Digestive system anatomy part 1

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Digestive System: Overview

- The alimentary canal or gastrointestinal (GI) tract digests and absorbs food

- **Alimentary canal –**
  - **oral cavity mouth,**
  - **pharynx,**
  - **esophagus,**
  - **stomach,**
  - **small intestine,**
  - **and large intestine ,rectum**
  - **anus**
- **Accessory digestive organs –**
  - **teeth,**
  - **tongue,**
  - **gallbladder,**
  - **salivary glands,**
  - **liver, and pancreas**

- **Mouth** - the first part of the digestive system, where food enters the body. Chewing and salivary enzymes in the mouth are the beginning of the digestive process (breaking down the food).

- **Salivary glands** - glands located in the mouth that produce saliva. Saliva contains enzymes that break down carbohydrates (starch) into smaller molecules.

- **Esophageus** - the long tube between the mouth and the stomach. It uses rhythmic muscle movements (called peristalsis) to force food from the throat into the stomach.

- **Peristalsis** - rhythmic muscle movements that force food in the esophagus from the throat into the stomach. Peristalsis is involuntary - you cannot control it. It is also what allows you to eat and drink while upside-down.

- **Liver** - a large organ located above and in front of the stomach. It filters toxins from the blood, and makes bile (which breaks down fats) and some blood proteins.

- **Stomach** - a sack-like, muscular organ that is attached to the esophagus. Both chemical and mechanical digestion takes place in the stomach. When food enters the stomach, it is churned in a bath of acids and enzymes.

- **Chyme** - food in the stomach that is partly digested and mixed with stomach acids. Chyme goes on to the small intestine for further digestion.

- **Gall bladder** - a small, sac-like organ located by the duodenum. It stores and releases bile (a digestive chemical which is produced in the liver) into the small intestine.

- **Bile** - a digestive chemical that is produced in the liver, stored in the gall bladder, and secreted into the small intestine.

- **Pancreas** - an enzyme-producing gland located below the stomach and above the intestines. Enzymes from the pancreas help in the digestion of carbohydrates, fats and proteins in the small intestine.

- **Duodenum** - the first part of the small intestine; it is C-shaped and runs from the stomach to the jejunum.

- **Jejunum** - the long, coiled mid-section of the small intestine; it is between the duodenum and the ileum.

- **Ileum** - the last part of the small intestine before the large intestine begins.
- **Cecum** - the first part of the large intestine; the appendix is connected to the cecum.
- **Appendix** - a small sac located on the cecum.
- **Ascending colon** - the part of the large intestine that run upwards; it is located after the cecum.
- **Transverse colon** - the part of the large intestine that runs horizontally across the abdomen.
- **Descending colon** - the part of the large intestine that run downwards after the transverse colon and before the sigmoid colon.
- **Sigmoid colon** - the part of the large intestine between the descending colon and the rectum.
- **Rectum** - the lower part of the large intestine, where faeces are stored before they are excreted.
- **Anus** - the opening at the end of the digestive system from which faeces (waste) exits the body

General Structure and Functions of the Digestive System

Form a continuous tube that extends about 30 feet (9–10 meters) from the mouth to the anus.

Smooth muscle in the GI tract wall pushes materials from one end to the other.

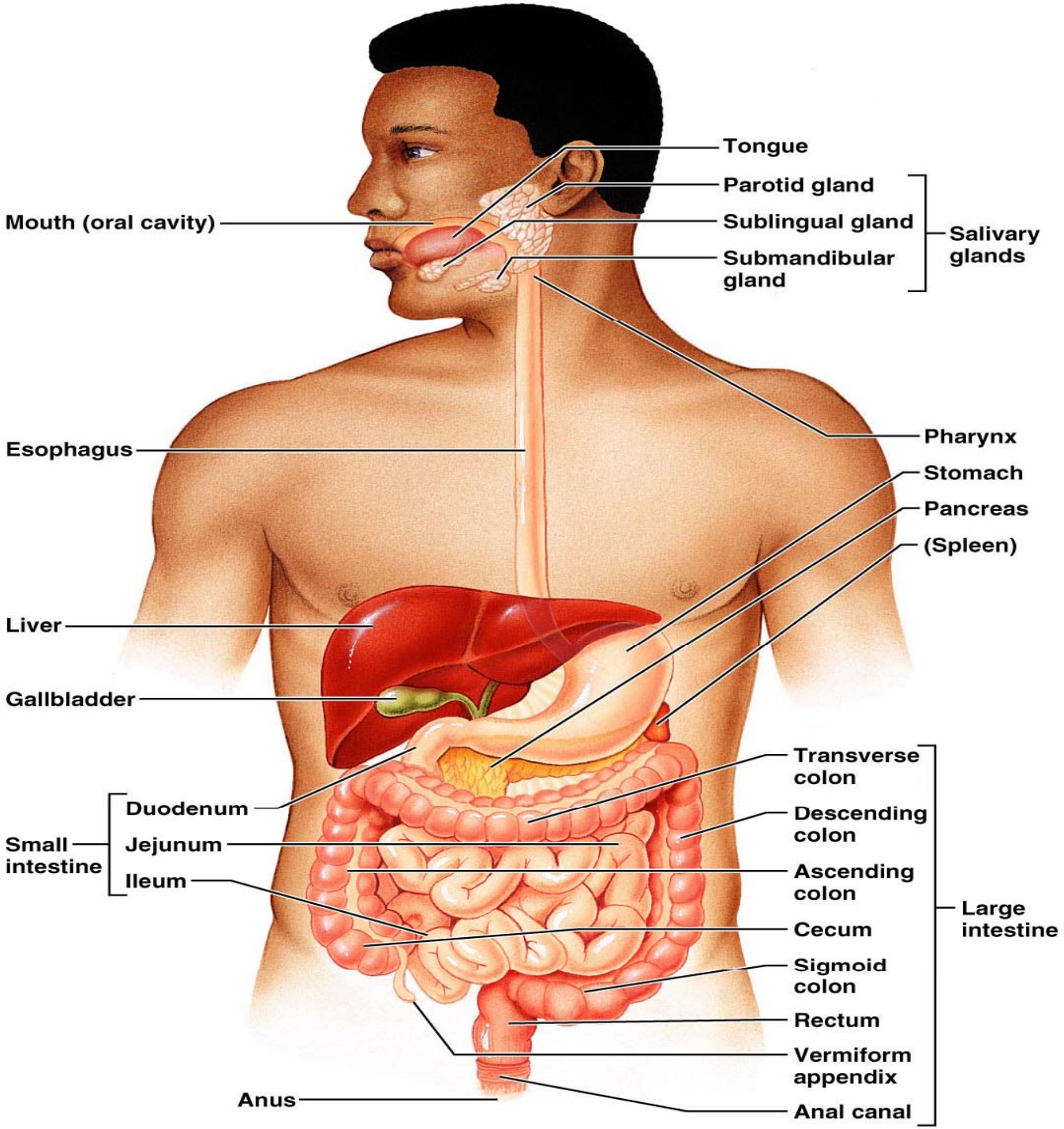
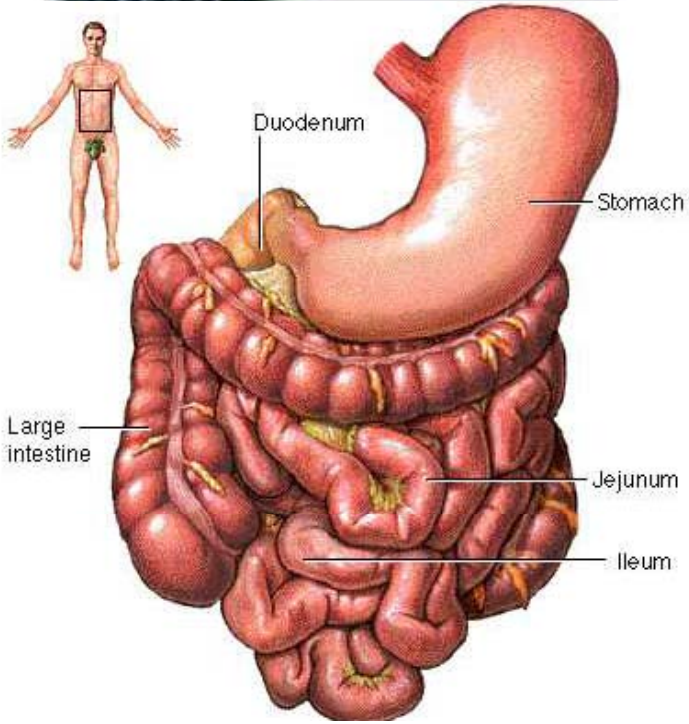

Tongue
Parotid gland
Mouth (oral cavity)
Sublingual gland
Salivary glands
Submandibular gland
Pharynx
Esophagus
Stomach
Pancreas
(Spleen)
Liver
Gallbladder
Transverse colon
Duodenum
Descending colon
Small intestine
Jejunum
Ascending colon
Ileum
Large intestine
Cecum
Sigmoid colon
Rectum
Vermiform appendix
Anus
Anal canal

Figure 23.1

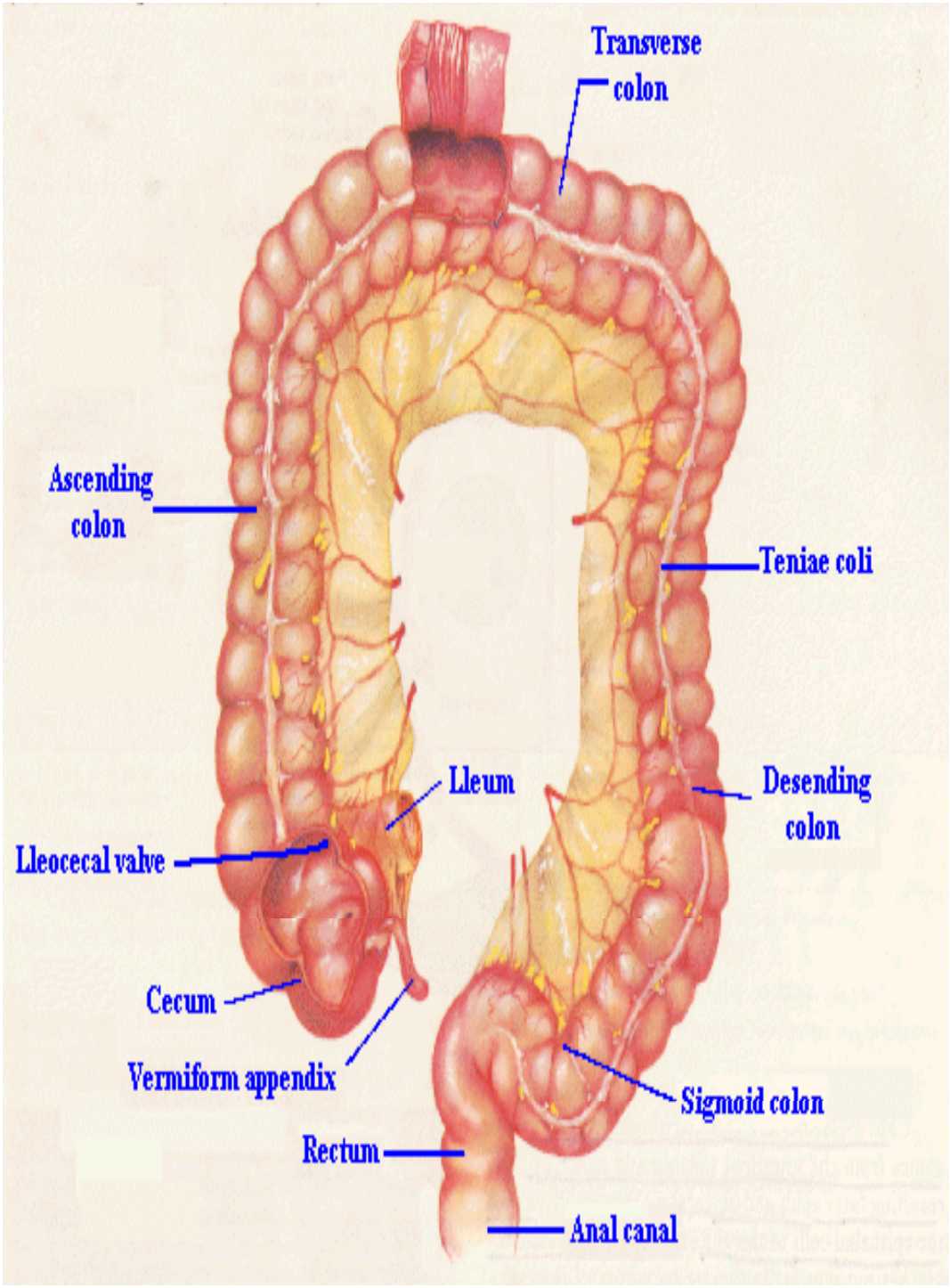
Digestive Process

- The GI tract is a "disassembly" line
  - Nutrients become more available to the body in each step
- **There are six essential activities:**
  - **Ingestion,**
  - **propulsion,**
  - **mechanical digestion**
  - **Chemical digestion,**
  - **absorption,**
  - **defecation**



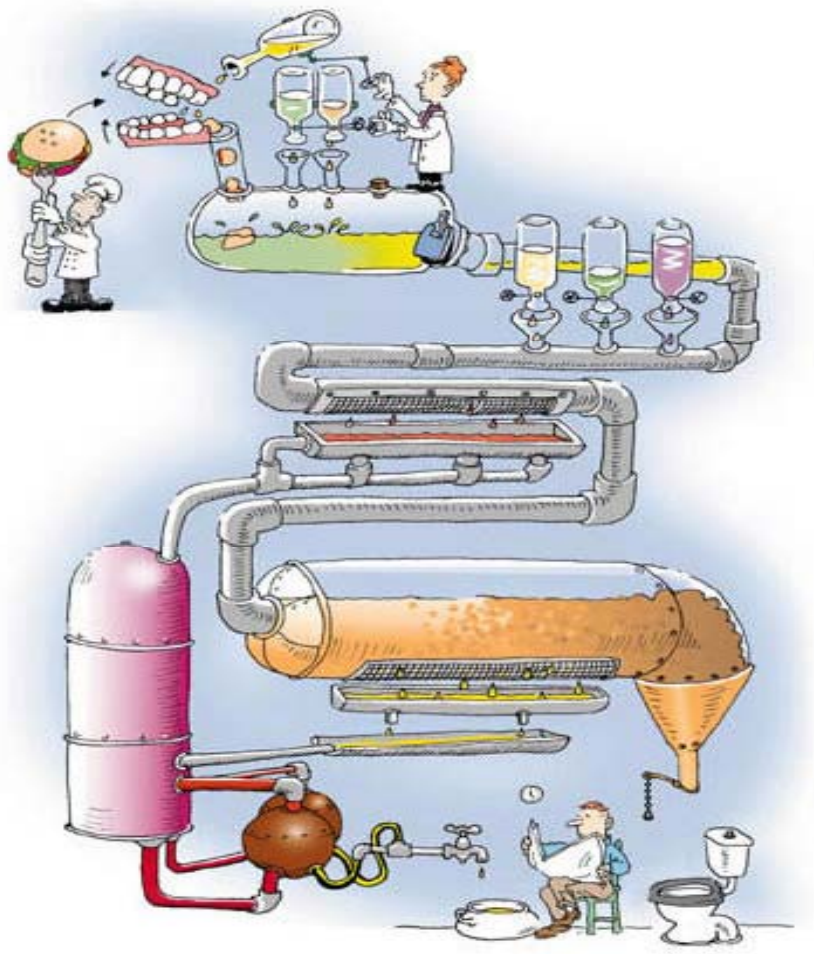
Digestion

- Processing of food
- Types
  - Mechanical (physical)
    - Chew
    - Tear
    - Grind
    - Mash
    - Mix
  - Chemical
    - Catabolic reactions
    - Enzymatic hydrolysis
      - Carbohydrate
      - Protein
      - Lipid



Digestion, what is it?

- Mechanical breakdown of food
- Chemical breakdown of food
- Absorption of nutrients



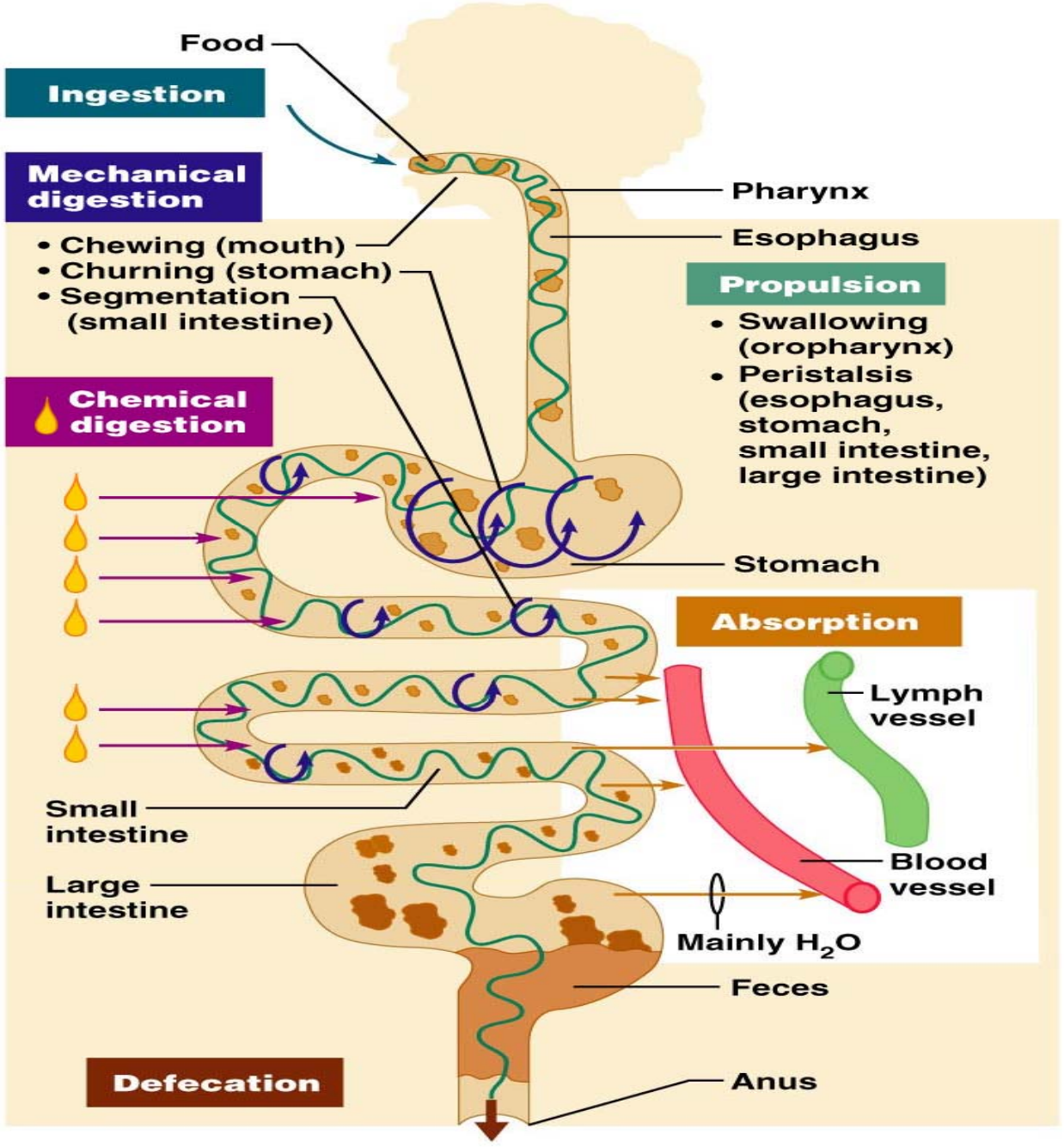

Food
Ingestion
Mechanical digestion
• Chewing (mouth)
• Churning (stomach)
• Segmentation (small intestine)
Chemical digestion
Pharynx
Esophagus
Propulsion
• Swallowing (oropharynx)
• Peristalsis (esophagus, stomach, small intestine, large intestine)
Stomach
Absorption
Lymph vessel
Blood vessel
Mainly H_2O
Small intestine
Large intestine
Feces
Defecation
Anus

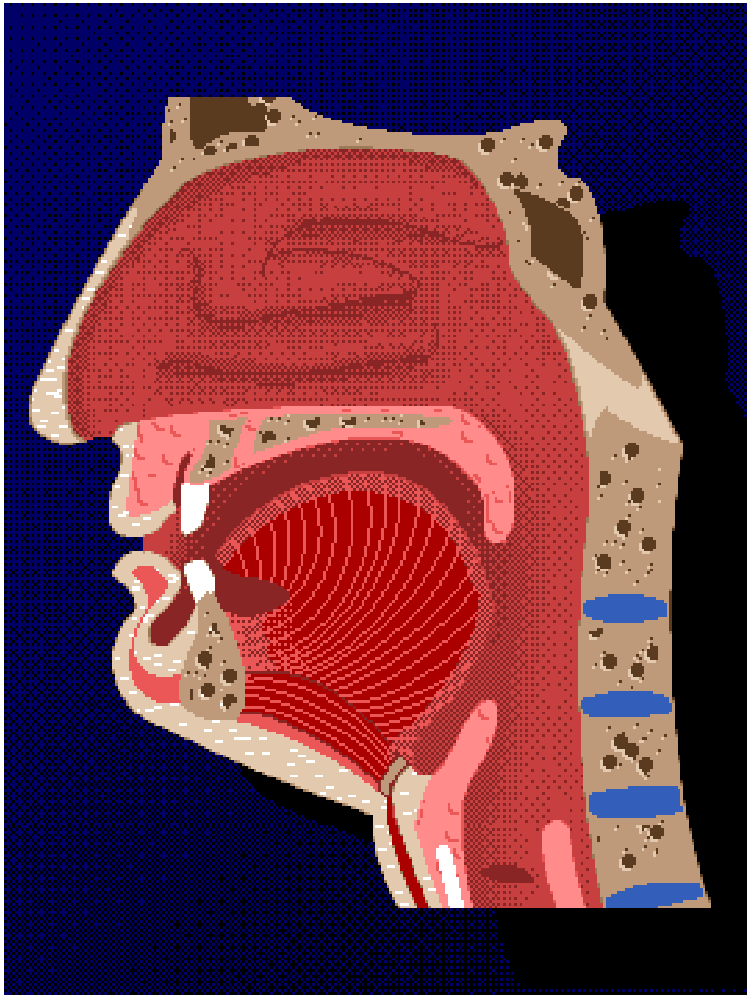
Figure 23.2

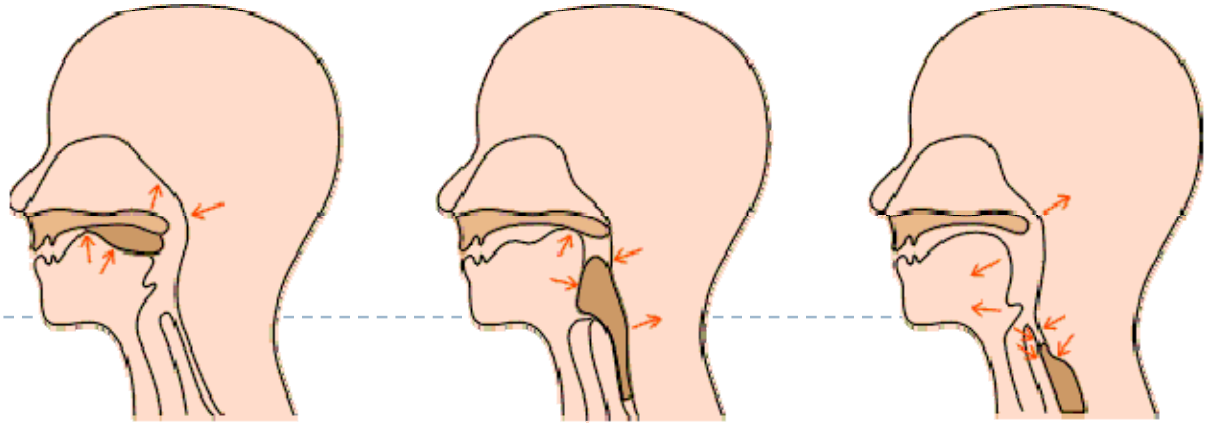
Gastrointestinal Tract Activities

- **Ingestion** – taking food into the digestive tract
- **Propulsion** – swallowing and peristalsis
  - Peristalsis – waves of contraction and relaxation of muscles in the organ walls
- **Mechanical digestion** – chewing, mixing, and churning food

Deglutition (swallowing)

- Sequence
  - Voluntary stage
    - Push food to back of mouth
  - Pharyngeal stage
    - Raise
      - Soft palate
      - Larynx + hyoid
      - Tongue to soft palate
  - Esophageal stage
    - Contract pharyngeal muscles
    - Open esophagus
    - Start peristalsis

