

Business

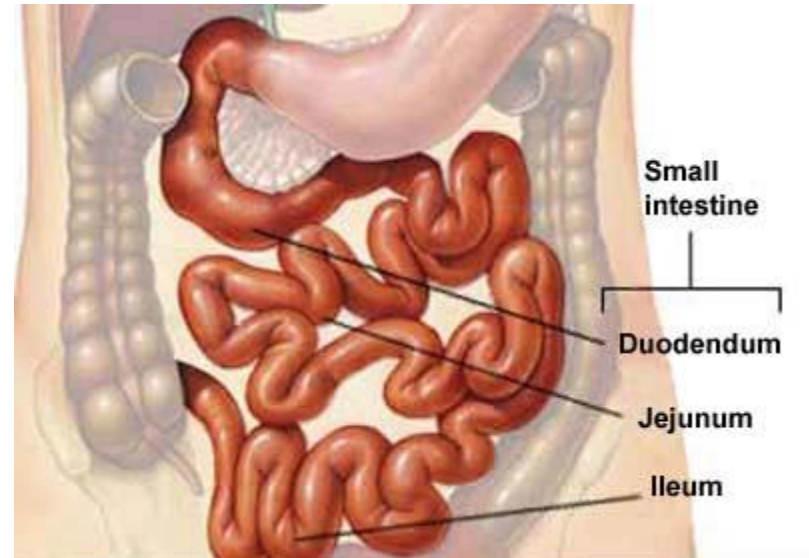
- *Reminder: No class Monday (Memorial Day)*
- **Midterm 2 is Tuesday 5/28/13**
 - Optional review session tomorrow @ 5pm
- *Homework due in Lab*
 1. PreLab 8 (1pt)
 2. Replace a Missing Assignment (4 pts)
 - Homework page 17

Digestive System

Part 2

Digestive System

- Small intestine
 - Major organ of digestion and absorption
 - 2 - 4 m long; from pyloric sphincter to ileocecal valve
 - Subdivisions
 - Duodenum
 - Jejunum
 - Ileum



Digestive System

- Small intestine
 - Structural modifications
 - Villi
 - Intestinal glands
 - Mucosa
 - Submucosa

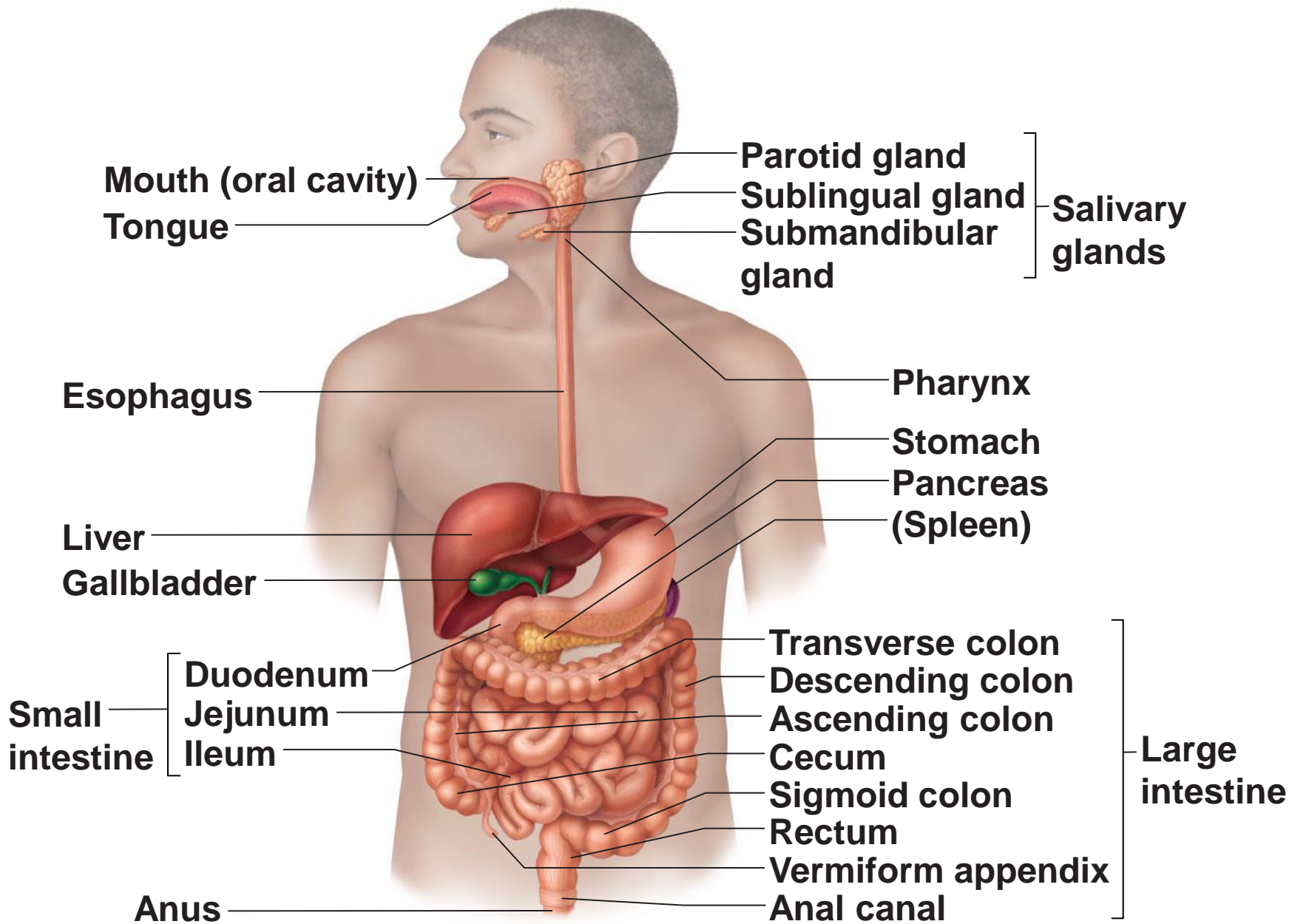
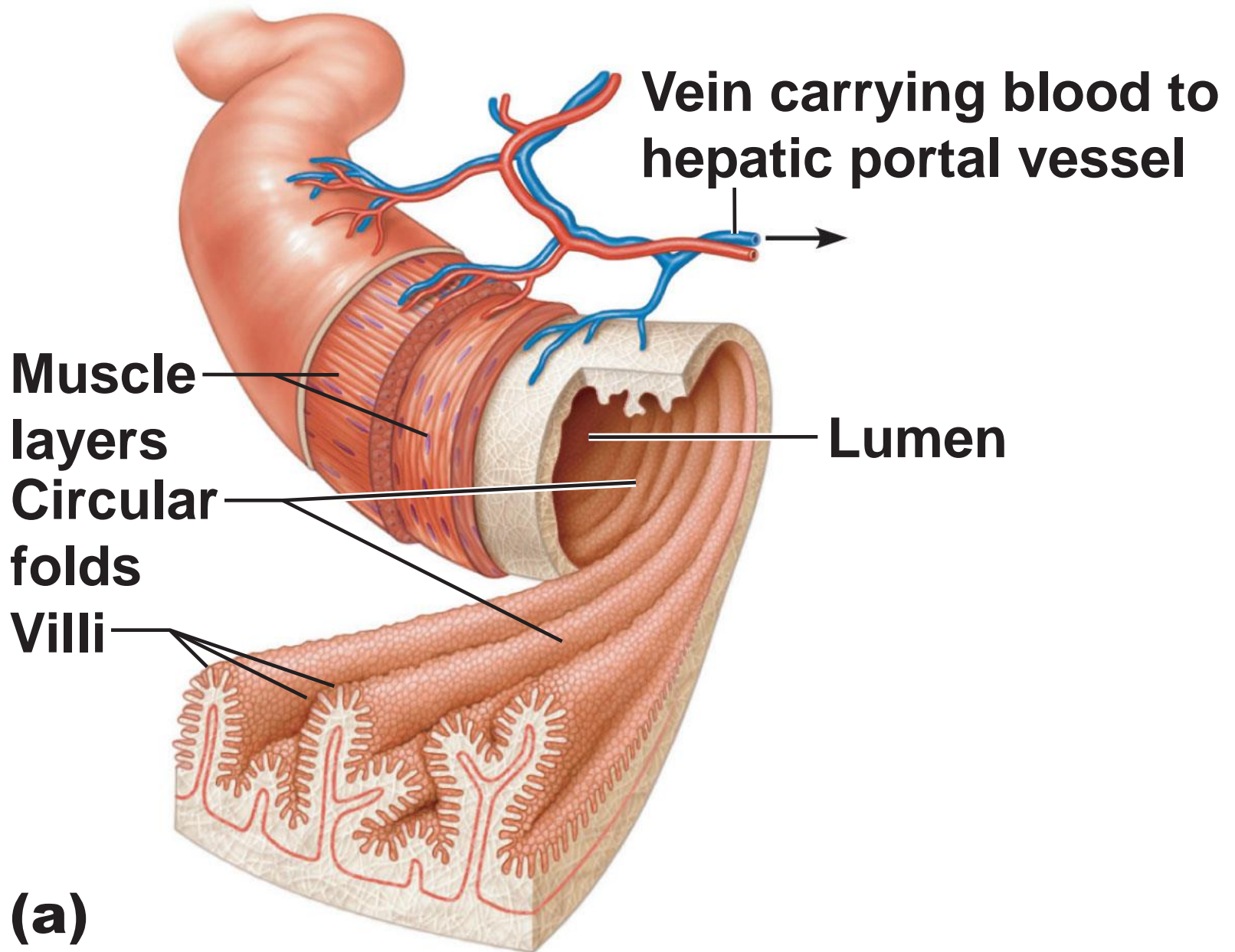
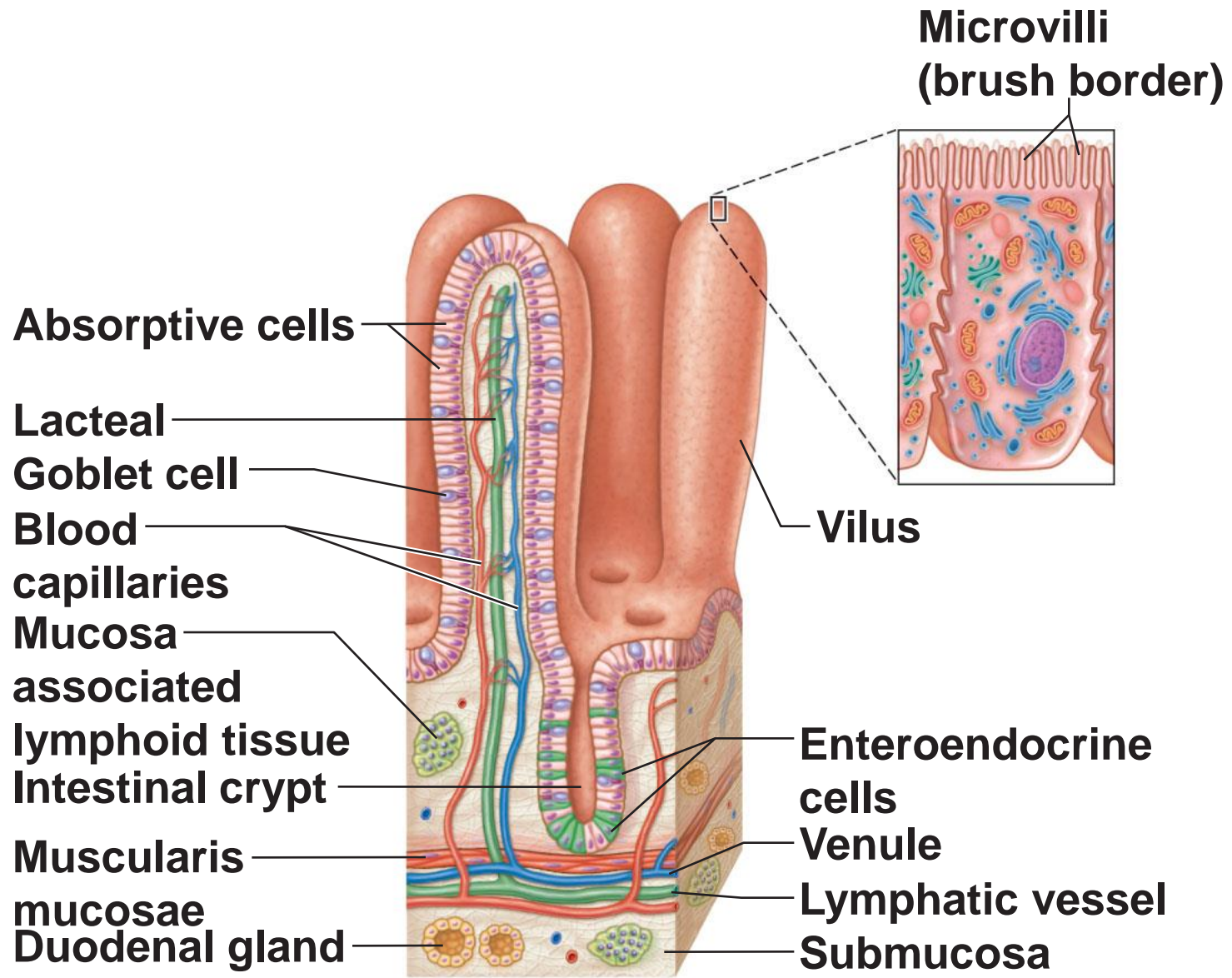


