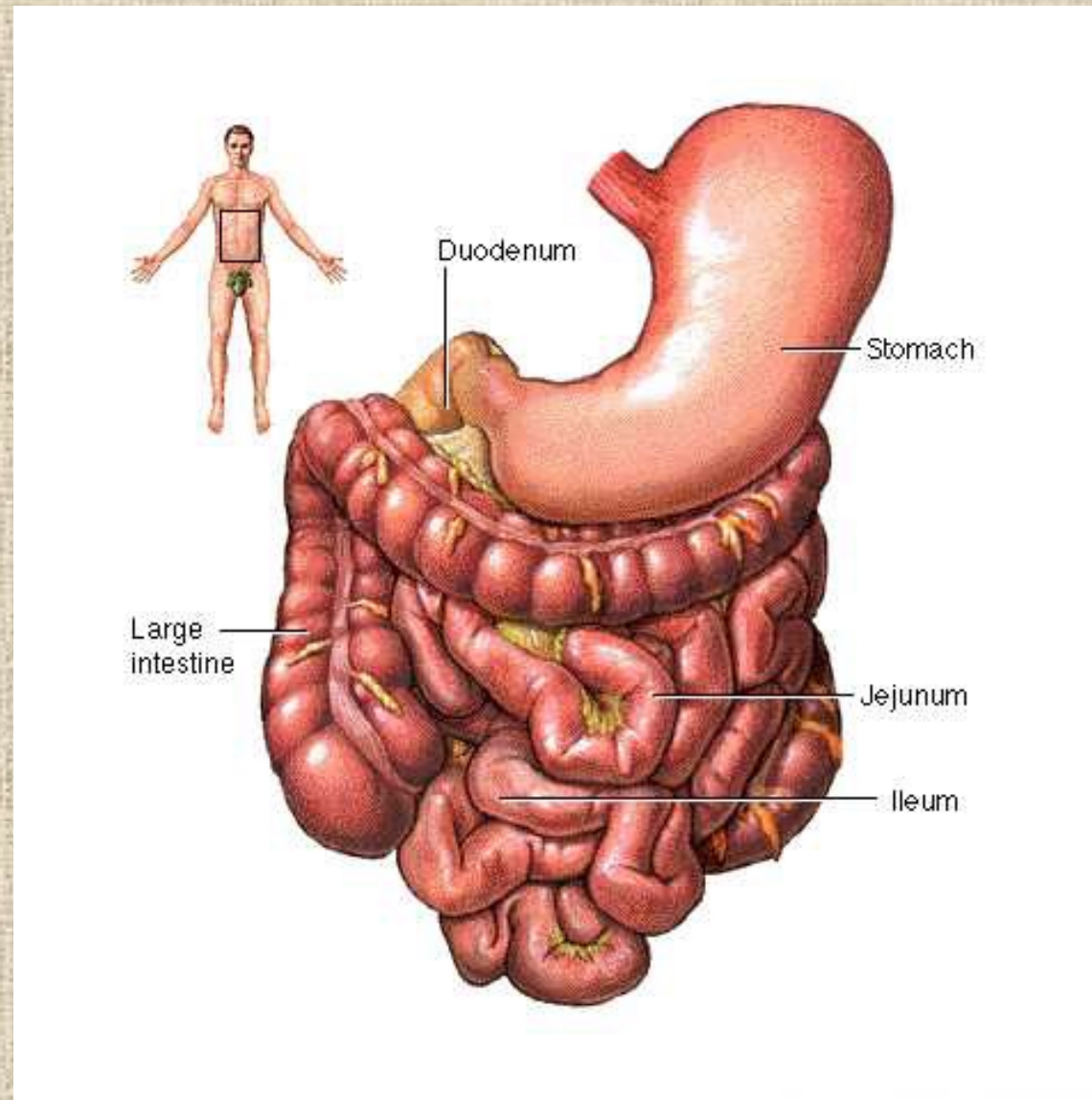


Digestion begins in the mouth

The Digestive System



Digestion

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

Digestion

- Phases
 - Ingestion
 - Movement
 - Digestion
 - Absorption
 - Further digestion

Digestive System Organization

- **Gastrointestinal (GI) tract (Alimentary canal)**

- Tube within a tube
- Direct link/path between organs

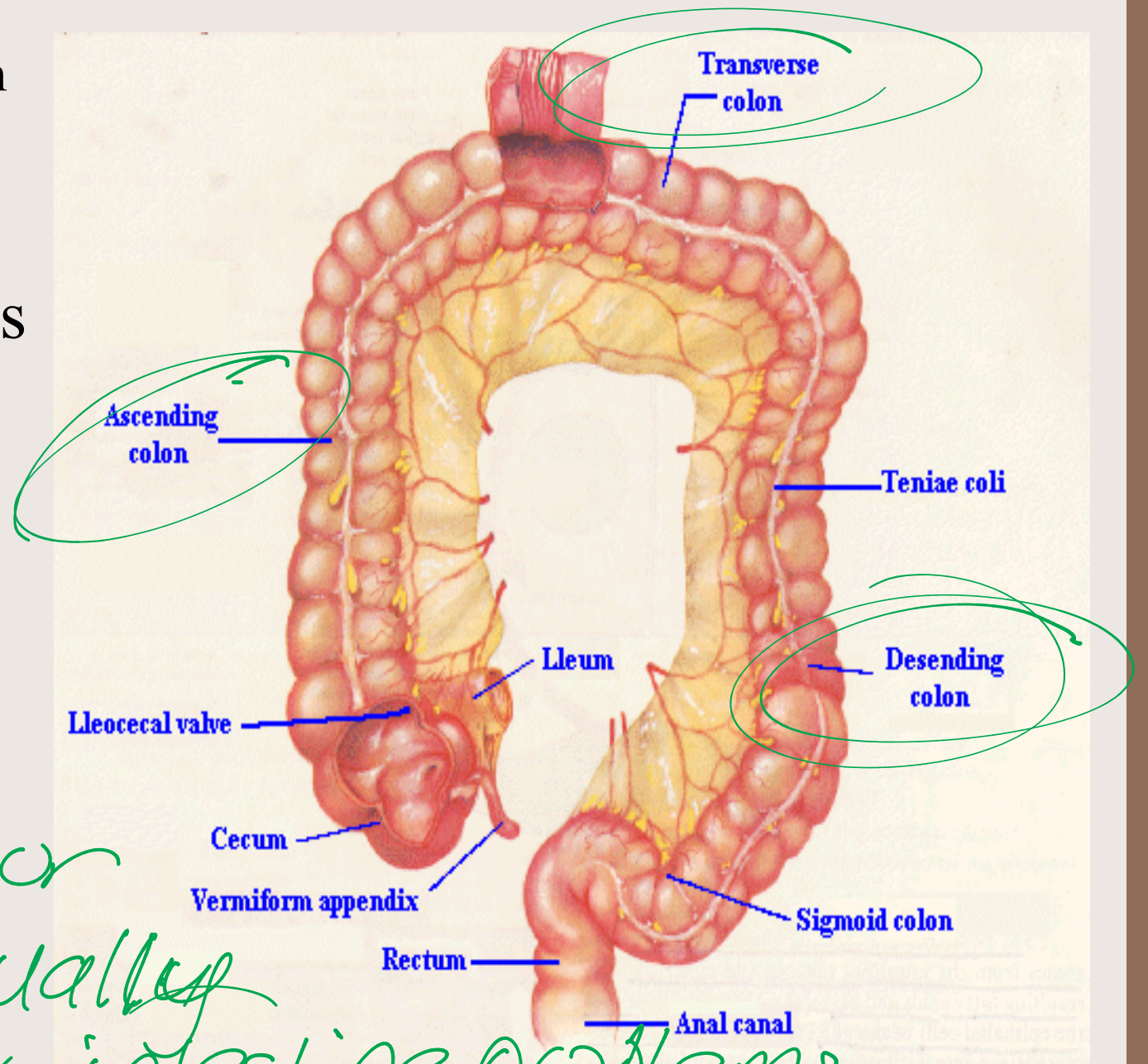
- **Structures**

- Mouth
- Oral Cavity
- Pharynx
- Esophagus
- Stomach
- Duodenum
- Jejunum
- Ileum
- Cecum
- Ascending colon
- Transverse colon