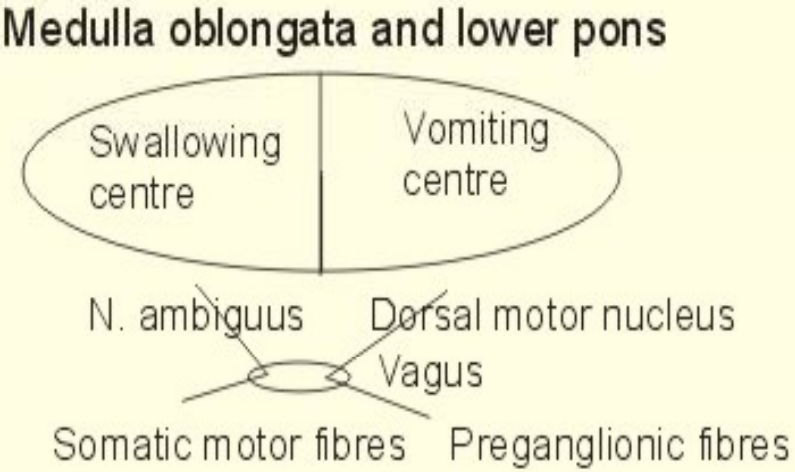


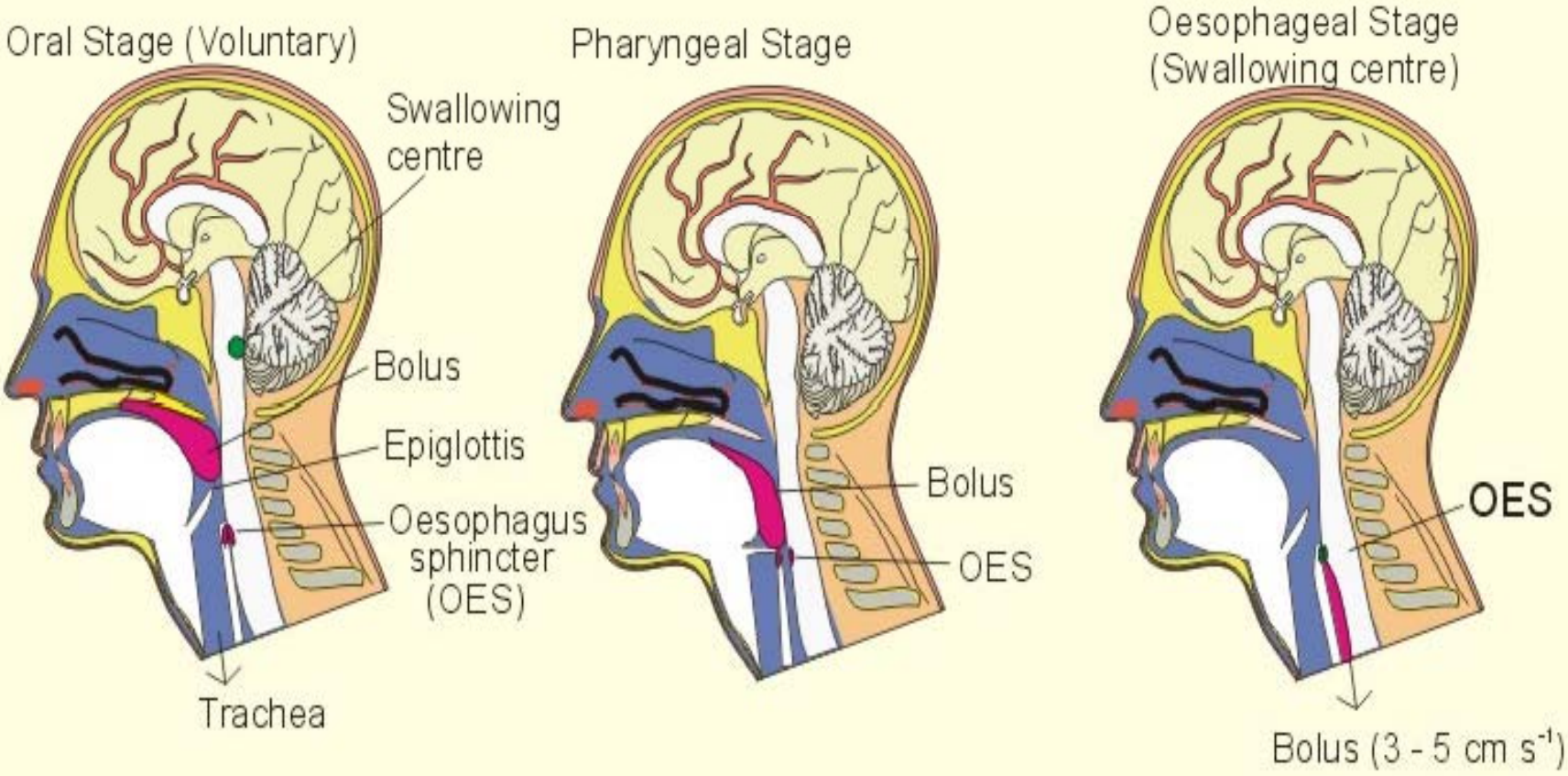


Deglutition (swallowing)

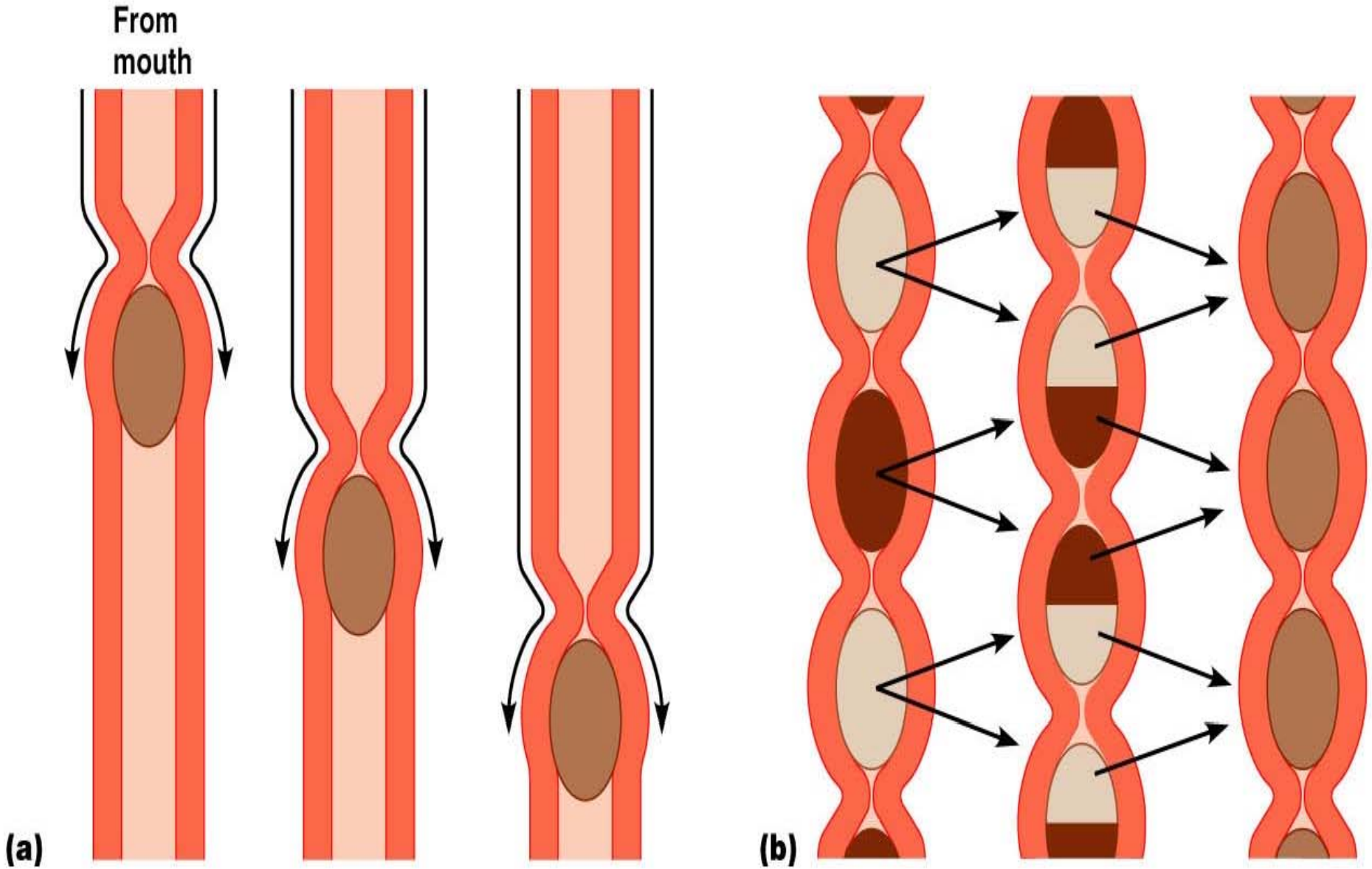
- Control
  - Nerves
    - **Glossopharyngeal**
    - **Vagus**
    - **Accessory**
  - Brain stem
    - Deglutition center
      - Medulla oblongata
      - Pons
  - Disorders
    - **Dysphagia**
    - **Aphagia**

Swallowing Of A Bolus

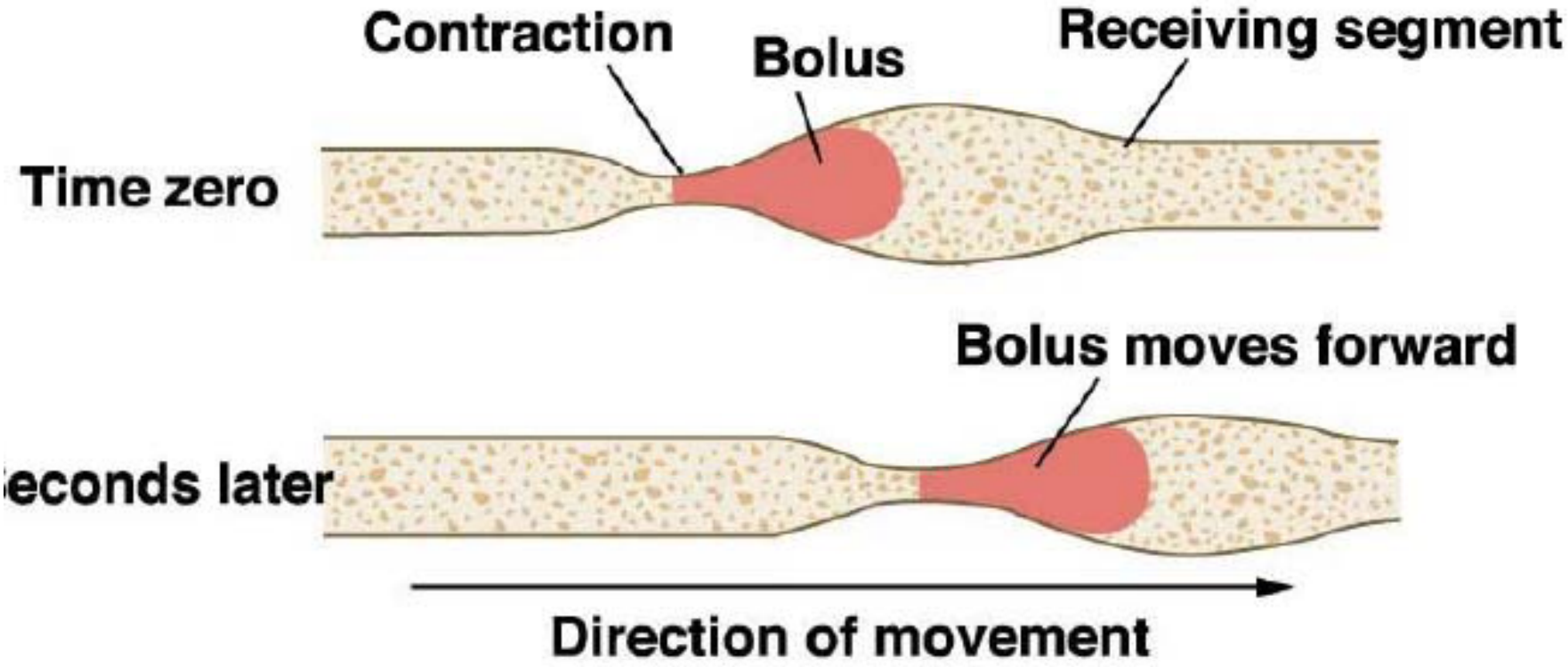




Peristalsis and Segmentation



Peristaltic contractions are responsible for forward movement



Intestinal Smooth Muscle Potentials & Contractions

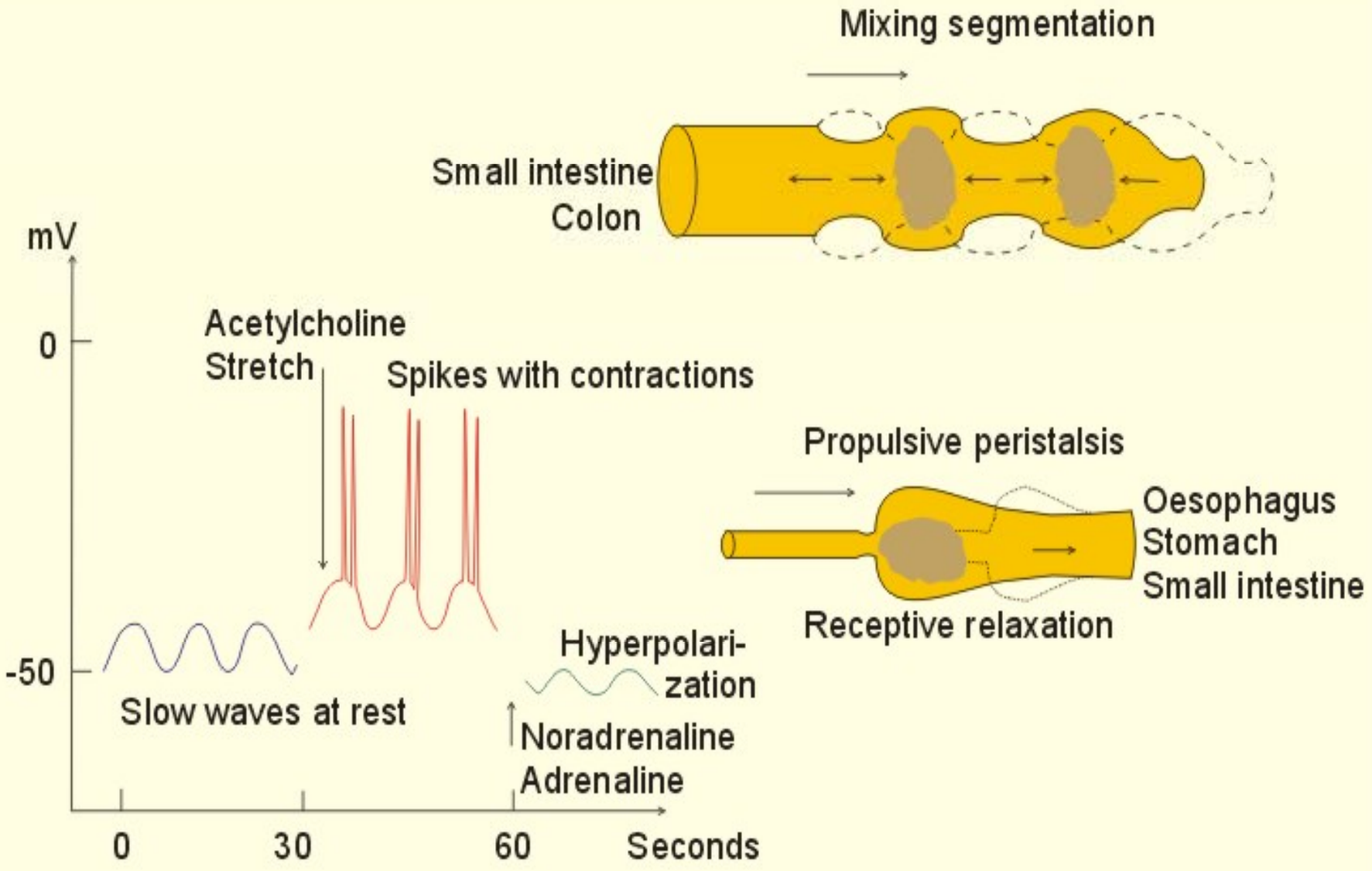


Fig. 22-3

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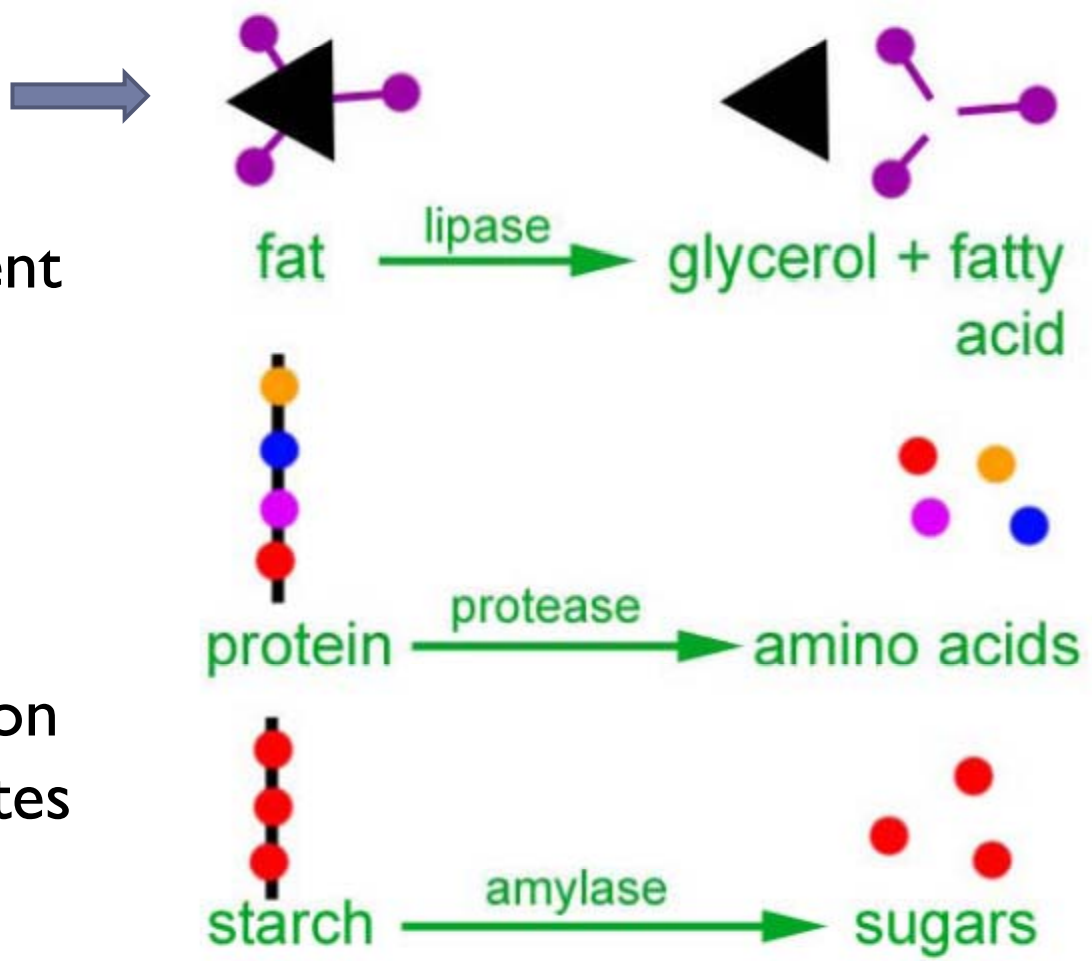
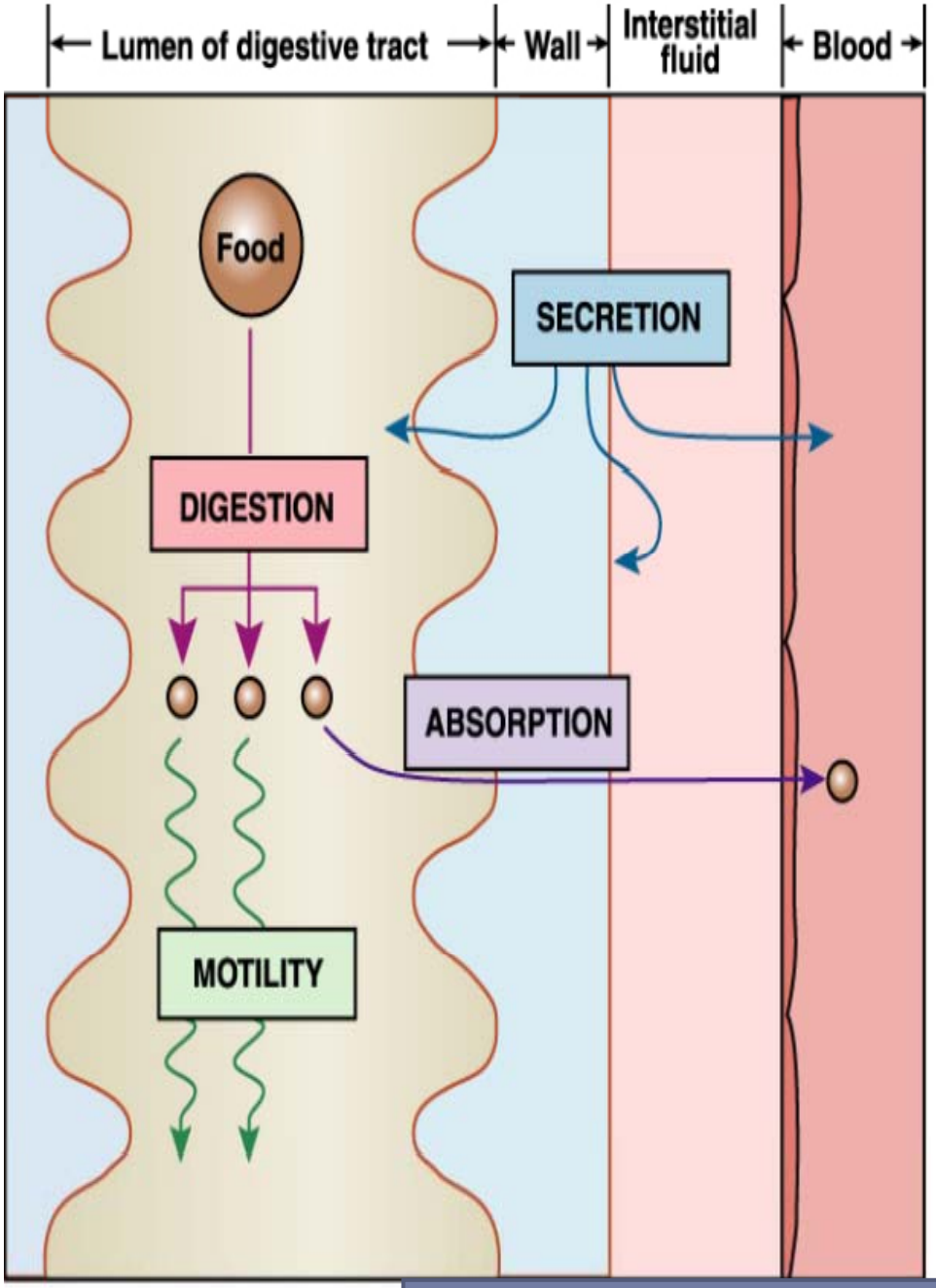
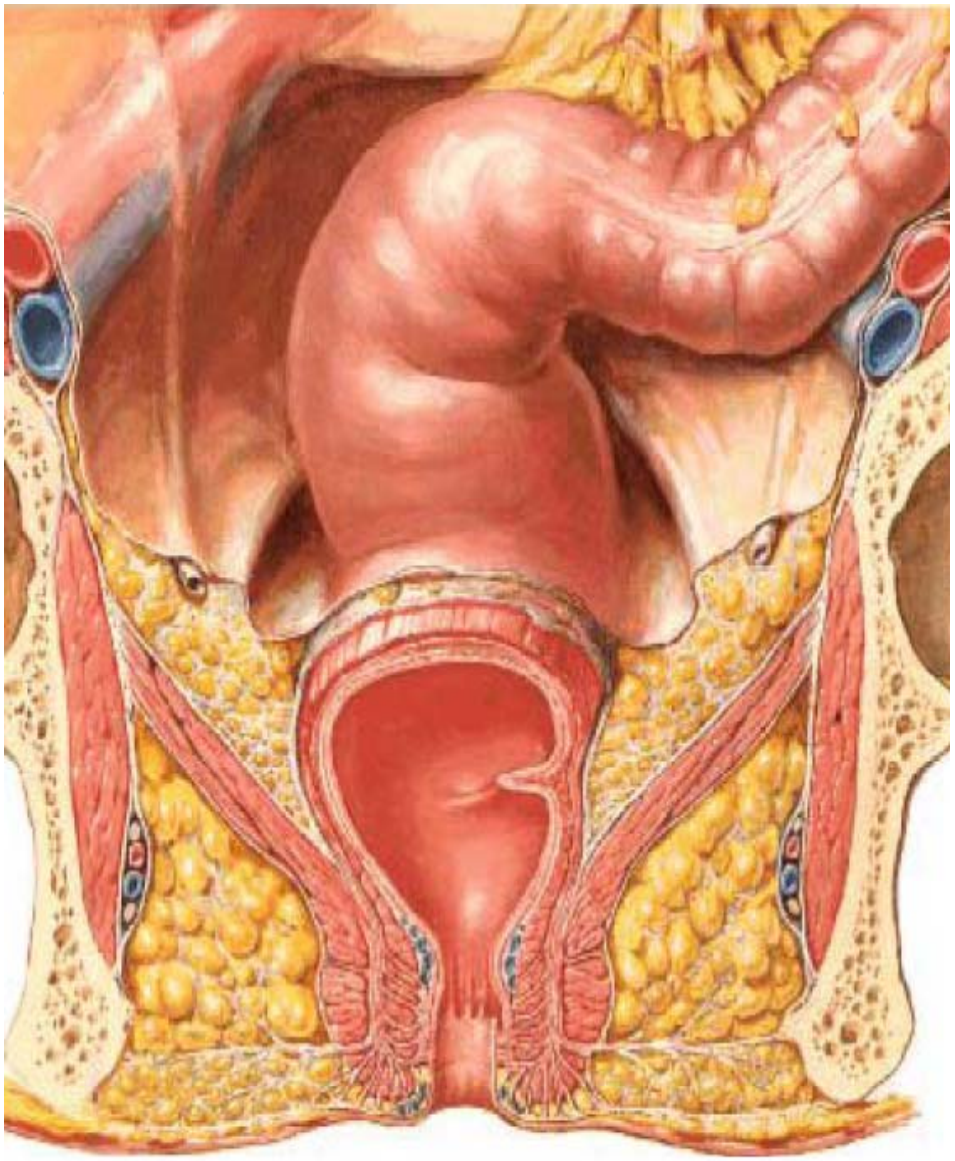
Gastrointestinal Tract Activities

- **Chemical digestion** – catabolic breakdown of food



- **Absorption** – movement of nutrients from the GI tract to the blood or lymph
- **Defecation** – elimination of indigestible solid wastes


Lumen of digestive tract
Wall
Interstitial fluid
Blood
Food
SECRETION
DIGESTION
ABSORPTION
MOTILITY



Defecation

Absorption

The small intestine is the main site of absorption

•Most ***water-soluble nutrients*** such as monosaccharides, small fatty acids, and many amino acids are absorbed by either active transport or facilitated diffusion.