Figure 23.1





(b)



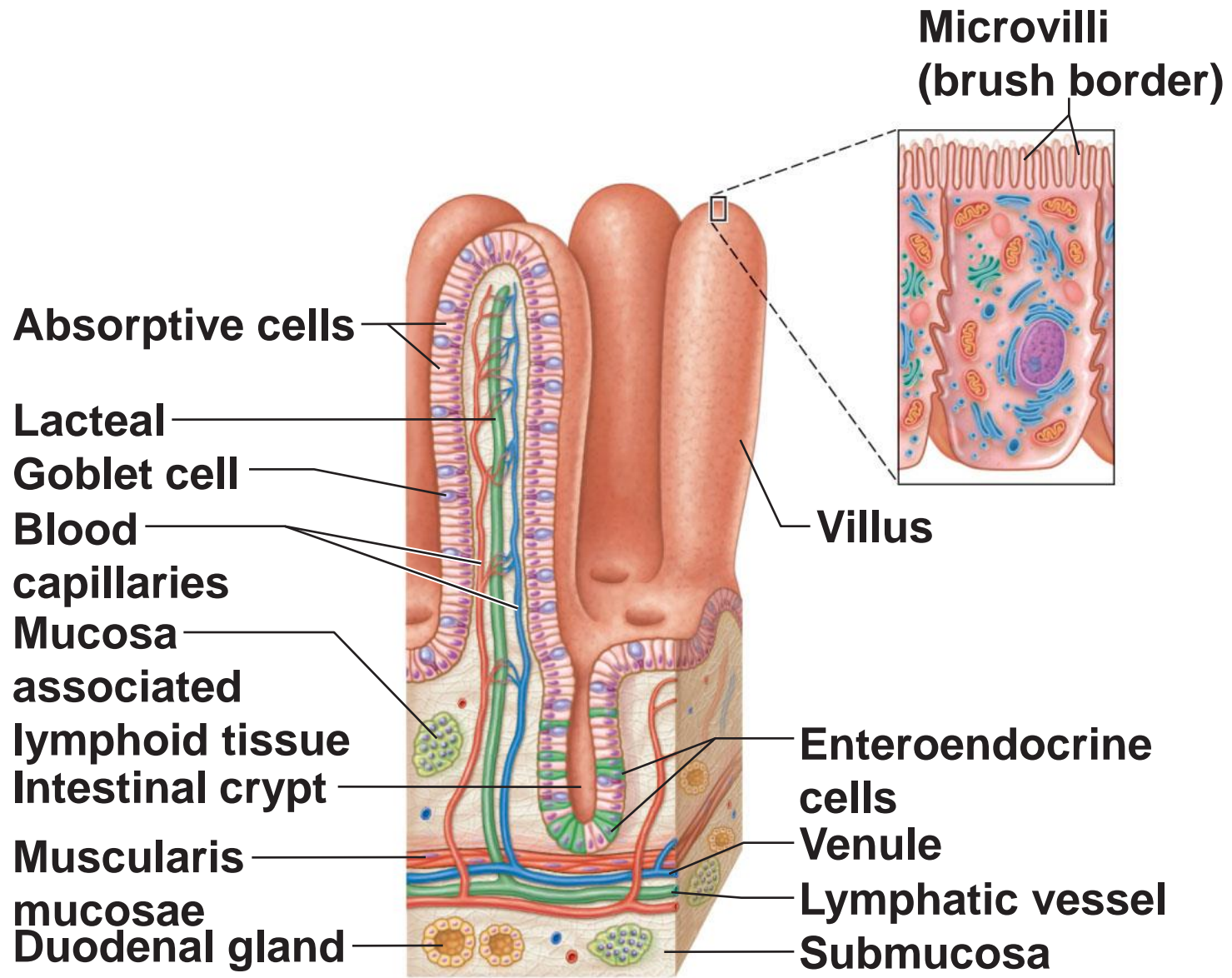
Microvilli

**Absorptive
cell**

(b)

Digestive System

- Chemical digestion in the small intestine
 - Food entering SI = partially digested
 - Intestinal juice
 - Water, mucous
 - Crypt cells produce lysozyme



(b)

Digestive System

- Chemical digestion in the small intestine
 - Pancreatic juice
 - Enzymes
 - Amylase
 - Carbohydrates
 - Lipase
 - Fats
 - Trypsinogen, chymotrypsinogen, carboxypeptidase
 - Activated to digest protein
 - Sodium bicarbonate
 - Neutralize stomach acid

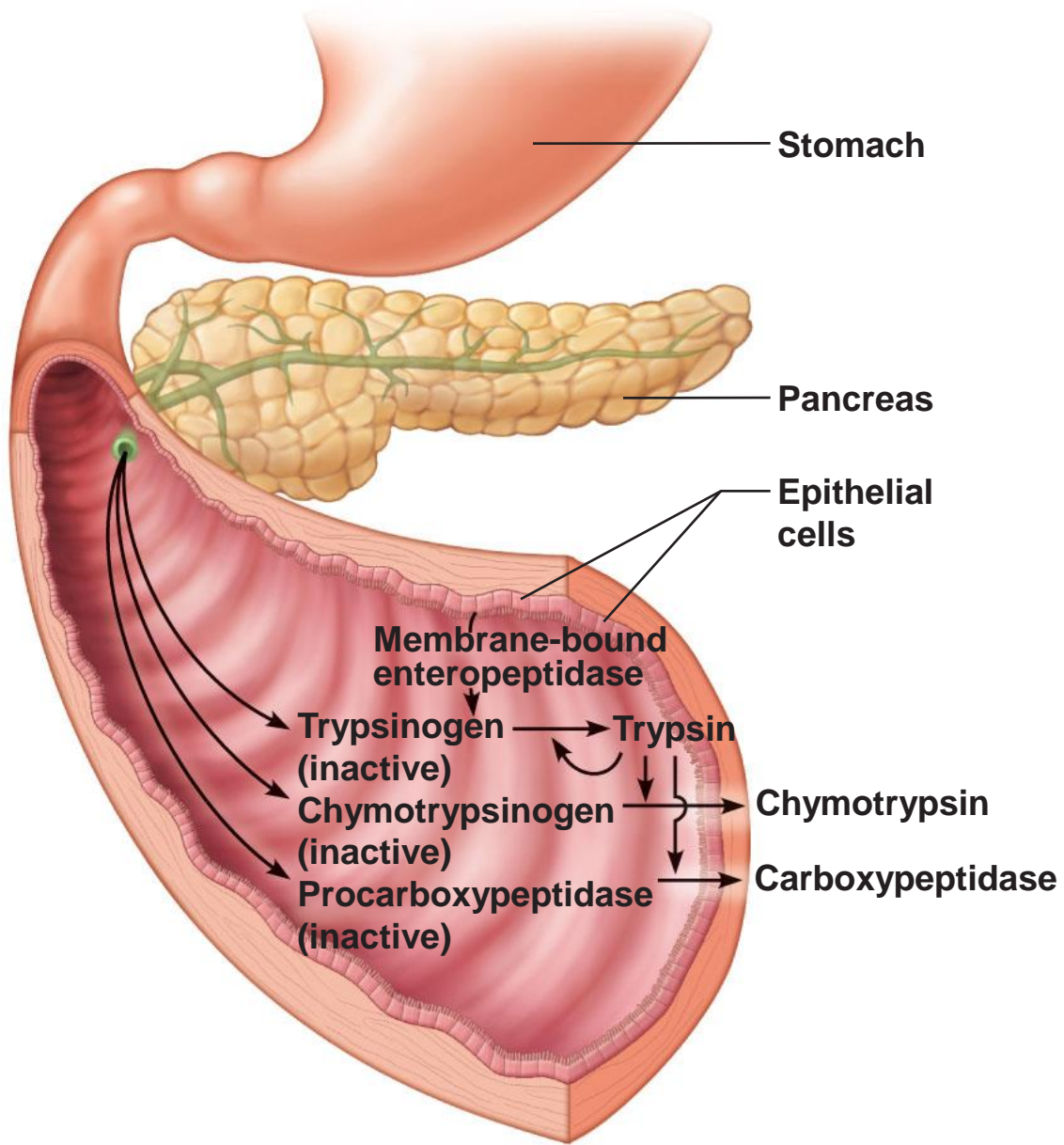


Figure 23.27

Digestive System

- Chemical digestion in the small intestine
 - Bile
 - Emulsify lipids
 - Disaccharidases and peptidases
 - Protective mucous secreted as well