Know in order

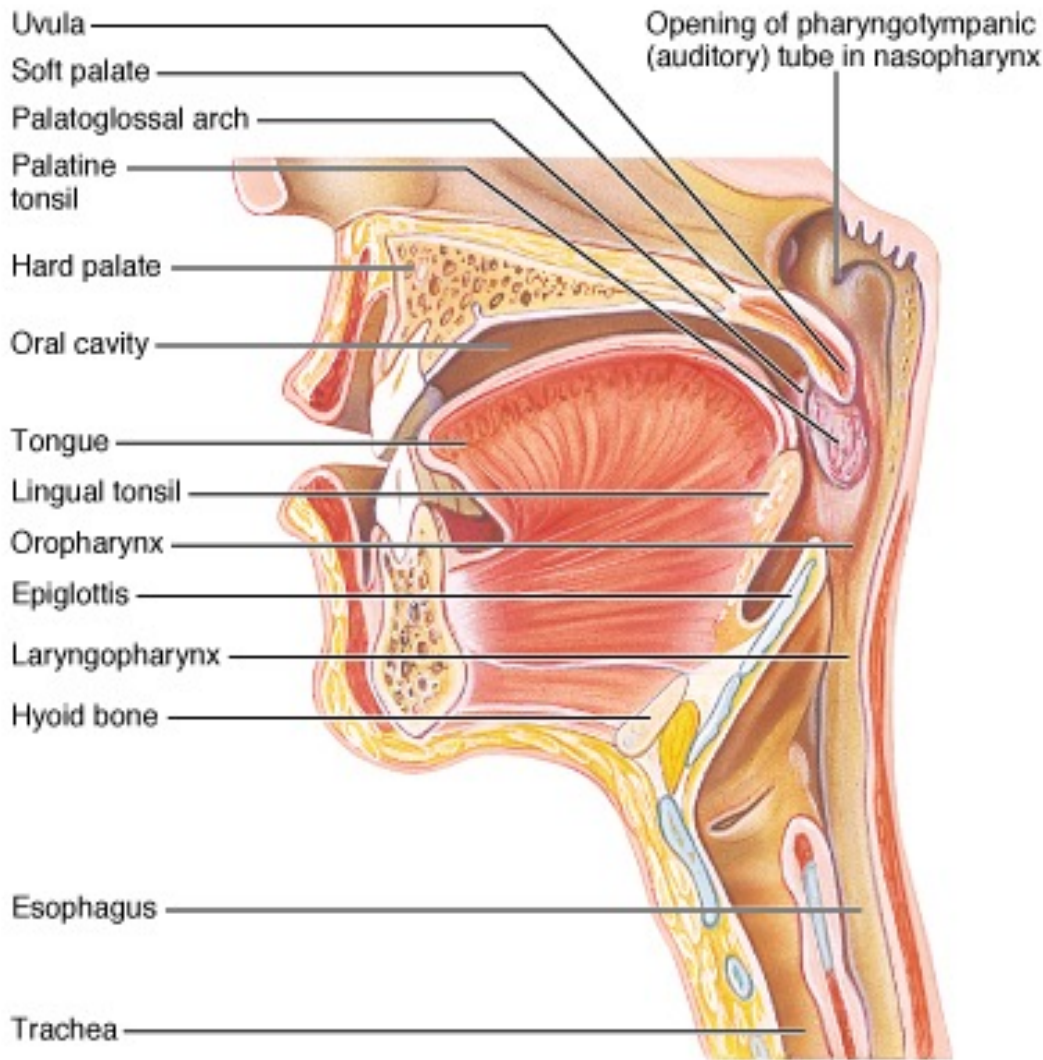
Digestive System Organization

- Descending colon
- Sigmoid colon
- Rectum
- Anus
- Accessory structures
 - Not in tube path
 - Organs
 - Teeth
 - Tongue
 - Salivary glands
 - Liver
 - Gall bladder
 - Pancreas



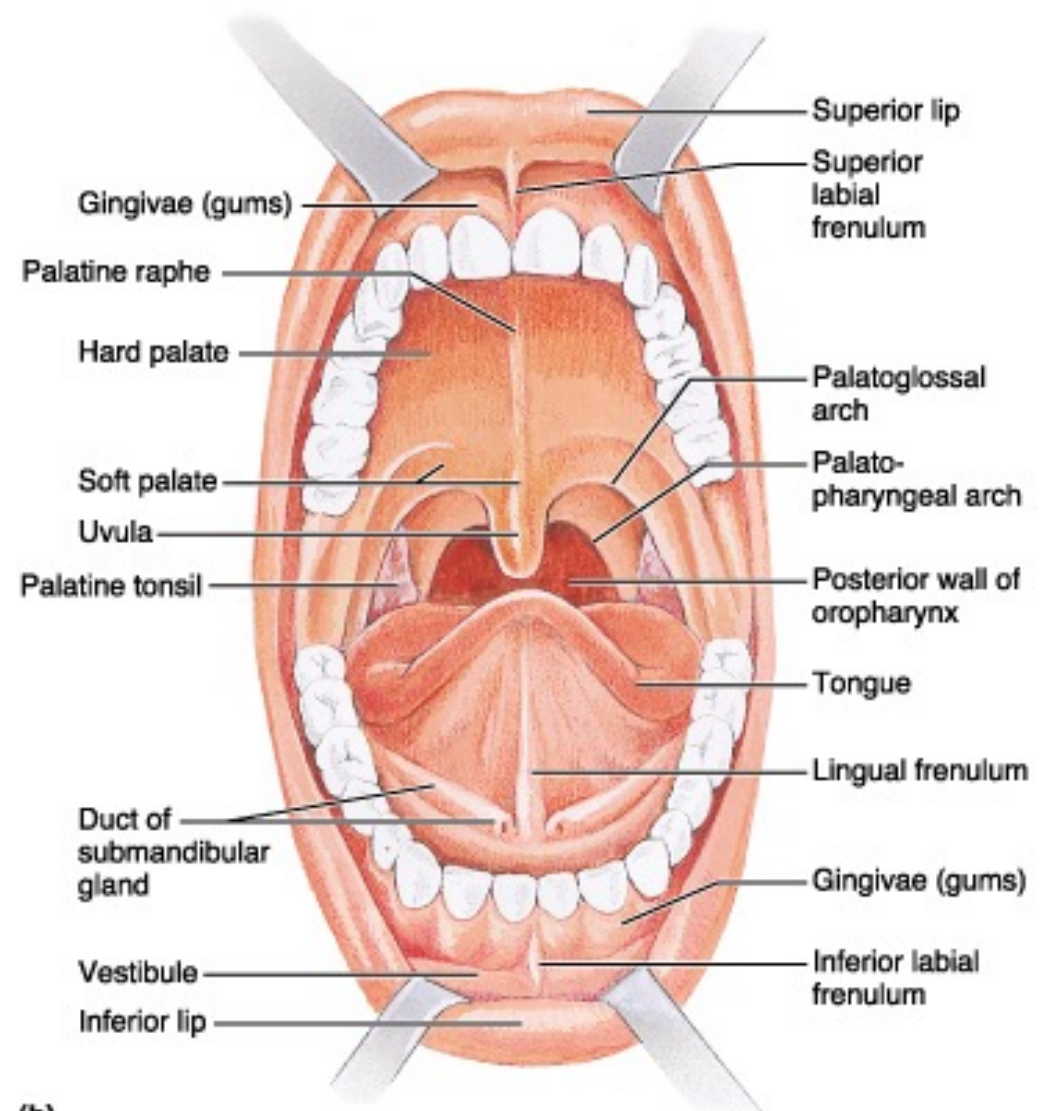
Constipation or diarrhea usually indicates large intestine problems

Anatomy of the Mouth and Throat



(a)

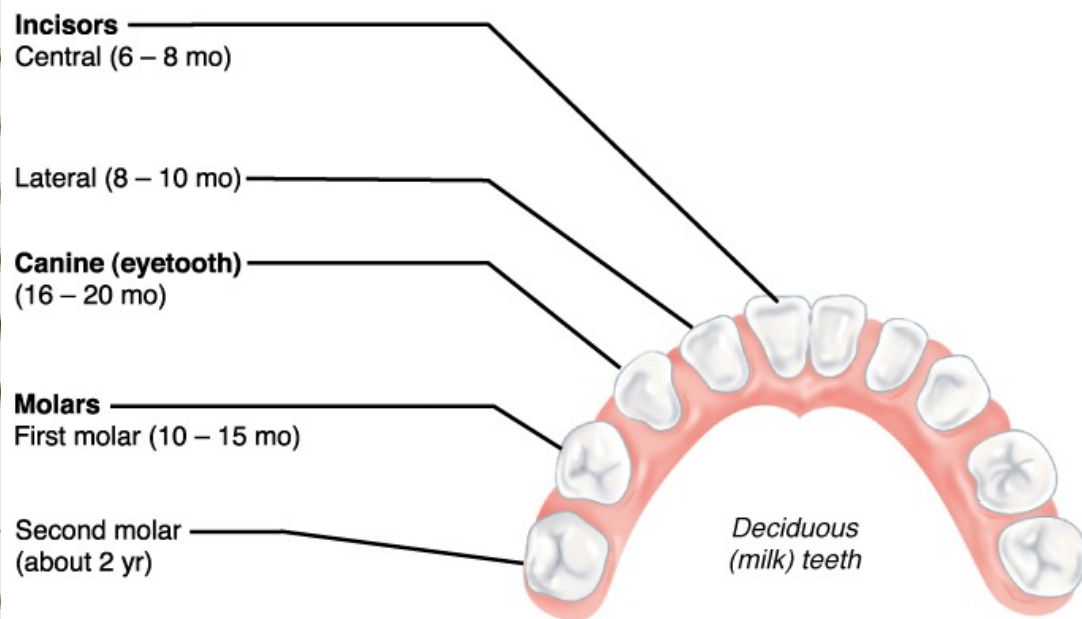
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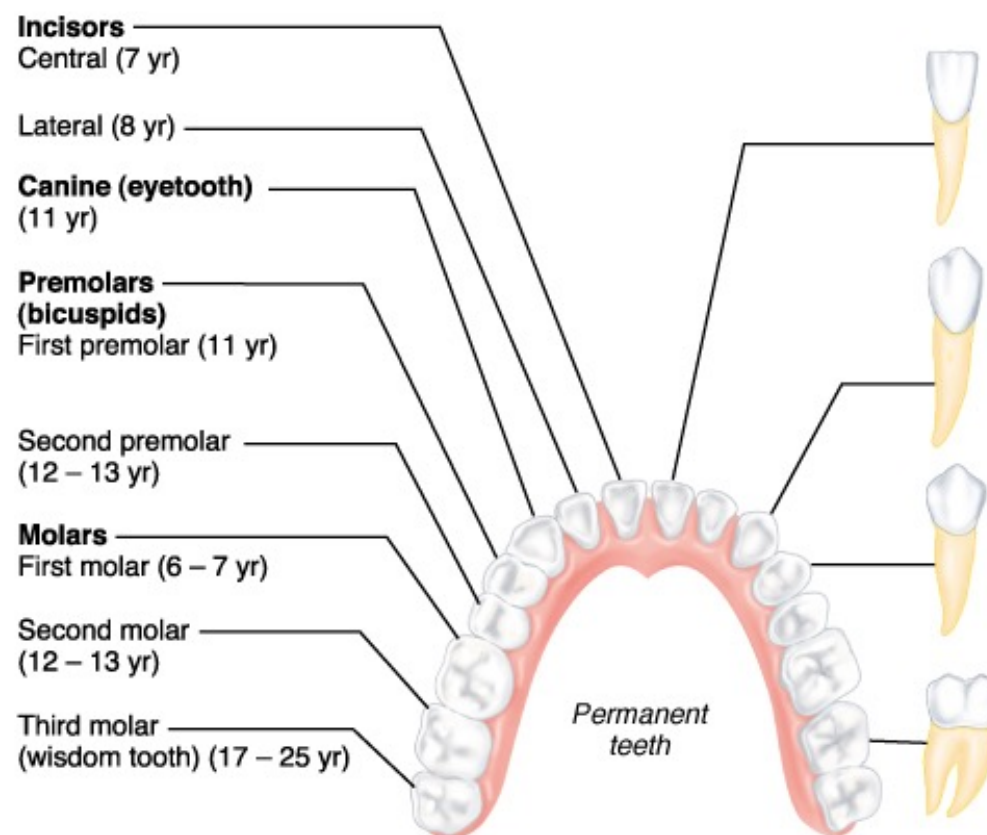
(b)

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Human Deciduous and Permanent Teeth