Once in the lining cells, they may pass freely into the numerous ***capillaries*** of the mucosa's connective tissue (the lamina propria).

The "finishing enzymes" (brush border enzymes) in the small intestine help to break up disaccharides and small chain polypeptides that are still just a wee bit to large to absorb through the membrane.

•***Fat-soluble nutrients*** cannot be absorbed so simply, and must be processed by the lining cells.

•After packaging lipids into little bubbles of membrane they are exuded from the cell and pass into lymphatic capillaries called ***lacteals*** in the villus.

• Like most nutrients, these will find themselves headed for the liver for processing.

GI Tract

- External environment for the digestive process

- ***Regulation of digestion involves:***
  - **Mechanical and chemical stimuli** – stretch receptors, osmolarity, and presence of substrate in the lumen
  - **Extrinsic control** by CNS centers
  - **Intrinsic control** by local centers

Receptors of the GI Tract

- **Mechano- and chemoreceptors respond to:**
  - **Stretch, osmolarity, and pH**
  - **Presence of substrate, and end products of digestion**

- They initiate reflexes that:
  - Activate or inhibit digestive glands
  - Mix lumen contents and move them along

Nervous Control of the GI Tract

- **Intrinsic controls**
  - Nerve plexuses near the GI tract initiate short reflexes
  - Short reflexes are mediated by local enteric plexuses (gut brain)
- **Extrinsic controls**
  - Long reflexes arising within or outside the GI tract
  - CNS centers and extrinsic autonomic nerves

The enteric nervous system, along with the sympathetic and parasympathetic nervous systems, constitute the autonomic nervous system.

The principal components of the enteric nervous system are two networks or plexuses of neurons, both of which are embedded in the wall of the digestive tract and extend from esophagus to anus:

The myenteric plexus is located between the longitudinal and circular layers of muscle in the tunica muscularis and, appropriately, exerts control primarily over digestive tract motility.

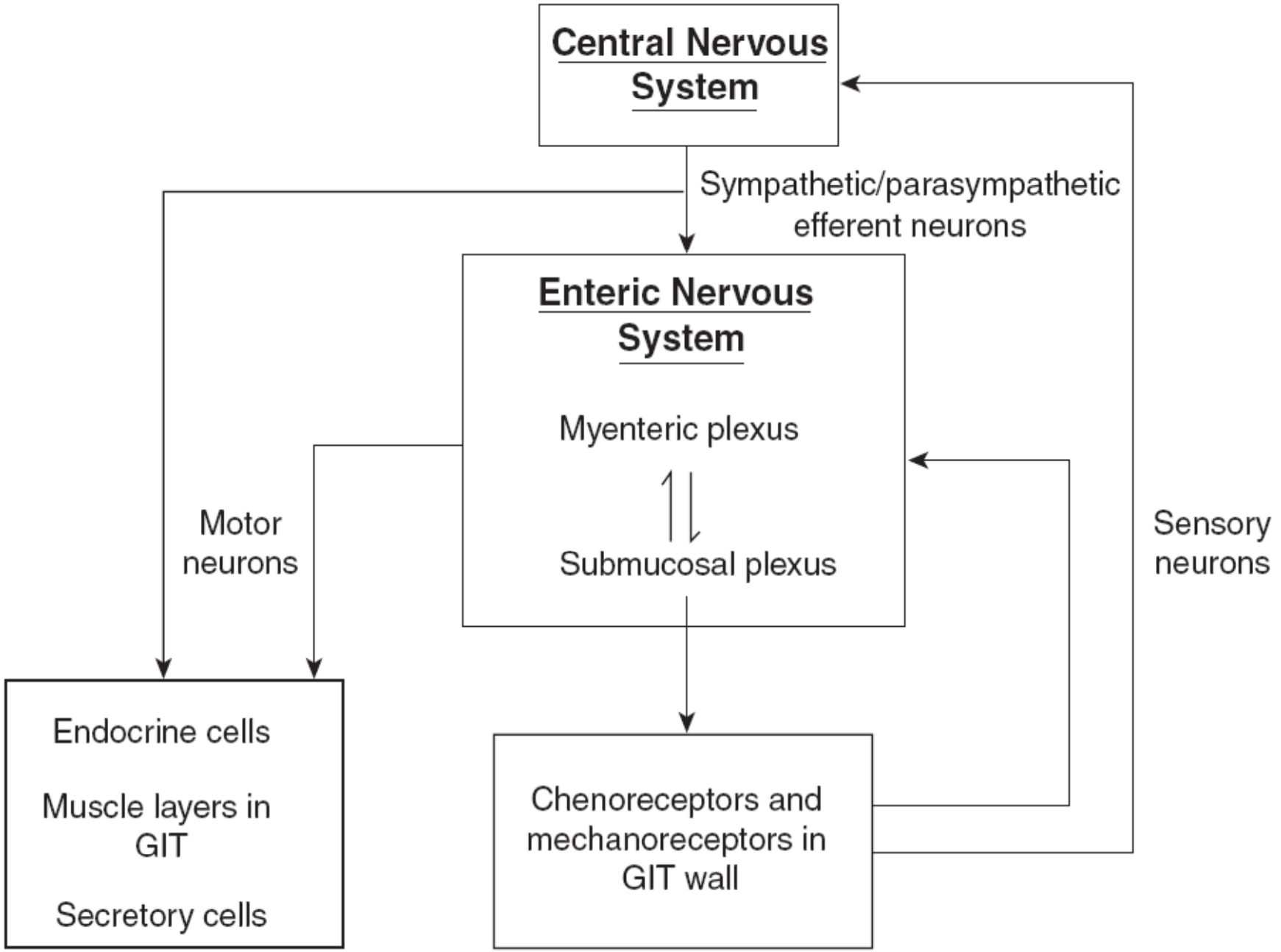
The submucous plexus, as its name implies, is buried in the submucosa. Its principal role is in sensing the environment within the lumen, regulating gastrointestinal blood flow and controlling epithelial cell function. In regions where these functions are minimal, such as the esophagus, the submucous plexus is sparse and may actually be missing in sections.

Within enteric plexuses are three types of neurons, most of which are multipolar:

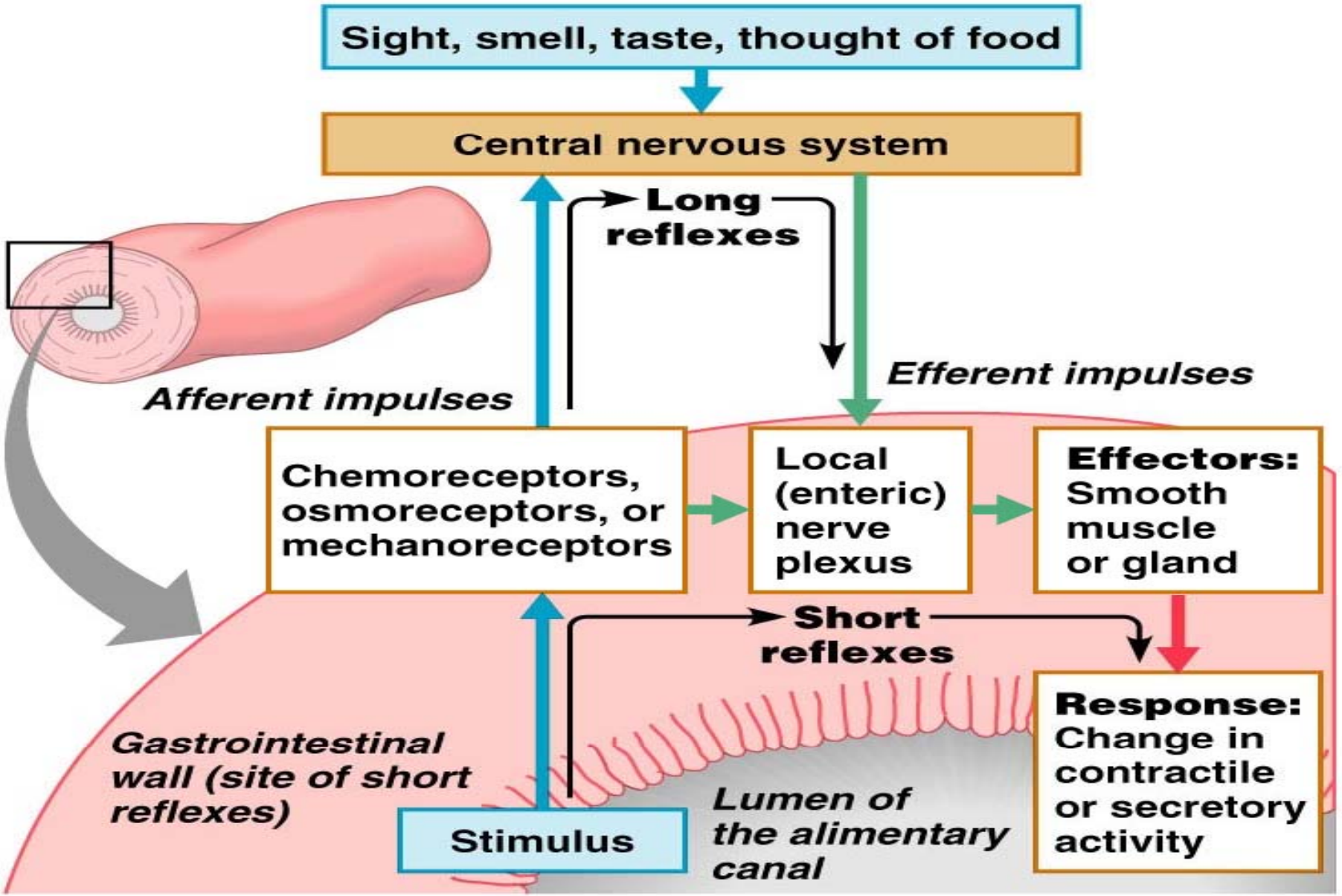
Sensory neurons receive information from sensory receptors in the mucosa and muscle.
At least five different sensory receptors have been identified in the mucosa, which respond to mechanical, thermal, osmotic and chemical stimuli.
Chemoreceptors sensitive to acid, glucose and amino acids have been demonstrated which, in essence, allows "tasting" of lumenal contents.
Sensory receptors in muscle respond to stretch and tension.
Collectively, enteric sensory neurons compile a comprehensive battery of information on gut contents and the state of the gastrointestinal wall.

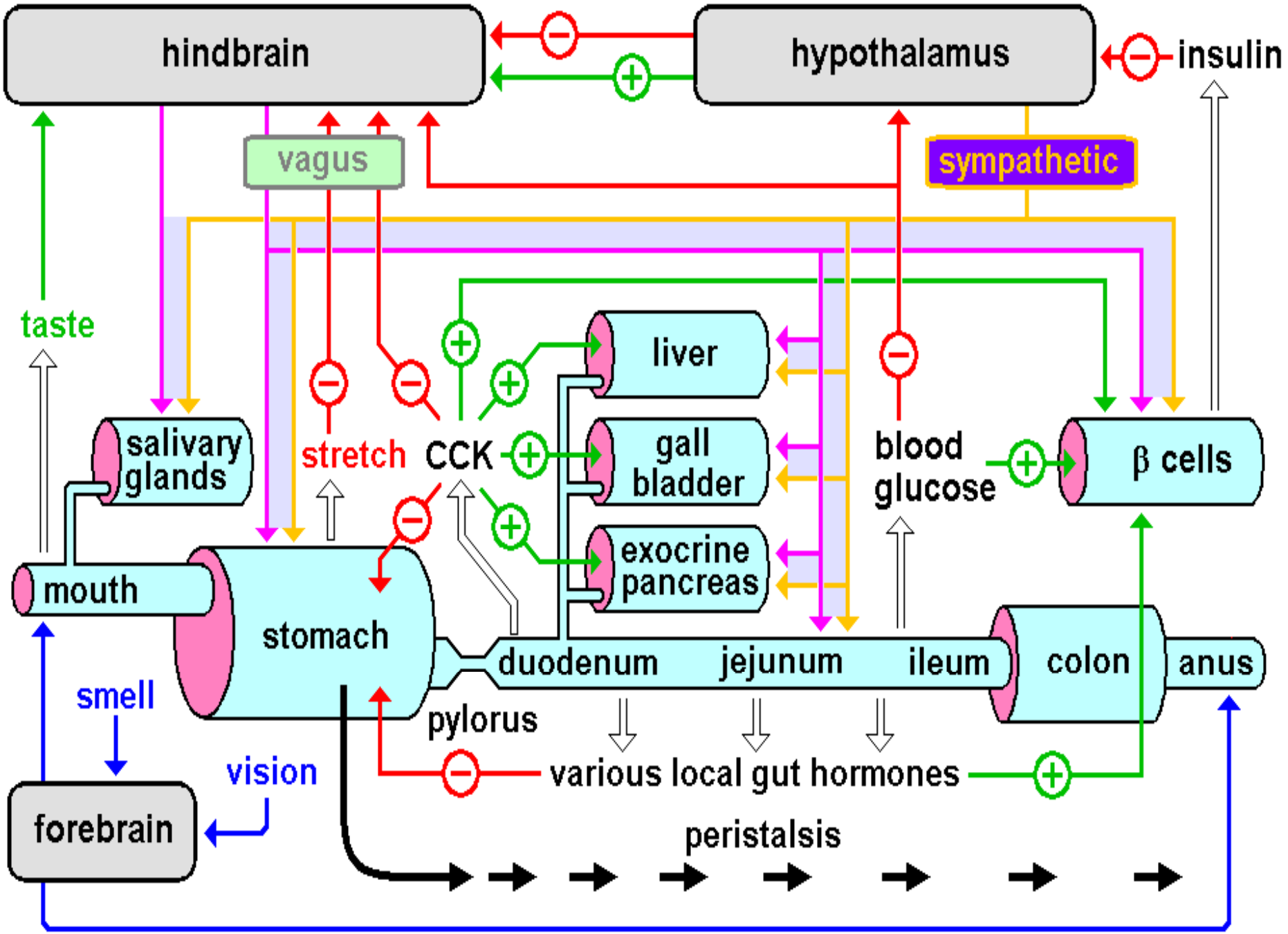
Motor neurons within the enteric plexuses control gastrointestinal motility and secretion, and possibly absorption.
In performing these functions, motor neurons act directly on a large number of effector cells, including **smooth muscle, secretory cells (chief, parietal, mucous, enterocytes, pancreatic exocrine cells) and gastrointestinal endocrine cells.**

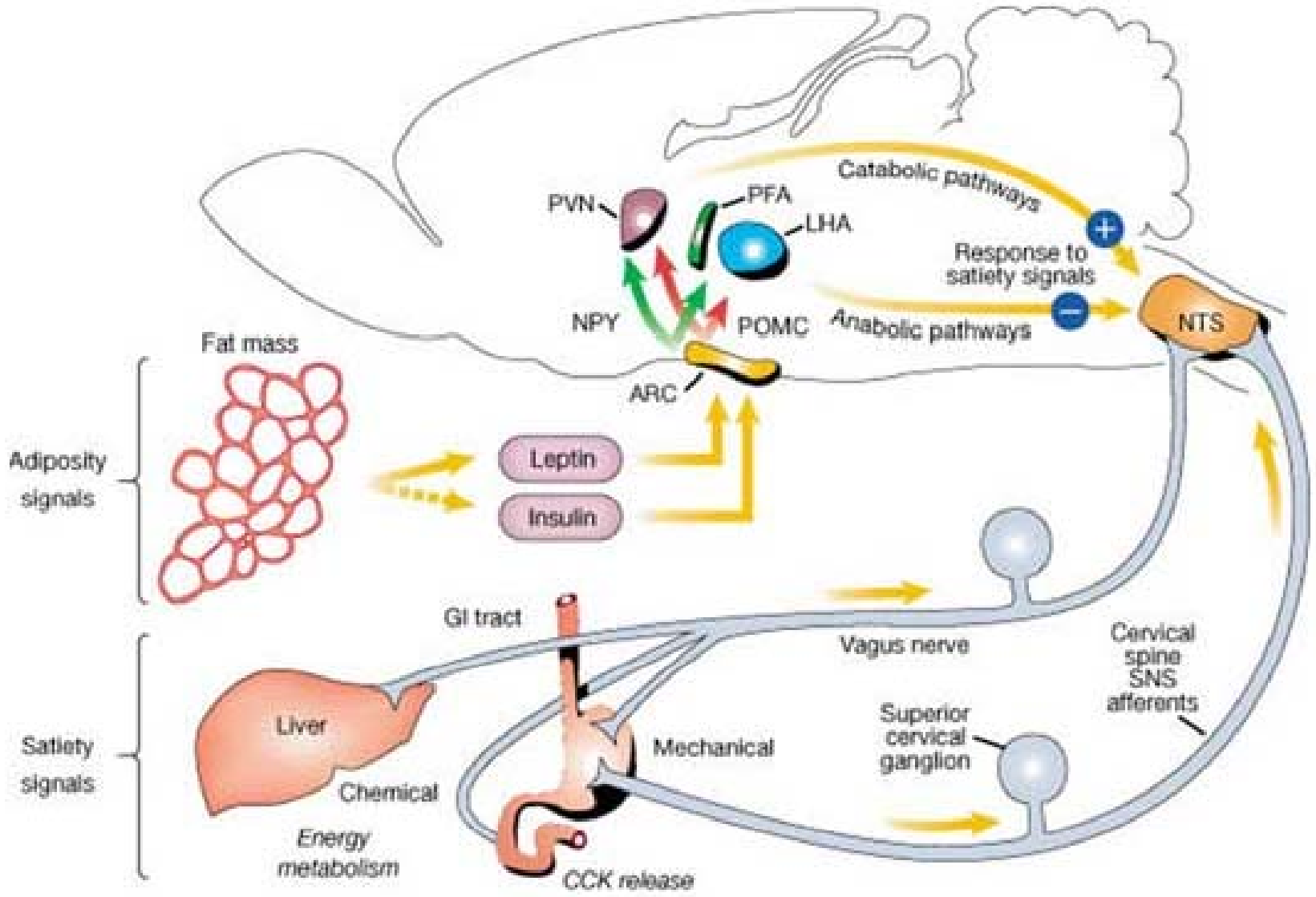
Interneurons are largely responsible for integrating information from sensory neurons and providing it to ("programming") enteric motor neurons.


Central Nervous System
Sympathetic/parasympathetic efferent neurons
Enteric Nervous System
Myenteric plexus
Submucosal plexus
Motor neurons
Sensory neurons
Endocrine cells
Muscle layers in GIT
Secretory cells
Chenoreceptors and mechanoreceptors in GIT wall

Nervous Control of the GI Tract




hindbrain
hypothalamus
insulin
vagus
sympathetic
taste
liver
salivary glands
stretch
CCK
gall bladder
blood glucose
β cells
exocrine pancreas
mouth
stomach
duodenum
jejunum
ileum
colon
anus
smell
pylorus
vision
various local gut hormones
forebrain
peristalsis


Catabolic pathways
PVN
PFA
LHA
Response to satiety signals
NPY
POMC
Anabolic pathways
NTS
ARC
Fat mass
Adiposity signals
Leptin
Insulin
GI tract
Vagus nerve
Cervical spine SNS afferents
Liver
Satiety signals
Mechanical
Superior cervical ganglion
Chemical
Energy metabolism
CCK release

Peritoneum and Peritoneal Cavity

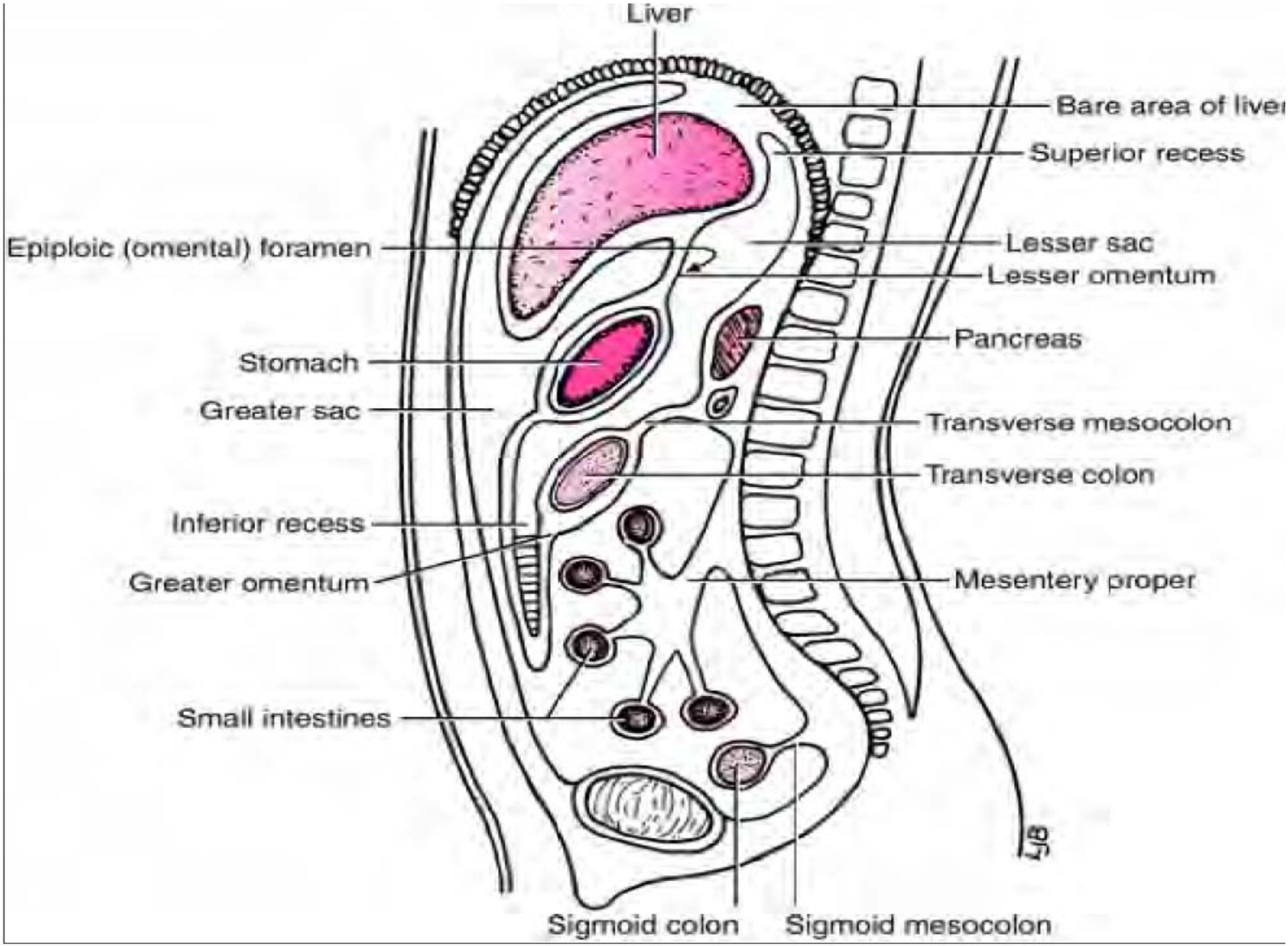
- **Peritoneum** – serous membrane of the abdominal cavity
  - Visceral – covers external surface of most digestive organs
  - Parietal – lines the body wall
  - Is a **serous membrane lined by mesothelial cells.**