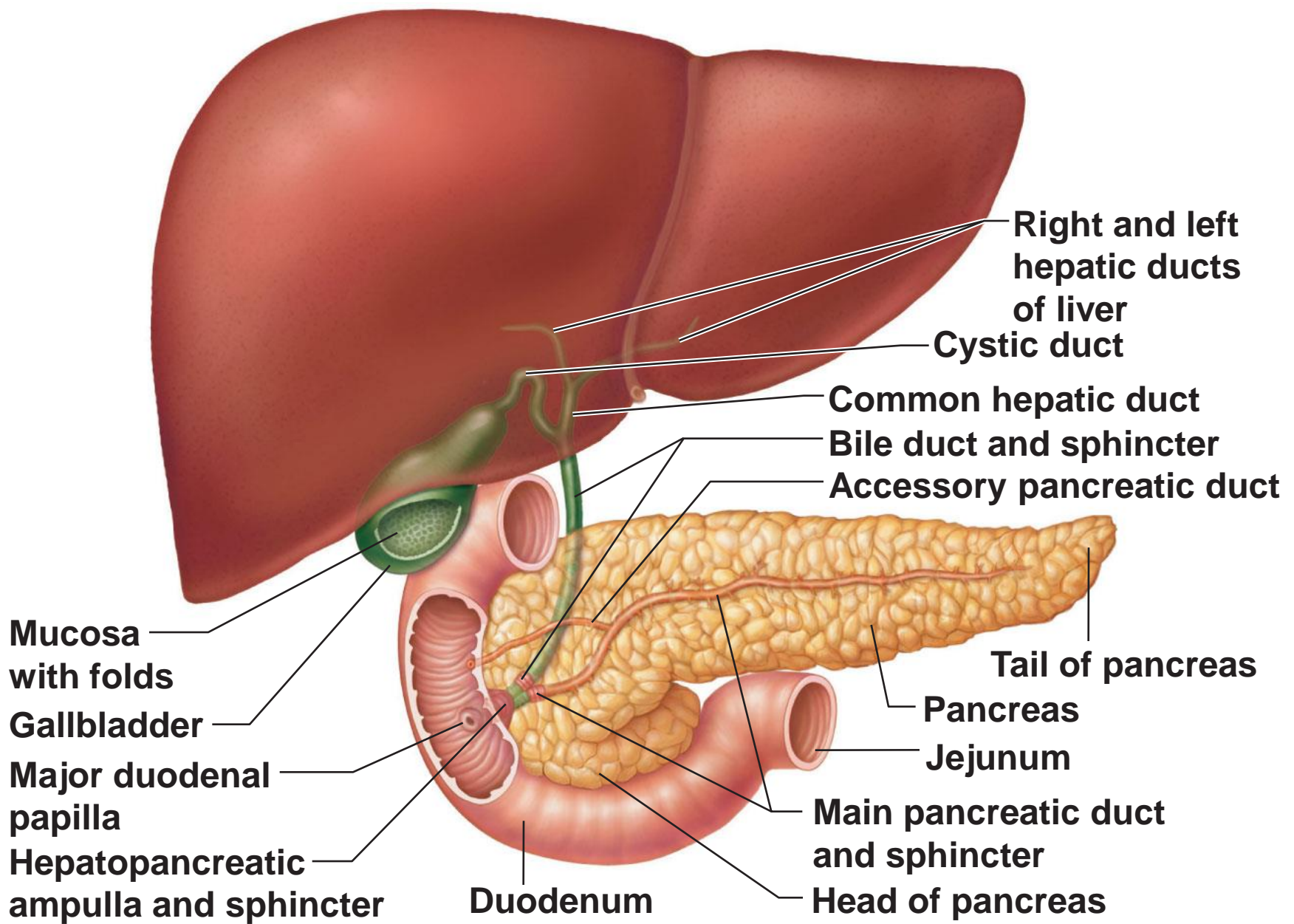


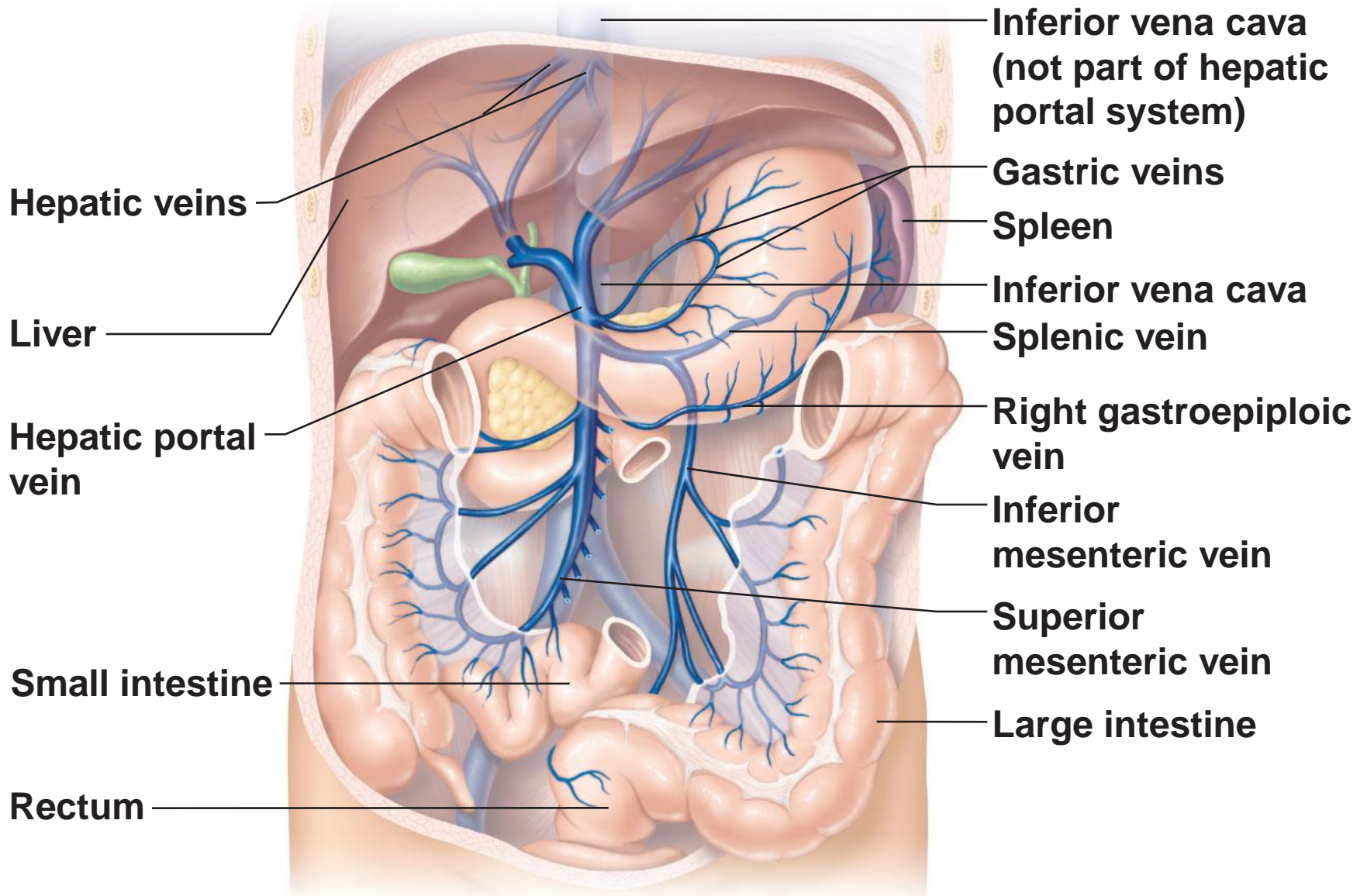
Figure 23.21

Digestive System

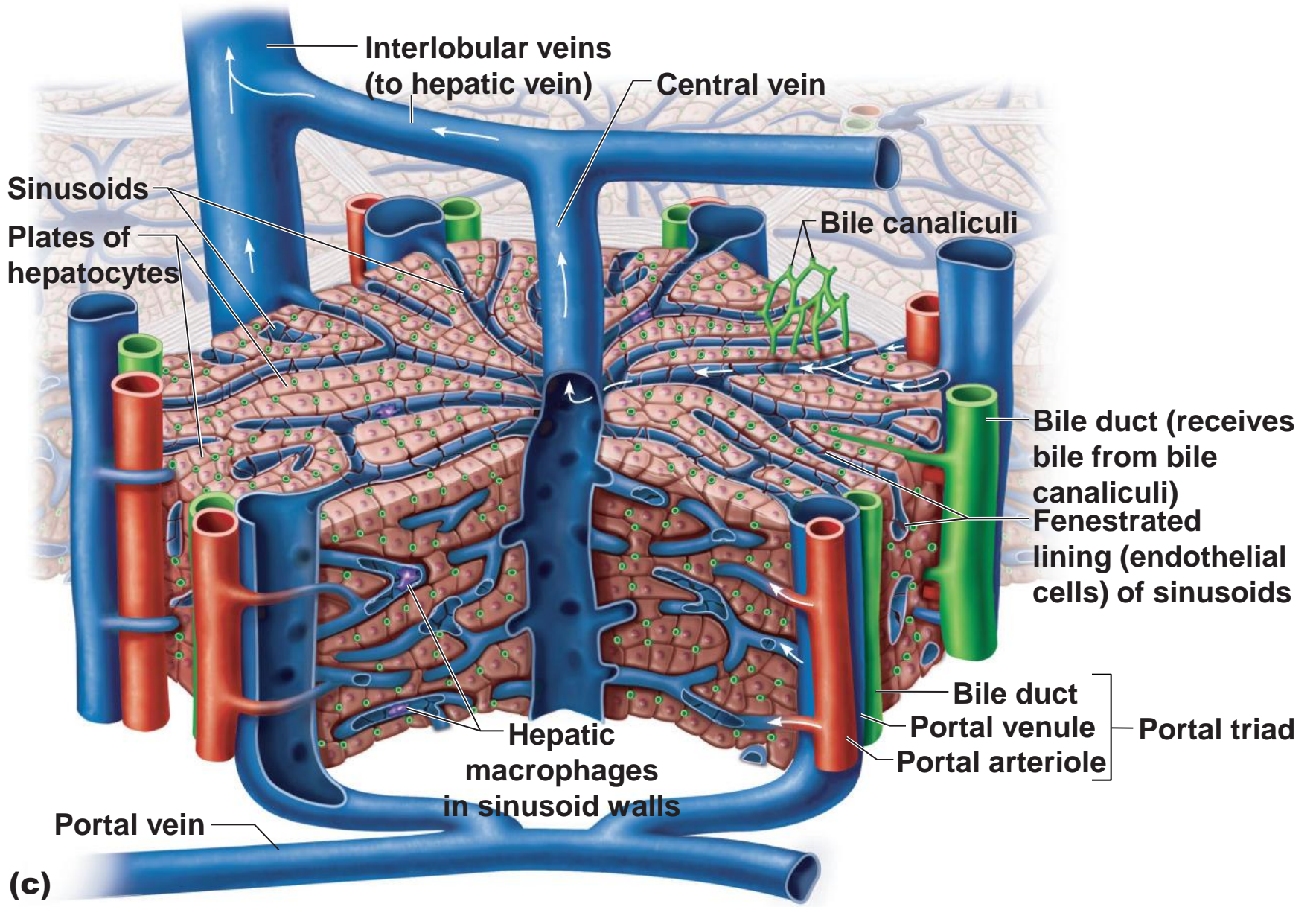
- Accessory digestive organs
 - Liver
 - Pancreas
 - Gallbladder

