
Small intestine

- Functions are digestion and absorption.
- Digestion completed in small intestine, where **carbohydrates** and **fats** are broken-down.
- ~23 ft. long, extends from pylorus to ileocecal valve. Composed of **duodenum**, **jejunum**, **ileum**.

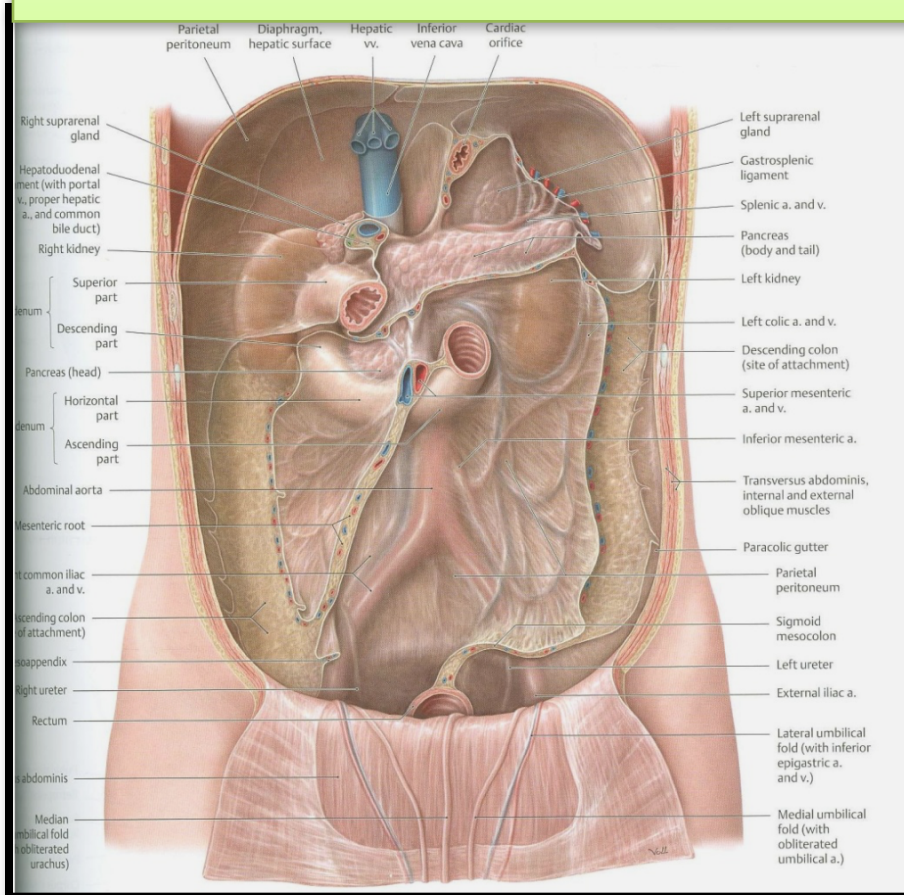


Small Intestine

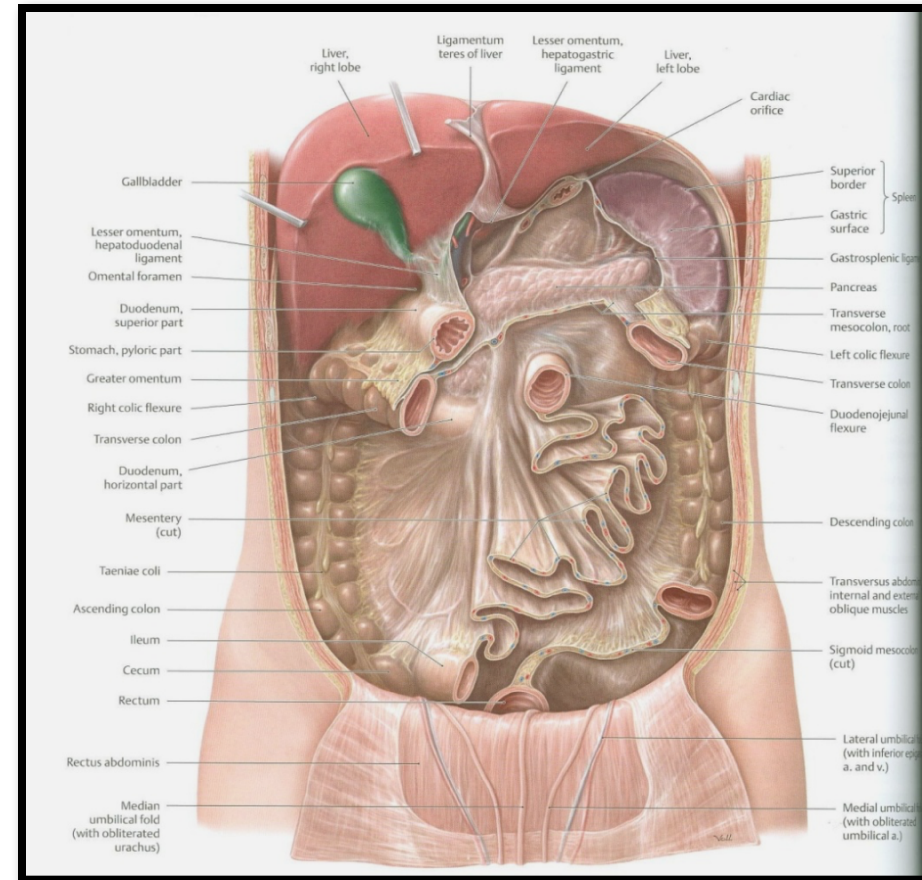
- Small intestines are roughly **7** meters long
- Lining of intestine walls has finger-like projections called **villi**, to increase surface area.



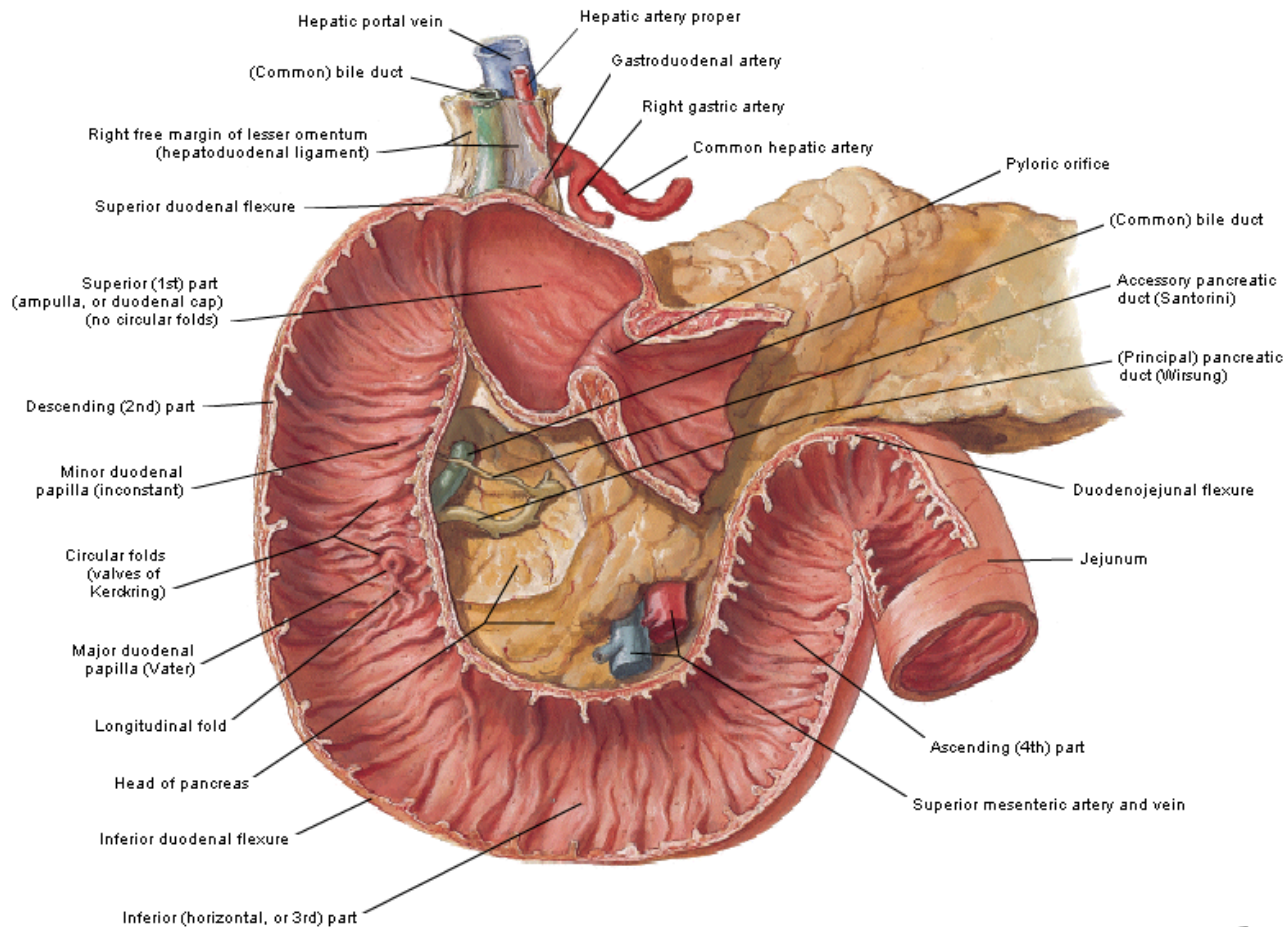
FIXED (Retro peritoneal) PART (NO MESENTERY) DUODENUM