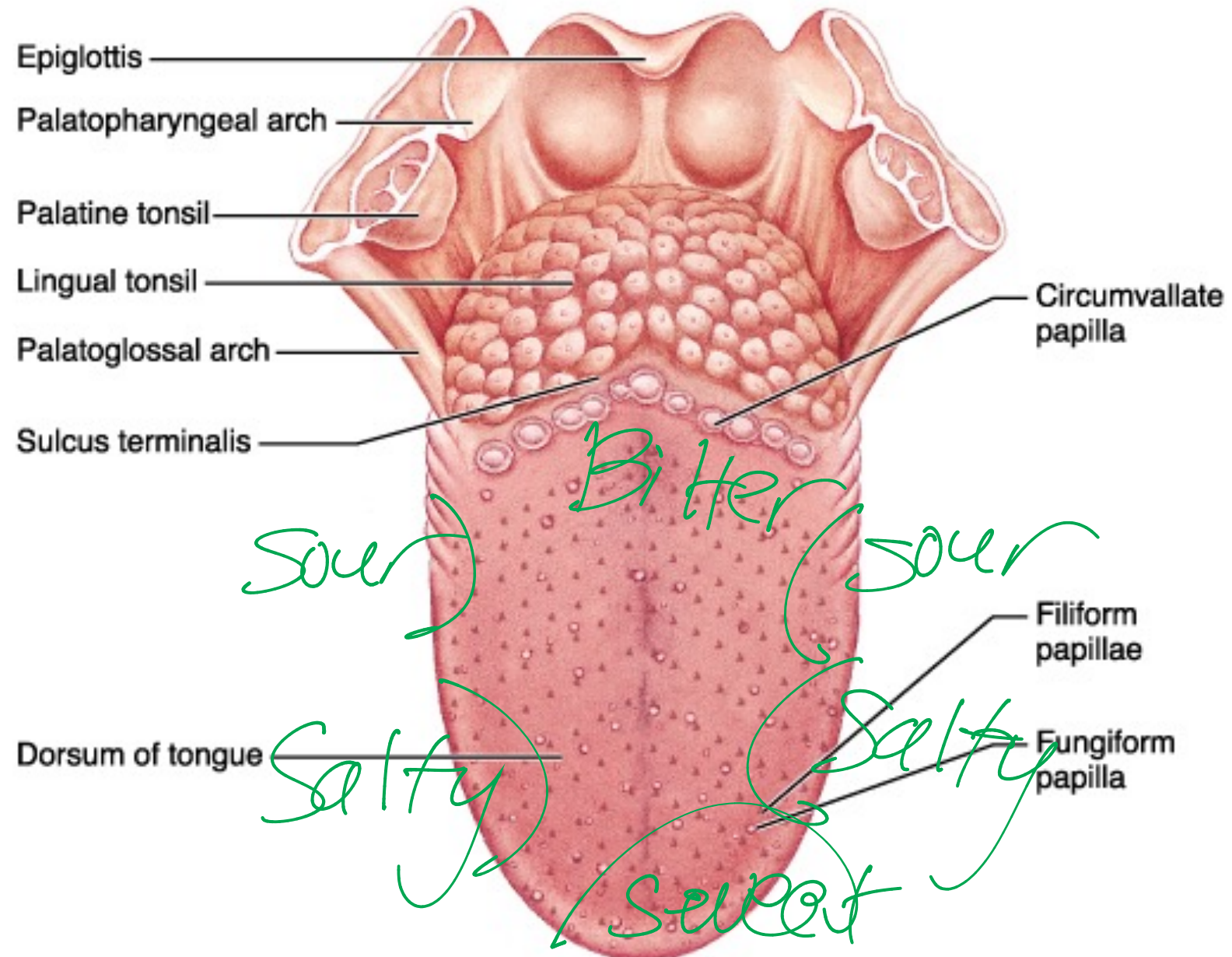


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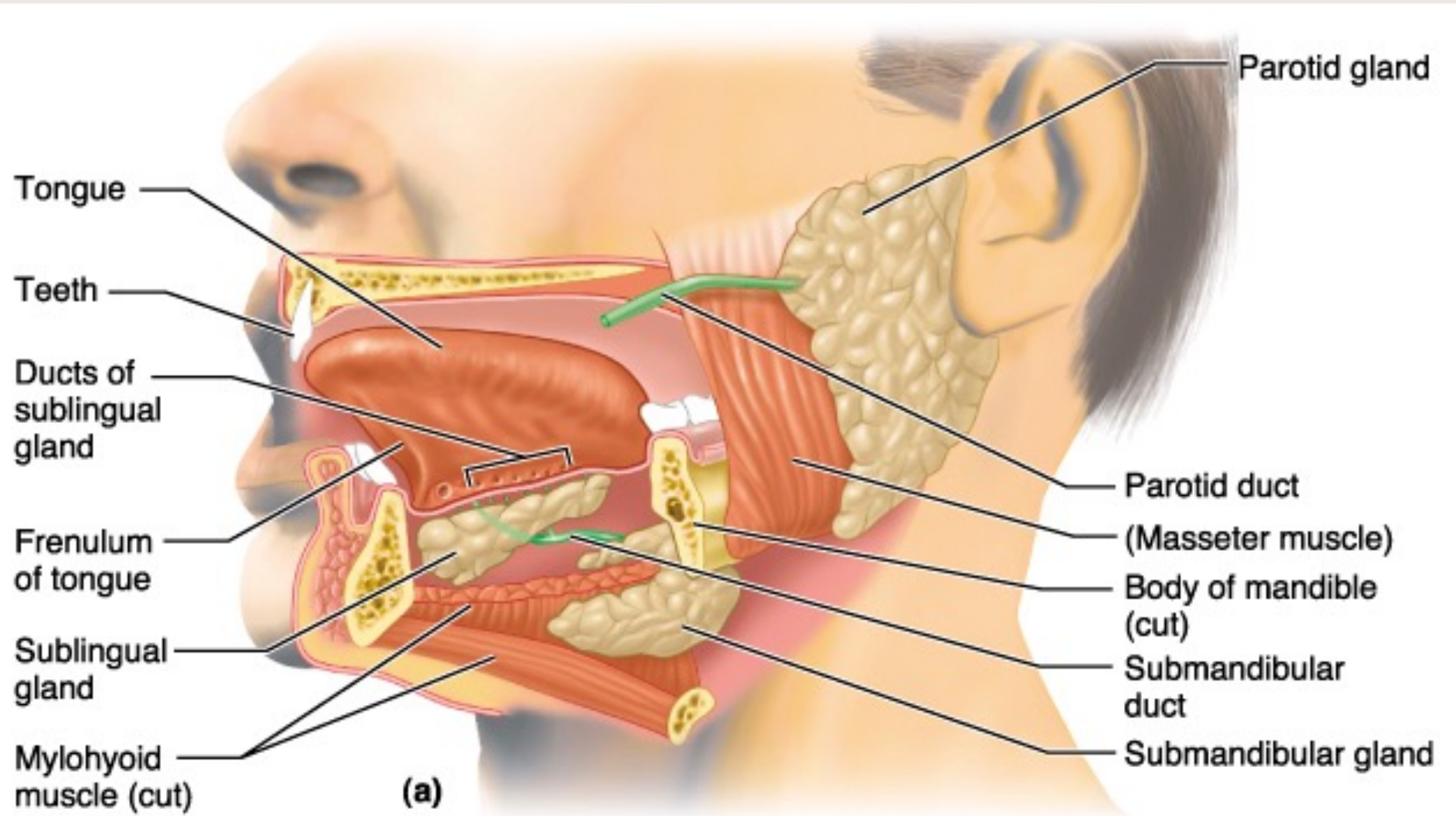
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Dorsal Surface of the Tongue



The Major Salivary Glands

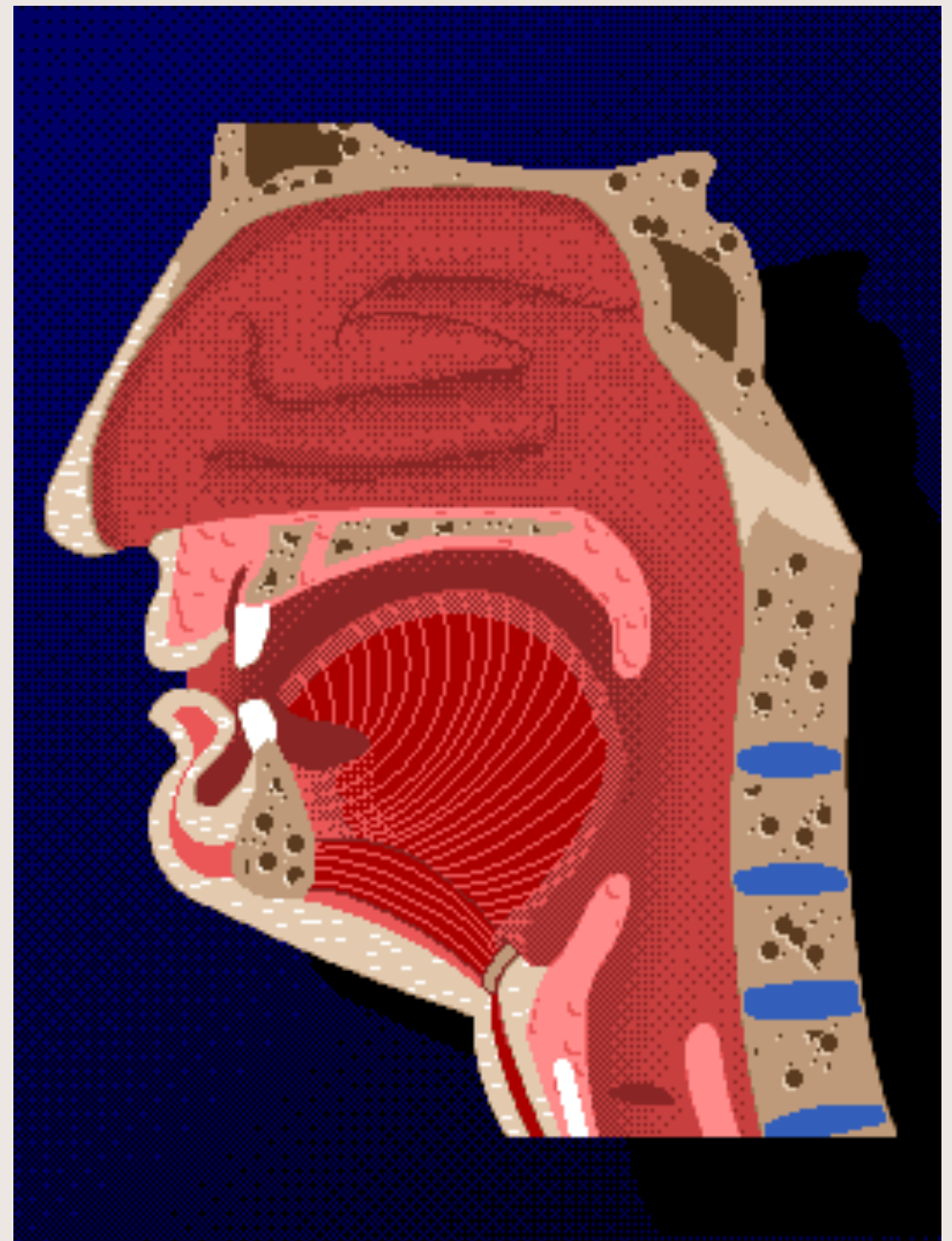
secrete saliva



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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)