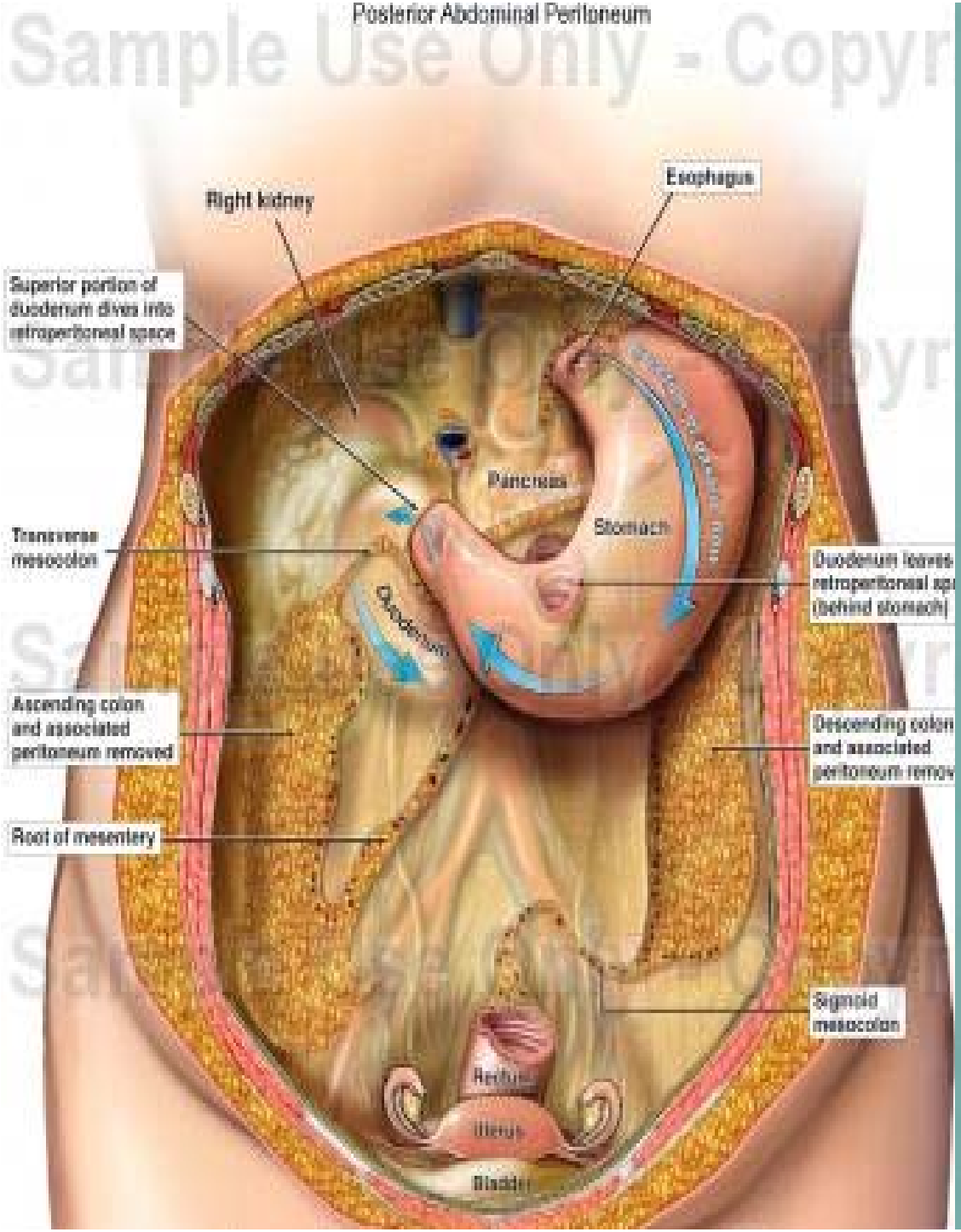
- **Peritoneal cavity**
  - **Lubricates digestive organs**
  - **Allows them to slide across one another**

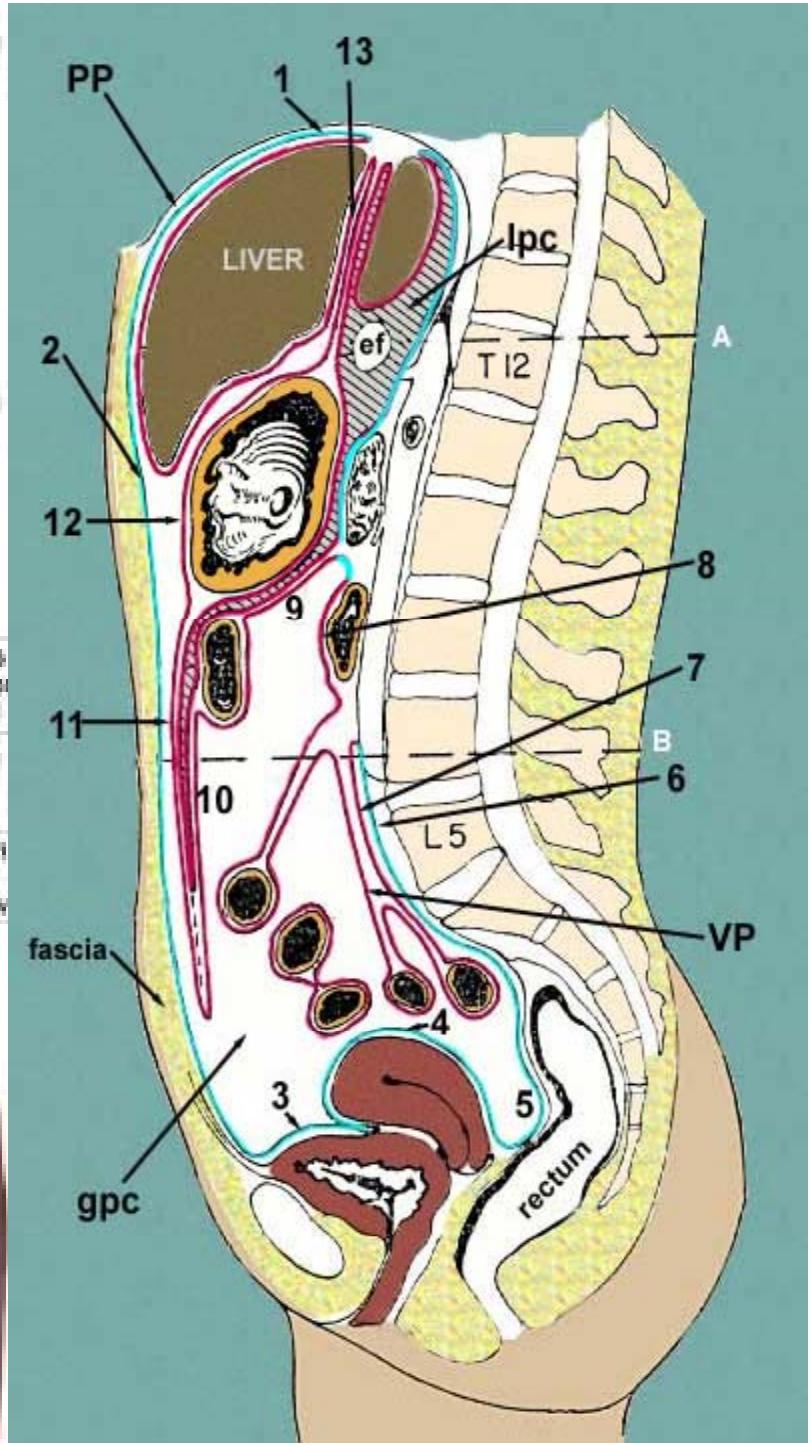
Is a **potential space between the parietal and visceral peritoneum.**
Contains a film of fluid that lubricates the surface of the peritoneum and facilitates free movements of the viscera.
Is a completely closed sac in the male but is open in the female through the uterine tubes, uterus, and vagina.
Is divided into the lesser and greater sacs.

- **A. Parietal peritoneum**
- Lines the abdominal and pelvic walls and the inferior surface of the diaphragm.
- Is innervated by the :
  - somatic nerves such as the phrenic,
  - lower intercostal, subcostal, iliohypogastric, and ilioinguinal nerves.

- **B. Visceral peritoneum**
  - Covers the viscera, is innervated by visceral nerves, and is insensitive to pain.


Liver
Bare area of liver
Superior recess
Epiploic (omental) foramen
Lesser sac
Lesser omentum
Pancreas
Stomach
Greater sac
Transverse mesocolon
Transverse colon
Inferior recess
Greater omentum
Mesentery proper
Small intestines
Sigmoid colon
Sigmoid mesocolon


Posterior Abdominal Peritoneum
Right kidney
Esophagus
Superior portion of duodenum dives into retroperitoneal space
Pancreas
Stomach
Transverse mesocolon
Duodenum
Ascending colon and associated peritoneum removed
Root of mesentery
Sigmoid mesocolon
Uterus
Bladder


PP
1
13
LIVER
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VP
fascia
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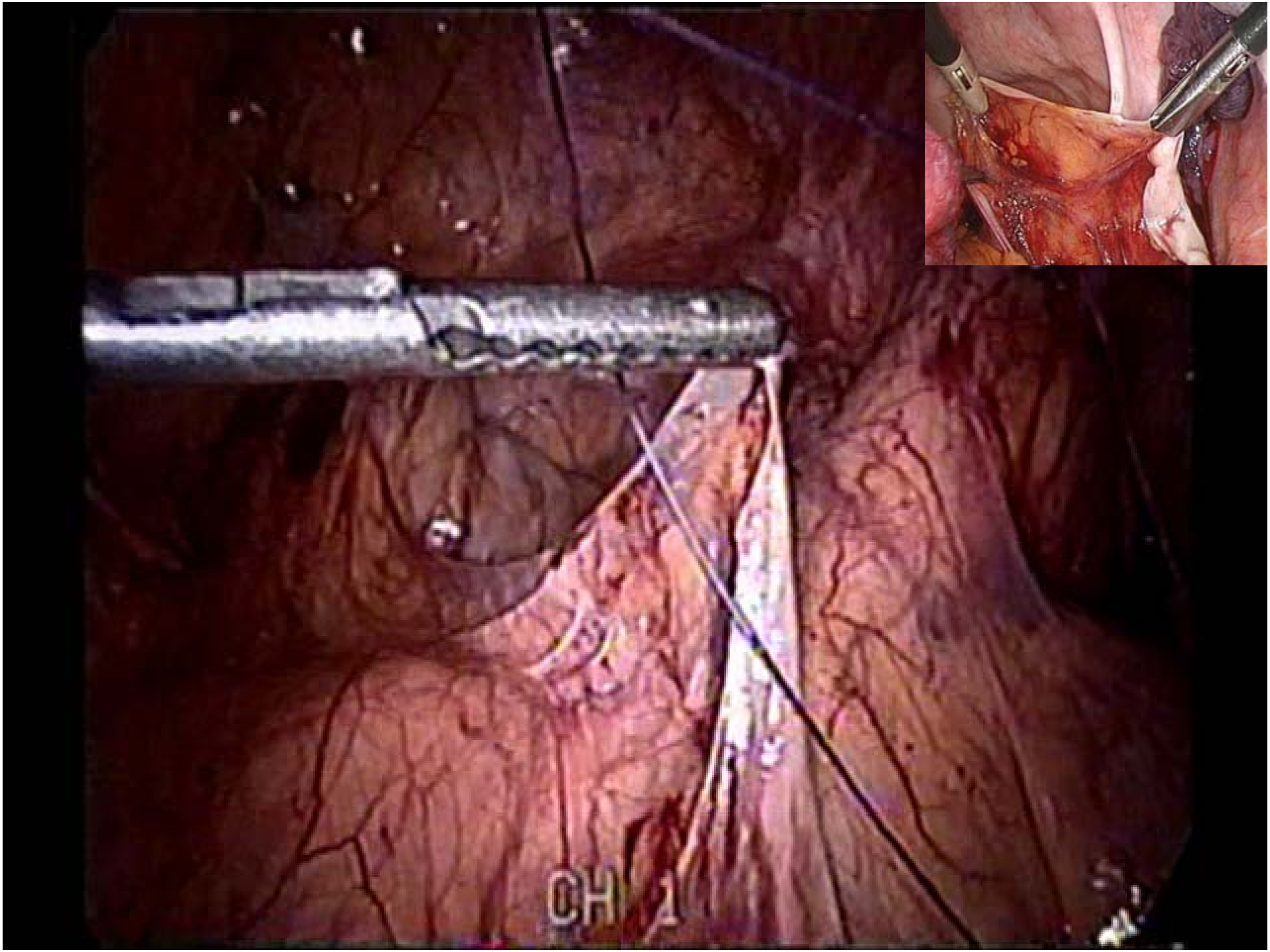
gpc
rectum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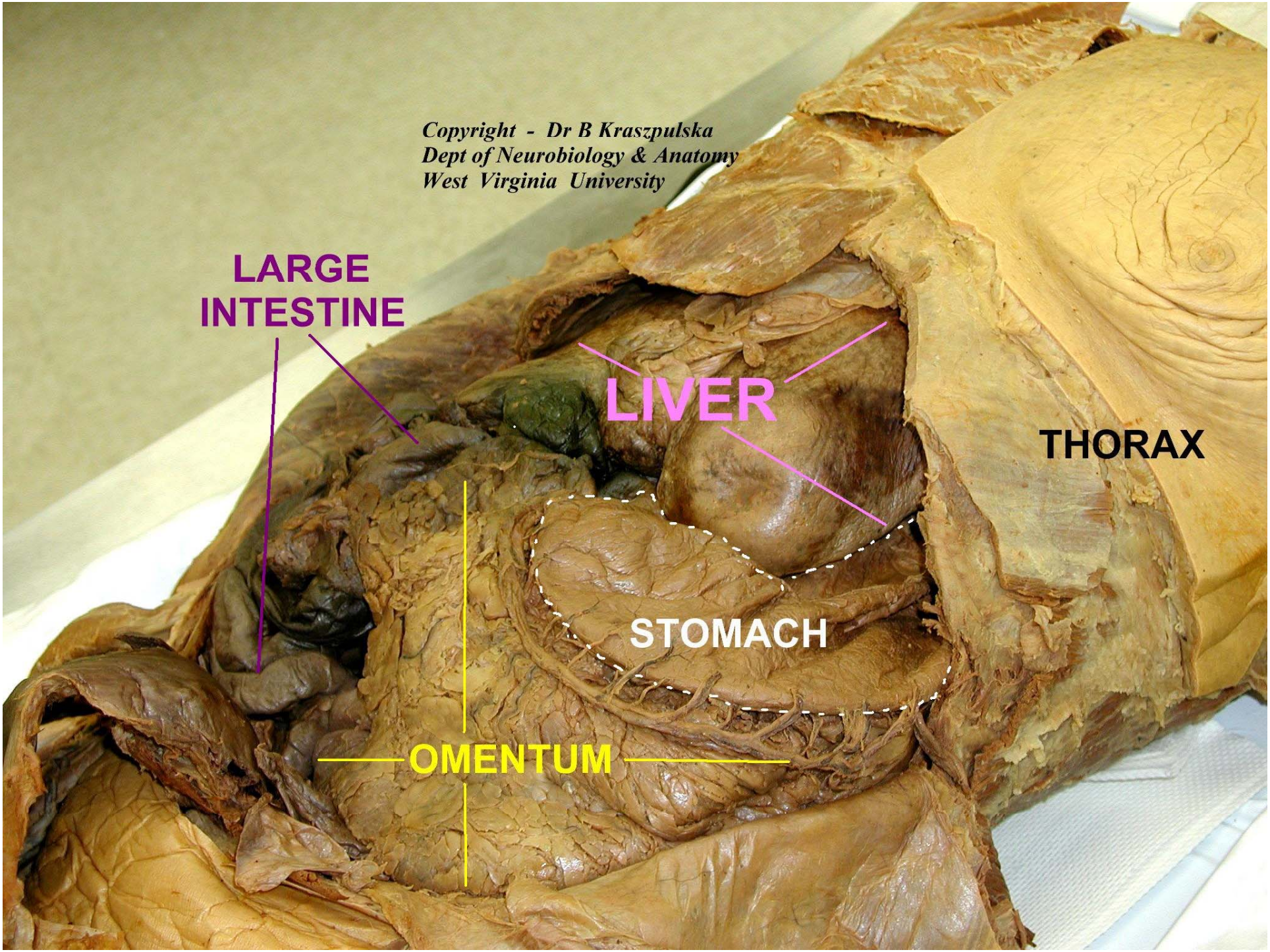
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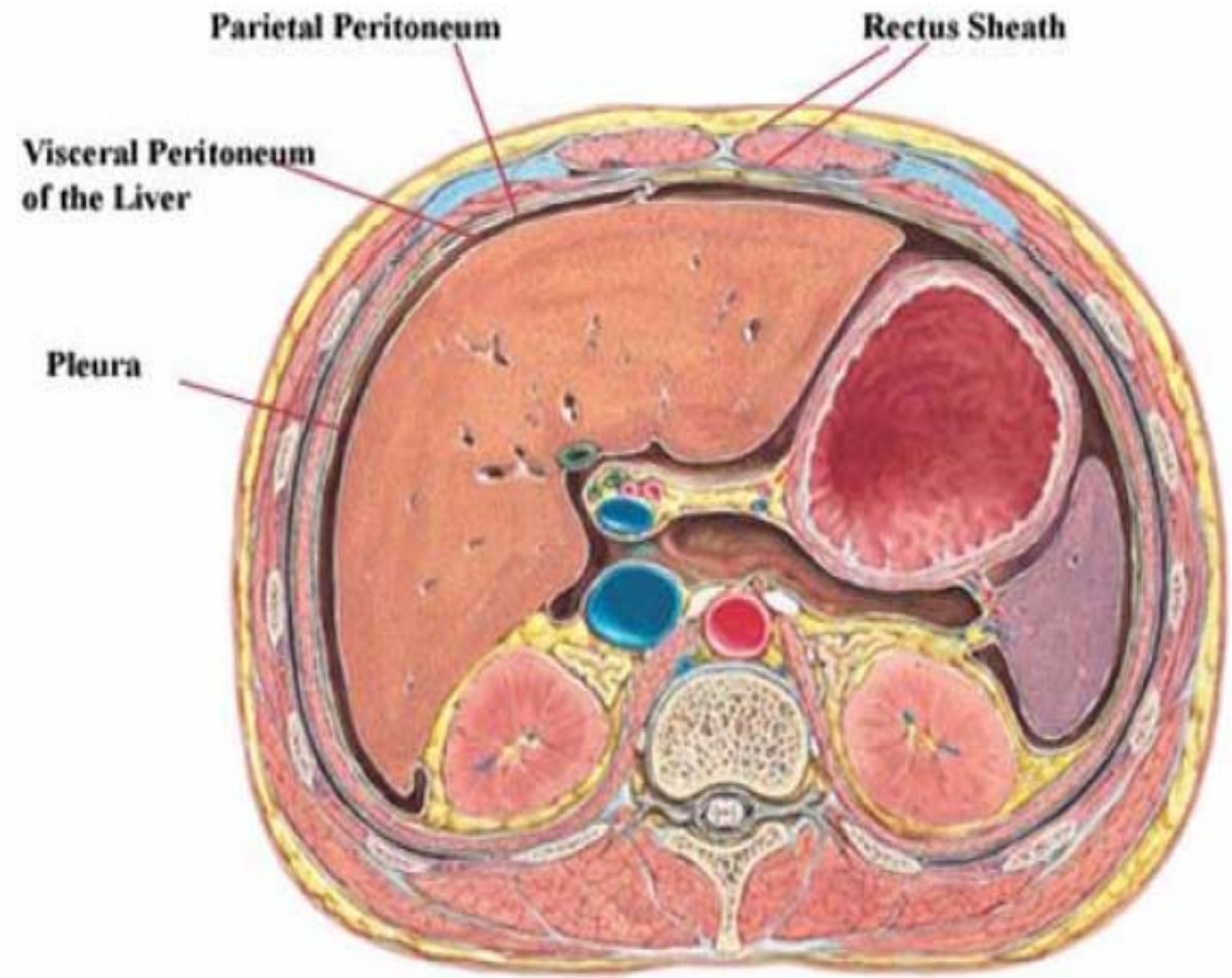
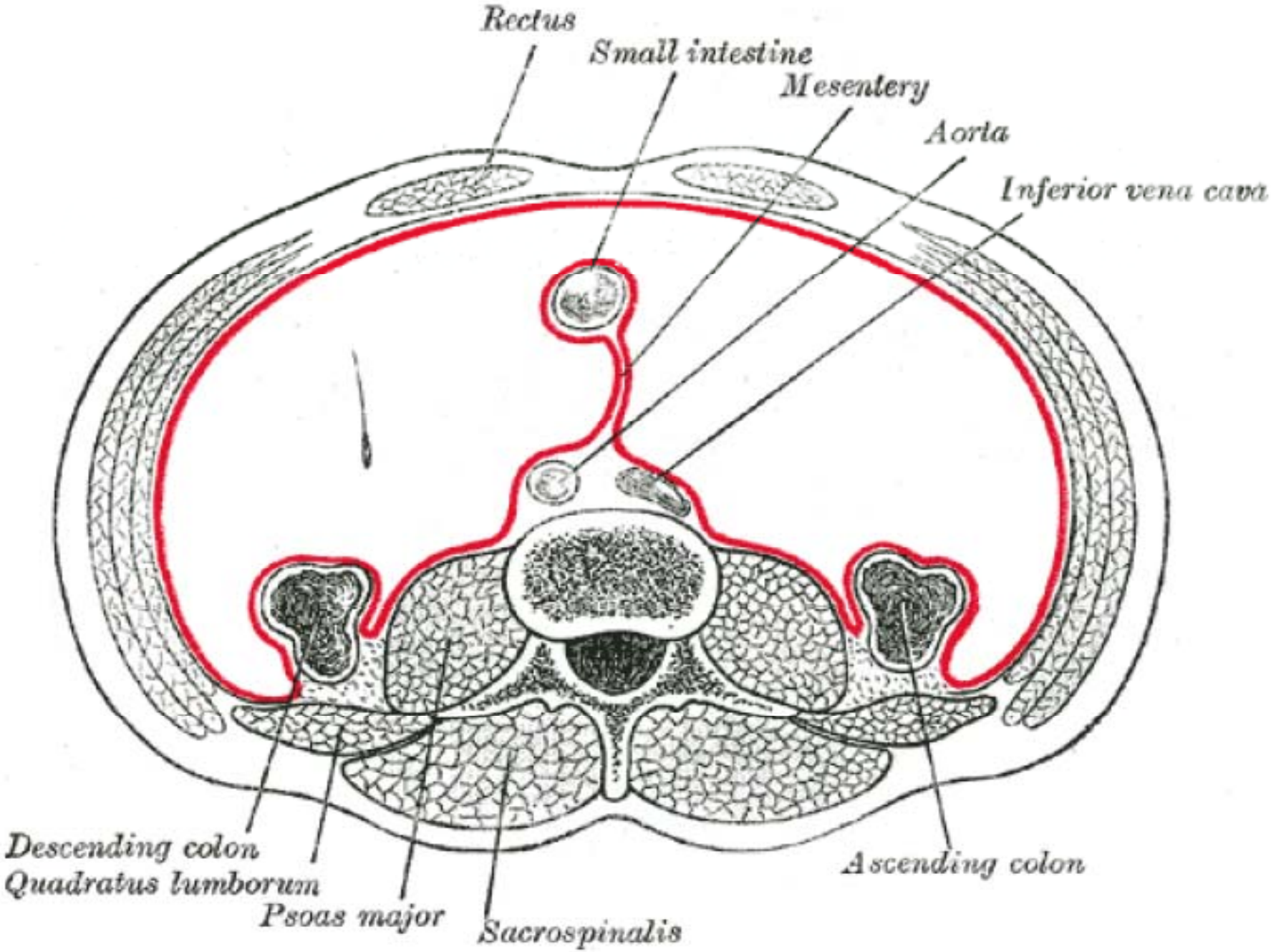
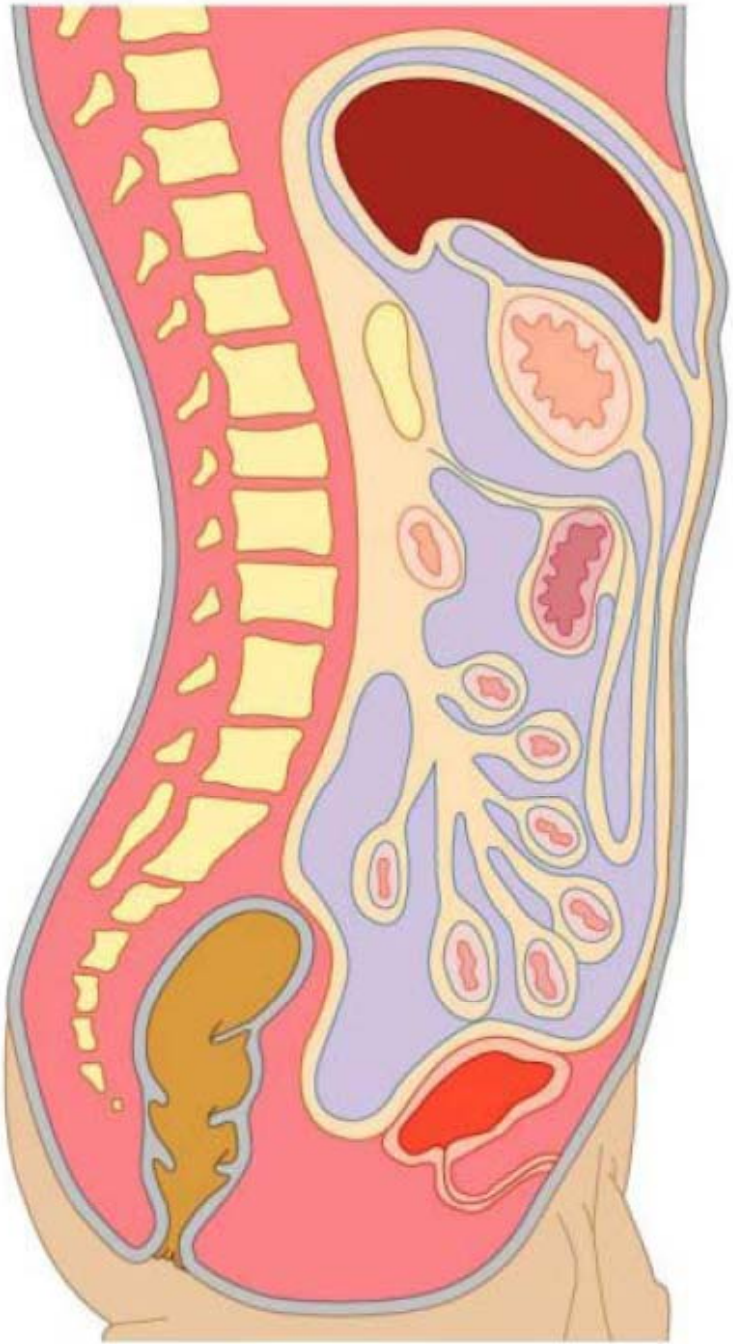
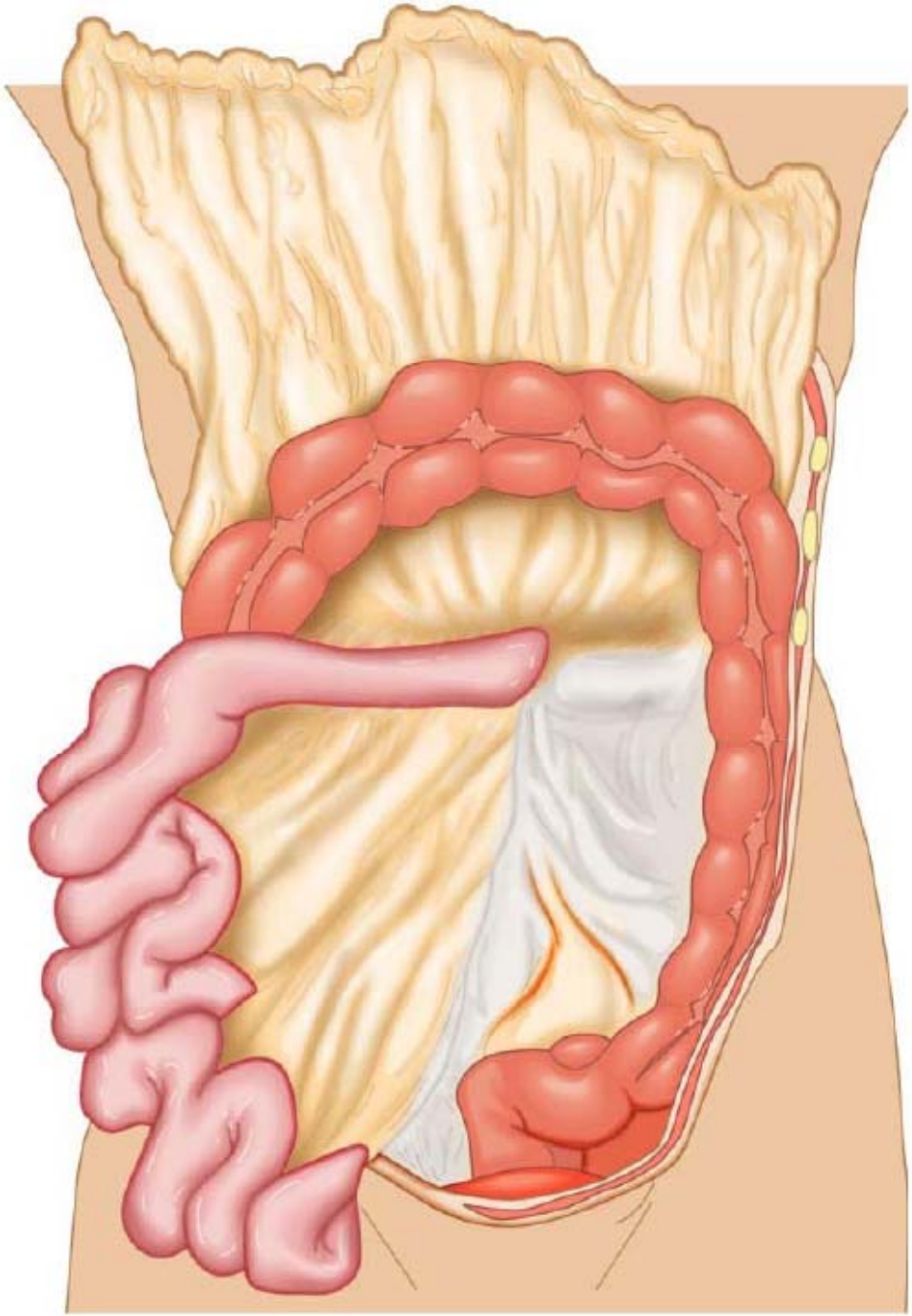
Dept of Neurobiology & Anatomy
West Virginia University
LARGE INTESTINE
LIVER
THORAX
STOMACH
OMENTUM