FREE (MOVABLE) PART (WITH MESENTERY) JEJUNUM & ILEUM

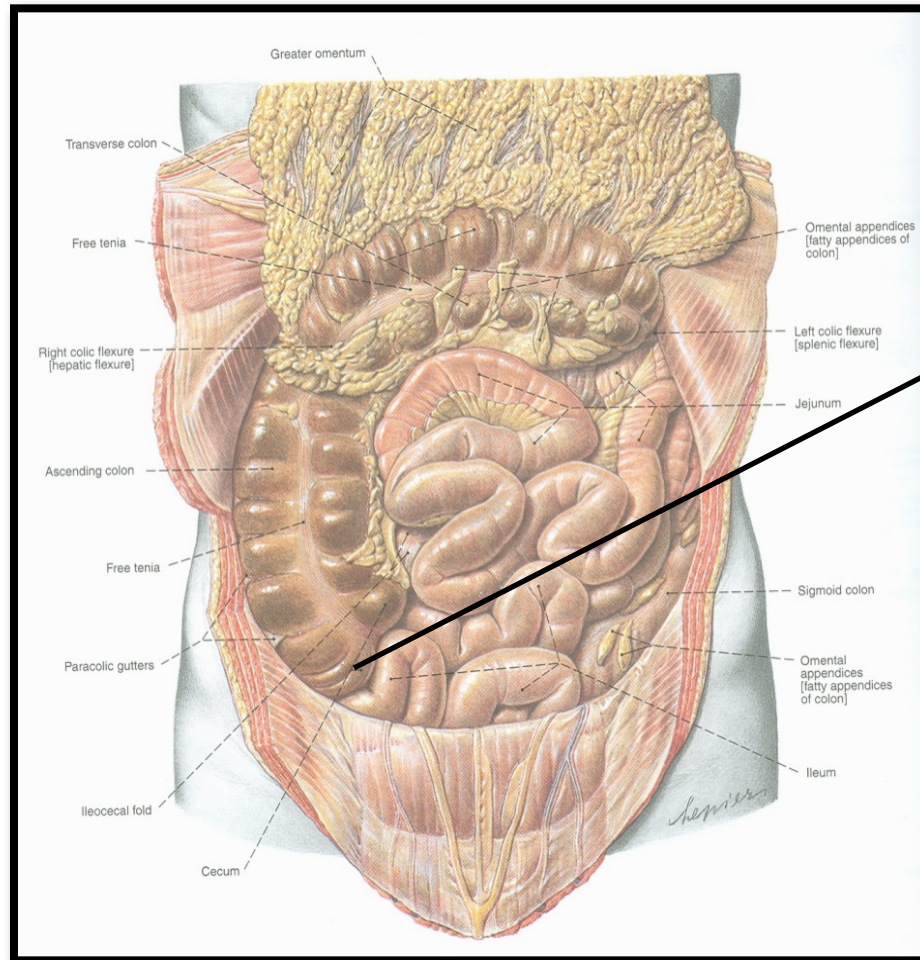


PARTS



- The duodenum is divided into (4) parts:
- 1st : **Superior.**
- 2nd : **Descending (vertical).**
- 3rd : **Inferior (Horizontal)**
- 4th : **Ascending**

JEJUNUM & ILEUM



□ **SHAPE:** Coiled tube

□ **LENGTH:** 6 meters (20 feet)

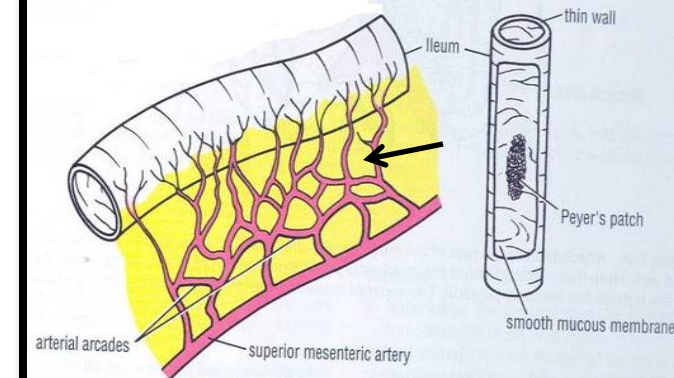
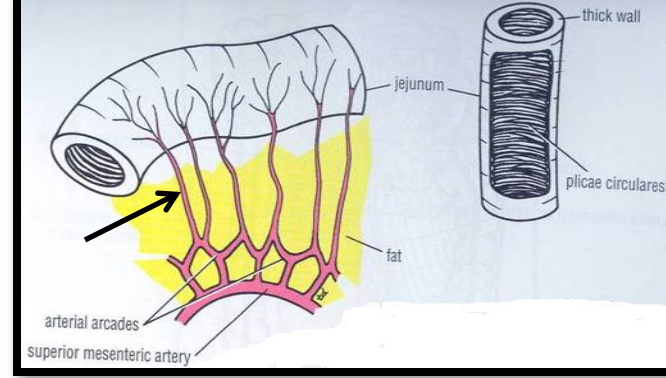
□ **BEGINNING:** at Duodeno-jejunal flexure

□ **TERMINATION:** at Ileocaecal junction

□ **EMBRYOLOGICAL ORIGIN:** Midgut

□ **Blood SUPPLY:** Superior mesenteric A & V

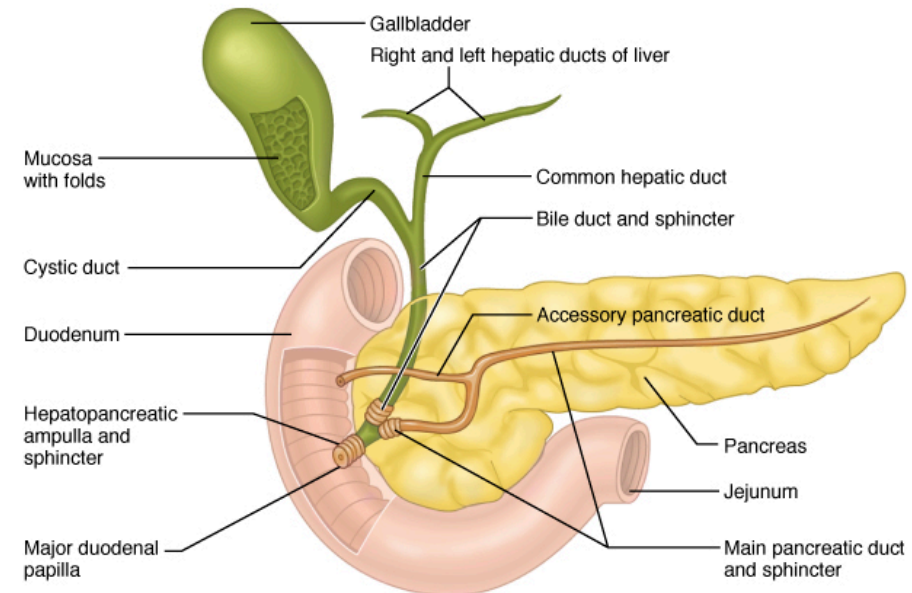
□ **LYMPHATIC DRAINAGE:** Superior mesenteric lymph nodes