Digestive System

- Accessory digestive organs
 - Liver
 - Largest internal surface area of any body organ
 - Blood supply
 - Hepatic artery
 - Hepatic-portal vein
 - Hepatic vein



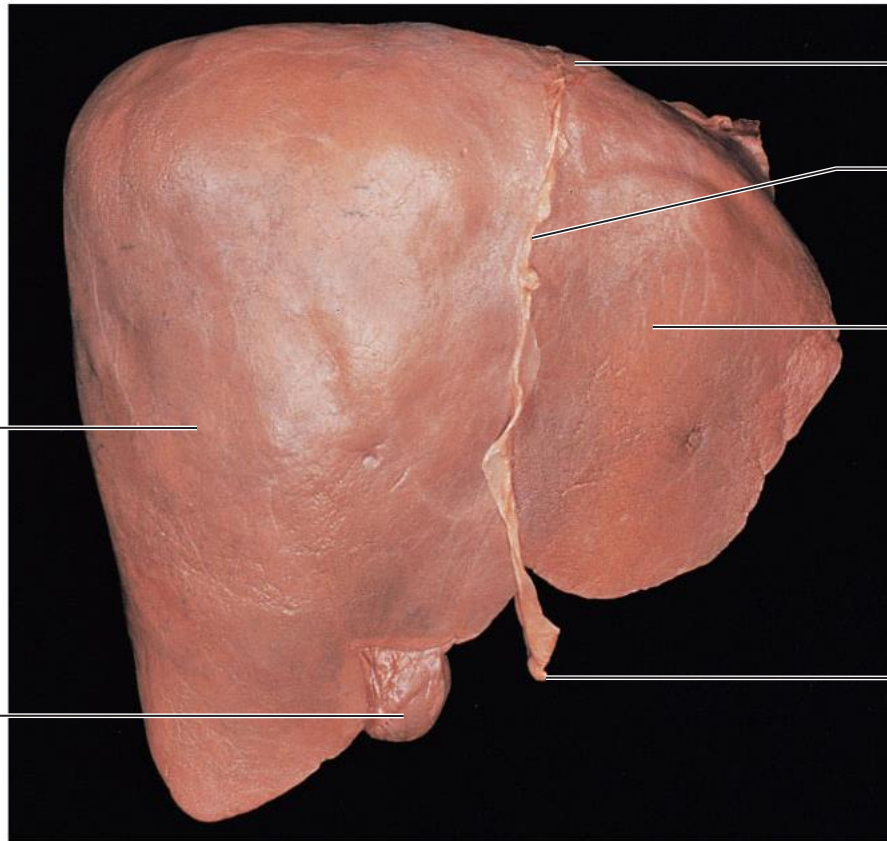
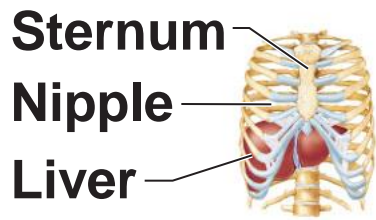
(c) The hepatic portal circulation.



(c)

Digestive System

- Accessory digestive organs
 - Liver
 - Microscopic compartments = lobules
 - Lined by hepatocytes = screen blood
 - Store nutrients
 - Manage toxins



**Right lobe
of liver**

Gallbladder

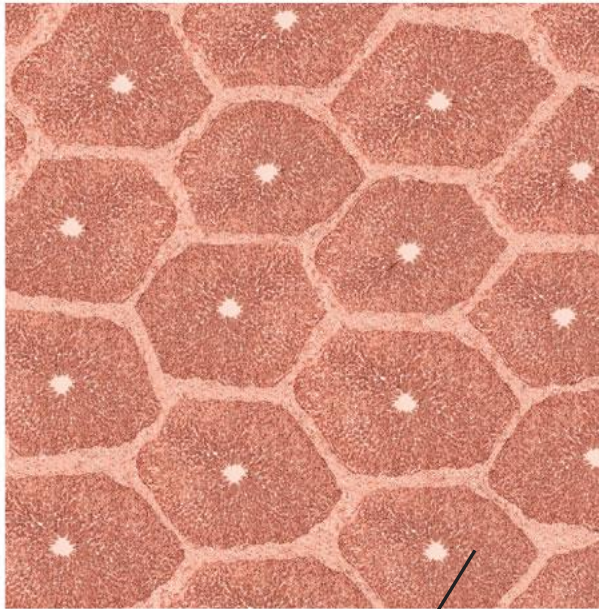
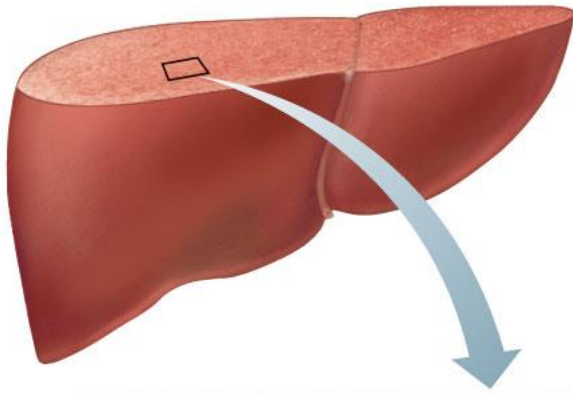
(a)

Bare area

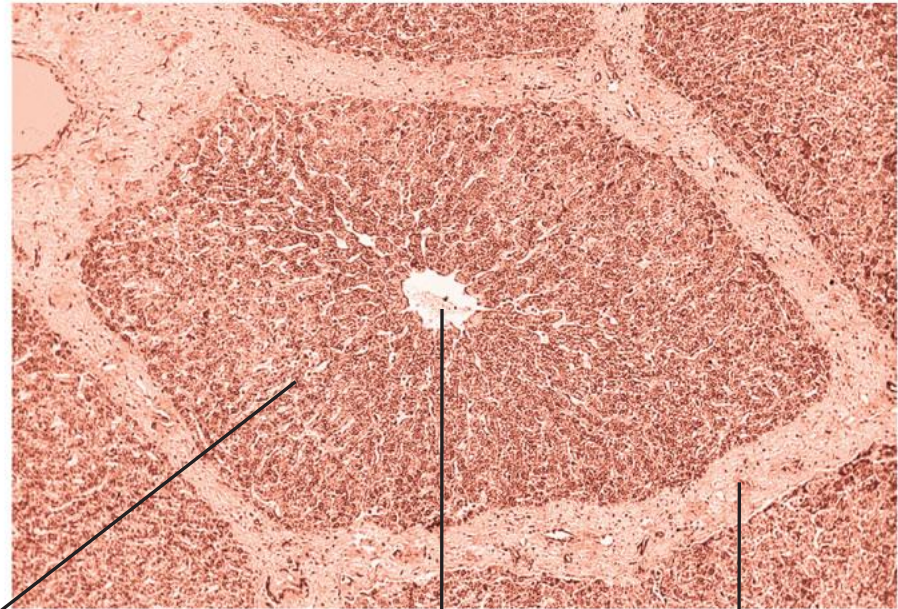
**Falciform
ligament**

Left lobe of liver

**Round ligament
(ligamentum
teres)**



(a) Lobule



(b) Central vein
Connective tissue septum

Digestive System

- Accessory digestive organs
 - Liver
 - Hepatocyte functions
 - Process blood borne nutrients
 - Store fat-soluble vitamins
 - Perform detoxification
 - Produce ~900 ml bile per day
 - Glucose is stored as glycogen