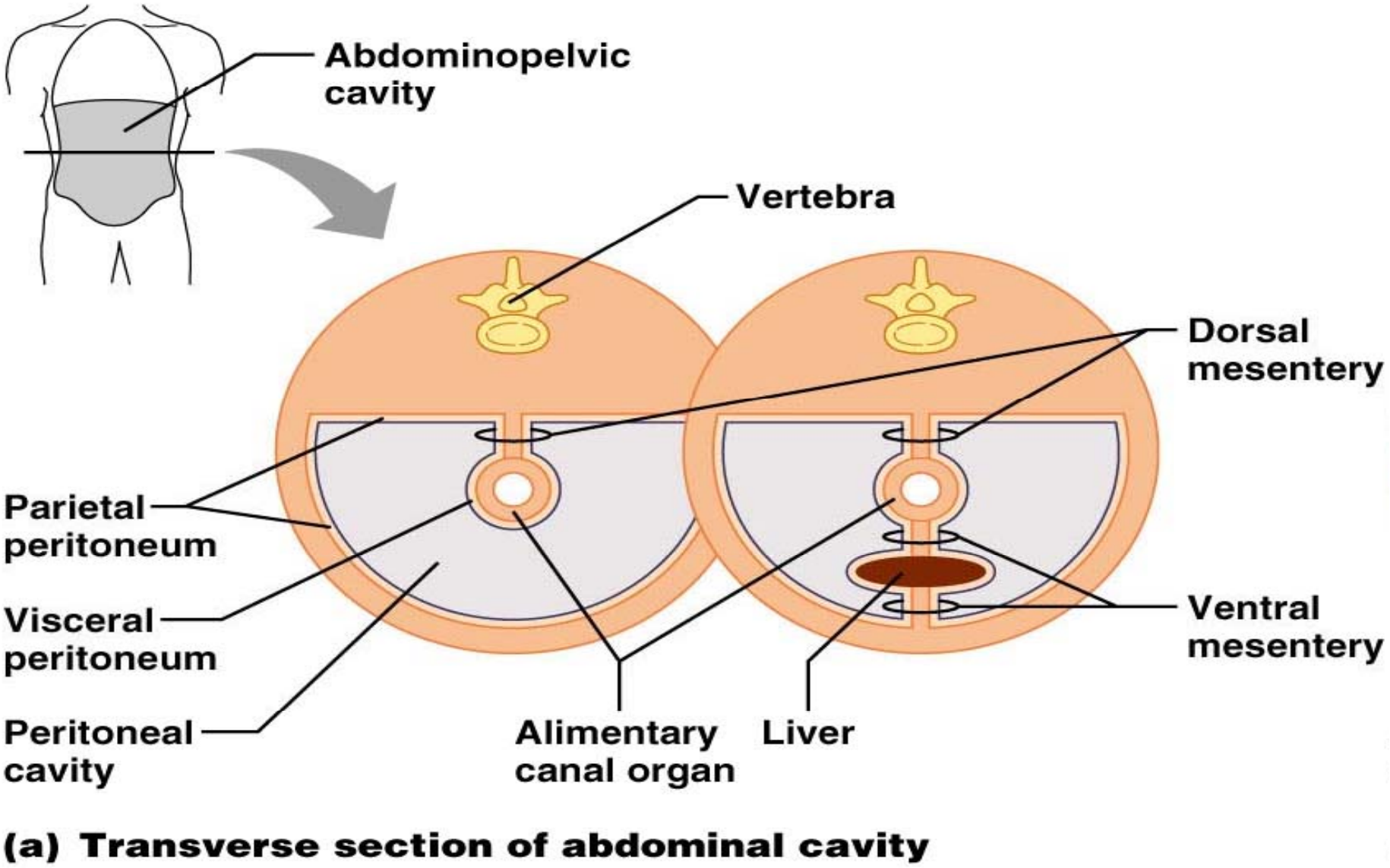

Parietal Peritoneum
Rectus Sheath
Visceral Peritoneum
of the Liver
Pleura


Rectus
Small intestine
Mesentery
Aorta
Inferior vena cava
Descending colon
Quadratus lumborum
Psoas major
Sacrospinalis
Ascending colon





Peritoneum and Peritoneal Cavity



Peritoneum and Peritoneal Cavity

- **Mesentery** – double layer of peritoneum that provides:
  - Vascular and nerve supplies to the viscera
  - Hold digestive organs in place and store fat
- **Retroperitoneal organs** – organs outside the peritoneum
- **Peritoneal organs (intraperitoneal)** – organs surrounded by peritoneum

Retroperitoneal organs

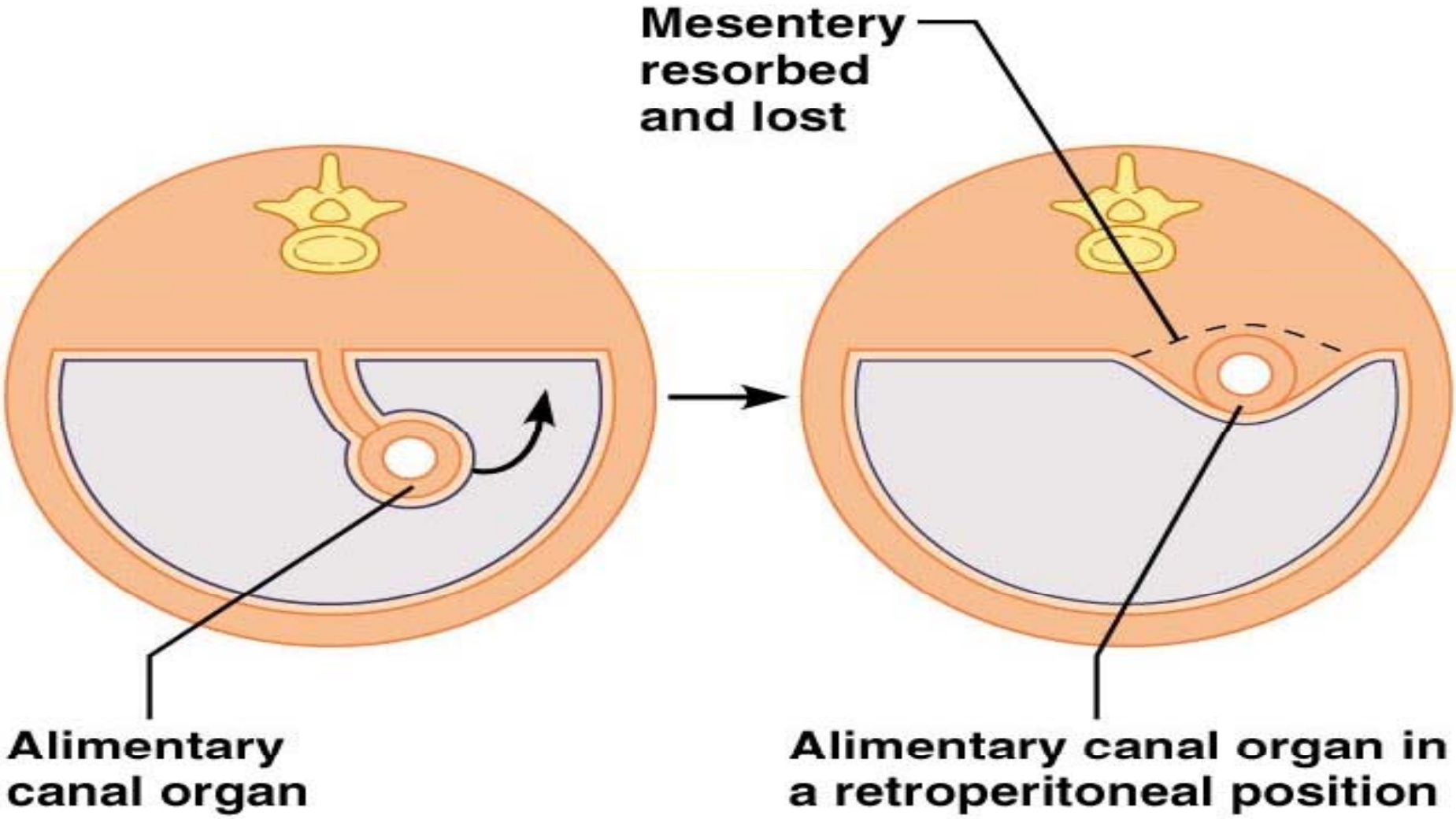
- Structures that lie behind the peritoneum are termed "retroperitoneal". These include:
- **Primarily retroperitoneal:**
  - urinary
    - adrenal glands
    - kidneys
    - ureter
    - bladder
  - circulatory
    - aorta
    - inferior vena cava
  - digestive
    - esophagus (part)
    - rectum
  - Reproductive
    - uterus

Secondarily retroperitoneal:

- the head and neck of the pancreas (but not the tail)
- the duodenum, except for the proximal first segment
- ascending and descending portions of the colon (but not the transverse or sigmoid

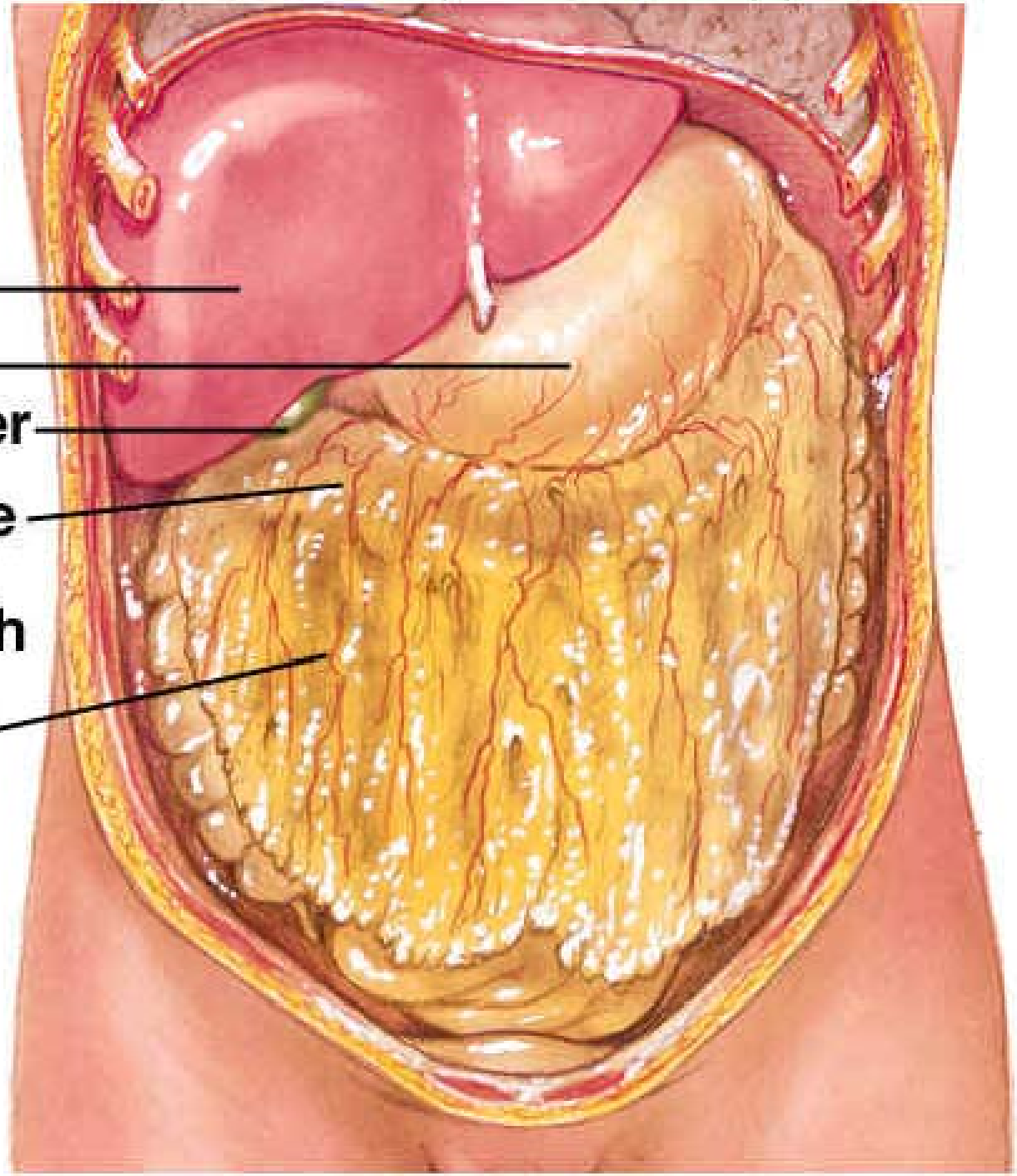
A useful mnemonic to aid recollection of the abdominal retroperitoneal viscera is SAD PUCKER:
S = **S**uprarenal glands (aka the adrenal glands)
A = **A**orta/IVC
D = **D**uodenum (second and third segments)
P = **P**ancreas
U = **U**reters
C = **C**olon (only the ascending and descending branches)
K = **K**idneys
E = **E**sophagus
R = **R**ectum

Peritoneum and Peritoneal Cavity



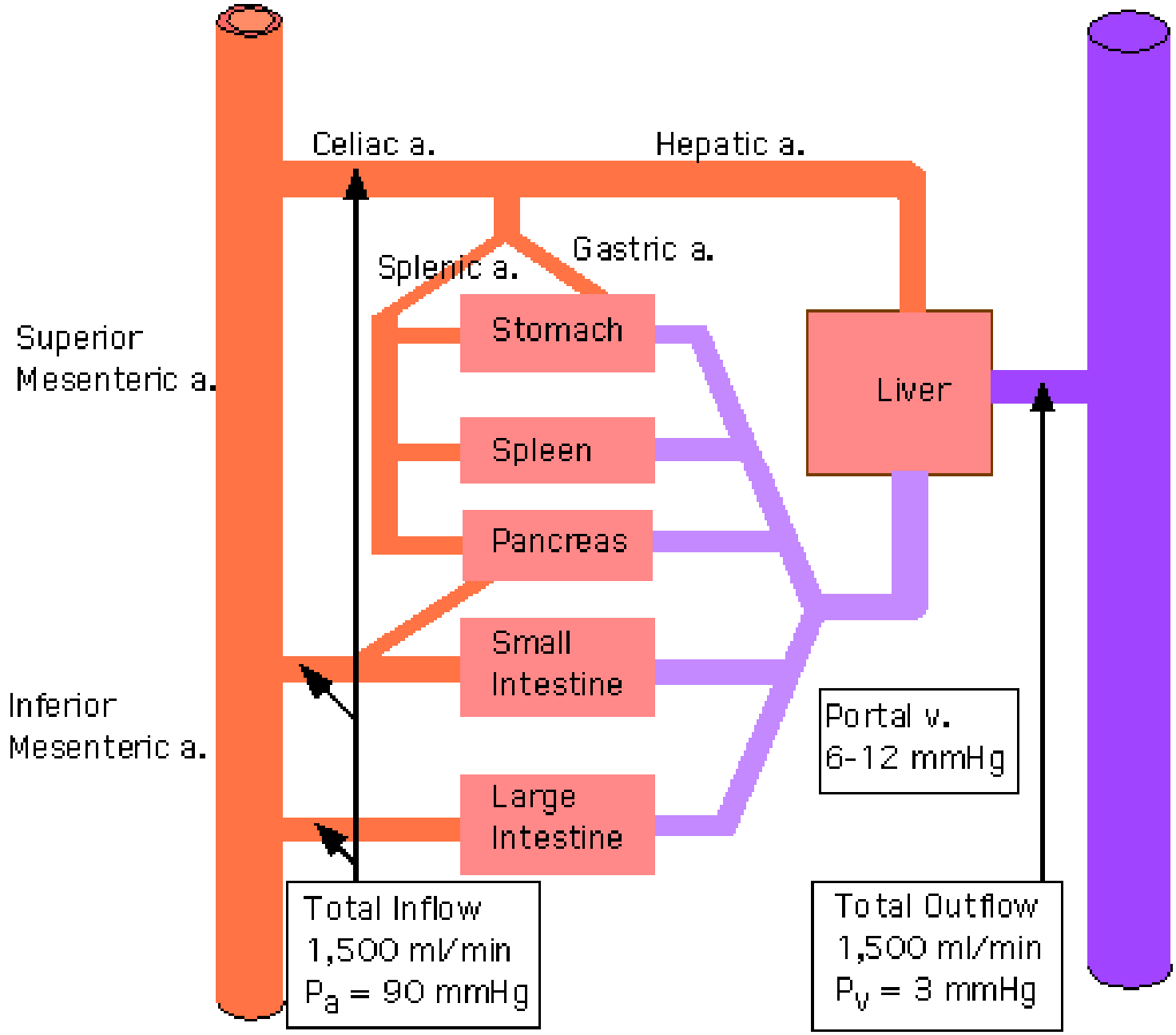
(b) Some organs become retroperitoneal

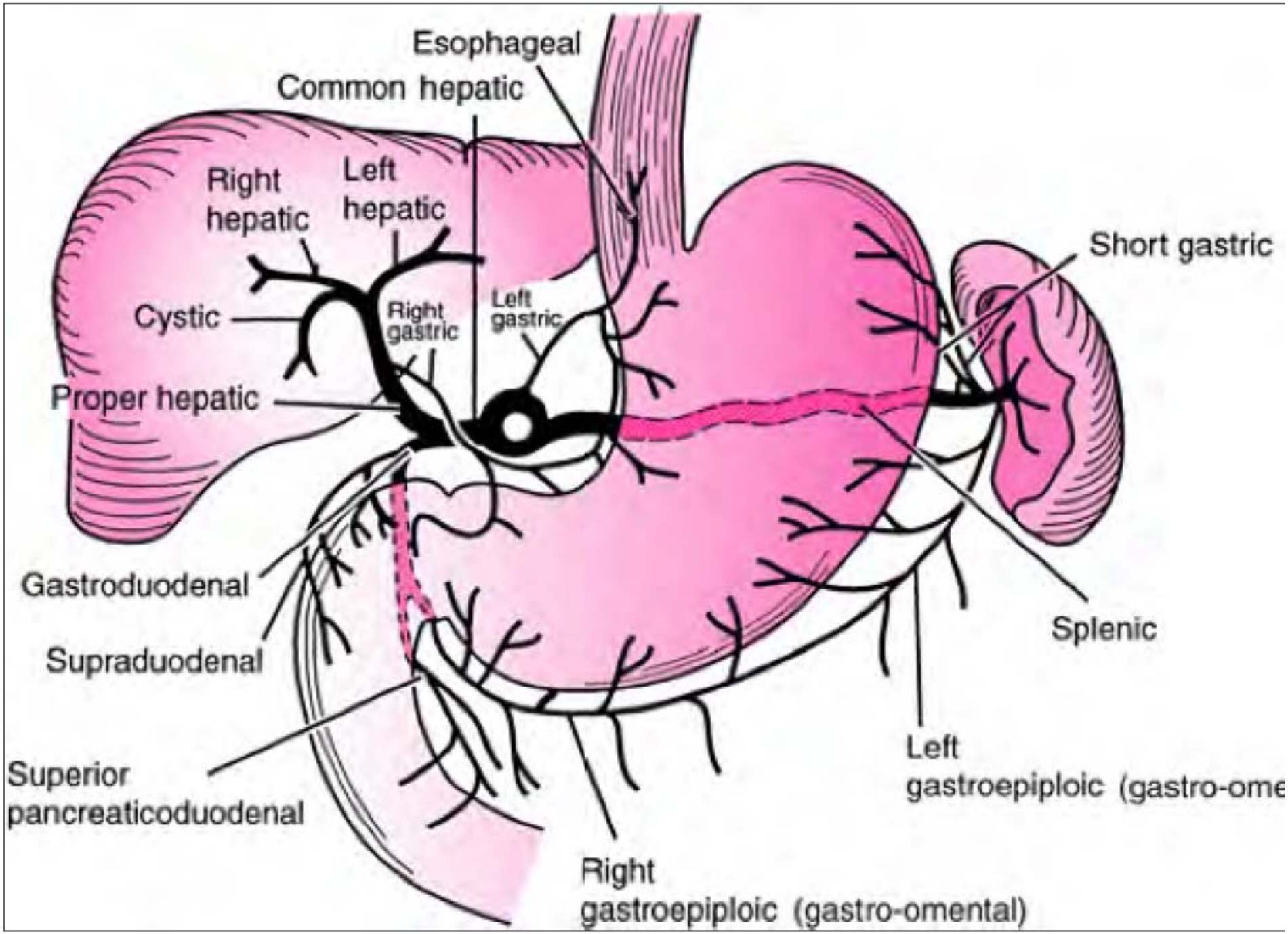
Greater Omentum



Blood Supply: Splanchnic Circulation

- Arteries and the organs they serve include
  - **The hepatic, splenic, and left gastric:** spleen, liver, and stomach
  - **Inferior and superior mesenteric:** small and large intestines


