Digestive System

Human Biology (ANE106)

Year 1/ Spring semester

Lecture 5

Anesthesia Department

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May 31, 2026

Digestive System

The digestive system is a group of organs responsible for breaking down food into smaller molecules that can be absorbed and used by the body for energy, growth, and repair.

Main Functions of the Digestive System

1. Ingestion

- Taking food into the mouth.

2. Digestion

Breaking food into smaller molecules.

- Mechanical digestion: Physical breakdown of food.
- Chemical digestion: Enzymatic breakdown of food.

Main Functions of the Digestive System

3. Absorption

- Movement of nutrients into the blood or lymph.

4. Elimination

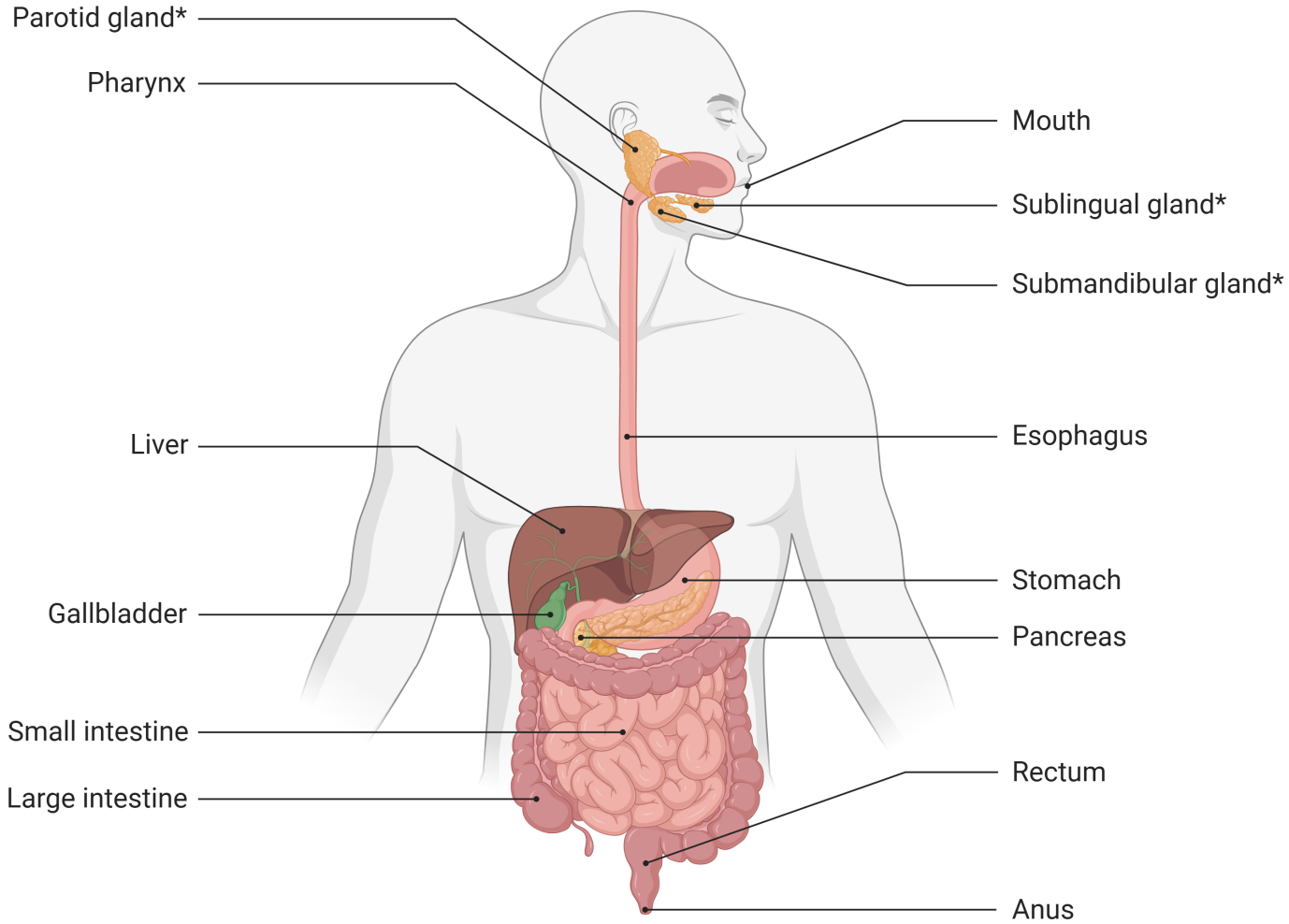
- Removal of indigestible waste materials.