Cystic, Hepatic and Bile ducts

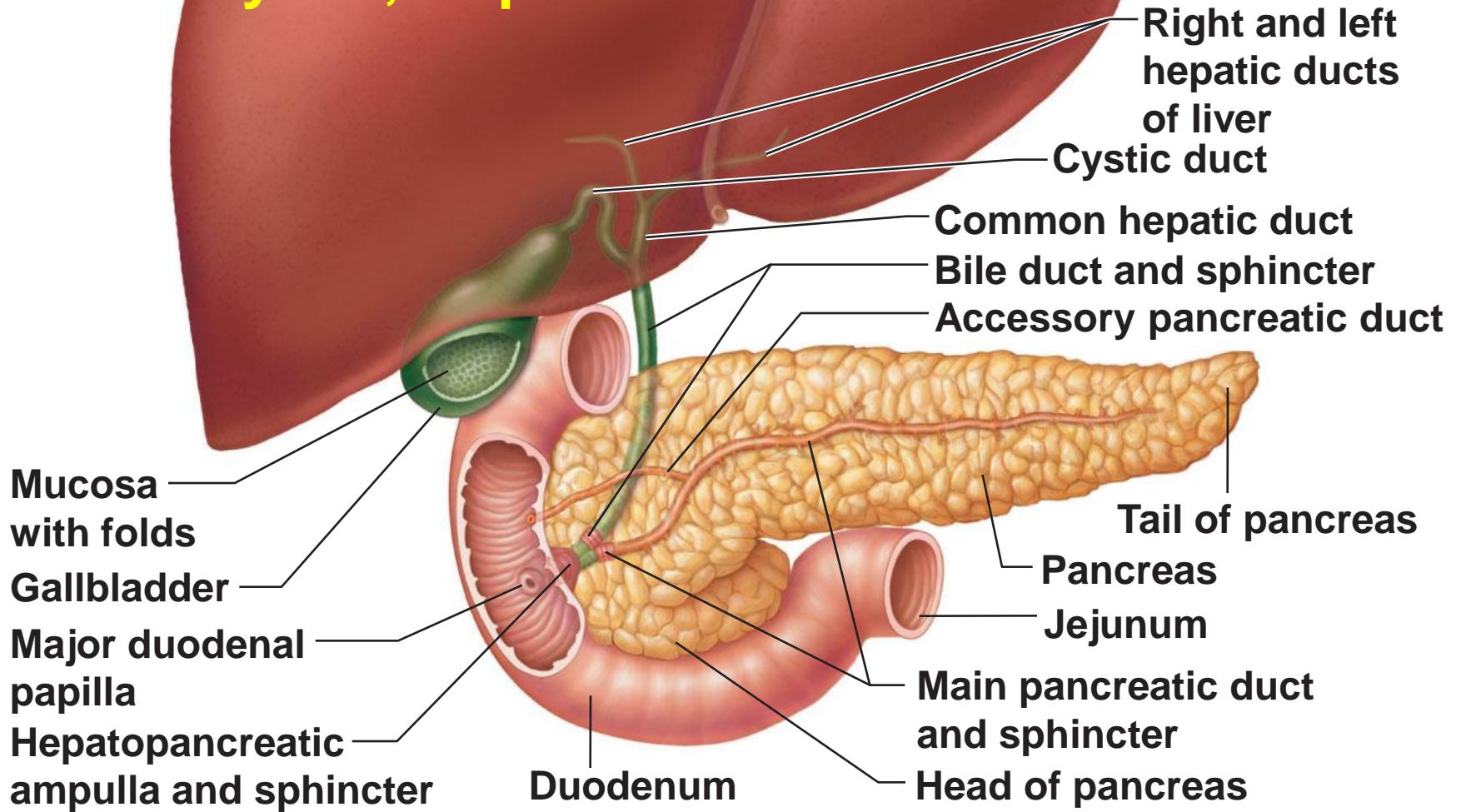
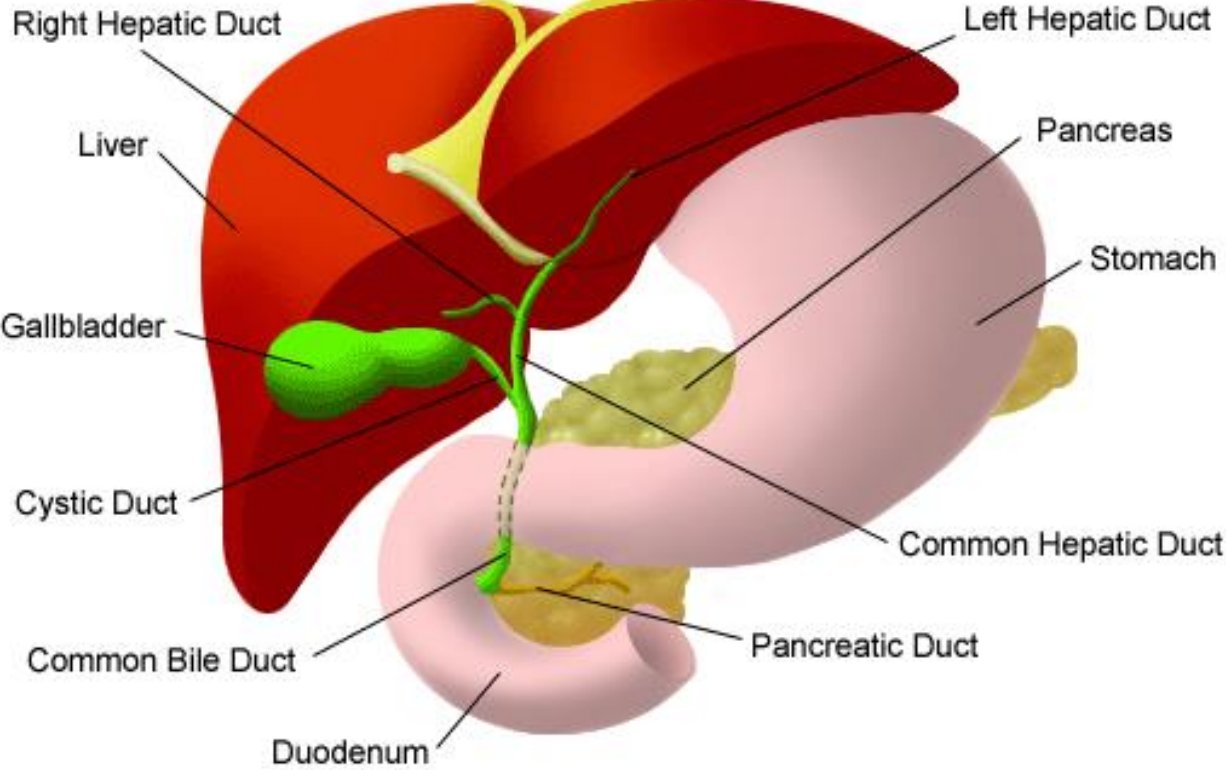


Figure 23.21

Digestive System

- Accessory digestive organs
 - Liver
 - Bile
 - Yellow-green, alkaline solution
 - Bile salts
 - Cholesterol derivatives that function in fat emulsification & absorption
 - Bilirubin
 - Pigment formed from heme
 - Metabolized to form urobilinogen → stercobilin
 - Lack of bile = grayish stools with fatty streaks (acholic feces)

Biliary System



Digestive System

- Accessory digestive organs
 - Liver
 - Other functions
 - Makes heparin and other plasma proteins
 - Stores vitamins, minerals and lipid soluble toxins
 - Stores nutrients
 - Catabolizes nitrogenous wastes

Digestive System

- Accessory digestive organs
 - Liver
 - Gallbladder
 - Thin-walled muscular sac on the ventral surface of the liver
 - Stores and concentrates bile by absorbing its water and ions
 - Releases bile via the cystic duct
 - Flows into the bile duct



Digestive System

- Accessory digestive organs
 - Pancreas
 - Function
 - Delivers digestive fluids and NaHCO_3 to duodenum via pancreatic duct
 - Tissue types
 - Endocrine
 - Islets of Langerhans → insulin and glucagon
 - Exocrine
 - Acinar tissue → pancreatic juice

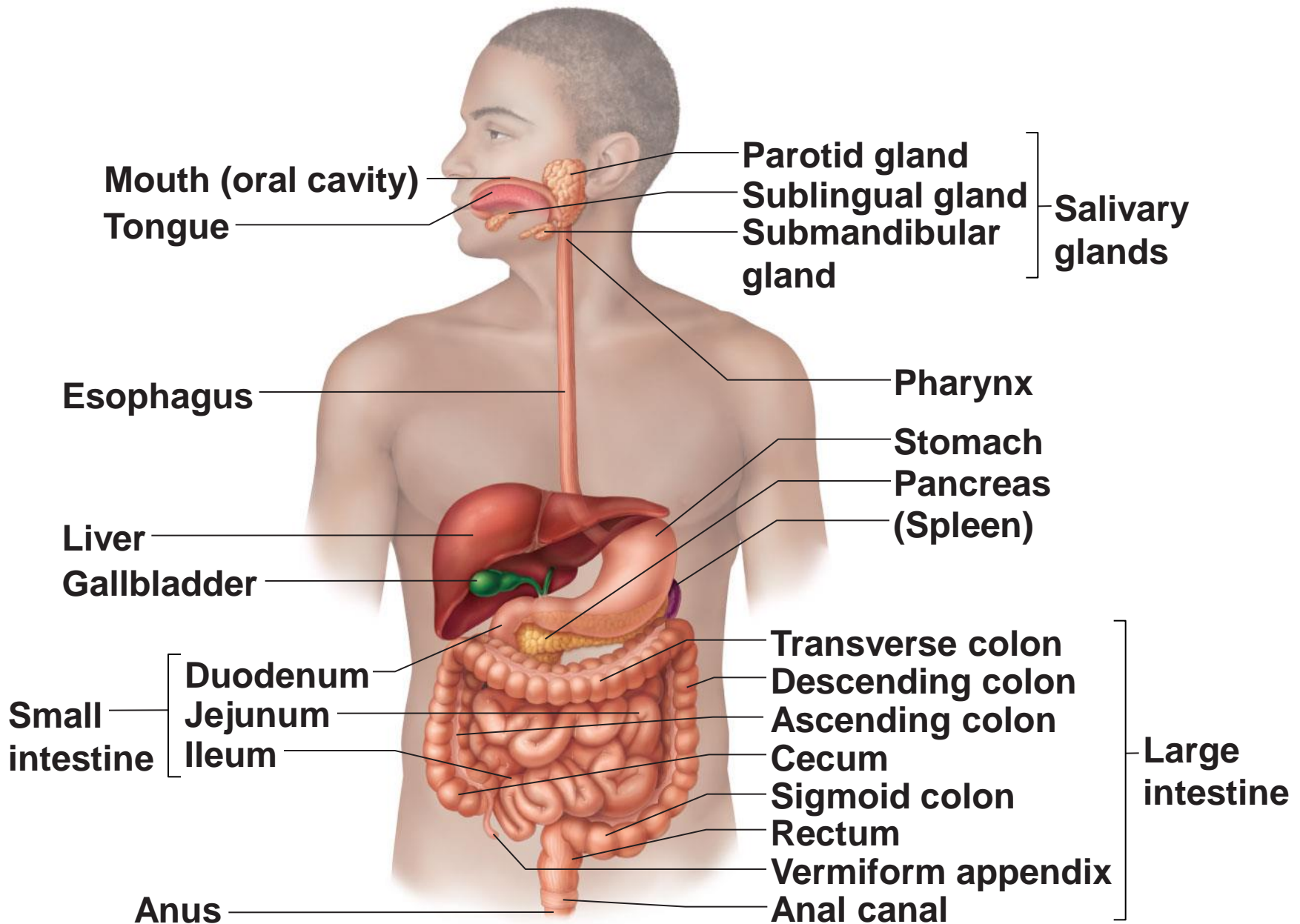
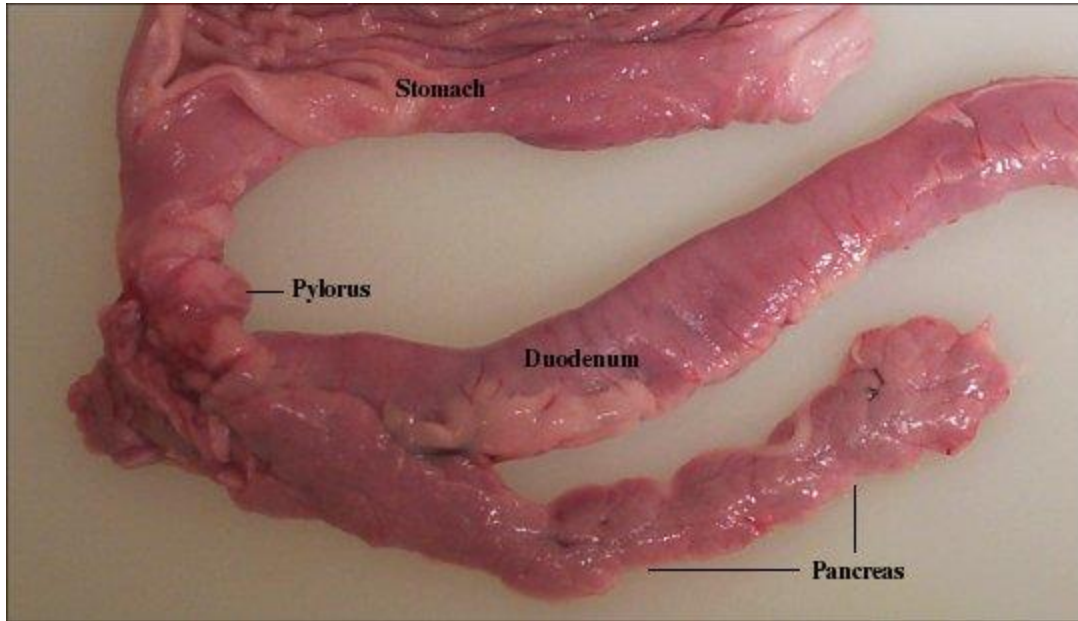