	JEJUNUM	ILEUM
LENGTH	Shorter (proximal 2/5) of SI	Longer (distal 3/5) of SI
DIAMETER	Wider	Narrower
WALL	Thicker (more plicae circulares)	Thinner (less plicae circulares)
APPEARANCE	Dark red (more vascular)	Light red (less vascular)
VESSELS	High & Less arcades (long terminal branches)	Low & More arcades (short terminal branches)
MESENTERIC FAT	Small amount & away from intestinal border	Large amount & close to intestinal border

Accessory Organs The Glands

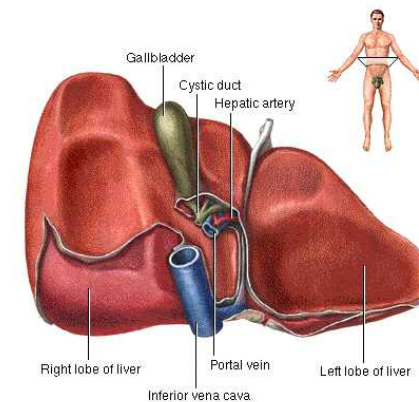
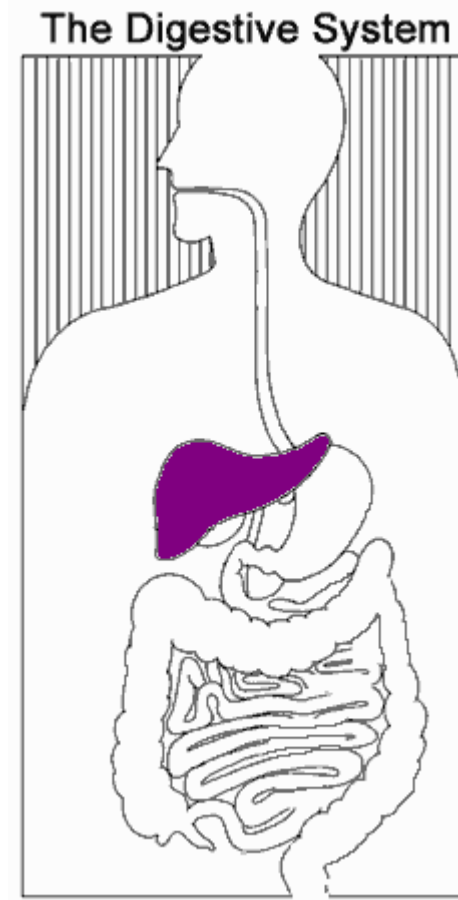
- Not part of the path of food, but play a critical role.
- Include: Liver, gall bladder, and pancreas



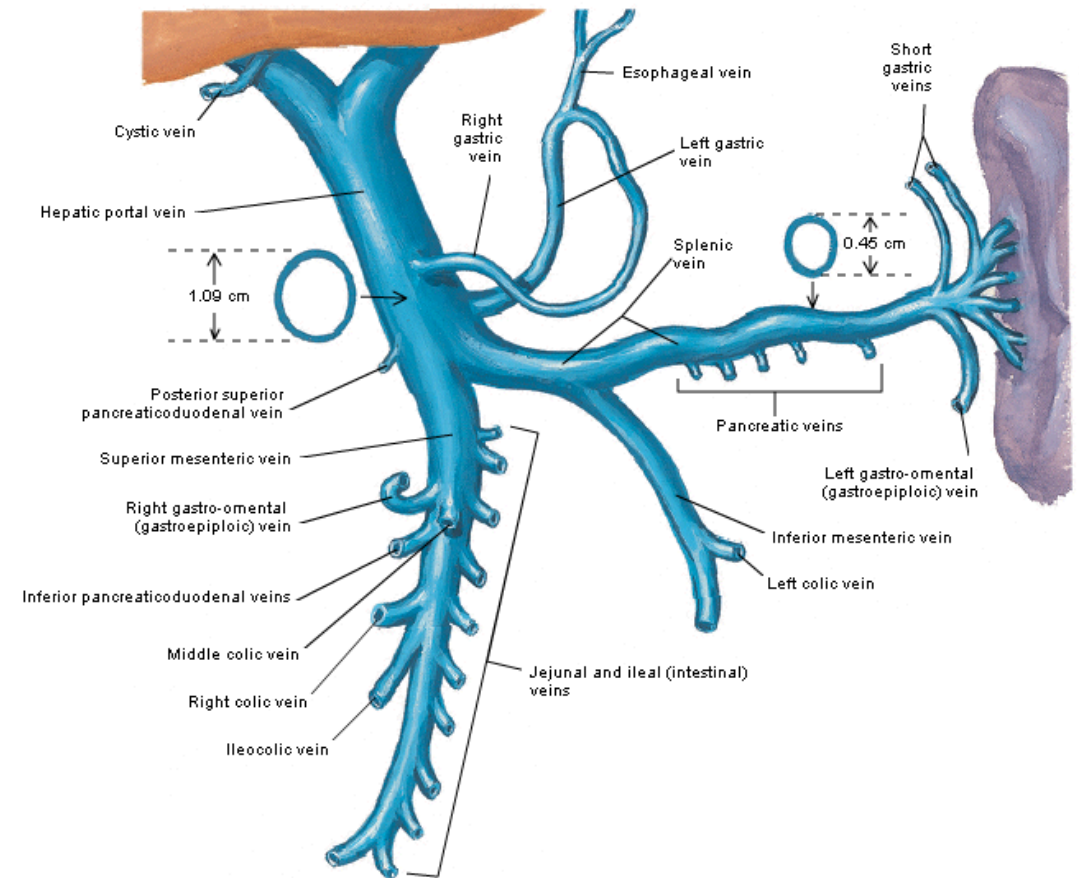
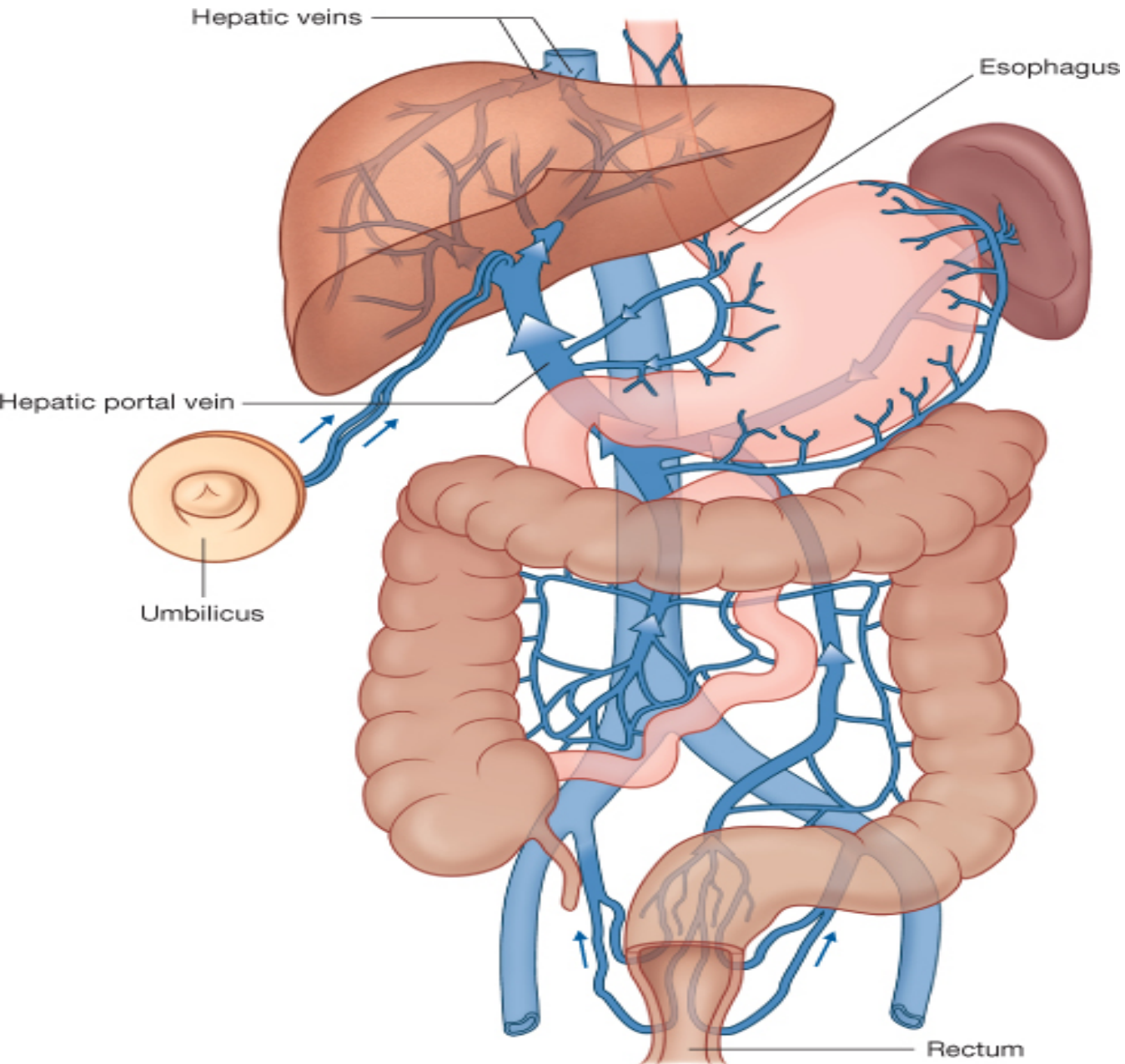
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Liver