Celiac a.
Hepatic a.
Splenic a.
Gastric a.
Superior Mesenteric a.
Stomach
Spleen
Pancreas
Liver
Small Intestine
Inferior Mesenteric a.
Portal v.
6-12 mmHg
Large Intestine
Total Inflow
1,500 ml/min
P_a = 90 mmHg
Total Outflow
1,500 ml/min
P_v = 3 mmHg


Esophageal
Common hepatic
Right hepatic
Left hepatic
Short gastric
Cystic
Right gastric
Left gastric
Proper hepatic
Gastroduodenal
Supraduodenal
Splenic
Superior pancreaticoduodenal
Left gastroepiploic (gastro-ome
Right gastroepiploic (gastro-omental)

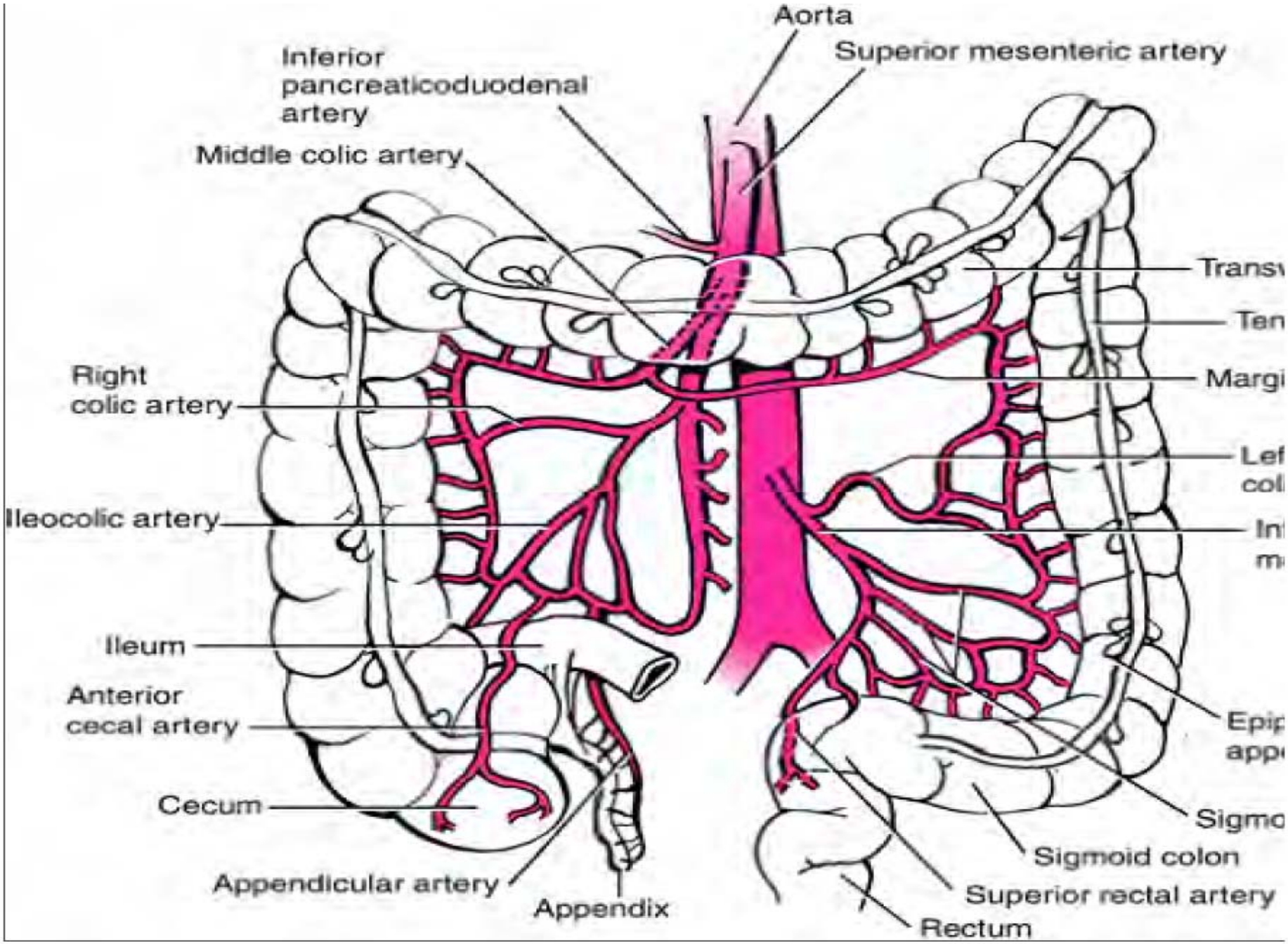


Figure 5-13 Branches of the superior and inferior mesenteric arteries.

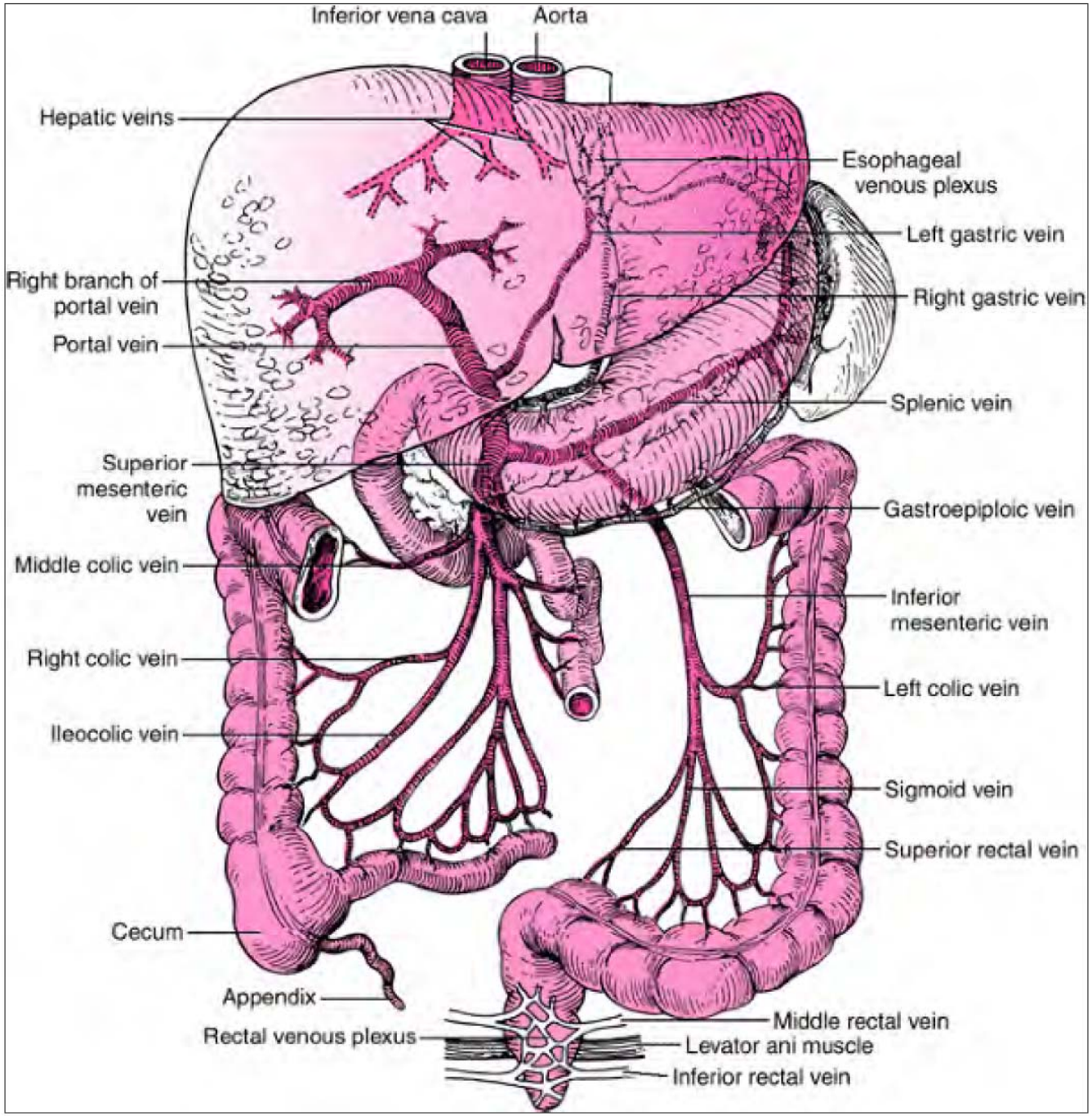
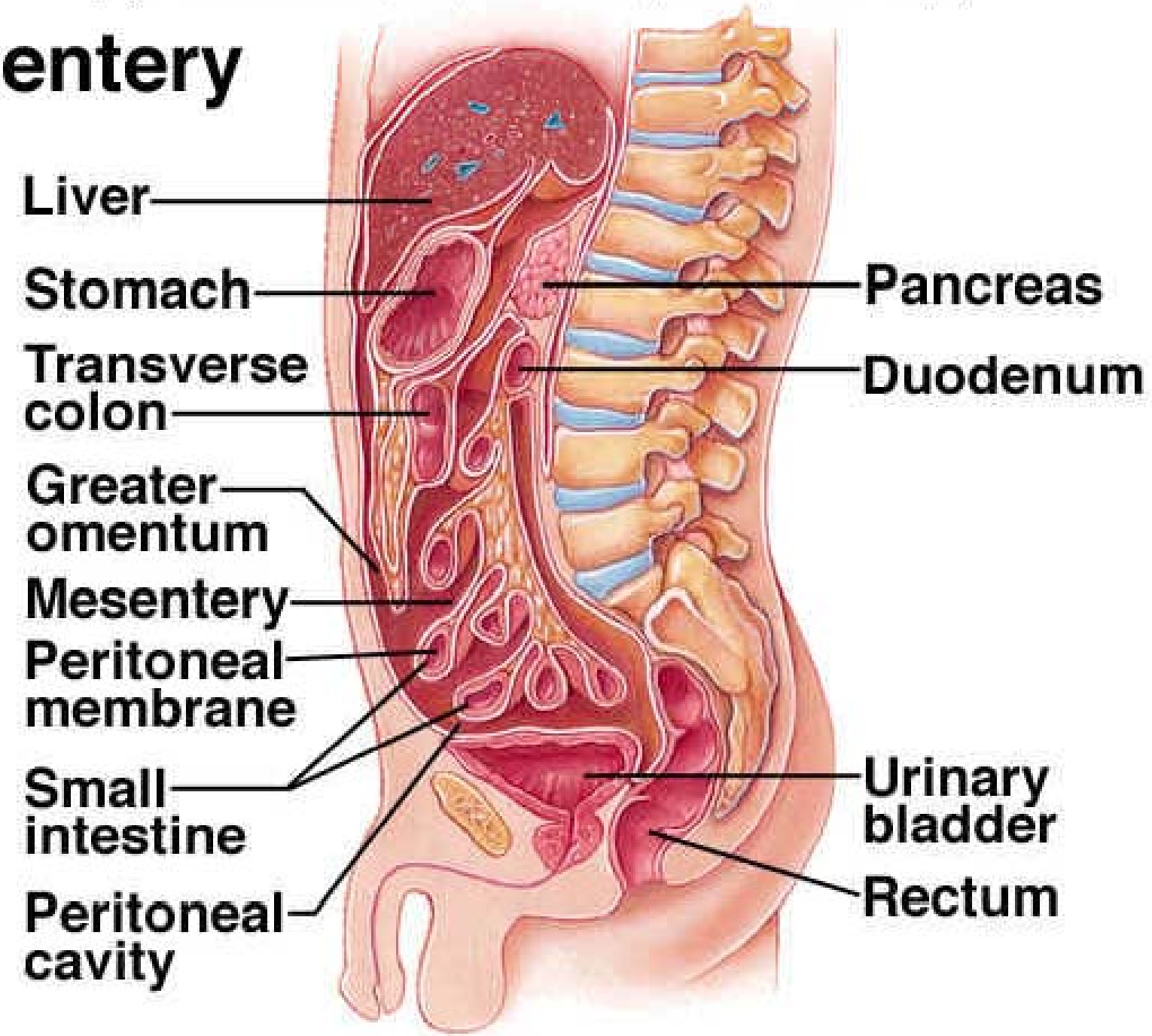


Figure 5-14 Portal venous system.

Mesentery



Blood Supply: Splanchnic Circulation

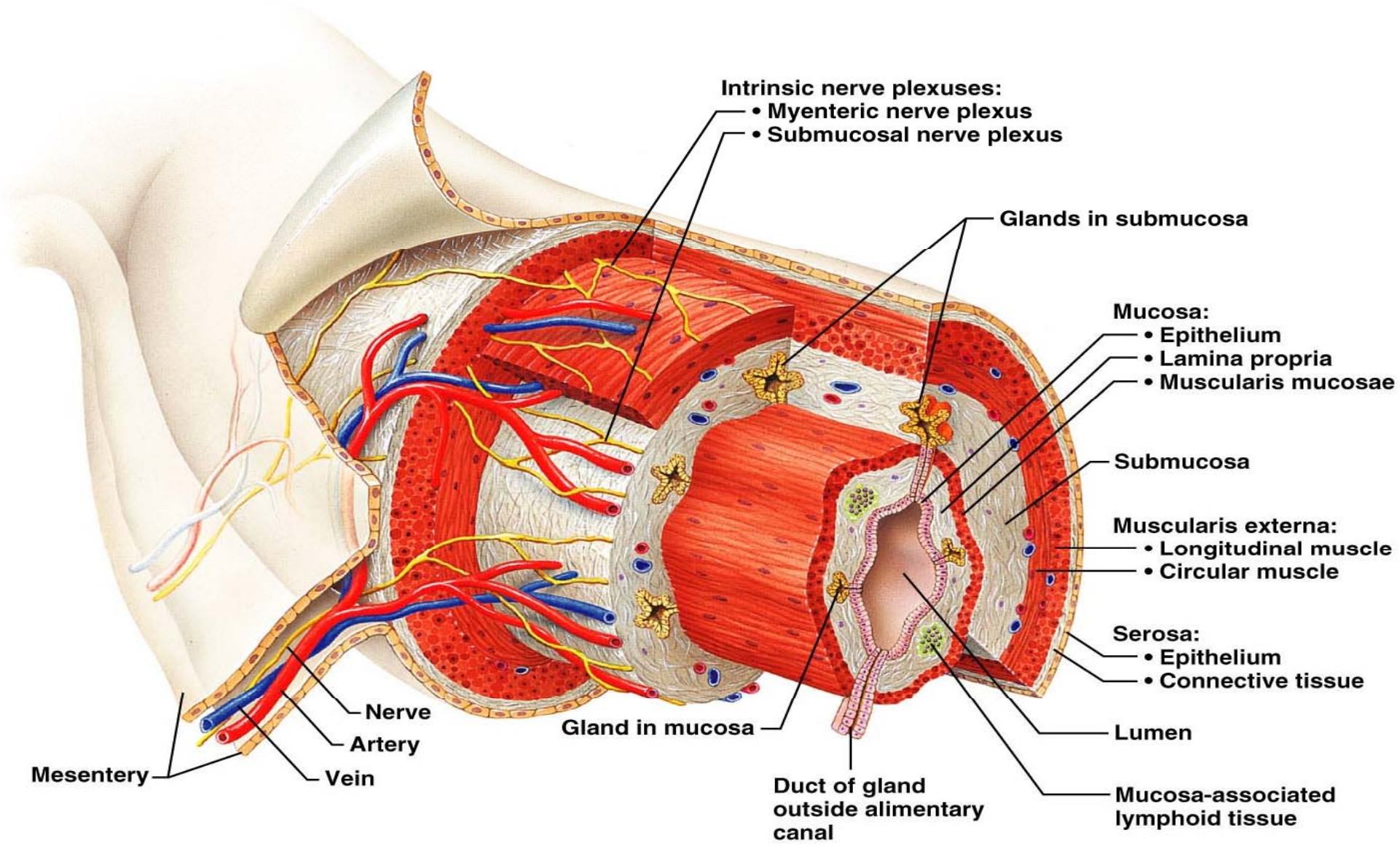
- Hepatic portal circulation:
  - Collects nutrient-rich venous blood from the digestive viscera
  - Delivers this blood to the liver for metabolic processing and storage

GI HISTOLOGY

Histology of the Alimentary Canal

- From esophagus to the anal canal the walls of the GI tract have the same four tunics
  - From the lumen outward they are the mucosa, submucosa, muscularis externa, and serosa
- Each tunic has a predominant tissue type and a specific digestive function

Histology of the Alimentary Canal



Mucosa

- Moist epithelial layer that lines the lumen of the alimentary canal
- Three major functions:
  - Secretion of mucus
  - Absorption of end products of digestion
  - Protection against infectious disease
- Consists of three layers: a lining epithelium, lamina propria, and muscularis mucosae

Mucosa: Epithelial Lining

- Simple columnar epithelium and mucus-secreting goblet cells
- Mucus secretions:
  - Protect digestive organs from digesting themselves
  - Ease food along the tract
- Stomach and small intestine mucosa contain:
  - Enzyme-secreting cells
  - Hormone-secreting cells (making them endocrine and digestive organs)

Mucosa: Lamina Propria and Muscularis Mucosae

- Lamina Propria
  - Loose areolar and reticular connective tissue
  - Nourishes the epithelium and absorbs nutrients
  - Contains lymph nodes (part of MALT) important in defense against bacteria
- Muscularis mucosae – smooth muscle cells that produce local movements of mucosa

Mucosa: Other Sublayers

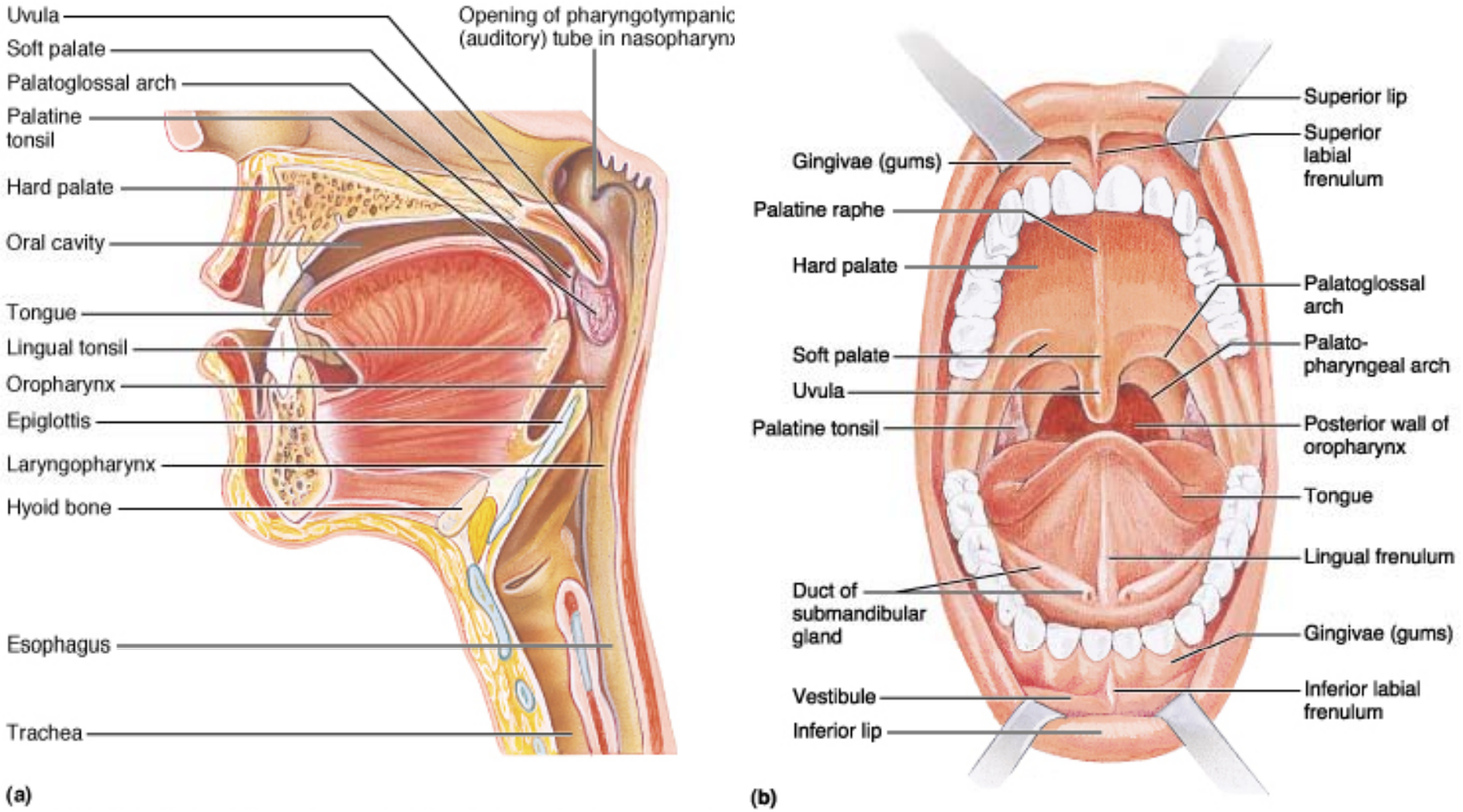
- Submucosa – dense connective tissue containing elastic fibers, blood and lymphatic vessels, lymph nodes, and nerves
- Muscularis externa – responsible for segmentation and peristalsis
- Serosa – the protective visceral peritoneum
  - Replaced by the fibrous adventitia in the esophagus
  - Retroperitoneal organs have both an adventitia and serosa

Enteric Nervous System

- Composed of two major intrinsic nerve plexuses:
  - Submucosal nerve plexus – regulates glands and smooth muscle in the mucosa
  - Myenteric nerve plexus – Major nerve supply that controls GI tract mobility
- Segmentation and peristalsis are largely automatic involving local reflex arcs
- Linked to the CNS via long autonomic reflex arc