Figure 23.1

Digestive System

- Accessory digestive organs
 - Pancreas
 - Secretion mediated by hormones
 - Secretin
 - Released in response to acid
 - Stimulates release of base from pancreas
 - Also stimulates release of pancreatic secretions and bile
 - Cholecystokinin
 - Released when protein and fat enter intestine
 - Stimulates the release of pancreatic secretions and bile



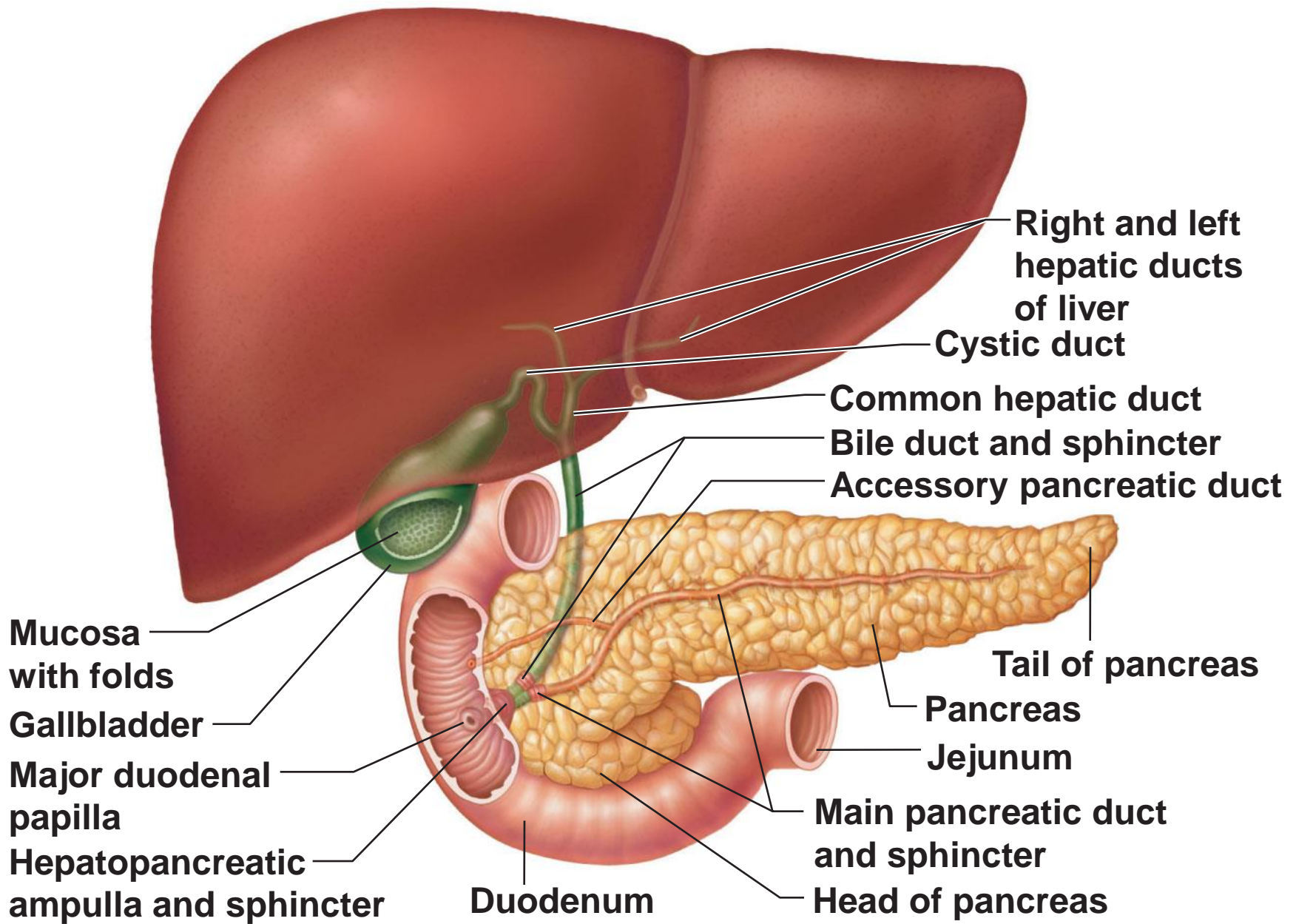
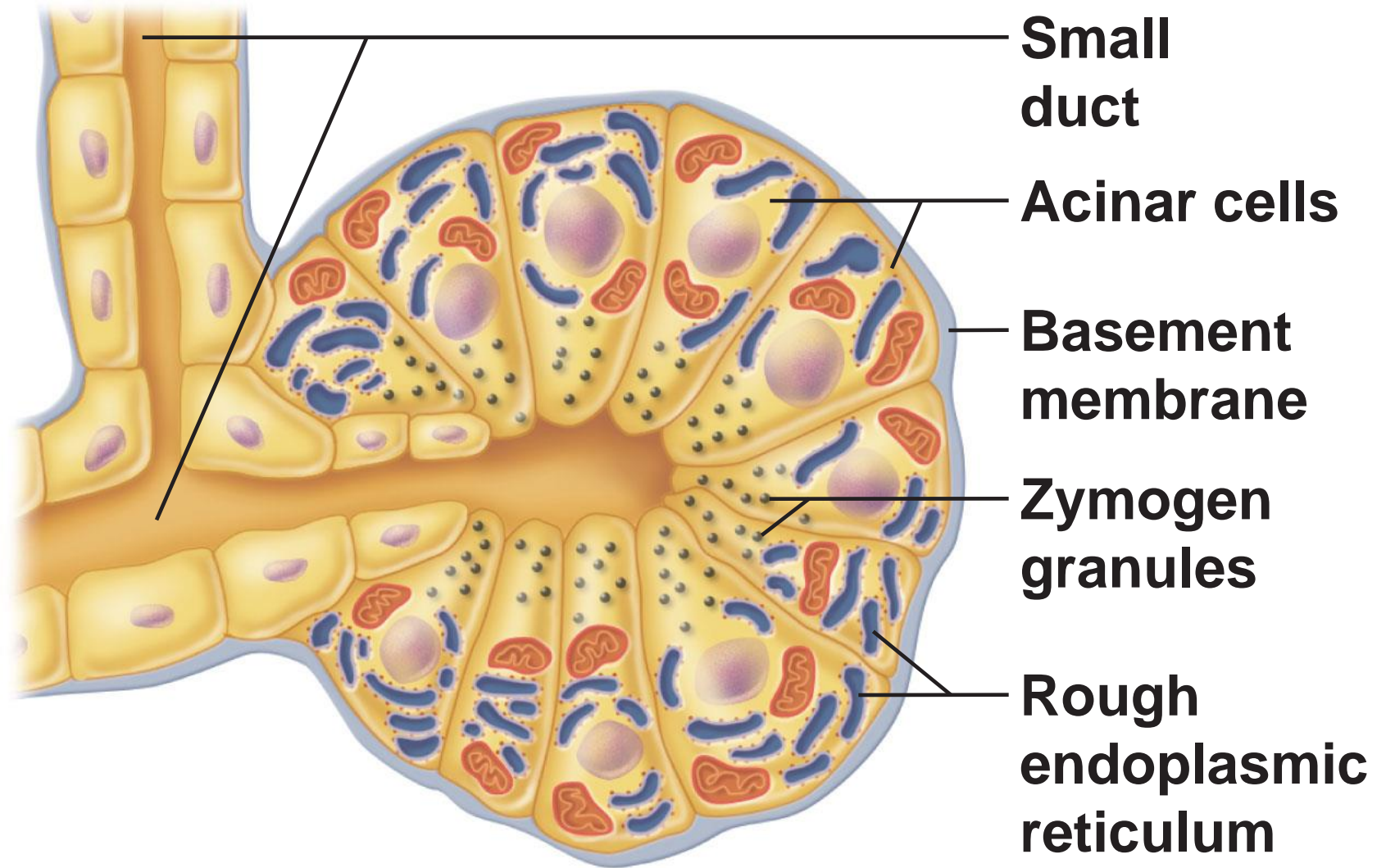


Figure 23.21



(a)

Digestive System

- Large intestine
 - About 1.5 meters in length in a cadaver (SI about 6m long)
- Functions
 - Vitamins, water, and electrolytes are reclaimed
 - Propulsion of feces toward the anus
 - Colon is not essential for life