- Directly affects digestion by producing **bile**
 - Bile helps digest **fat**
 - filters out **toxins** and waste including **drugs** and **alcohol and poisons**.

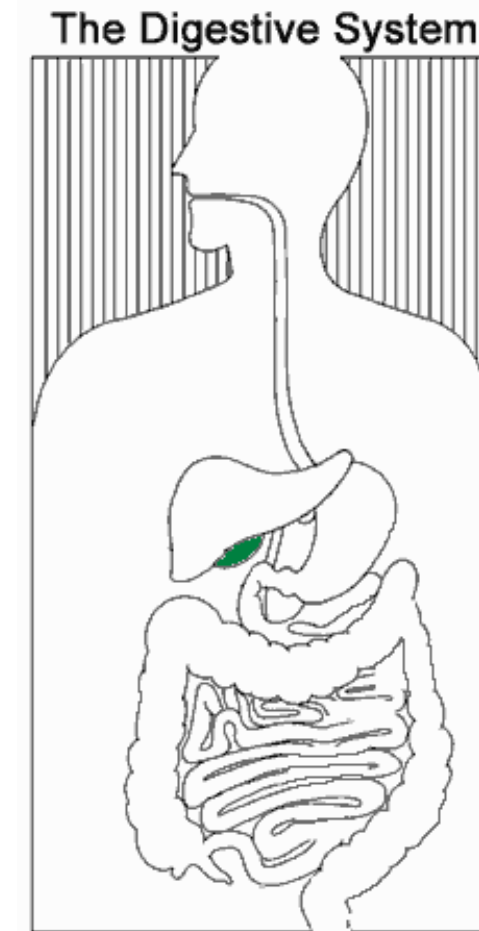


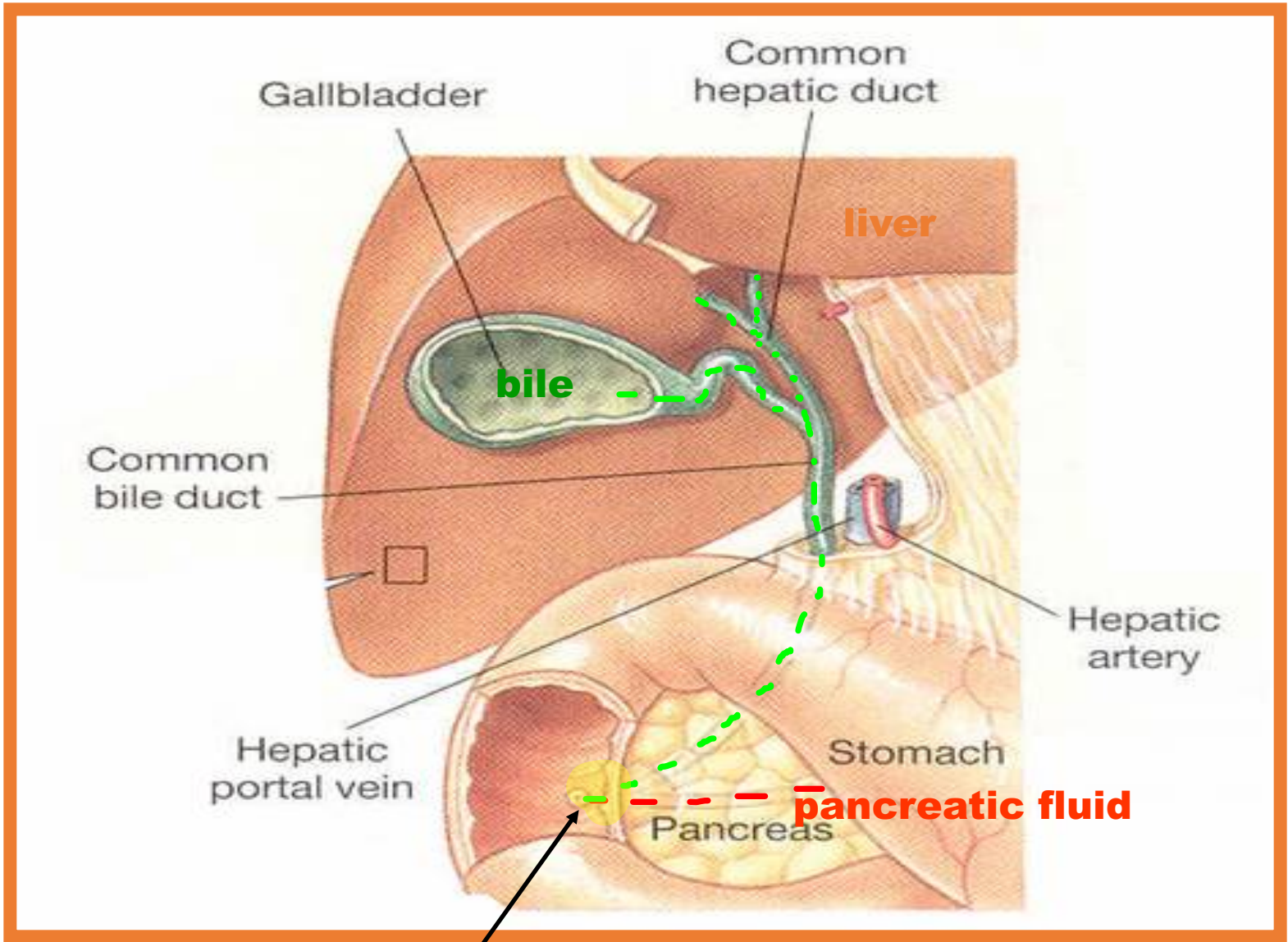
PORTAL VEIN



Gall Bladder

- Stores **bile** from the liver, releases it into the **small intestine**.