Organs of the Digestive System

The digestive system consists of:

- Gastrointestinal (GI) tract
- Accessory digestive organs

Digestive system



*Salivary glands

Gastrointestinal Tract

The GI tract is a continuous tube extending from the mouth to the anus.

Organs of the GI Tract

1. Mouth
2. Pharynx
3. Esophagus
4. Stomach
5. Small intestine
6. Large intestine

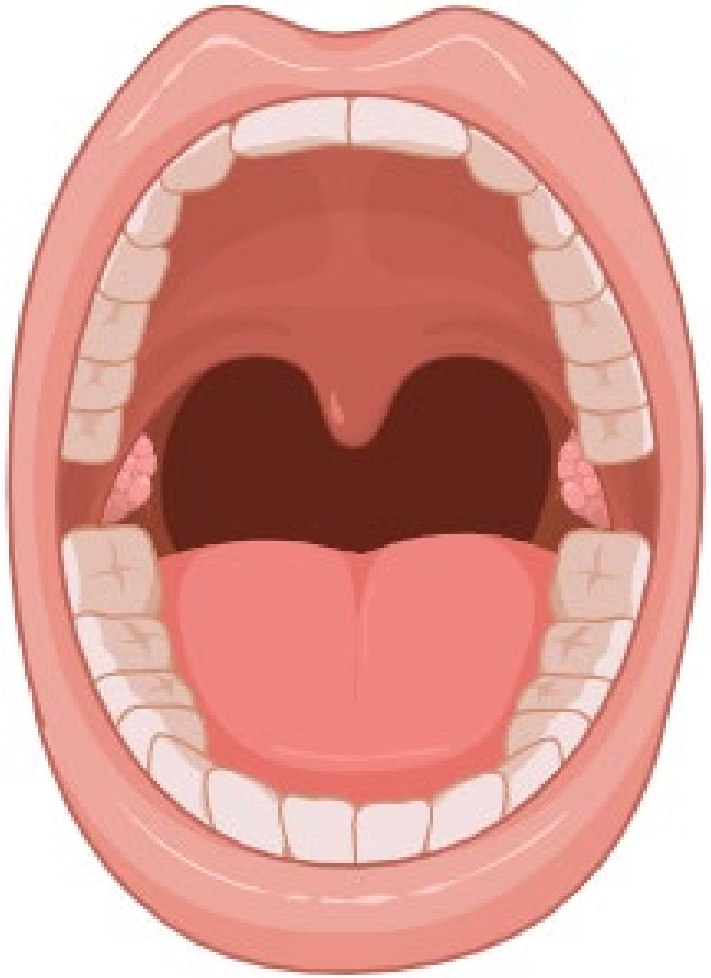
1. Mouth

Functions

- Ingestion of food
- Mechanical digestion by chewing
- Beginning of carbohydrate digestion

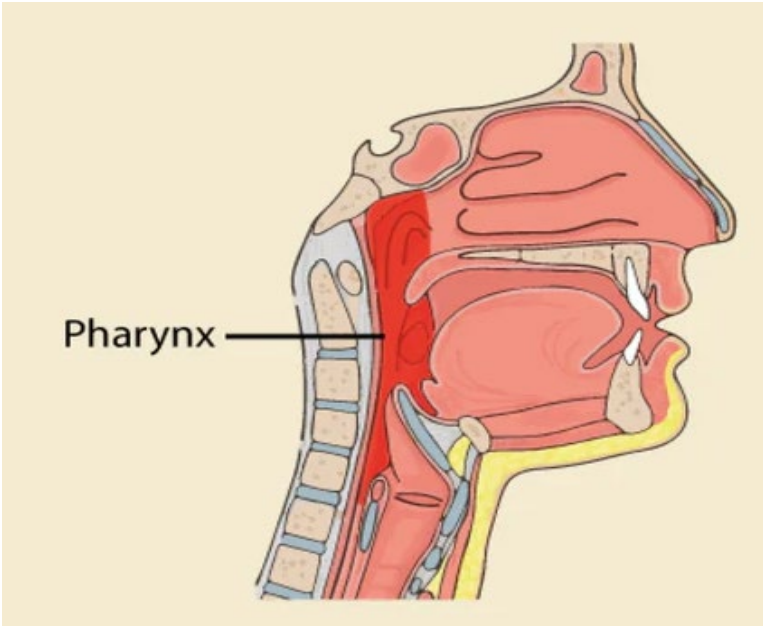
Structures

- Teeth
- Tongue
- Salivary glands



2. Pharynx

The pharynx is a muscular passageway that connects the mouth to the esophagus and helps move food during swallowing.