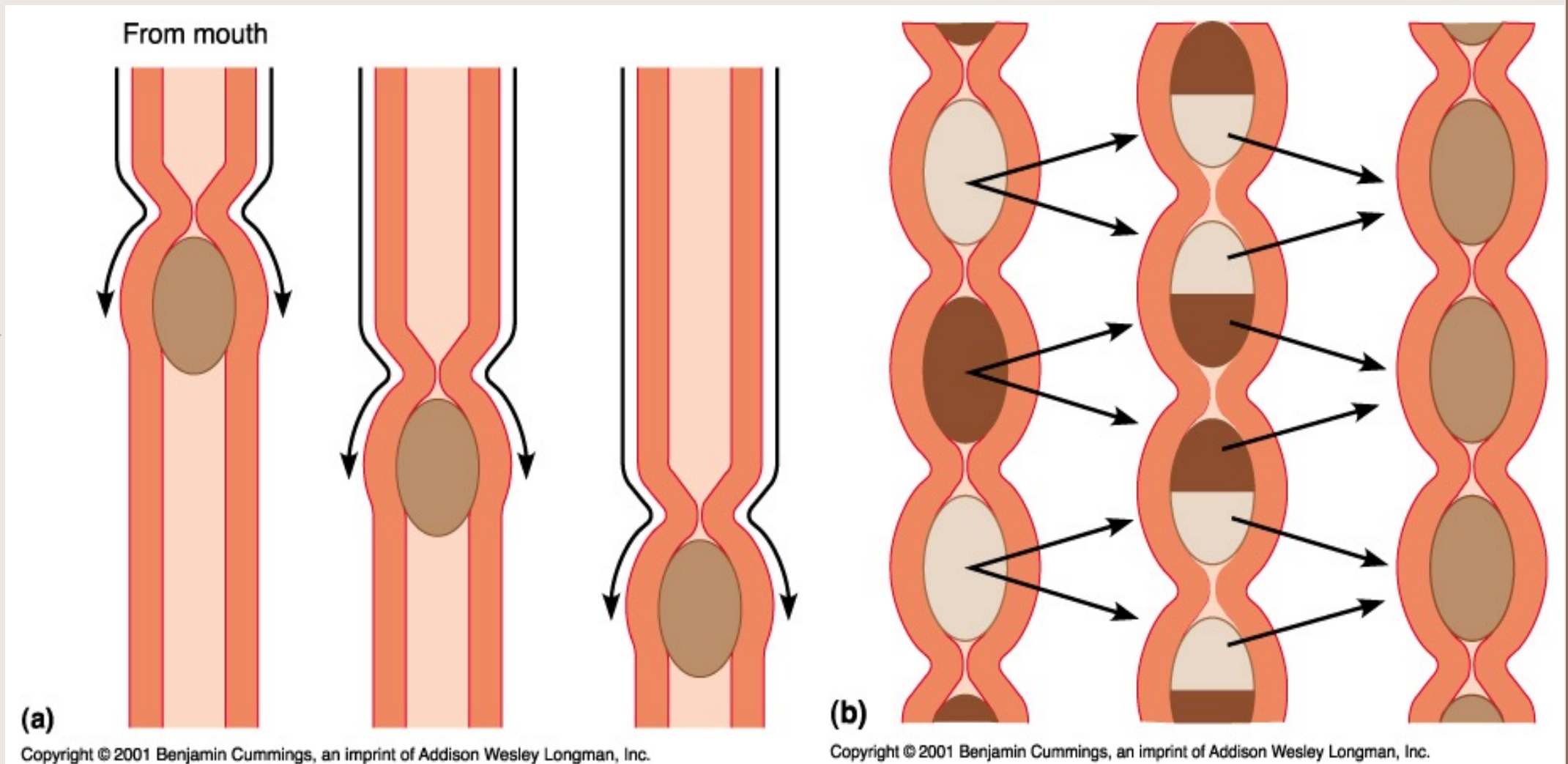
- Control
 - Nerves
 - Glossopharyngeal
 - Vagus
 - Accessory
 - Brain stem
 - Deglutition center
 - Medulla oblongata
 - Pons
 - Disorders
 - Dysphagia
 - Aphagia

Esophagus

- Usually collapsed (closed)
- 3 constrictions
 - Aortic arch
 - Left primary bronchus
 - Diaphragm
- Surrounded by
 - SNS plexus
 - Blood vessels
- Functions
 - Secrete mucous
 - Transport food

Peristalsis and Segmentation

Know the difference



Esophagus

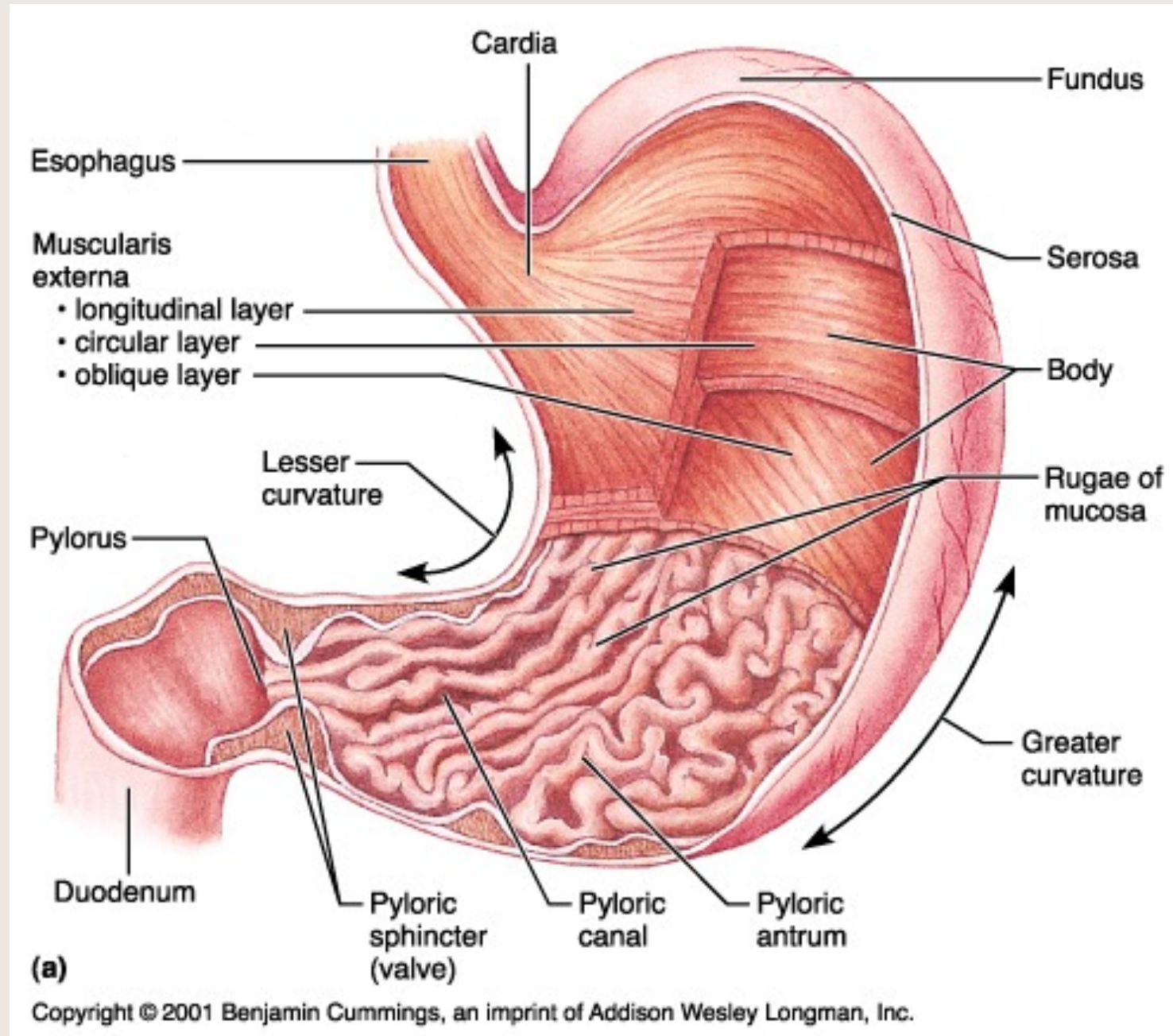
- Sphincters
 - Upper ← allows bolus to enter esophagus
 - Lower ← allows bolus to enter stomach
- Abnormalities
 - Achalasia
 - Atresia
 - Hernia
 - Barret's esophagus
 - Esophageal varices

Stomach

- Usually “J” shaped
- Left side, anterior to the spleen
- Mucous membrane
 - G cells – make gastrin
 - Goblet cells – make mucous
 - Gastric pit – Oxyntic gland – Parietal cells – Make HCl
 - Chief cells – Zymogenic cells
 - Pepsin
 - Gastric lipase