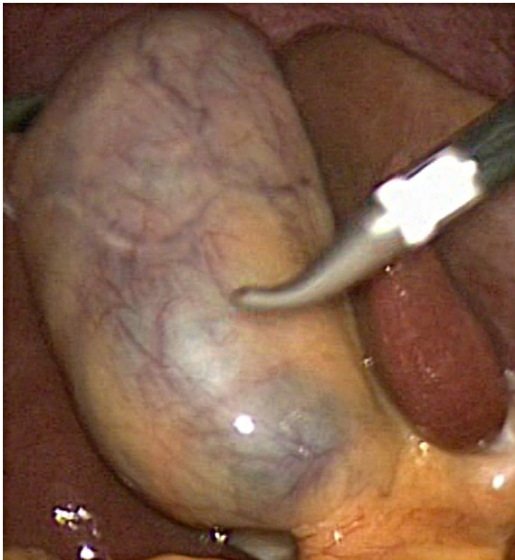
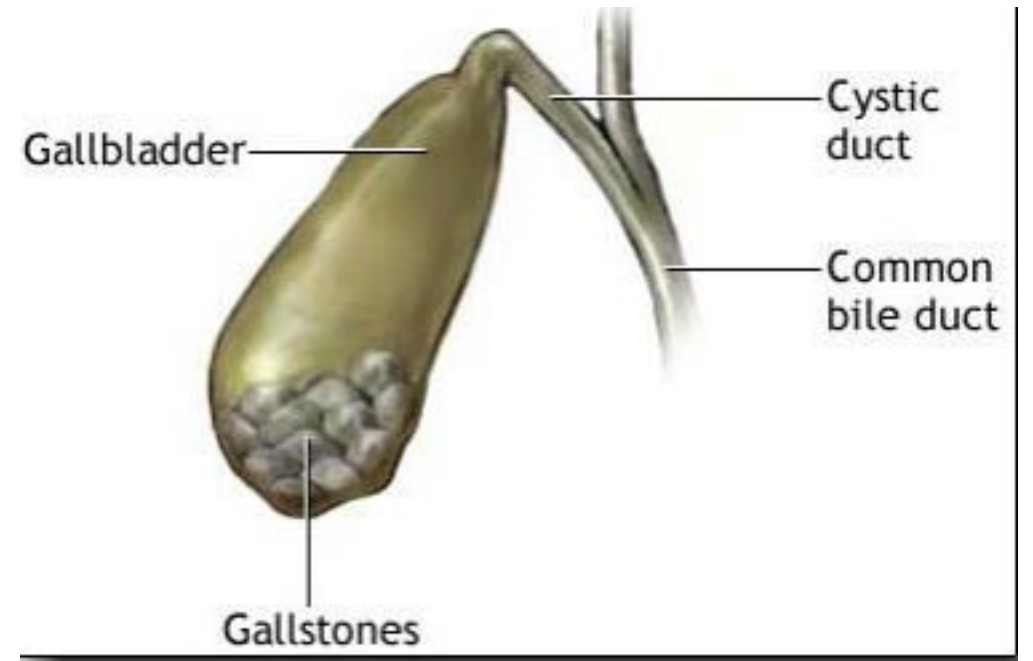


A tonically contracted **sphincter** (the *sphincter of Oddi*) keeps **pancreatic fluid** and **bile** (produced in liver and stored in gallbladder) from entering the small intestine except during a meal.