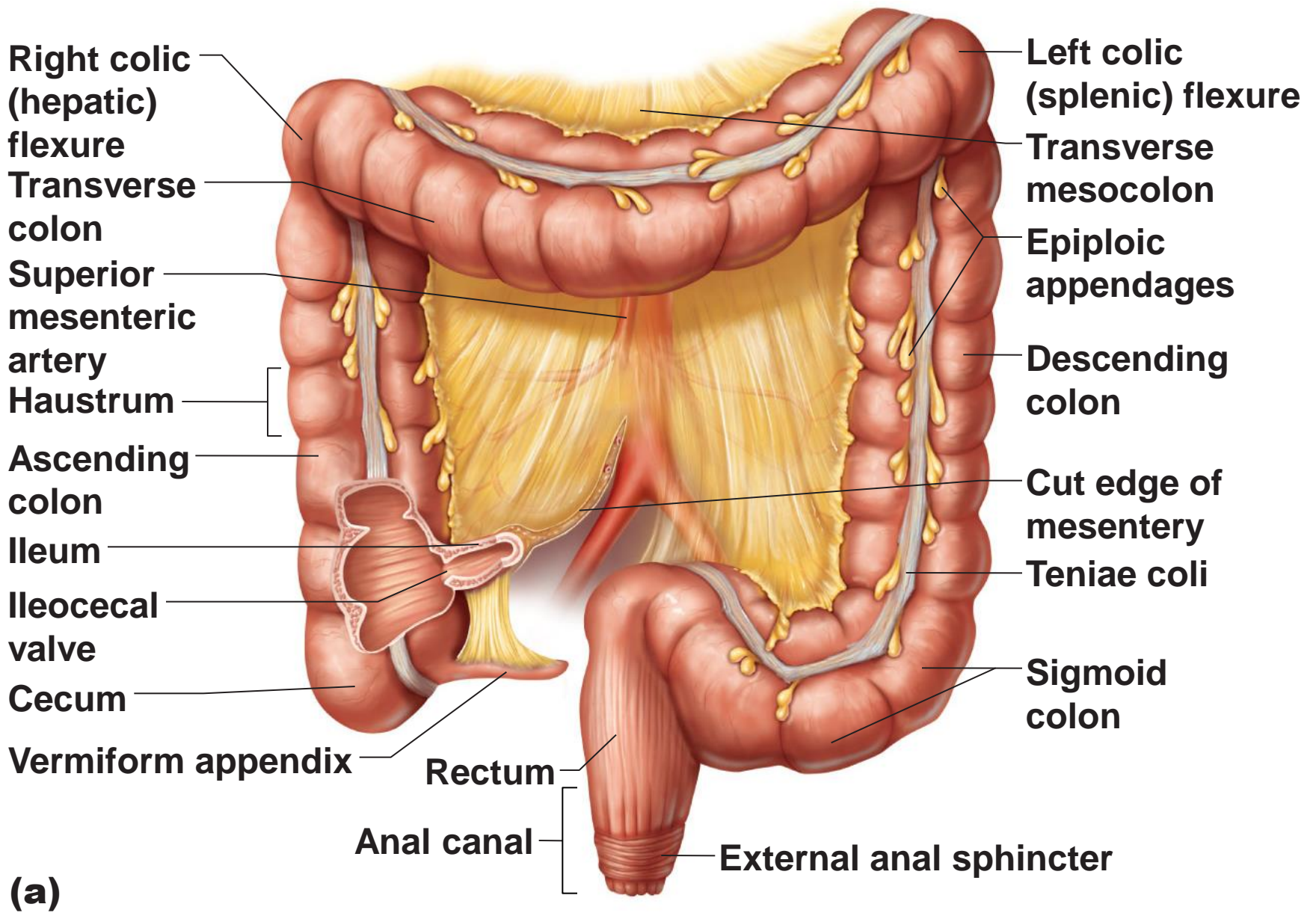
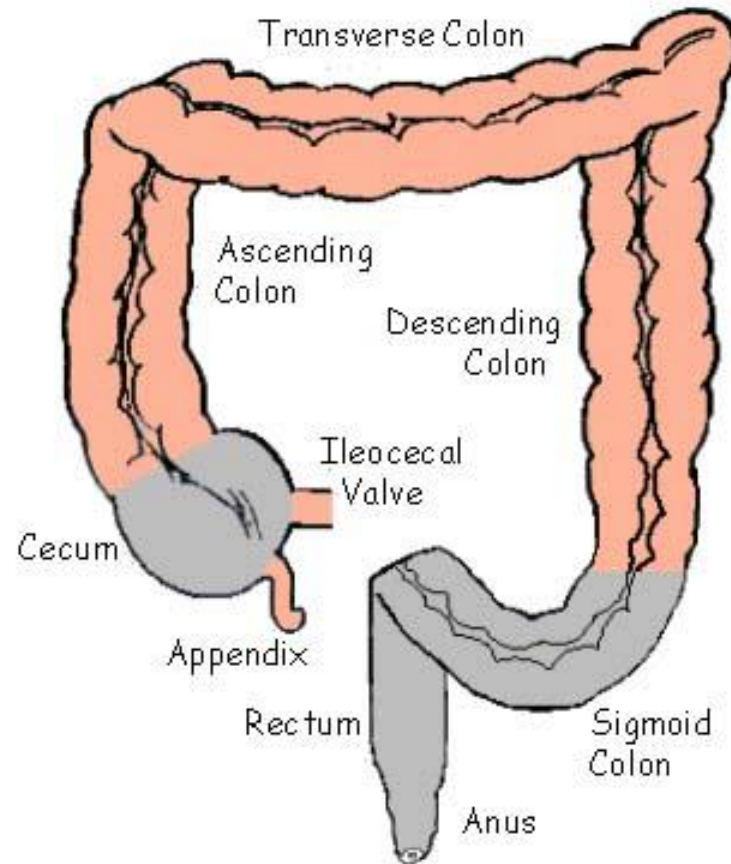


Figure 23.29a

Digestive System

- Regions
 - Cecum
 - Colon
 - Rectum
 - Anal canal

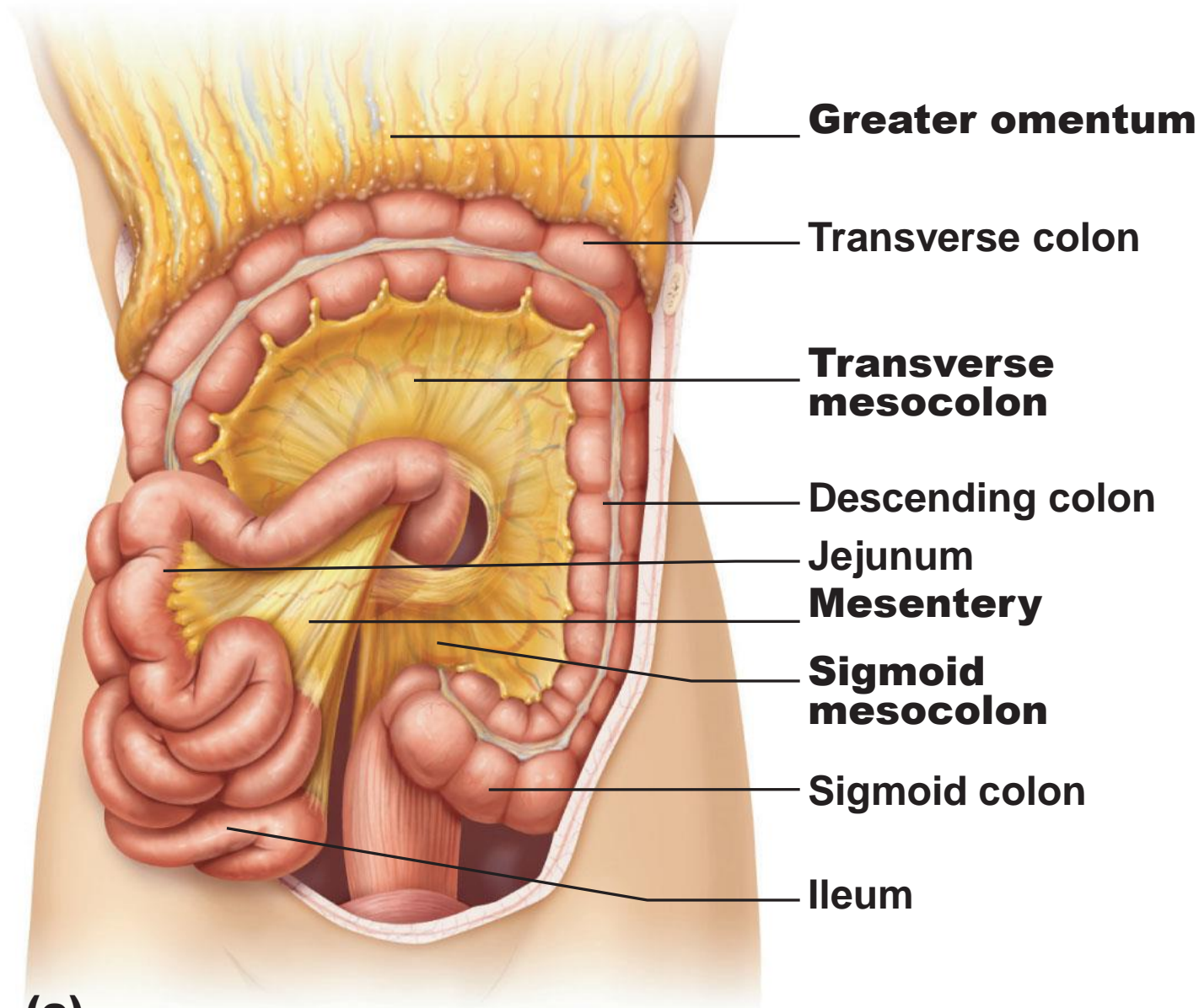


Digestive System

- Regions
 - Cecum
 - Blind pouch
 - Appendix attaches to this area
 - Bacteria
 - Immune function

Digestive System

- Regions
 - Colon
 - Ascending
 - Retroperitoneal
 - Transverse
 - Anchored via mesocolons (mesenteries)
 - Descending
 - Retroperitoneal
 - Sigmoid
 - Anchored via mesocolons (mesenteries)