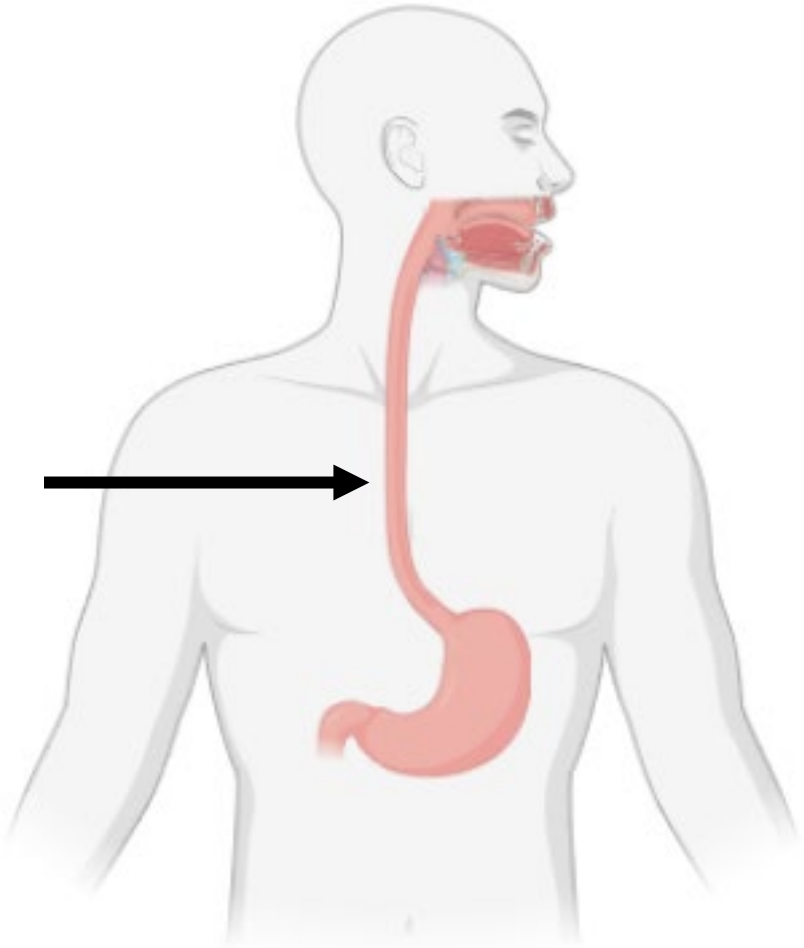


3. Esophagus

The esophagus is a muscular tube that transports food and liquids from the pharynx to the stomach by peristaltic movements.

Peristalsis

Wave-like muscular contractions that move food.