sphincter of Oddi

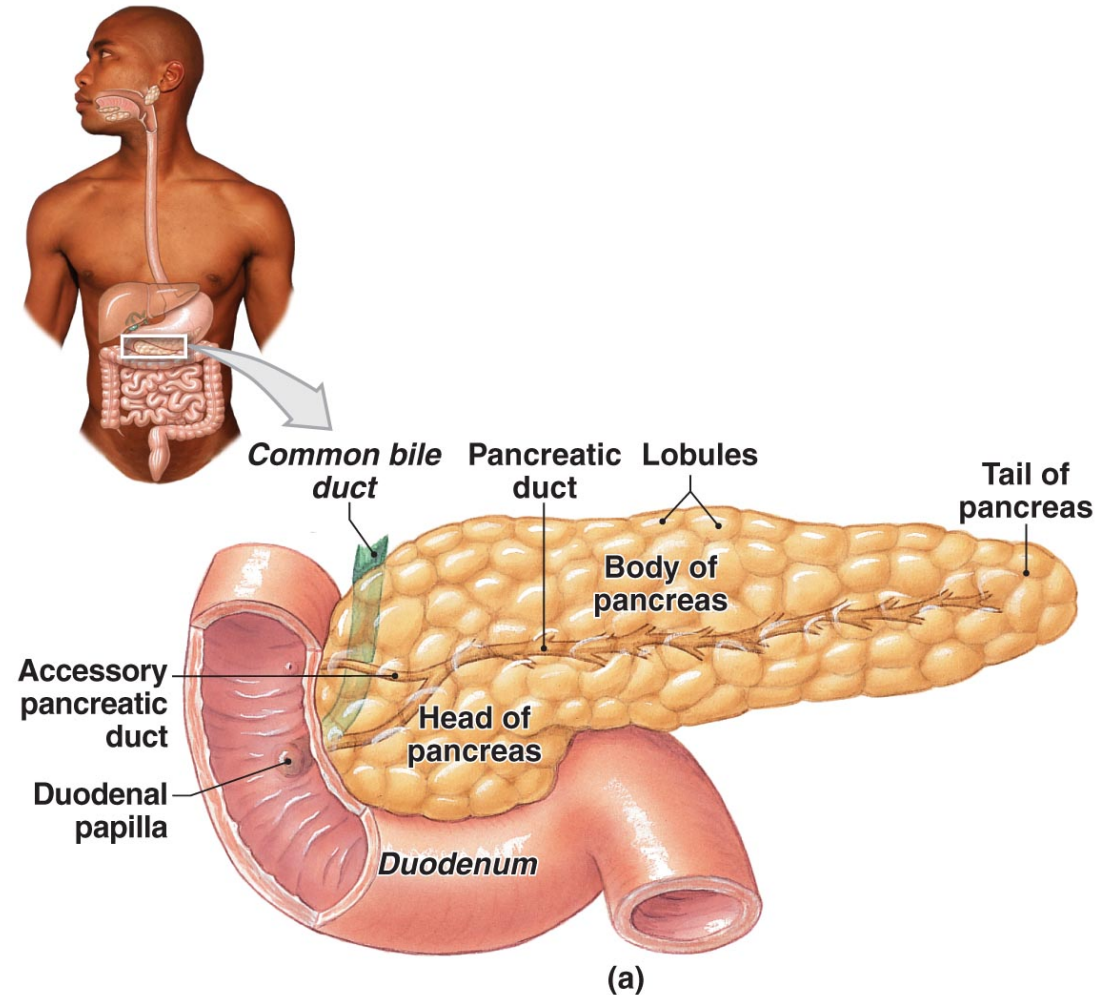
Gall Bladder

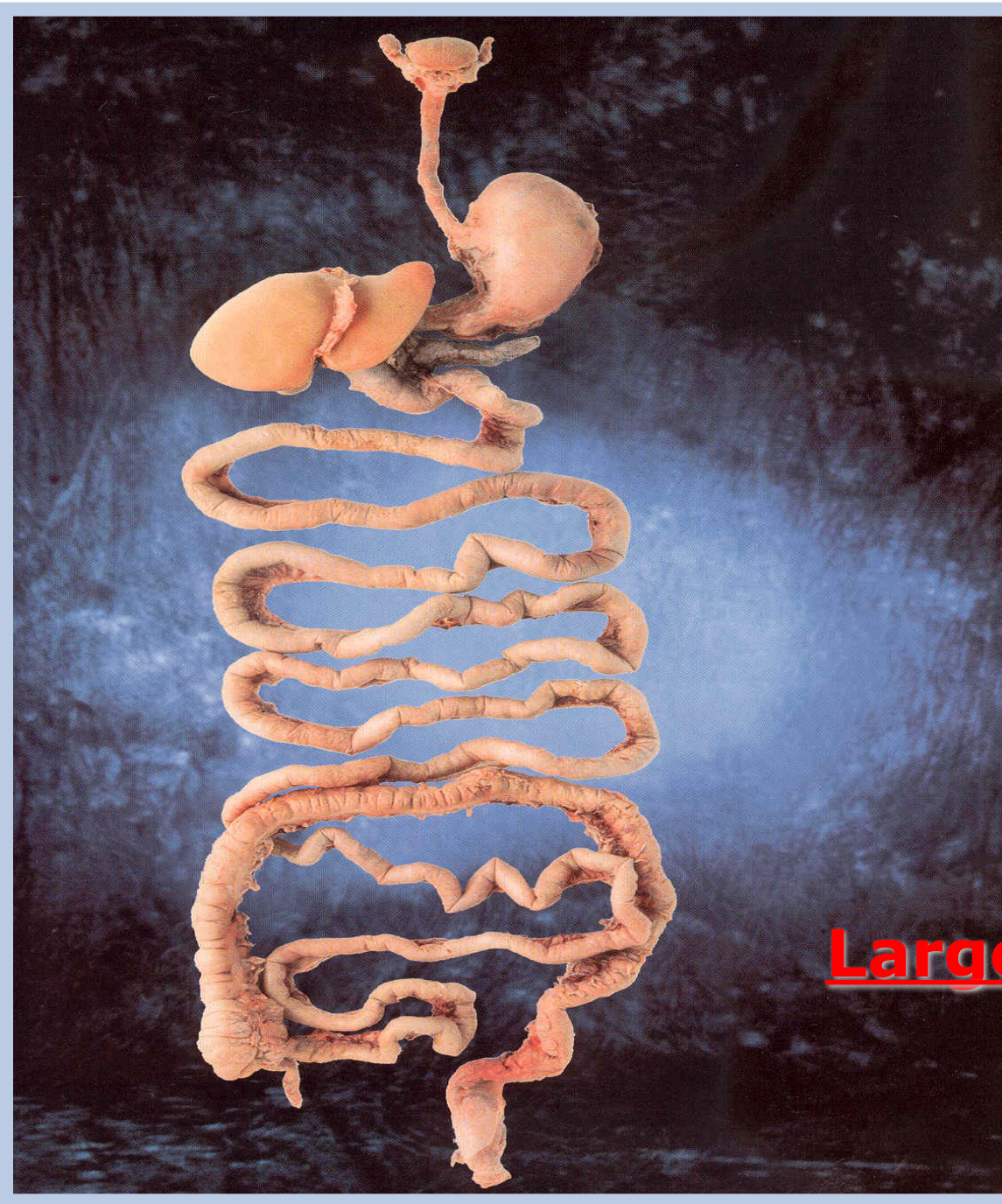
- Fatty diets can cause **gallstones**



Pancreas

- Produces digestive enzymes to digest **fats, carbohydrates** and **proteins (EXOCRINE FUNCTION)**
- Regulates blood sugar by producing **insulin (ENDOCRINE FUNCTION)**