Greater omentum

Transverse colon

Transverse mesocolon

Descending colon

Jejunum

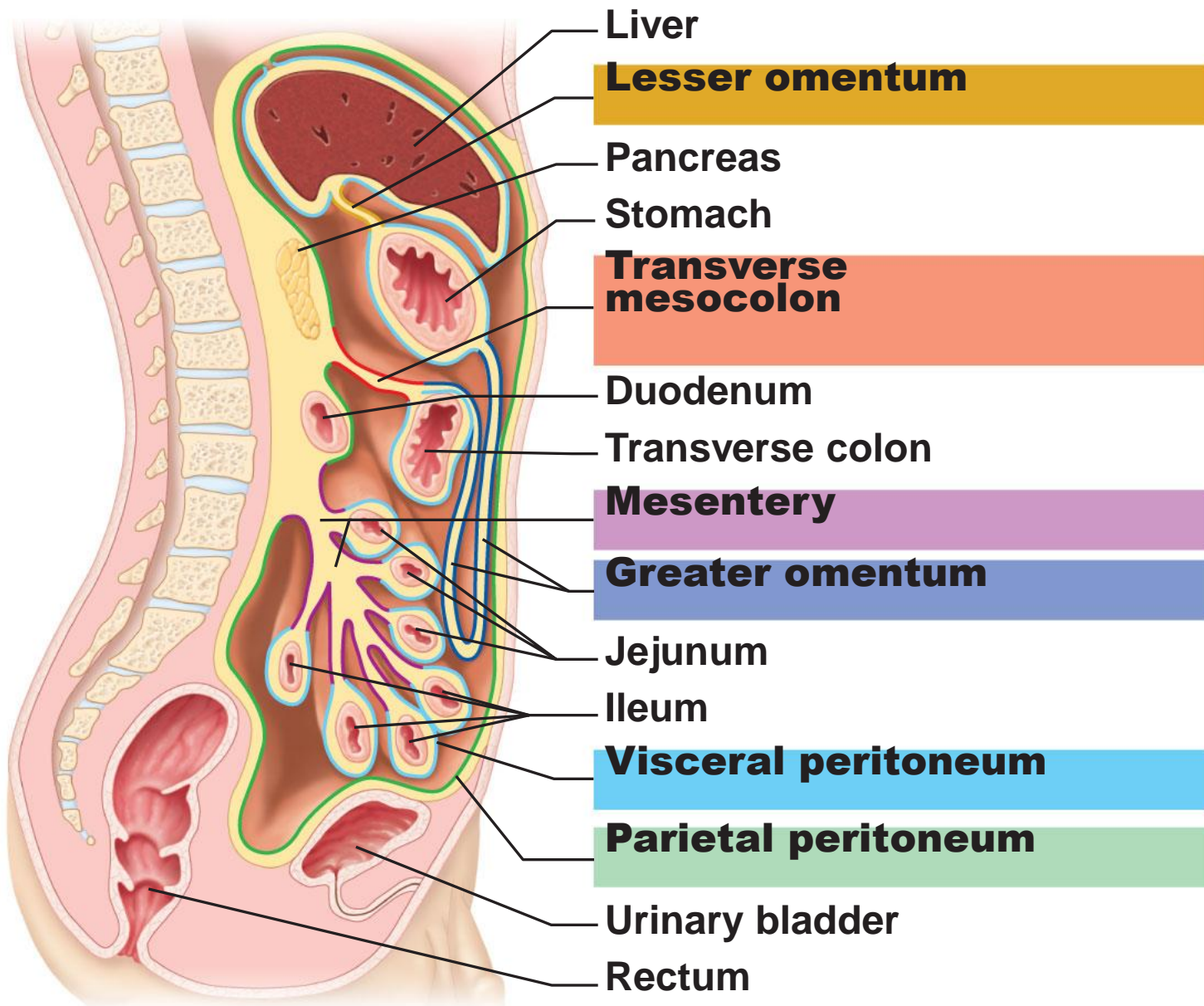
Mesentery

Sigmoid mesocolon

Sigmoid colon

Ileum

(c)



(d)

Digestive System

- Regions
 - Rectum
 - Rectal valves stop feces from being passed with gas
 - Anal canal
 - Last segment of the large intestine
 - Internal anal sphincter
 - Smooth muscle (involuntary)
 - Spinal reflex arcs
 - External anal sphincter
 - Skeletal muscle (voluntary)

Rectal valve

Rectum

**Hemorrhoidal
veins**

**Levator ani
muscle**

Anal canal

**External anal
sphincter**

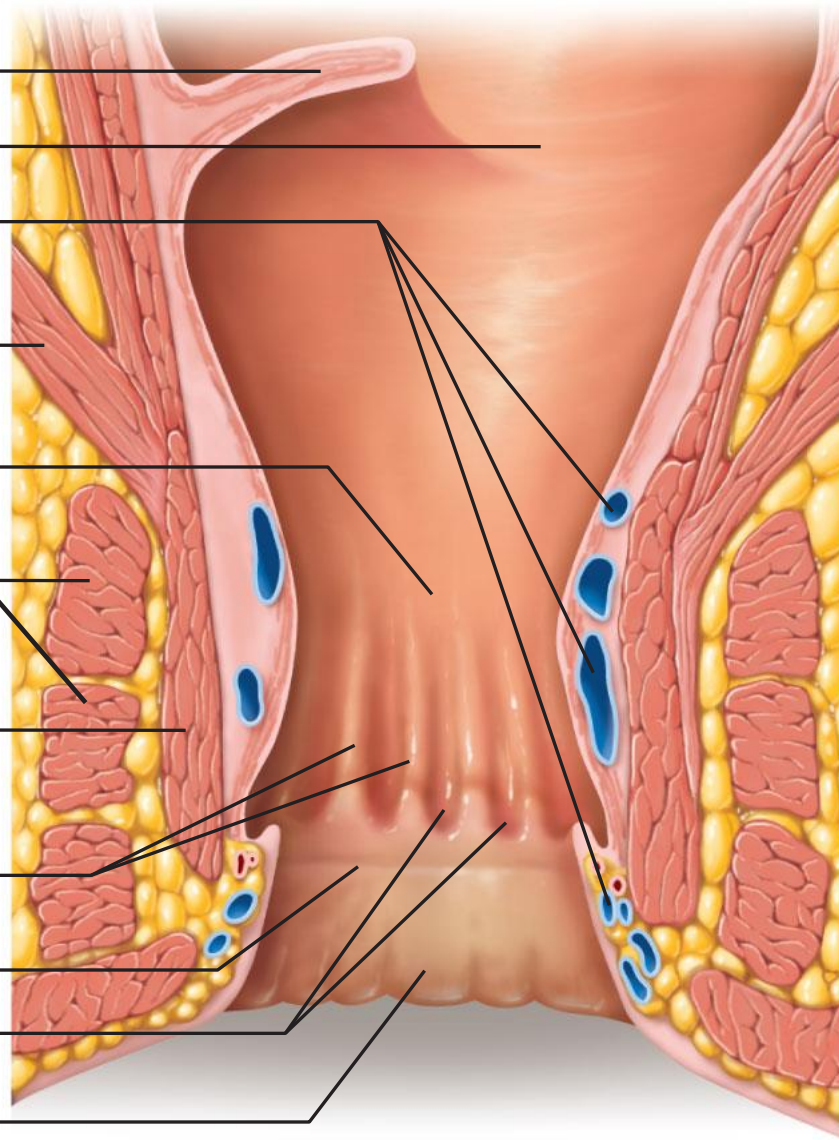
**Internal anal
sphincter**

Anal columns

Pectinate line

Anal sinuses

Anus

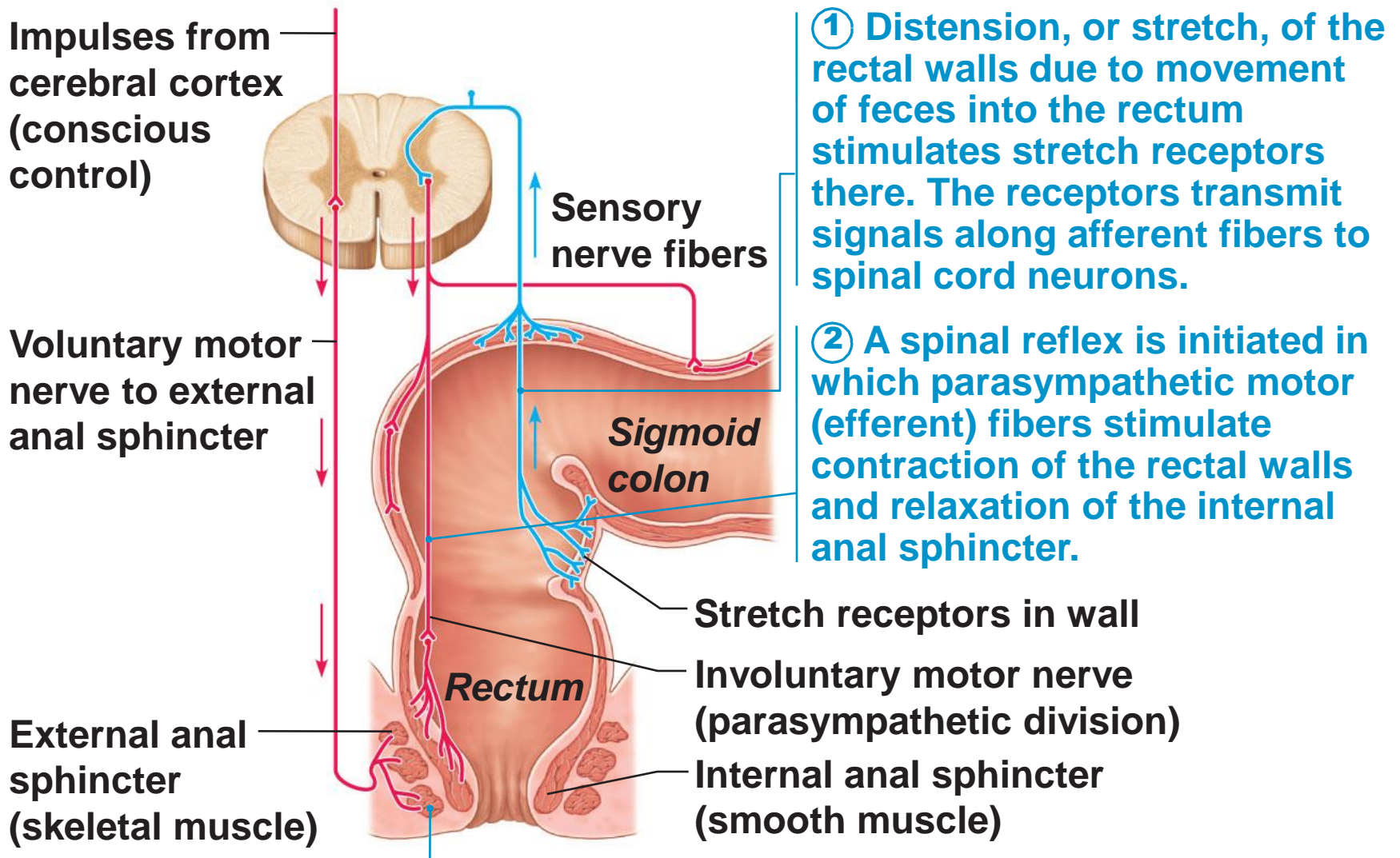


(b)

Digestive System

- Defecation
 - Mass movements force feces into rectum
 - Distension initiates spinal defecation reflex
 - Parasympathetic signals
 - Stimulate contraction of the sigmoid colon and rectum
 - Relax the internal anal sphincter
 - Conscious control allows relaxation of external anal sphincter
 - Valsalva's maneuver





① Distension, or stretch, of the rectal walls due to movement of feces into the rectum stimulates stretch receptors there. The receptors transmit signals along afferent fibers to spinal cord neurons.

② A spinal reflex is initiated in which parasympathetic motor (efferent) fibers stimulate contraction of the rectal walls and relaxation of the internal anal sphincter.

③ If it is convenient to defecate, voluntary motor neurons are inhibited, allowing the external anal sphincter to relax so that feces may pass.

Figure 23.31