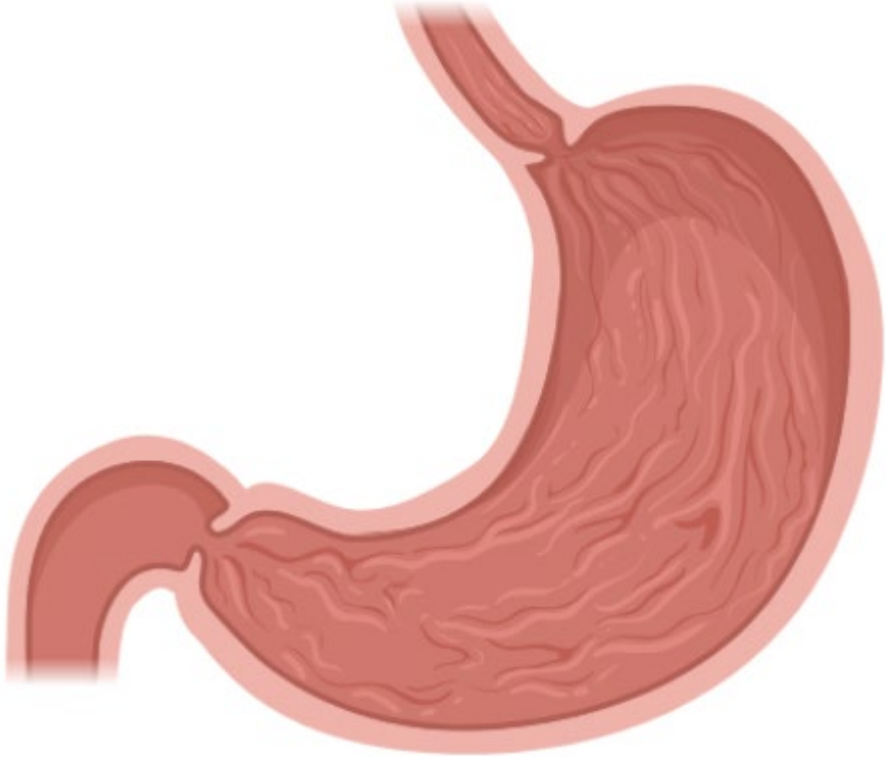


4. Stomach

The stomach is a muscular hollow organ that stores food and mechanically and chemically digests it, especially proteins, using gastric juices.

Functions

- Storage of food
- Mechanical mixing
- Protein digestion



Stomach

Gastric Juice Contains

1. Hydrochloric acid (HCl)
2. Pepsinogen (Inactive form of Pepsin)
3. Mucus

Hydrochloric Acid

1. Kills bacteria
2. Activates pepsin
3. Creates an acidic environment

Pepsin

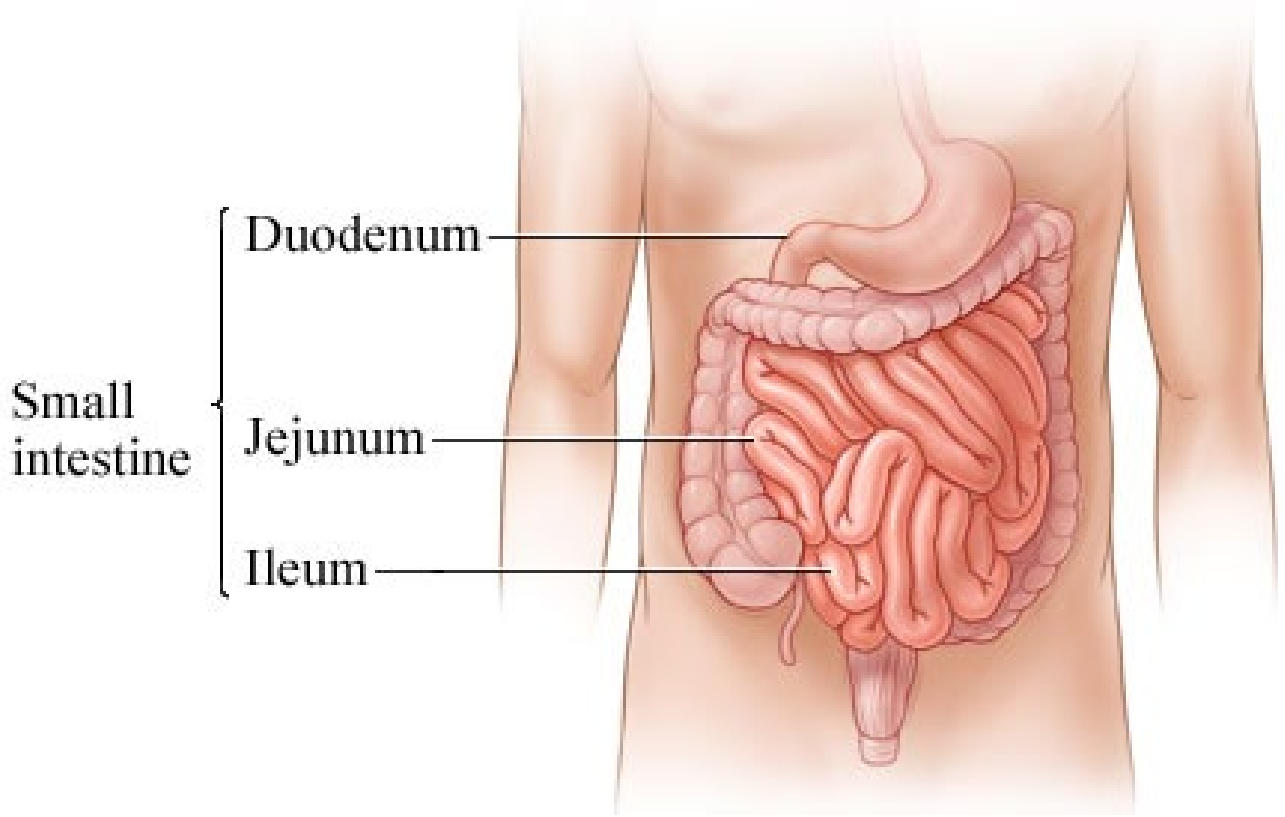
1. Digests proteins into peptides.