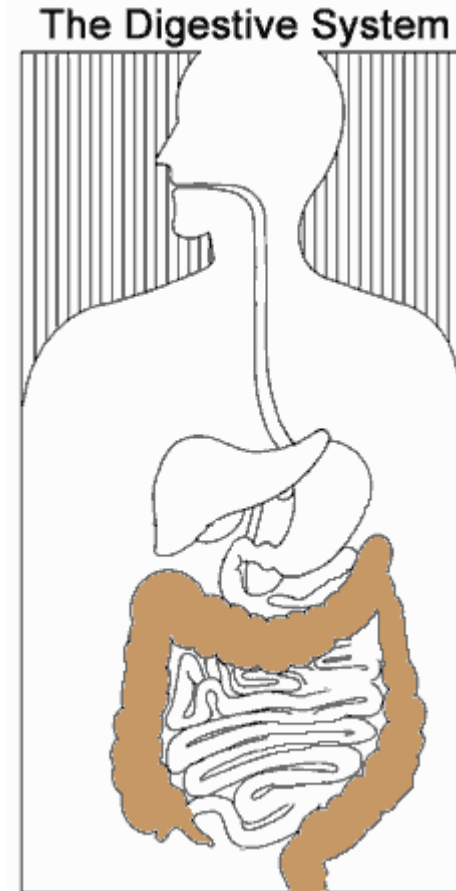




Large intestine

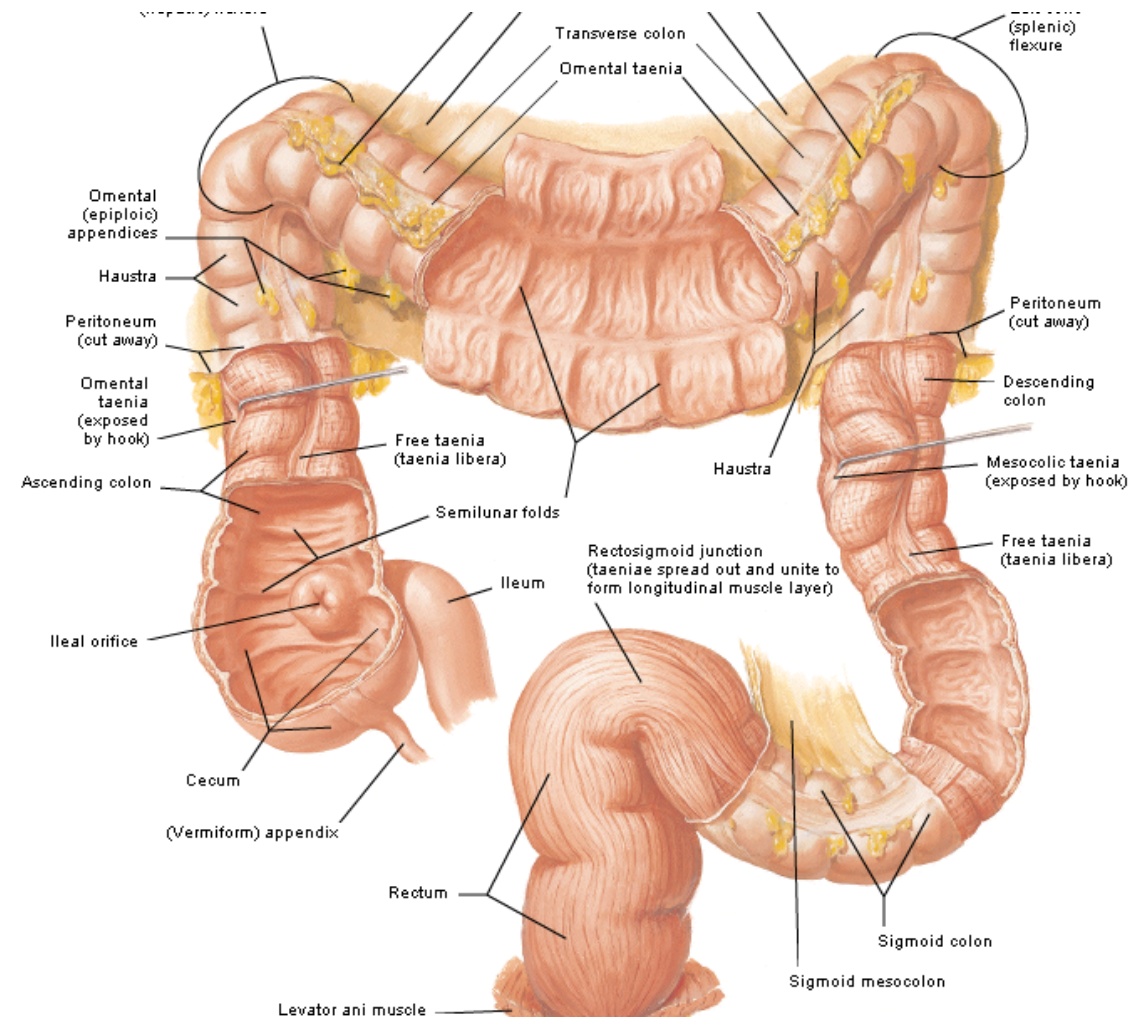
Large Intestine

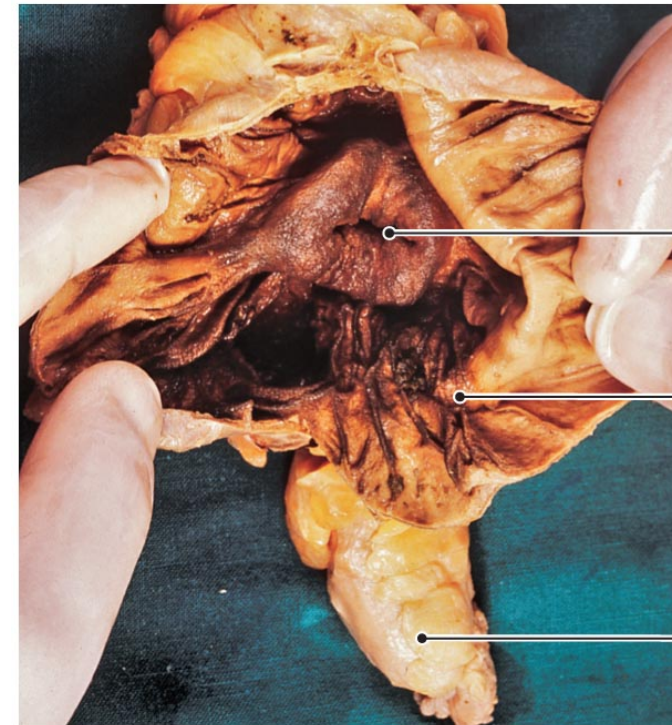
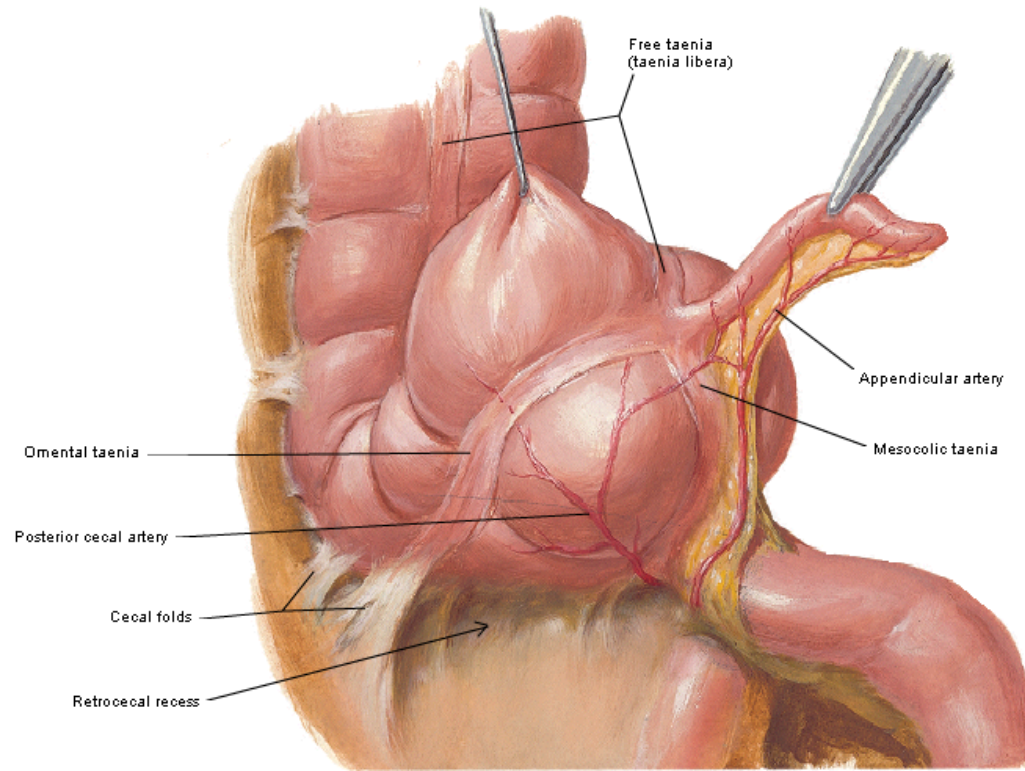
- About **1.5 meters** long
- Accepts what small intestines don't absorb
- **Rectum** (short term storage which holds feces before it is expelled).



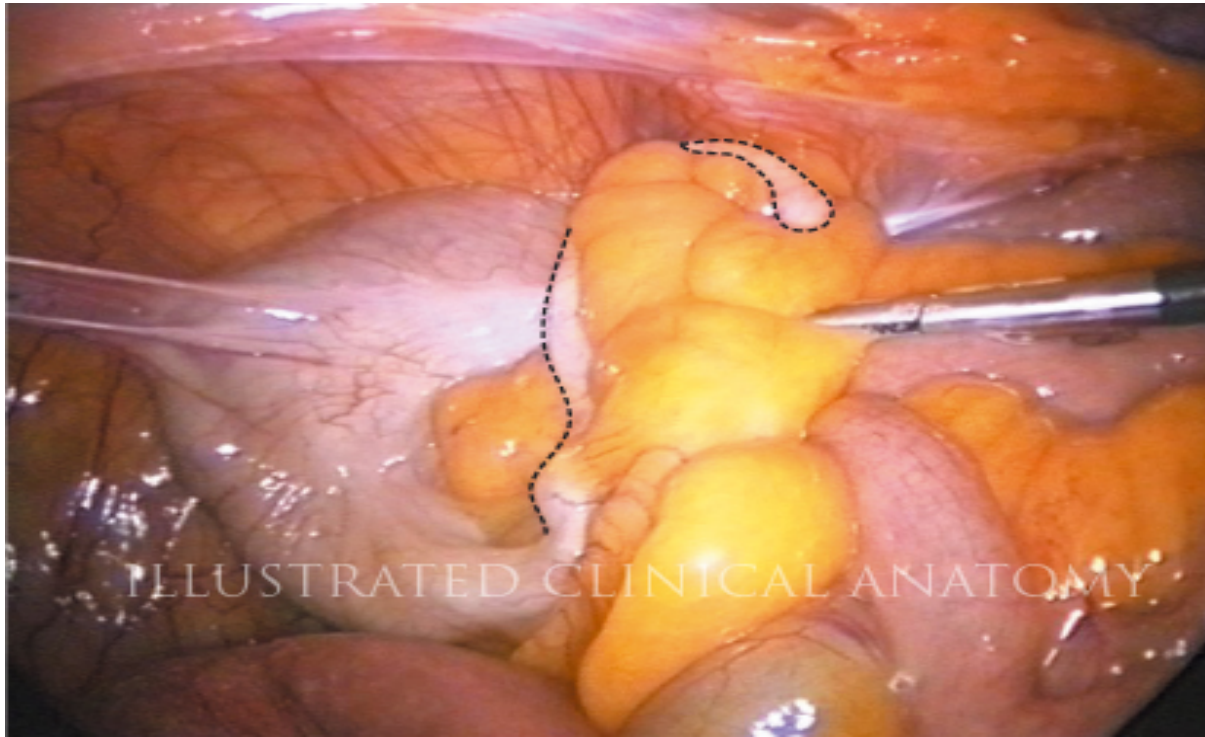
Large intestine

- Function is absorption of water and electrolytes, elimination (forms feces and serves as reservoir)
- 4 parts: **cecum** (and appendix), **colon** (ascending colon on the right side, transverse, descending colon on the left side, sigmoid), **rectum, anus.**