MOUTH

Anatomy of the Mouth and Throat



Mouth

- Oral or buccal cavity:
  - Is bounded by lips, cheeks, palate, and tongue
  - Has the oral orifice as its anterior opening
  - Is continuous with the oropharynx posteriorly

Mouth

- To withstand abrasions:
  - The mouth is lined with stratified squamous epithelium
  - The gums, hard palate, and dorsum of the tongue are slightly keratinized

Anatomy of the Oral Cavity: Mouth

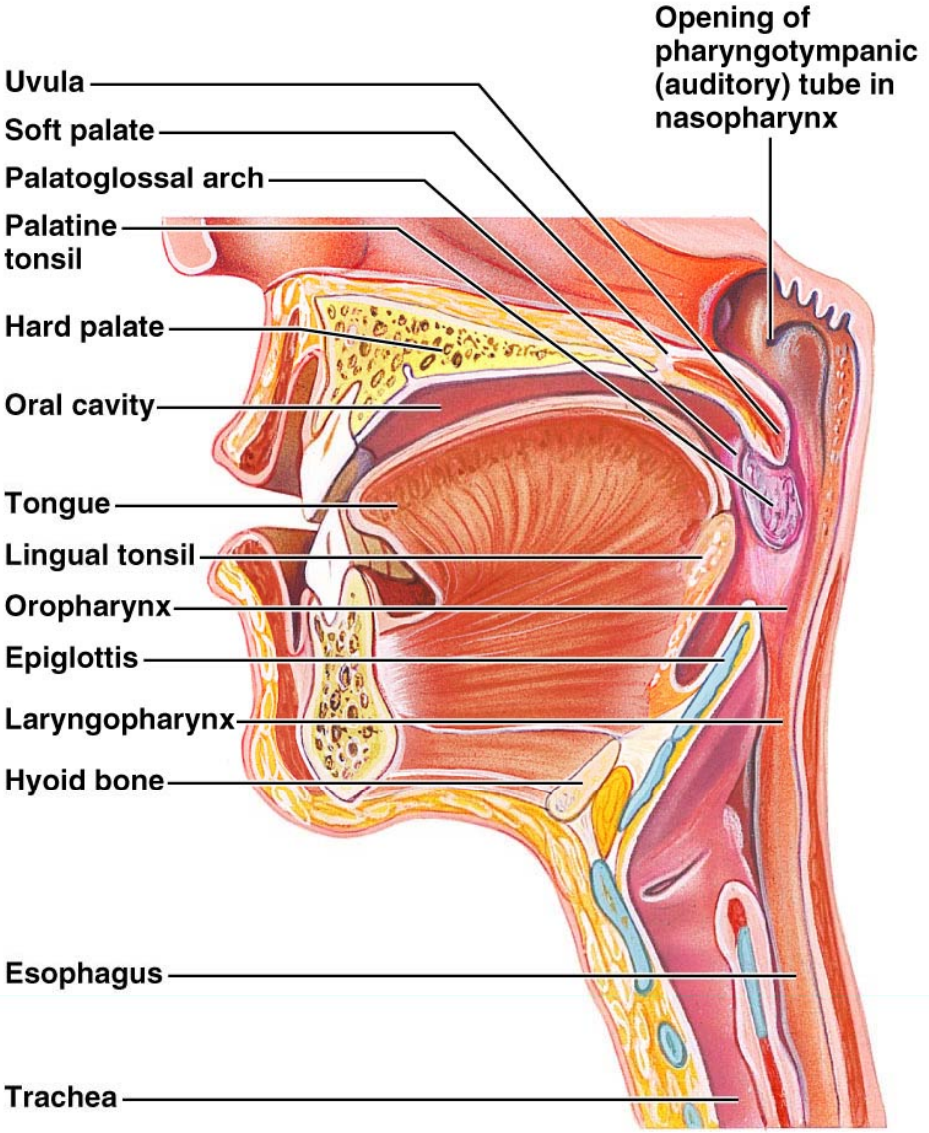


Figure 23.7a

Lips and Cheeks

- Have a core of skeletal muscles
  - Lips: orbicularis oris
  - Cheeks: buccinators
- Vestibule – bounded by the lips and cheeks externally, and teeth and gums internally
- Oral cavity proper – area that lies within the teeth and gums
- Labial frenulum – median fold that joins the internal aspect of each lip to the gum

Oral Cavity and Pharynx: Anterior View

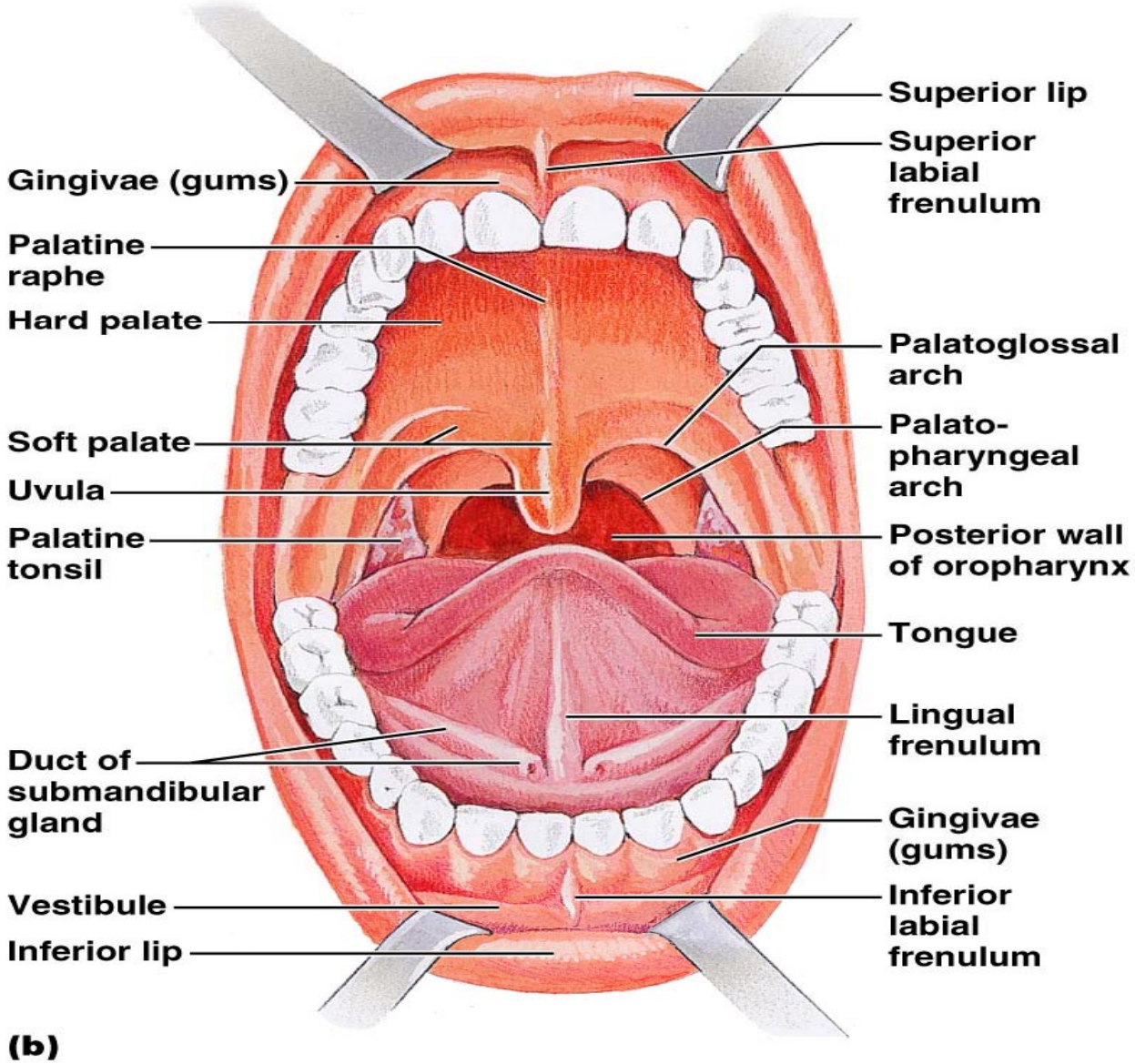
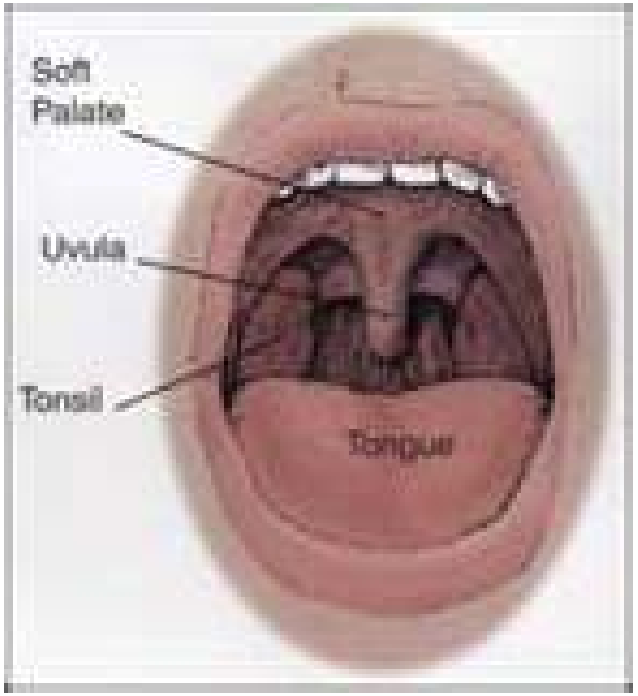


Figure 23.7b

Palate

- Roof of mouth with 2 parts: hard palate and soft palate.



- **Uvula** – attached to soft palate back of mouth
- l - function – closes off nasal cavity

- **Palatine tonsils** – on either side of back of mouth→ fight off infection

Cleft palate

Palate

- Hard palate – underlain by palatine bones and palatine processes of the maxillae
  - Assists the tongue in chewing
  - Slightly corrugated on either side of the raphe (midline ridge)

Palate

- Soft palate – mobile fold formed mostly of skeletal muscle
  - Closes off the nasopharynx during swallowing
  - Uvula projects downward from its free edge
- Palatoglossal and palatopharyngeal arches form the borders of the fauces

Tongue

Tongue

- Occupies the floor of the mouth and fills the oral cavity when mouth is closed

- Functions include:
  - Gripping and repositioning food during chewing
  - Mixing food with saliva and forming the bolus
  - Initiation of swallowing, and speech

Tongue

- **Intrinsic muscles** change the shape of the tongue
- **Extrinsic muscles** alter the tongue's position
- **Lingual frenulum** secures the tongue to the floor of the mouth

Tongue – Function?

Functions: mixing food with saliva, moving food to throat or pharynx to swallow.

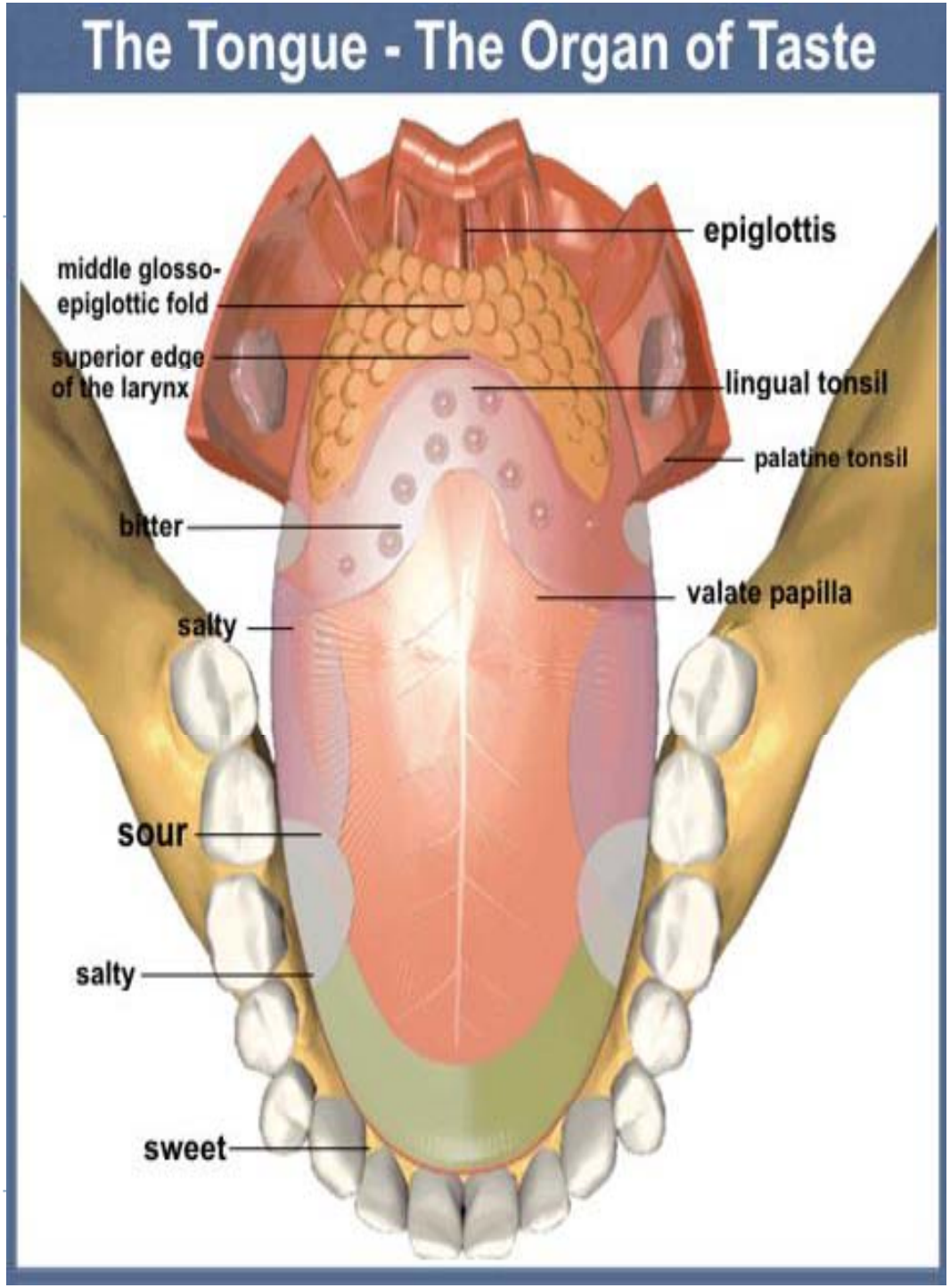
Papillae – small rough projections on tongue →help hold food and contain **taste buds**

Frenulum – holds tongue down in front

Root – back of tongue attached to hyoid bone

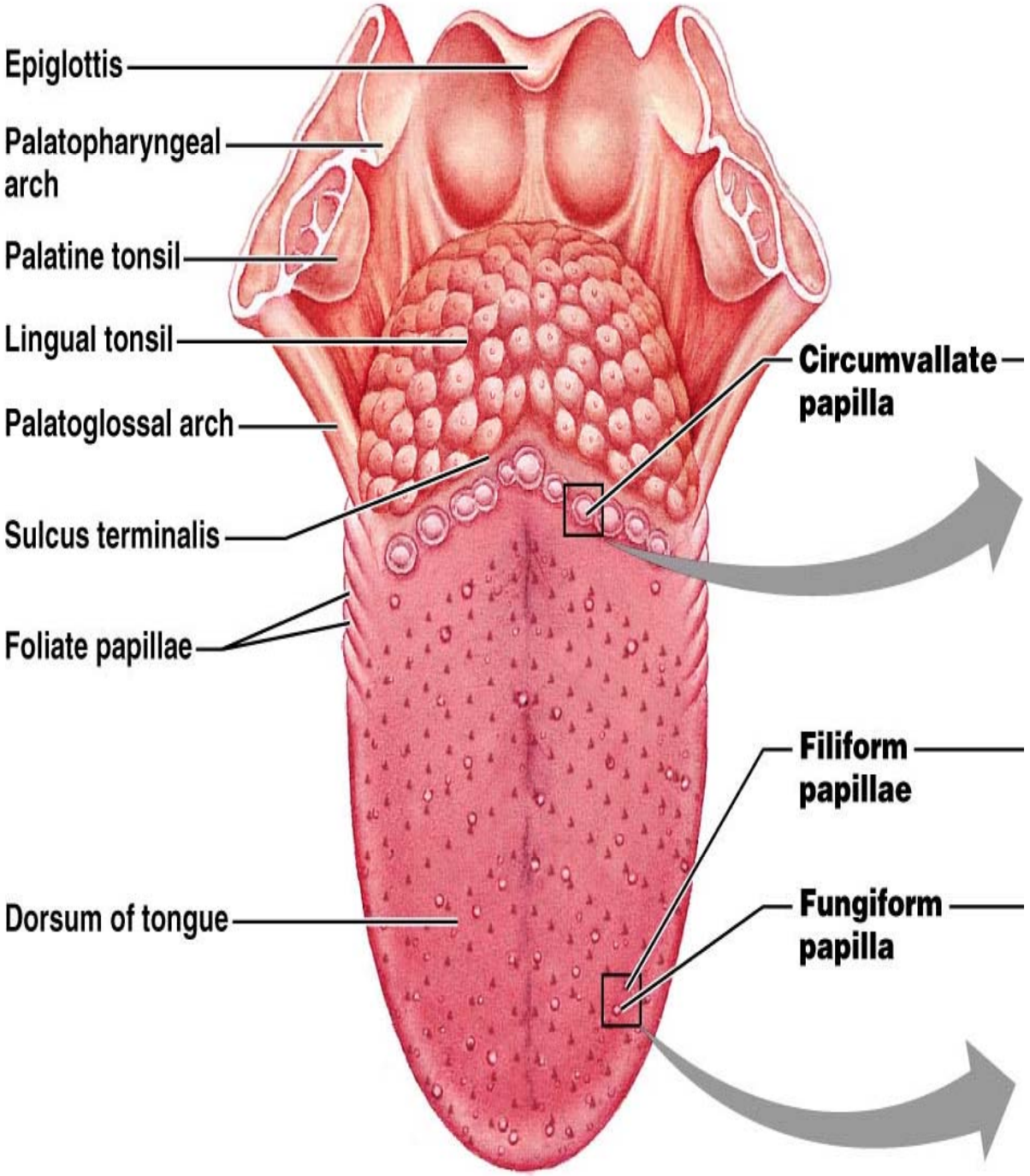
Tongue

- Superior surface bears three types of papillae
  - **Filiform** – give the tongue roughness and provide friction
  - **Fungiform** – scattered widely over the tongue and give it a reddish hue
  - **Circumvallate** – V-shaped row in back of tongue

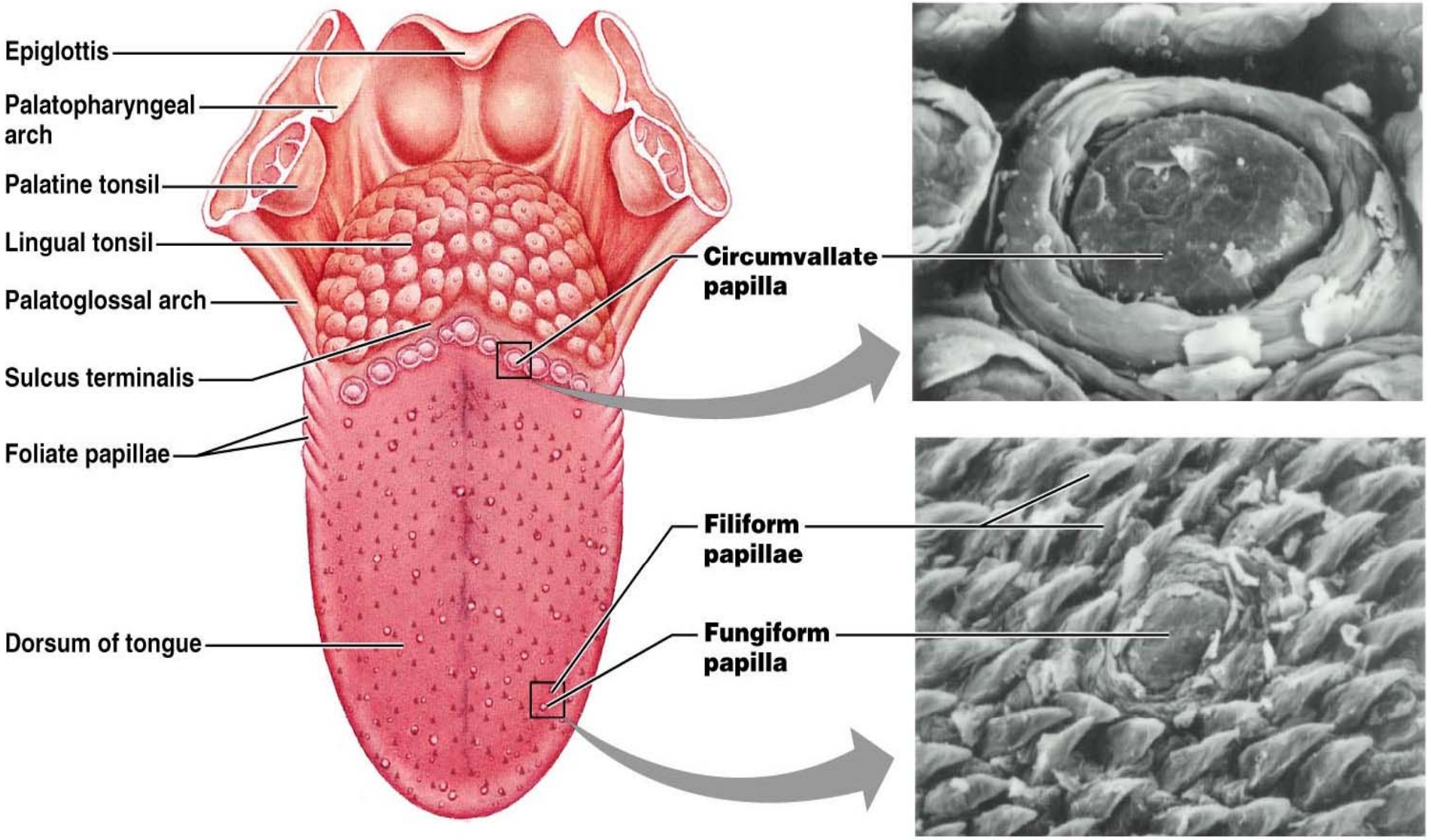


Tongue

- Sulcus terminalis – groove that separates the tongue into two areas:
  - **Anterior 2/3** residing in the oral cavity
  - **Posterior third** residing in the oropharynx



Tongue


Epiglottis
Palatopharyngeal arch
Palatine tonsil
Lingual tonsil
Palatoglossal arch
Sulcus terminalis
Foliate papillae
Dorsum of tongue
Circumvallate papilla
Filiform papillae
Fungiform papilla

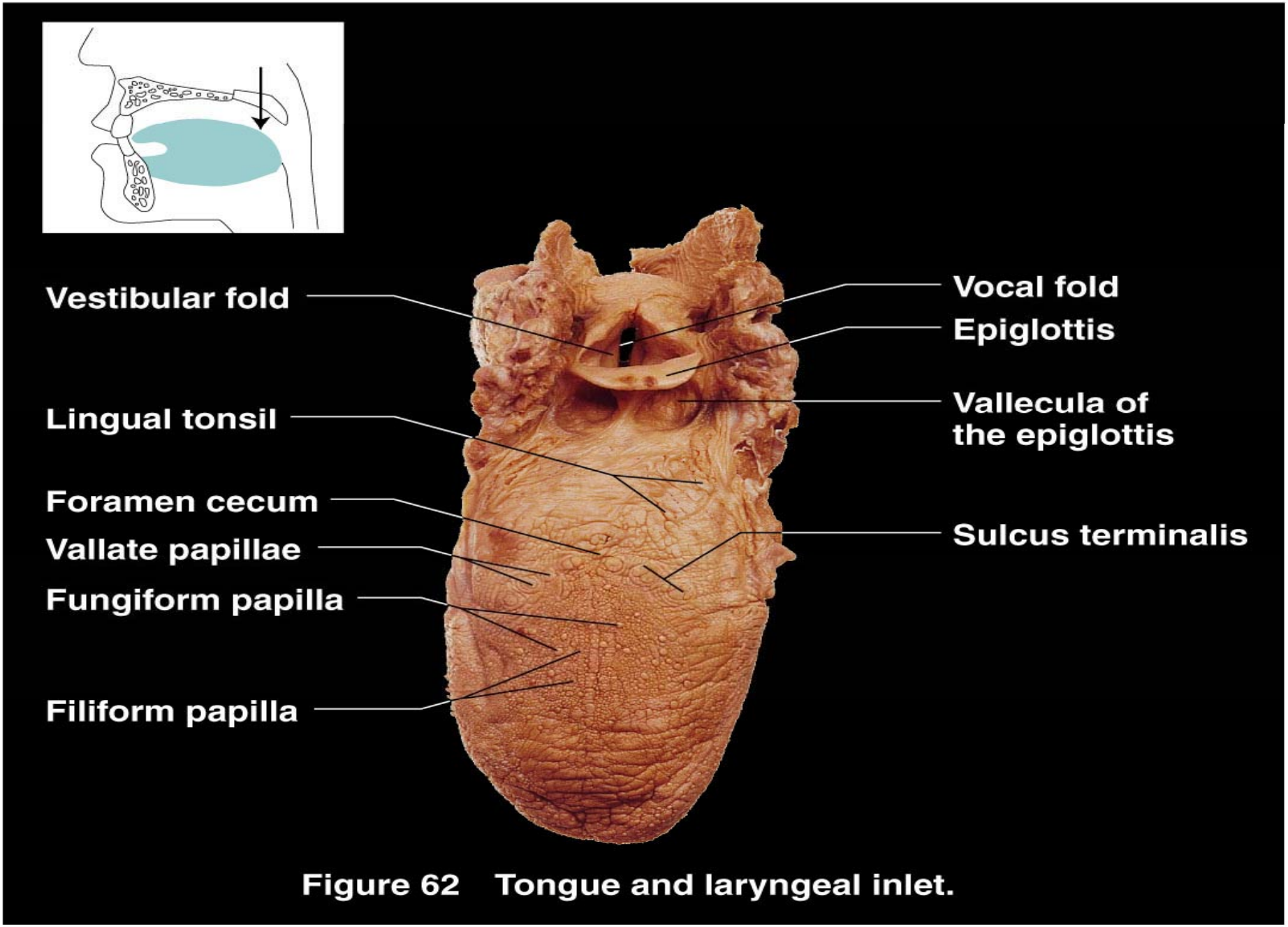
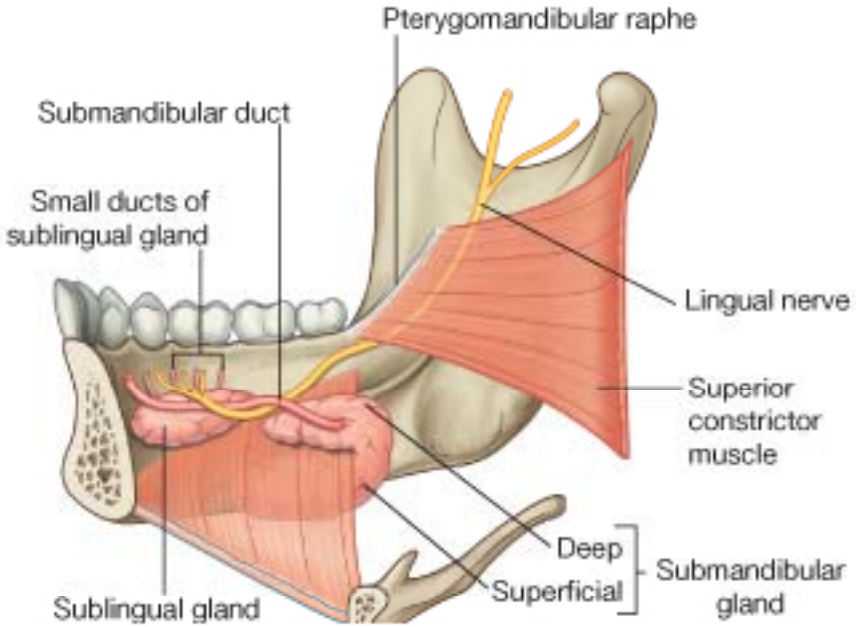


Figure 62 Tongue and laryngeal inlet.