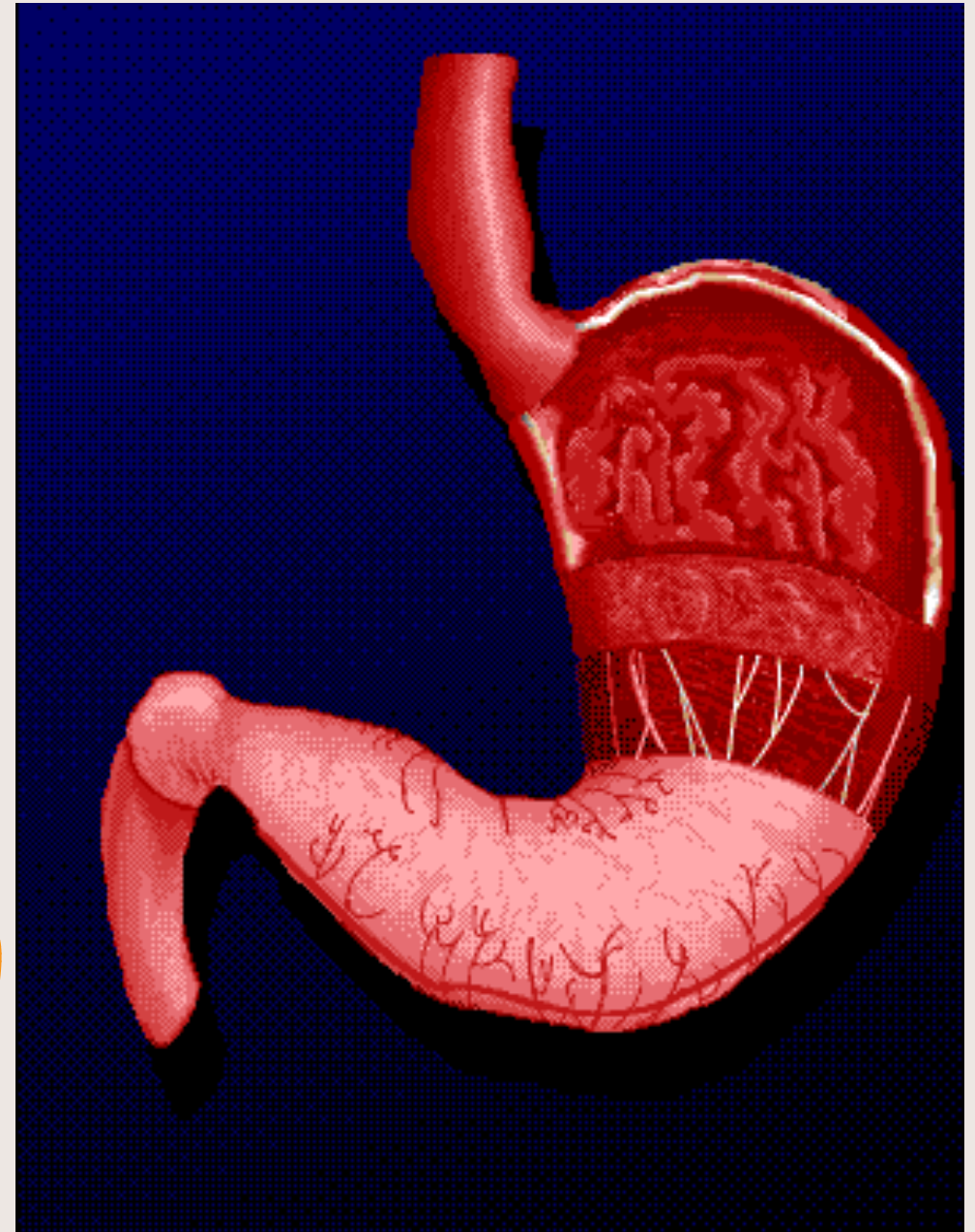
Anatomy of the Stomach

holes in stomach are ulcers



Stomach

- 3 muscle layers
 - Oblique
 - Circular
 - Longitudinal
- Regions
 - Cardiac sphincter
 - Fundus
 - Antrum (pylorus)
 - Pyloric sphincter
- Vascular
- Inner surface thrown into folds – Rugae
- Contains enzymes that work best at pH 1-2



Stomach

- **Functions**

- Mix food
- Reservoir
- Start digestion of
 - Protein
 - Nucleic acids
 - Fats
- Activates some enzymes
- Destroy some bacteria
- Makes intrinsic factor – B 12 absorption
- Destroys some bacteria

- **Absorbs**

- Alcohol
- Water
- Lipophilic acid
- B 12

After everything
is mixed, it's
now called
chyme!!!

Small Intestine

- Extends from pyloric sphincter → ileocecal valve

- **Regions**

- Duodenum
- Jejunum
- Ileum

*Remember
DJIE*

- **Movements**

- Segmentation
- Peristalsis



Small Intestine

- Histology

- Intestinal glands – Intestinal enzymes
- Duodenal glands – Alkaline mucous
- Paneth cells – Lysozyme
- Microvilli
- Lacteals
- Plica circularis
- Smooth muscle
- Lymphatic tissue – GALT
- Vascular

help with absorption

Small Intestine

- Absorbs

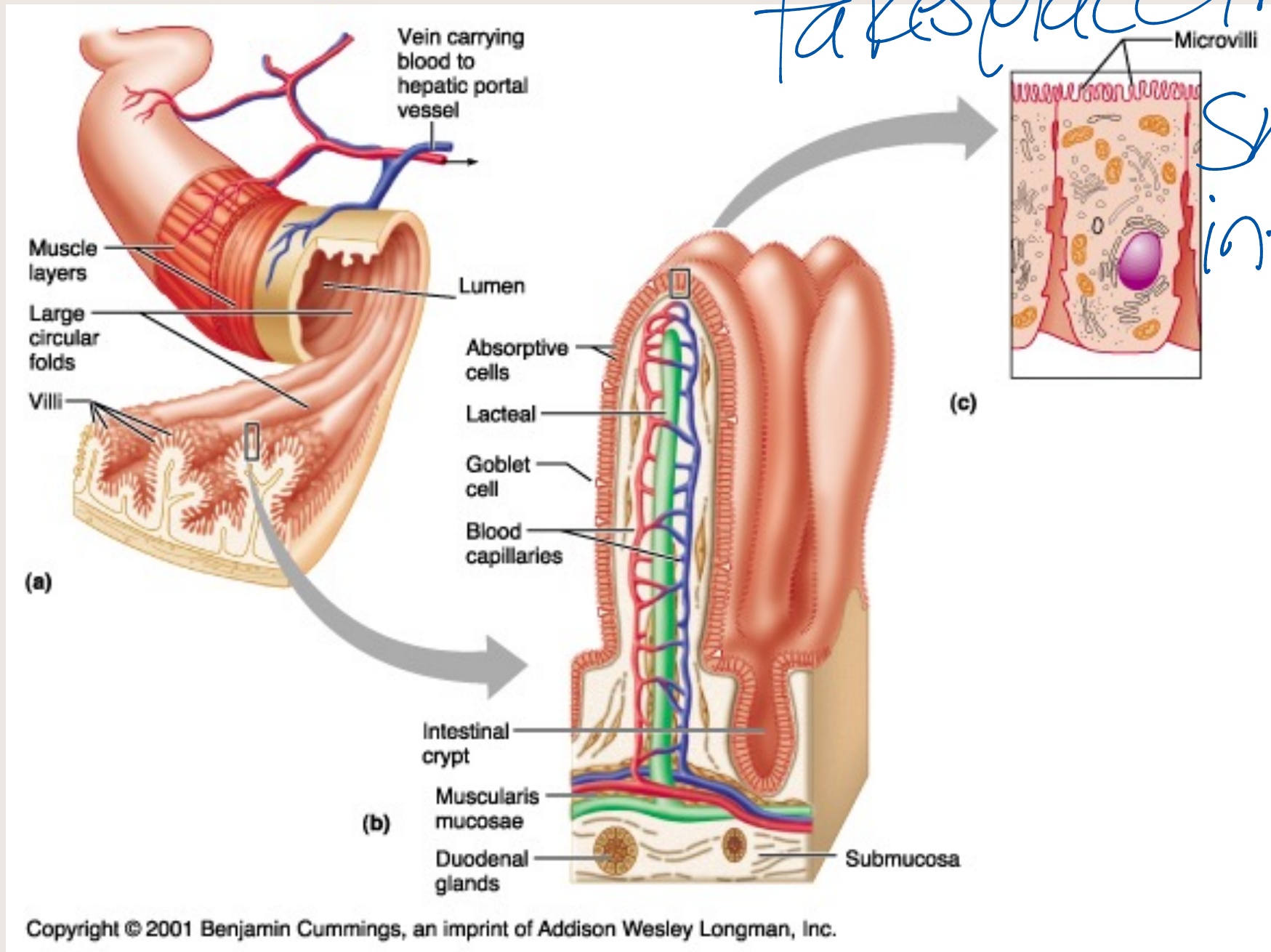
- 80% ingested water
- Electrolytes
- Vitamins
- Minerals
- Carbonates
 - Active/facilitated transport
 - Monosaccharides
- Proteins
 - Di-/tripeptides
 - Amino acids