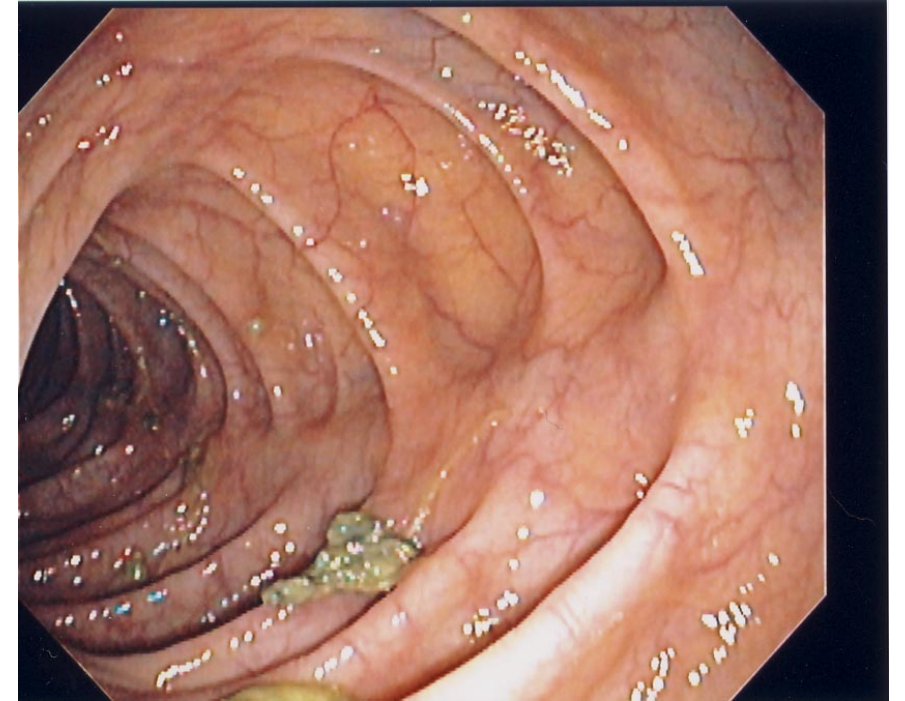
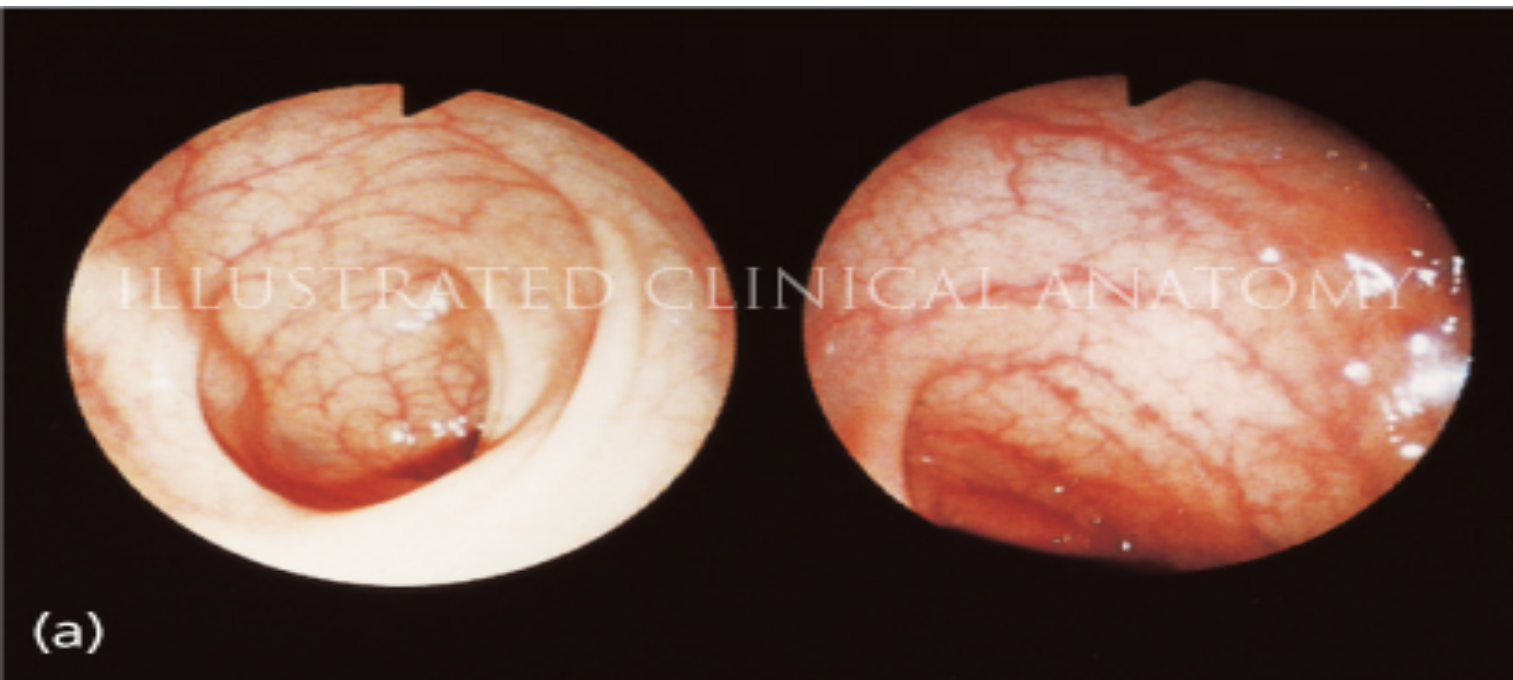


(b) Cecum and appendix



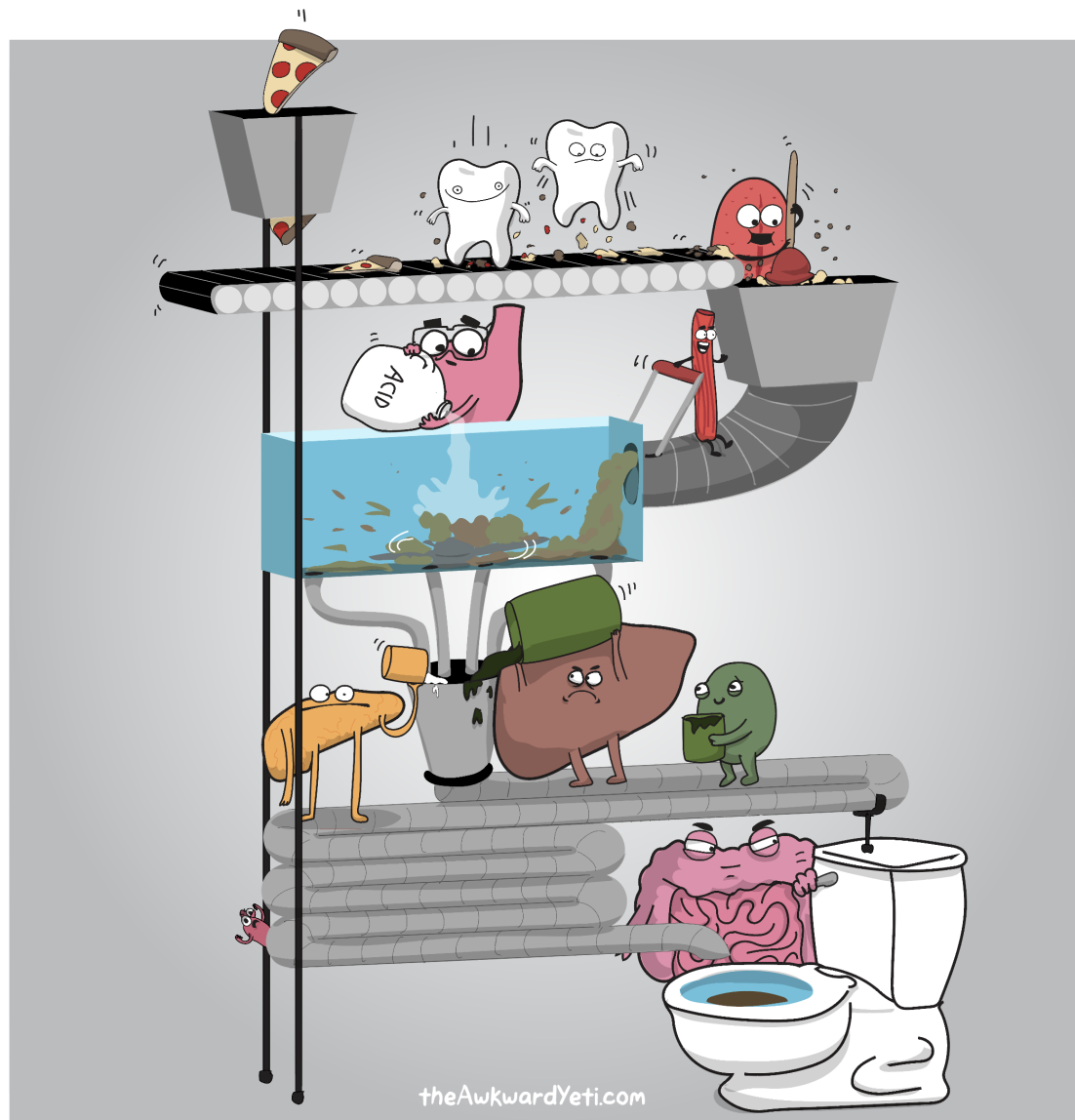
Laparoscopic view of normal appendix
(outlined),
elevated from a pelvic position





Colonoscopic view of left colon.

The mucosa is indented by contracting circular muscle



Thank you for your attention