Salivary Glands

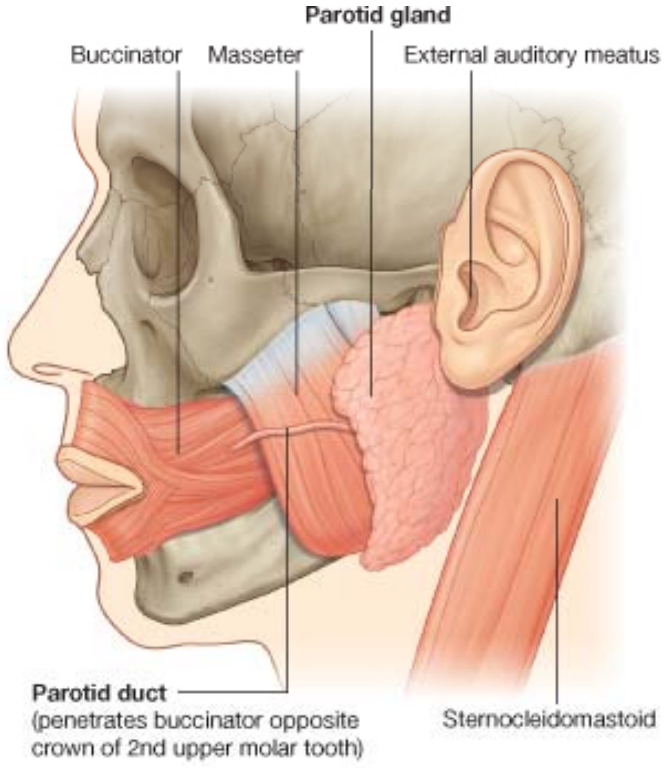
- Produce and secrete saliva that:
  - Cleanses the mouth
  - Moistens and dissolves food chemicals
  - Aids in bolus formation
  - Contains enzymes that break down starch

Salivary glands: Parotid, sublingual, and submandibular



Salivary gland functions

- Cleanse teeth
- Amylase to break down sugars
  Moisten food



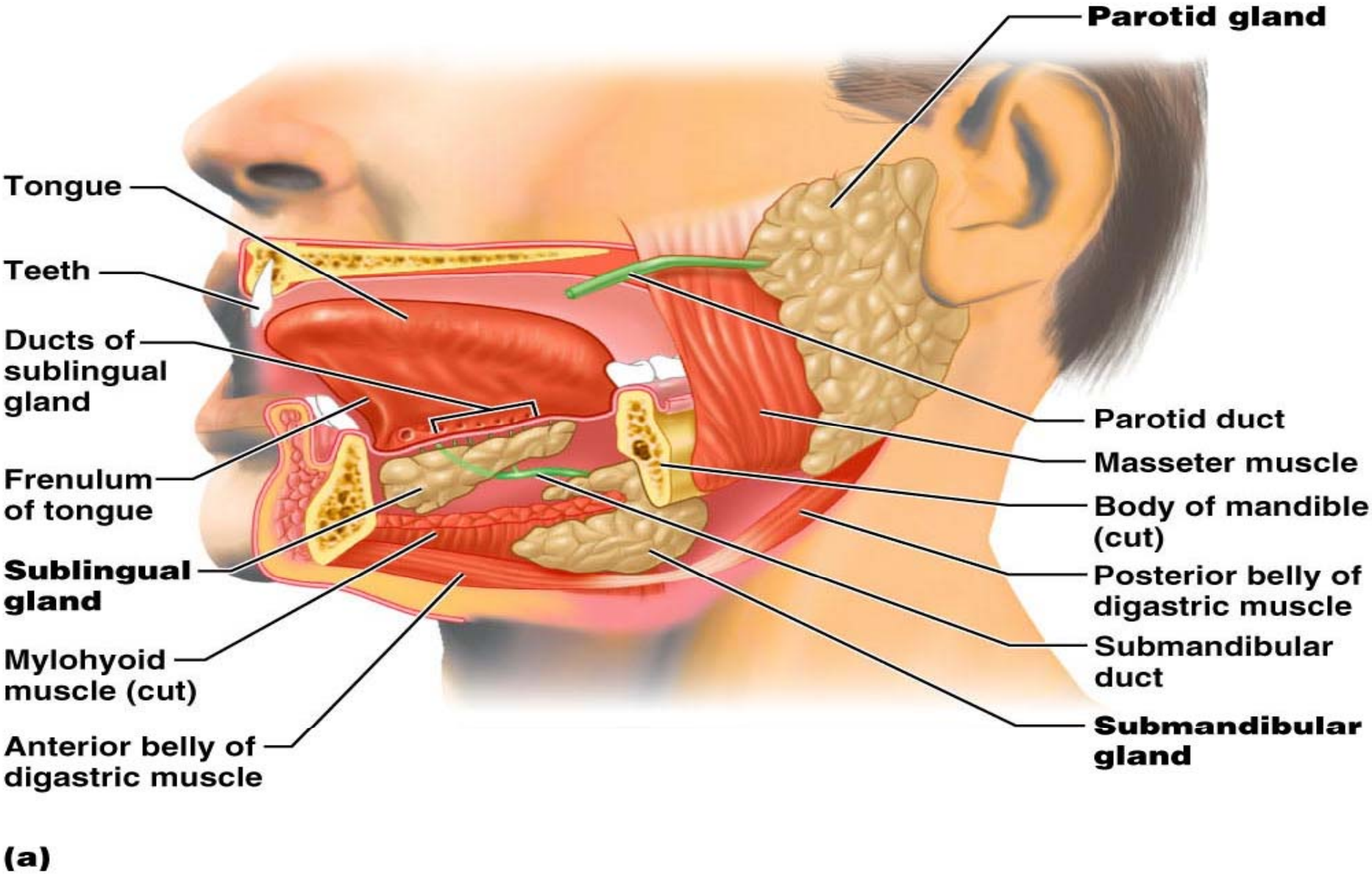
Salivary Glands

- Three pairs of extrinsic glands – parotid, submandibular, and sublingual
- Intrinsic salivary glands (buccal glands) – scattered throughout the oral mucosa

Salivary Glands

- Parotid – lies anterior to the ear between the masseter muscle and skin
  - Parotid duct opens into the vestibule next to second upper molar
- Submandibular – lies along the medial aspect of the mandibular body
  - Its ducts open at the base of the lingual frenulum
- Sublingual – lies anterior to the submandibular gland under the tongue
  - It opens via 10-12 ducts into the floor of the mouth

Salivary Glands



Saliva: Source and Composition

- Secreted from serous and mucous cells of salivary glands
- 97-99.5% water, hypo-osmotic, slightly acidic solution containing
  - Electrolytes – Na^+, K^+, Cl^-, PO_4^{2-}, HCO_3^-
  - Digestive enzyme – salivary amylase
  - Proteins – mucin, lysozyme, defensins, and IgA
  - Metabolic wastes – urea and uric acid

Control of Salivation

- Intrinsic glands keep the mouth moist
- Extrinsic salivary glands secrete serous, enzyme-rich saliva in response to:
  - Ingested food which stimulates chemoreceptors and pressoreceptors
  - The thought of food
- Strong sympathetic stimulation inhibits salivation and results in dry mouth

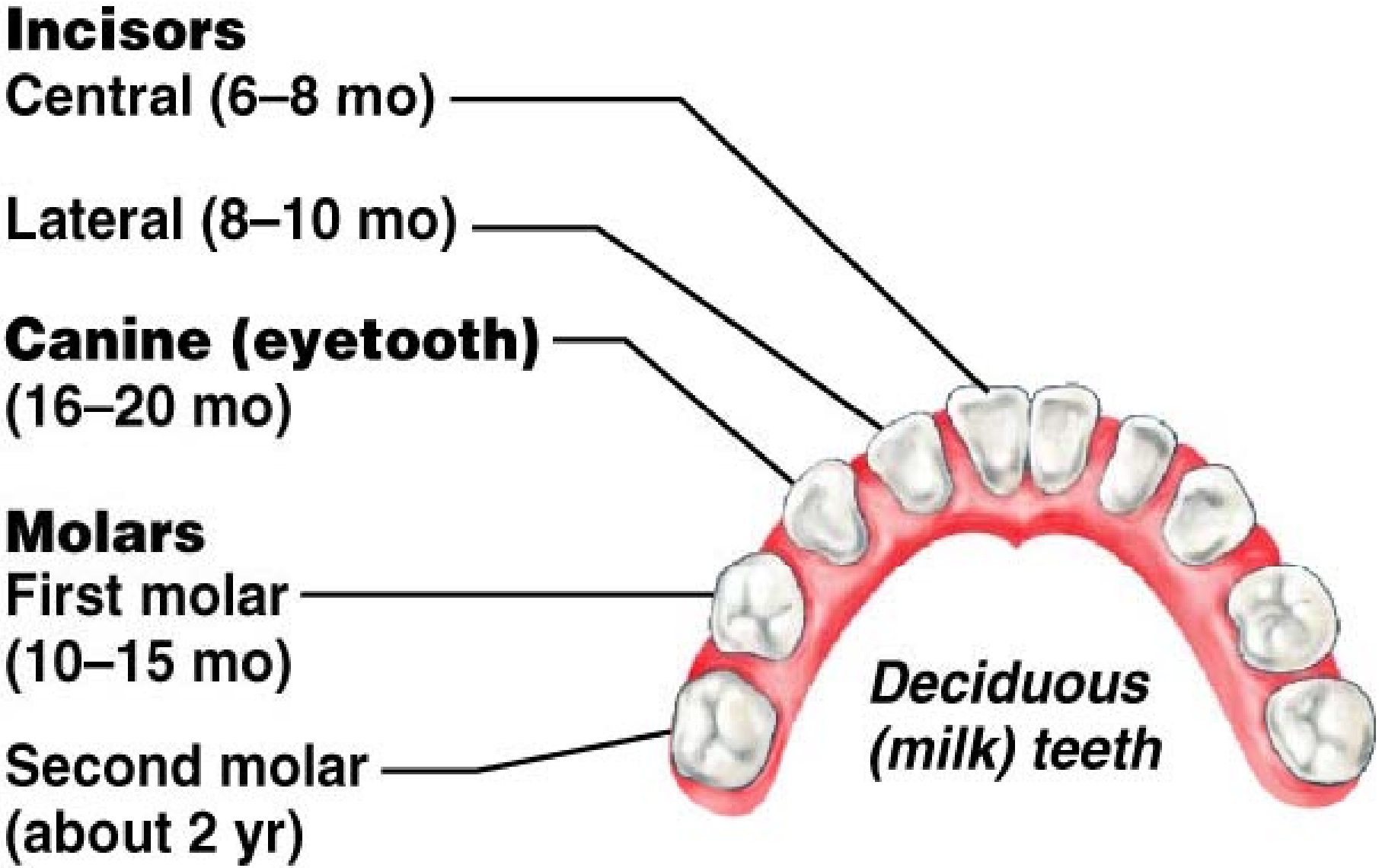
PLAY

***InterActive Physiology*®:**
Secretion, pages 3-5

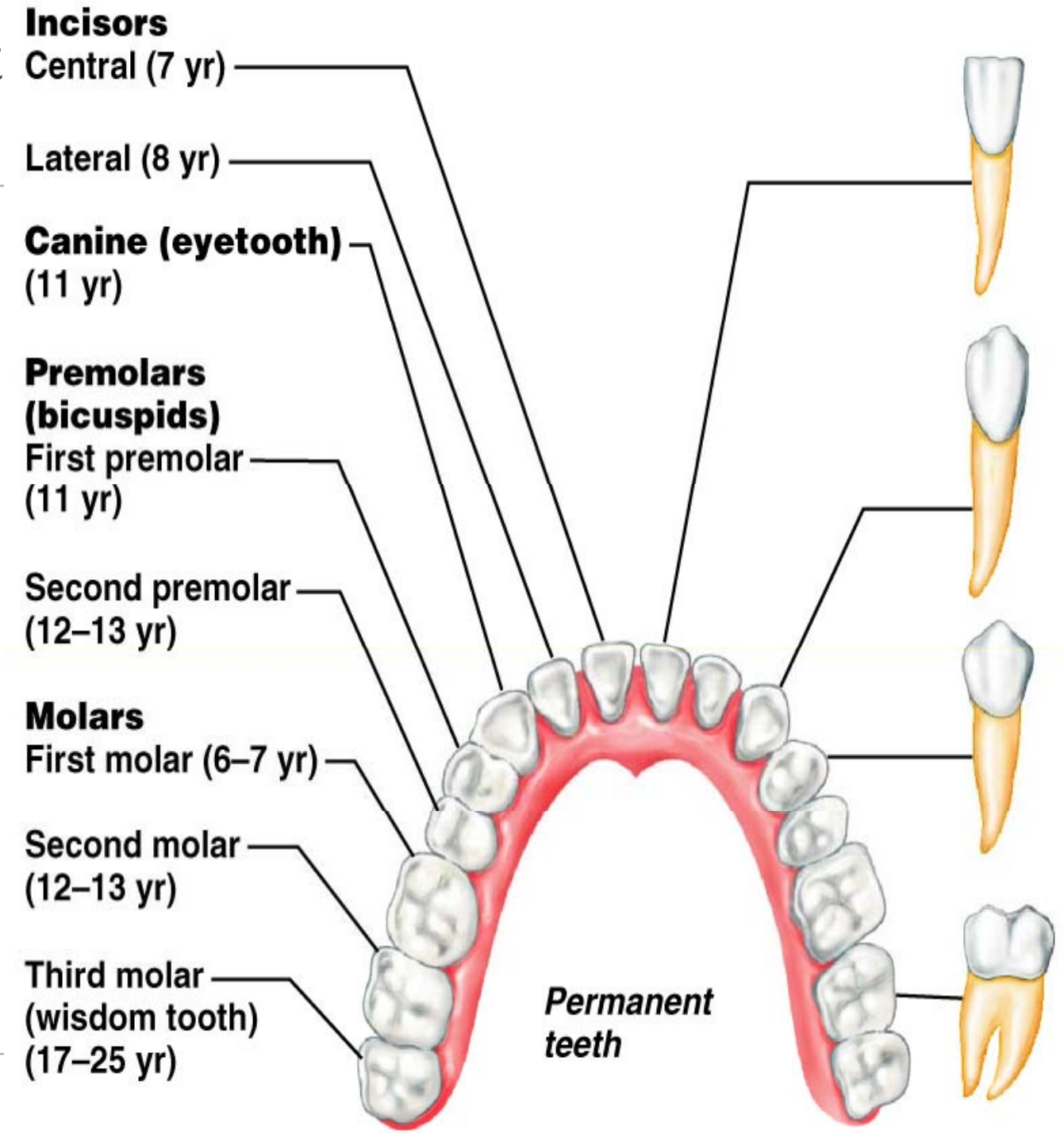
Teeth

- Primary and permanent dentitions have formed by age 21
- Primary – 20 deciduous teeth that erupt at intervals between 6 and 24 months
- Permanent – enlarge and develop causing the root of deciduous teeth to be resorbed and fall out between the ages of 6 and 12 years
  - All but the third molars have erupted by the end of adolescence
  - Usually 32 permanent teeth

Deciduous Teeth



Permanent Teeth



Classification of Teeth

- Teeth are classified according to their shape and function
  - Incisors – chisel-shaped teeth for cutting or nipping
  - Canines – fanglike teeth that tear or pierce
  - Premolars (bicuspids) and molars – have broad crowns with rounded tips; best suited for grinding or crushing
- During chewing, upper and lower molars lock together generating crushing force

Dental Formula: Permanent Teeth

- A shorthand way of indicating the number and relative position of teeth
  - Written as ratio of upper to lower teeth for the mouth
  - Primary: 2I (incisors), 1C (canine), 2M (molars)
  - Permanent: 2I, 1C, 2PM (premolars), 3M

2I	1C	2PM	3M	X	2 (32 teeth)
2I	1C	2PM	3M		

Tooth Structure

- Two main regions – crown and the root
- Crown – exposed part of the tooth above the gingiva
- Enamel – acellular, brittle material composed of calcium salts and hydroxyapatite crystals; the hardest substance in the body
  - Encapsules the crown of the tooth
- Root – portion of the tooth embedded in the jawbone

Tooth Structure

- Neck – constriction where the crown and root come together
- Cementum – calcified connective tissue
  - Covers the root
  - Attaches it to the periodontal ligament

Tooth Structure

- Periodontal ligament
  - Anchors the tooth in the alveolus of the jaw
  - Forms the fibrous joint called a gomaphosis
- Gingival sulcus – depression where the gingiva borders the tooth

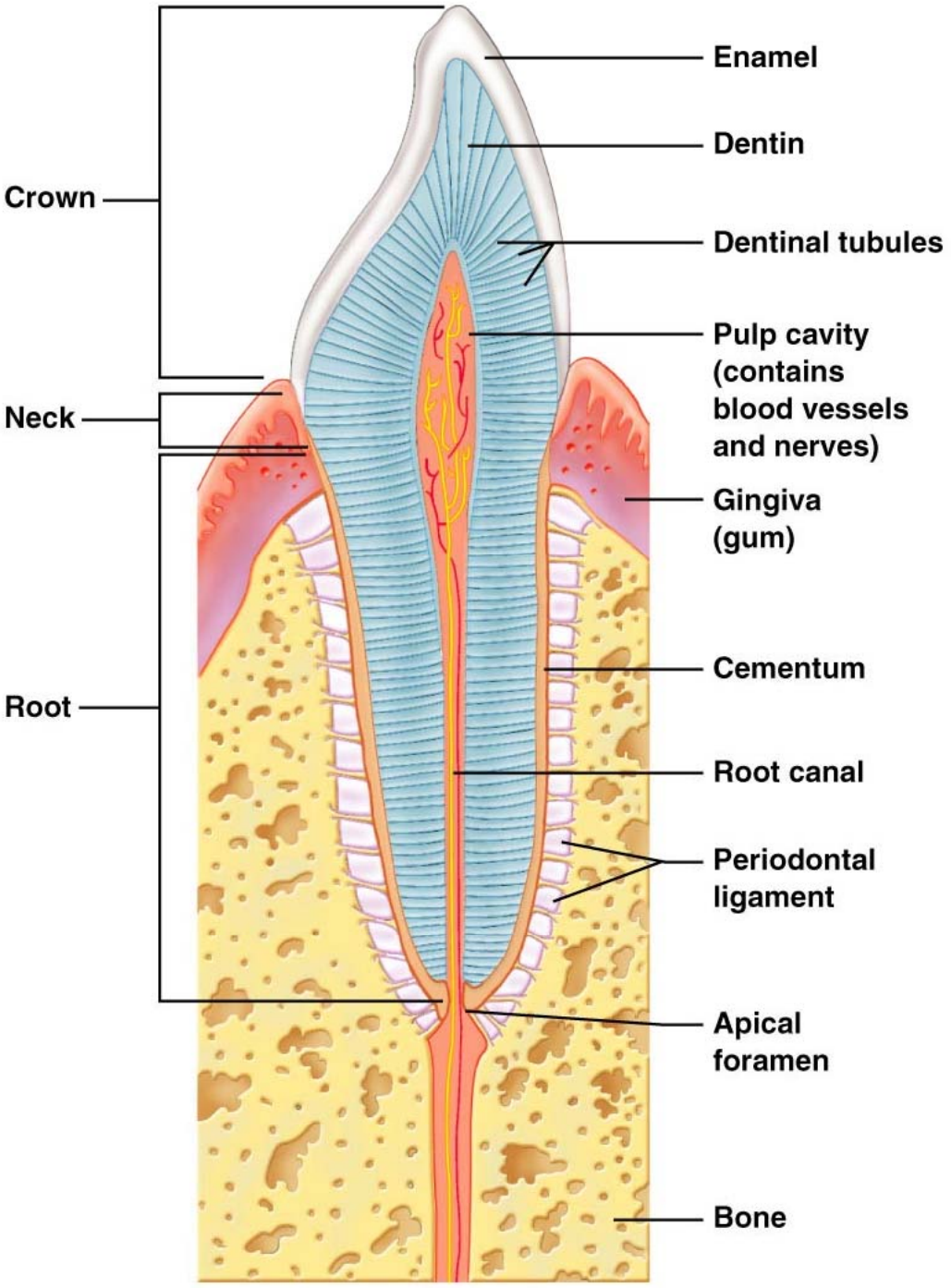
Tooth Structure

- **Dentin** – bonelike material deep to the enamel cap that forms the bulk of the tooth
- **Pulp cavity** – cavity surrounded by dentin that contains pulp
- **Pulp** – connective tissue, blood vessels, and nerves

Tooth Structure

- Root canal – portion of the pulp cavity that extends into the root
- Apical foramen – proximal opening to the root canal
- Odontoblasts – secrete and maintain dentin throughout life

Tooth Structure



Tooth and Gum Disease

- Dental caries – gradual demineralization of enamel and dentin by bacterial action
  - Dental plaque, a film of sugar, bacteria, and mouth debris, adheres to teeth
  - Acid produced by the bacteria in the plaque dissolves calcium salts
  - Without these salts, organic matter is digested by proteolytic enzymes
  - Daily flossing and brushing help prevent caries by removing forming plaque

Tooth and Gum Disease: Periodontitis

- Gingivitis – as plaque accumulates, it calcifies and forms calculus, or tartar
- Accumulation of calculus:
  - Disrupts the seal between the gingivae and the teeth
  - Puts the gums at risk for infection
- Periodontitis – serious gum disease resulting from an immune response
- Immune system attacks intruders as well as body tissues, carving pockets around the teeth and dissolving bone