- Lipids

- Monoglycerides
- Fatty acids
- Micelles
- Chylomicrons

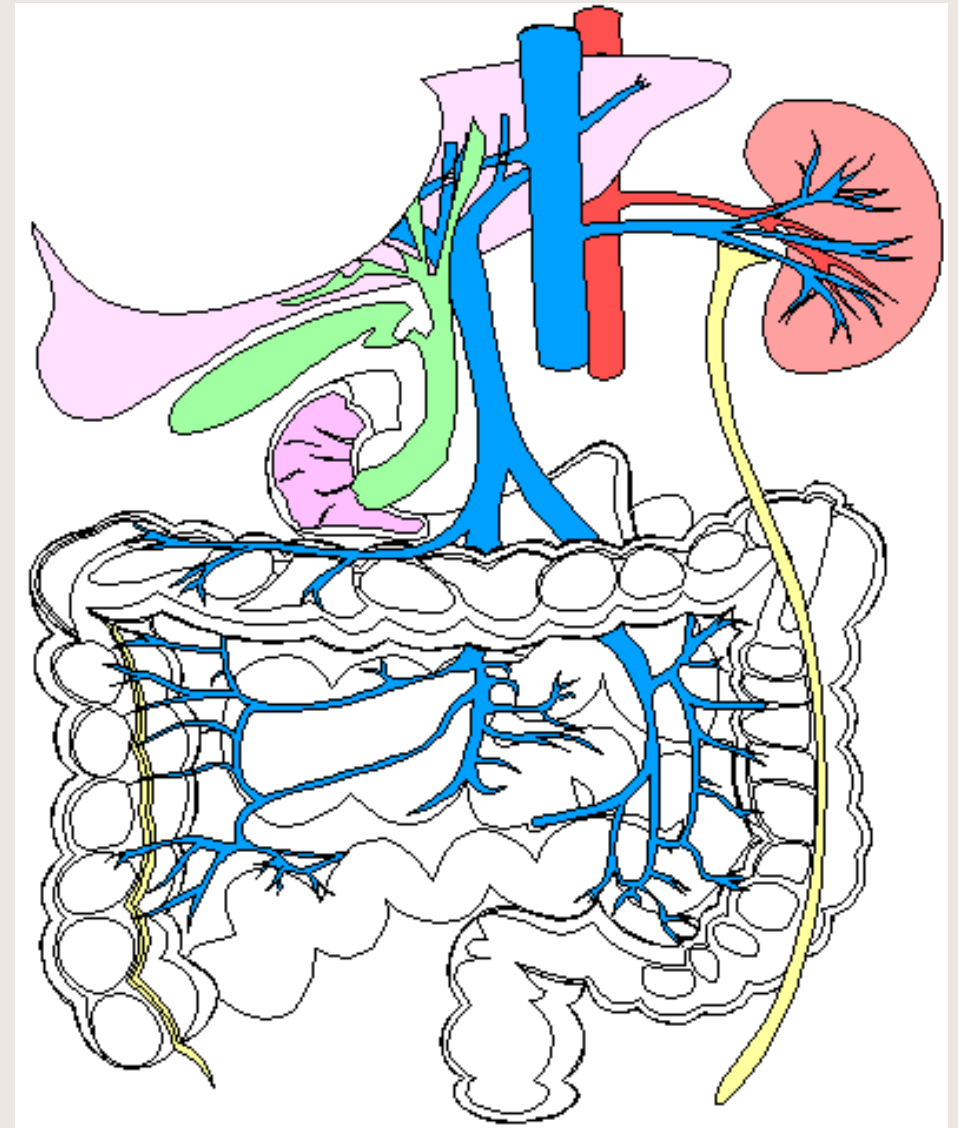
Structure of the Villi in the Small Intestine

Major absorption takes place in the small intestine



Small Intestine

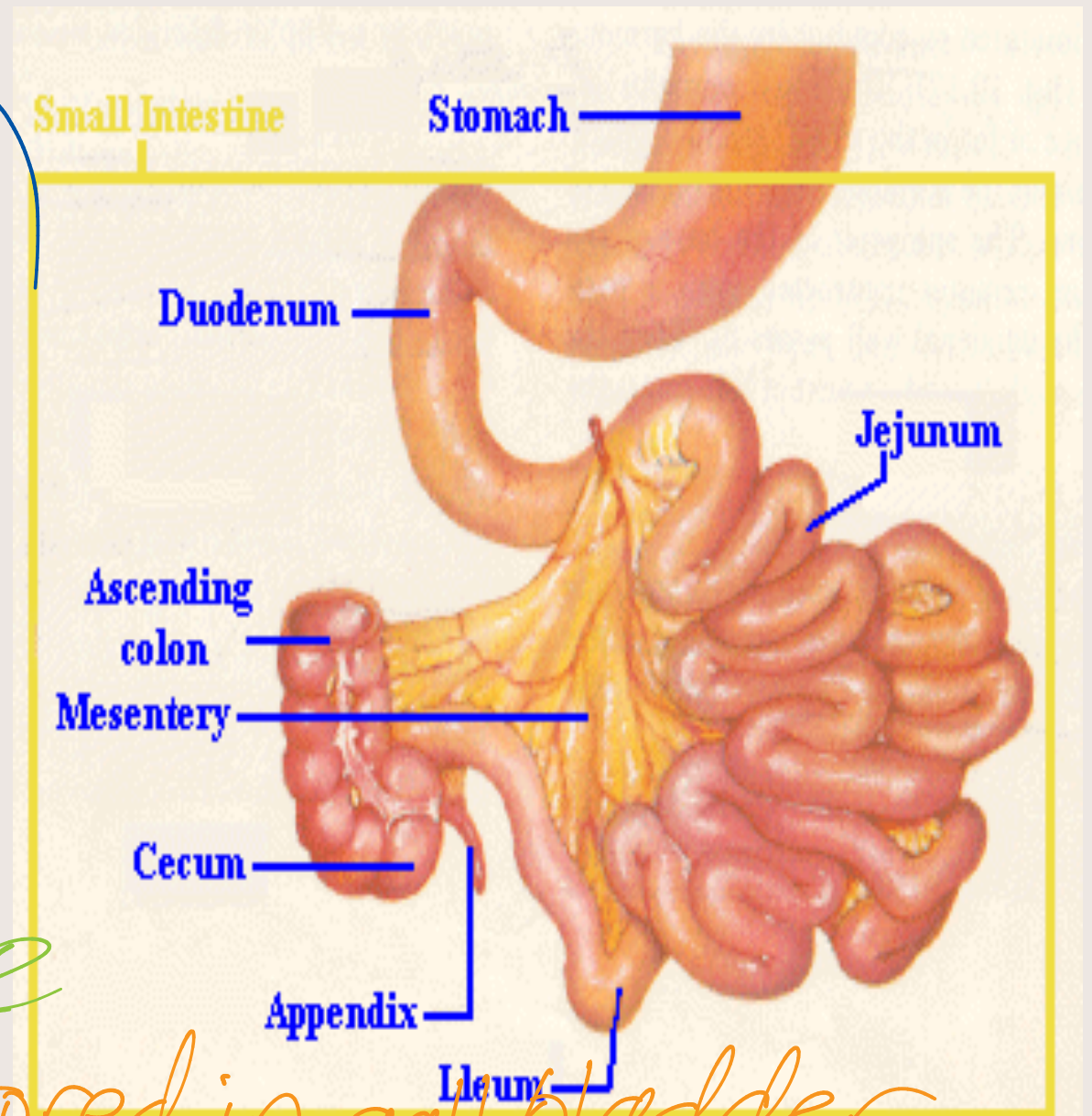
- Secretes digestive enzymes
 - Peptidases
 - Amino-
 - Di-
 - Tri-
 - Sucrases
 - Maltase
 - Lactase
 - Saccharidases
 - Di-
 - Tri-
 - Lipase
 - Nucleases



Small Intestine

From the pancreas

- Control
- Requires pancreatic enzymes & bile to complete digestion

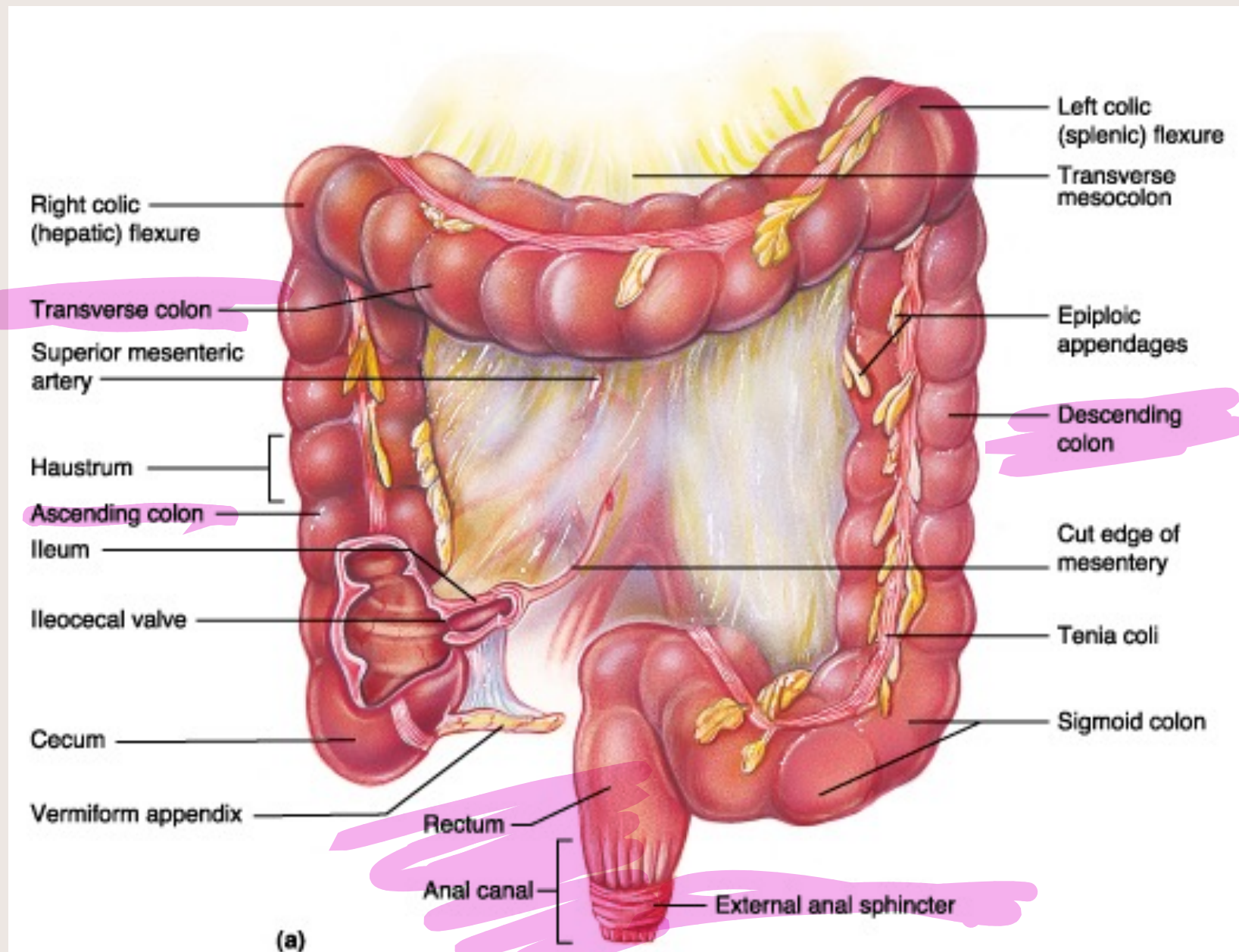


produced in the liver but stored in gall bladder

Large Intestine

- Extends from ileocecal valve to anus
- Regions
 - Cecum – Appendix
 - Colon
 - Ascending
 - Transverse
 - Descending
 - Rectum
 - Anal canal

Anatomy of the Large Intestine



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Large Intestine

- Histology
 - No villi
 - No permanent circular folds
 - Smooth muscle
 - Taeniae coli
 - Haustra
 - Epiploic appendages
 - Otherwise like rest of GI tract

Large Intestine

- **Functions**

- **Mechanical digestion**

- Haustral churning
- Peristalsis
- Reflexes
 - Gastroileal
 - Gastrocolic

- **Chemical digestion –
Bacterial digestion**

- Ferment carbohydrates
- Protein/amino acid breakdown

- Absorbs

- More water
- Vitamins

- B
- K

- Concentrate/eliminate wastes

Feces Formation and Defecation

- Chyme dehydrated to form feces
- Feces composition
 - Water
 - Inorganic salts
 - Epithelial cells
 - Bacteria
 - Byproducts of digestion
- Defecation
 - Peristalsis pushes feces into rectum
 - Rectal walls stretch
- Control
 - Parasympathetic nerves
 - Voluntary

Liver

- Location
 - R. Hypochondrium
 - Epigastric region

- 4 Lobes
 - Left
 - Quadrate
 - Caudate
 - Right

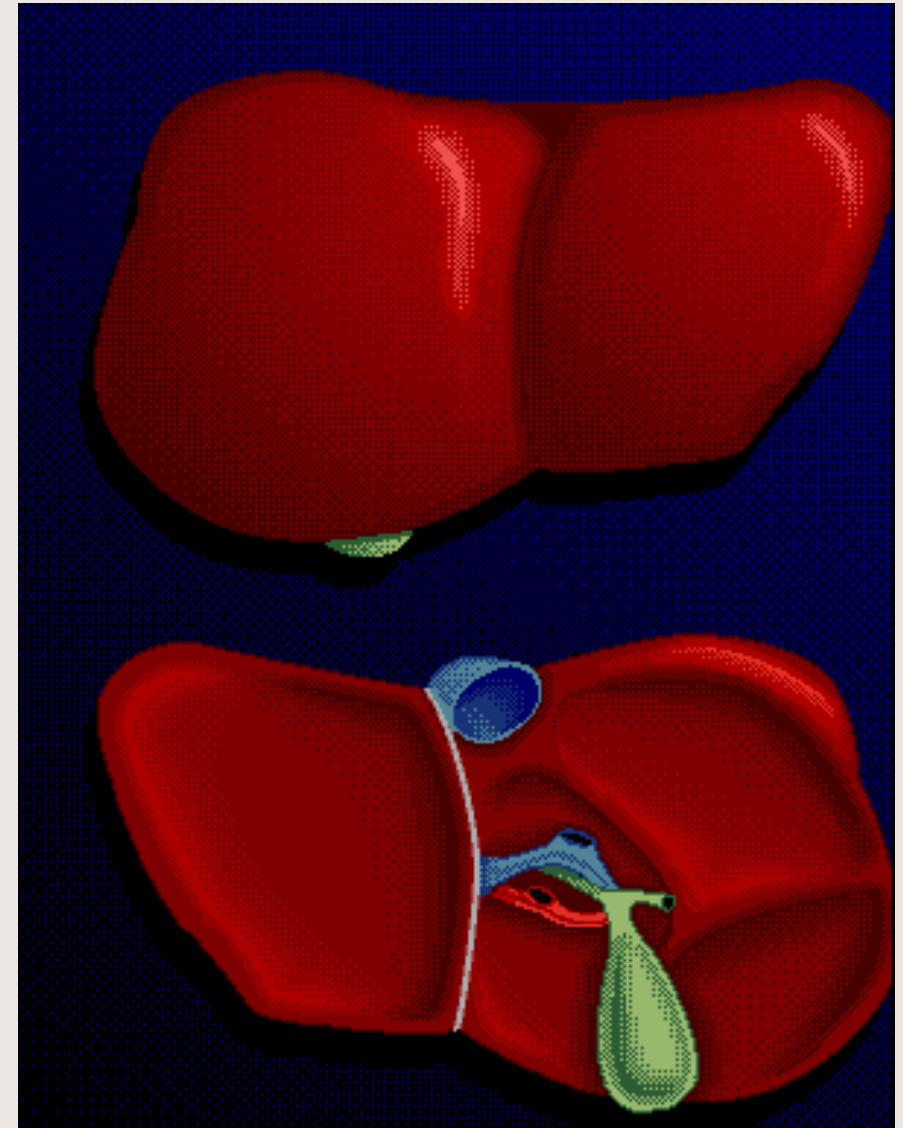
- Each lobe has lobules – Contains hepatocytes – Surround sinusoids – Feed into central vein

Stay away from alcohol and anything that contains acetaminophen

Such as Tylenol; cold medicine
Bad for liver

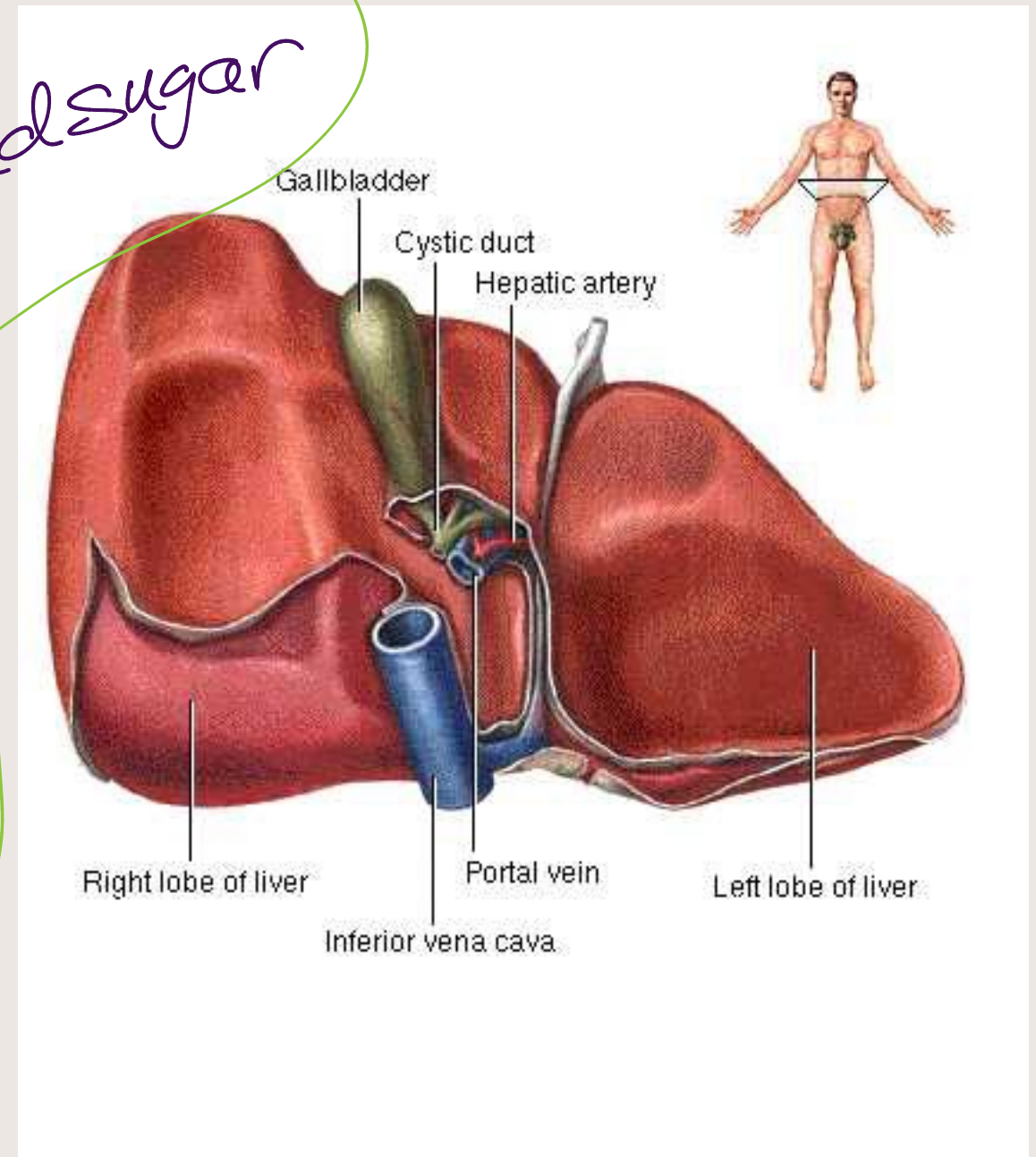
Liver

- Functions
 - Makes bile
 - Detergent – emulsifies fats
 - Release promoted by:
 - Vagus n.
 - CCK
 - Secretin
 - Contains
 - Water
 - Bile salts
 - Bile pigments
 - Electrolytes
 - Cholesterol
 - Lecithin



Liver

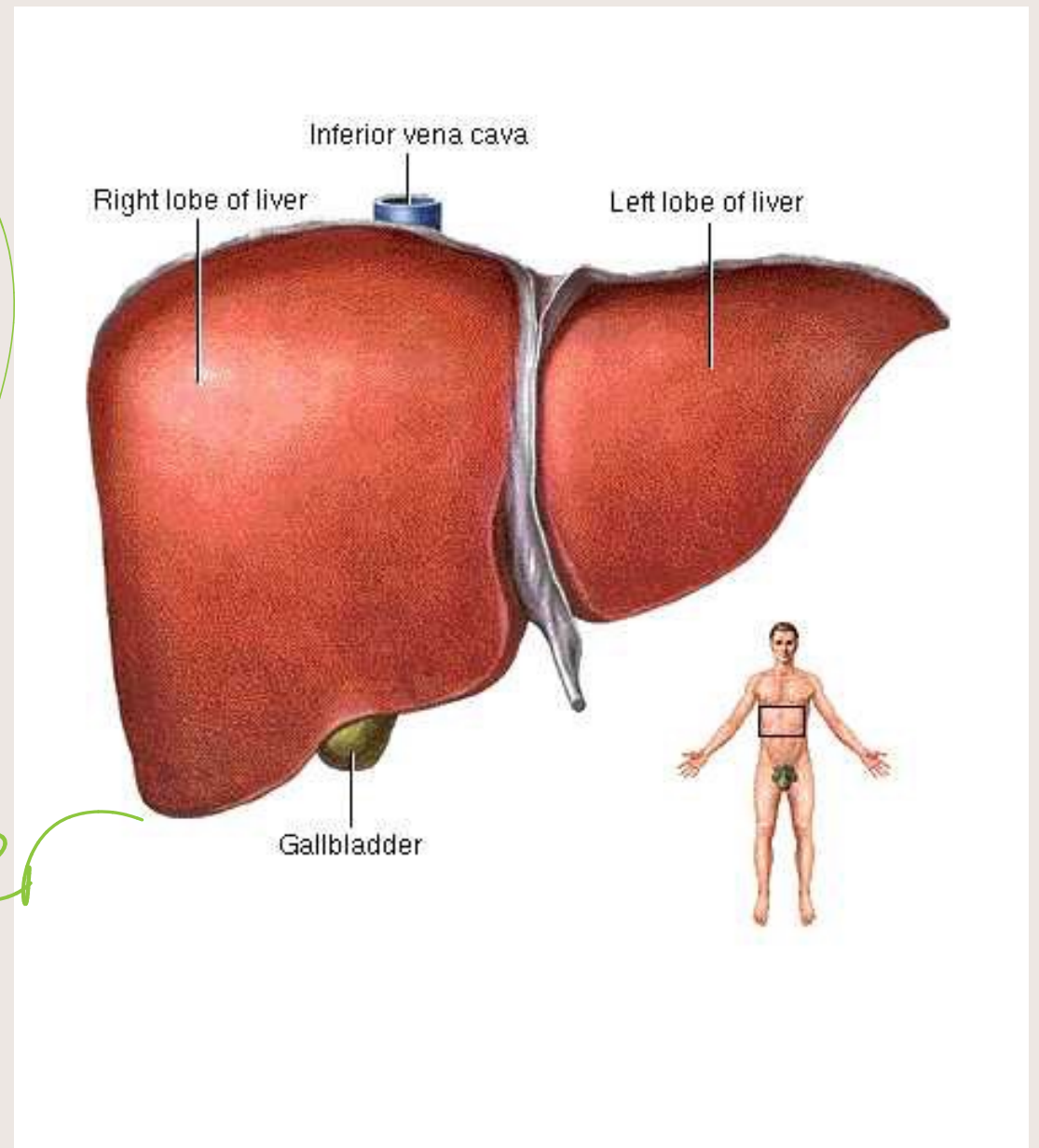
- Detoxifies/removes
 - Drugs
 - Alcohol
- Stores
 - Glycolgen ← *is stored sugar*
 - Vitamins (A, D, E, K)
 - Fe and other minerals
 - Cholesterol
- Activates vitamin D
- Fetal RBC production
- Phagocytosis
- Metabolizes absorbed food molecules
 - Carbohydrates
 - Proteins
 - Lipids



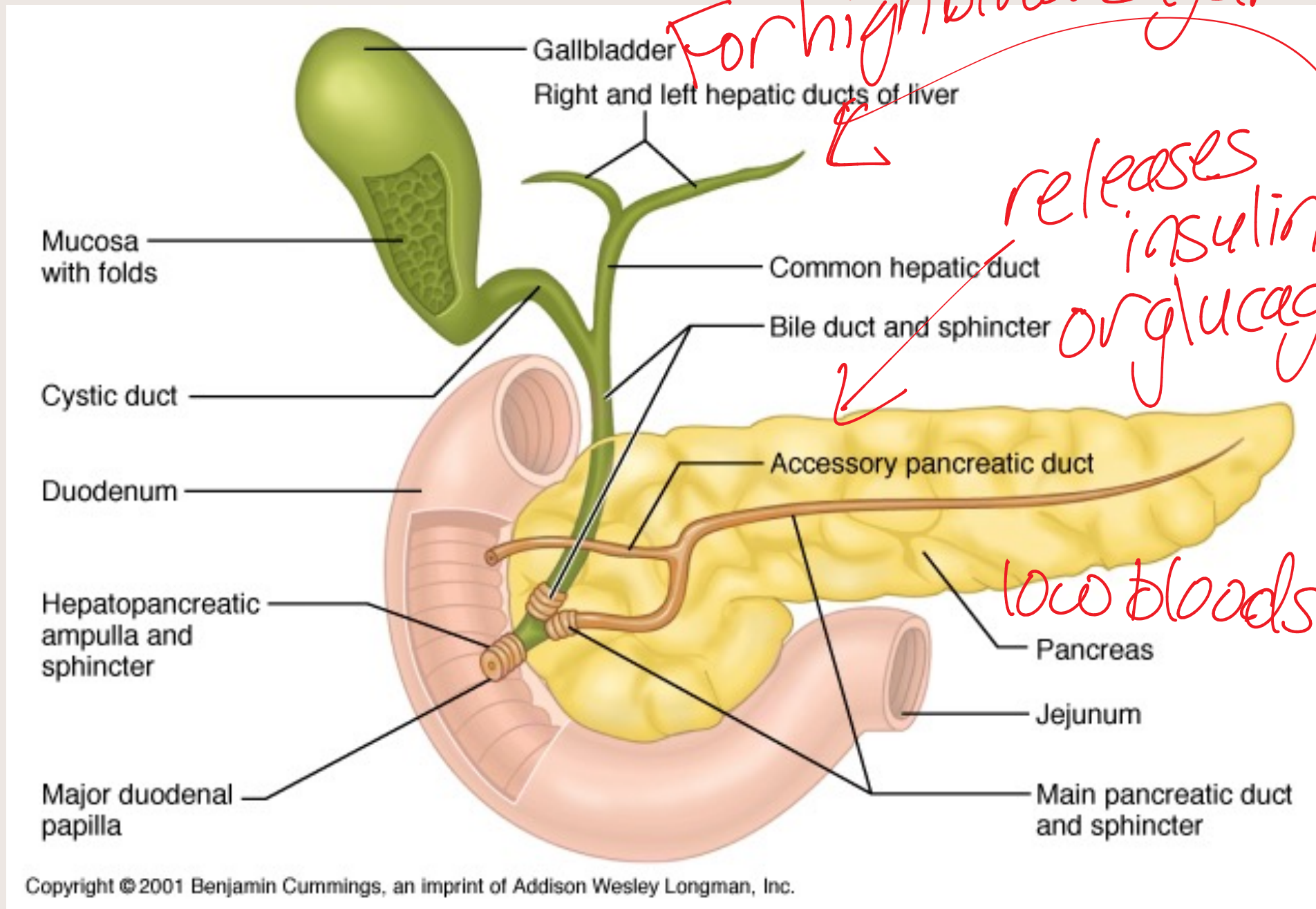
Liver

- Dual blood supply
 - Hepatic portal vein
 - Direct input from small intestine
 - Hepatic artery/vein
 - Direct links to heart

major vein in liver



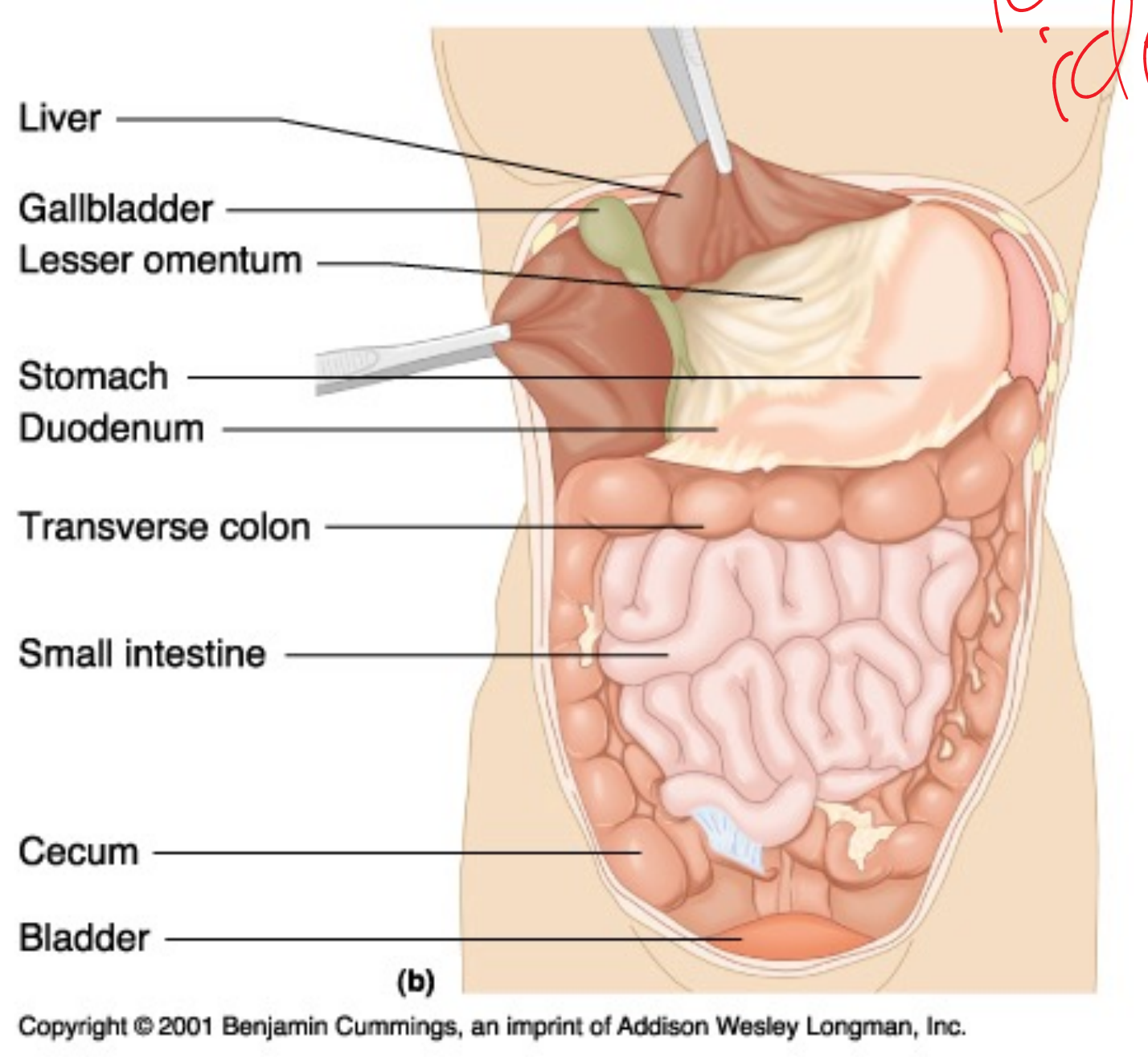
The Duodenum and Related Organs



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The Organs and Positions in the Abdominal Cavity

Be able to identify



Structures of the Alimentary Canal

Also called GI tract