5. Small Intestine

The small intestine is a long coiled digestive organ where most chemical digestion and nutrient absorption take place.

Parts

- Duodenum
- Jejunum
- Ileum



Small Intestine

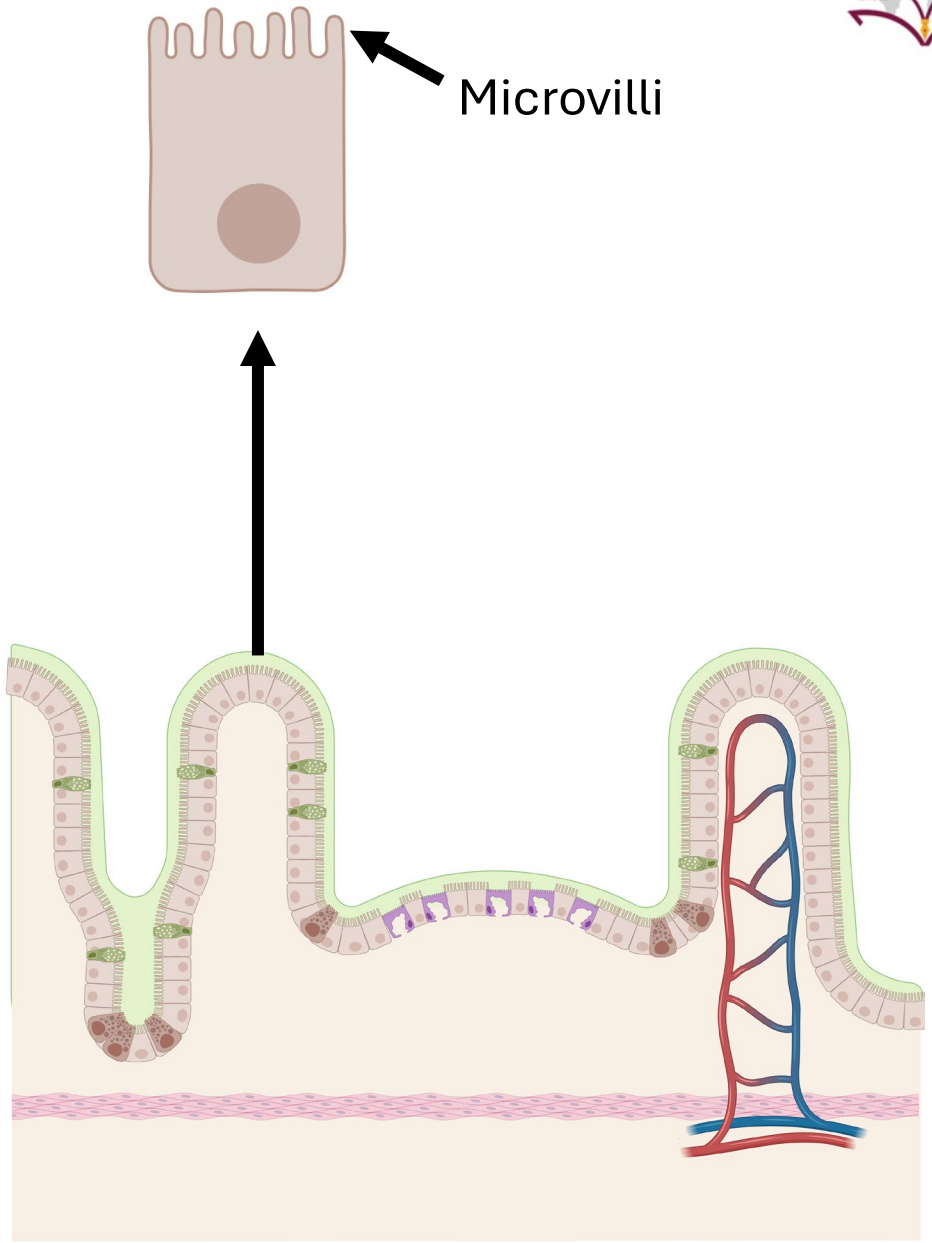
Functions

- Major site of digestion
- Major site of nutrient absorption

Adaptations for Absorption

- Circular folds
- Villi
- Microvilli

These structures increase surface area.

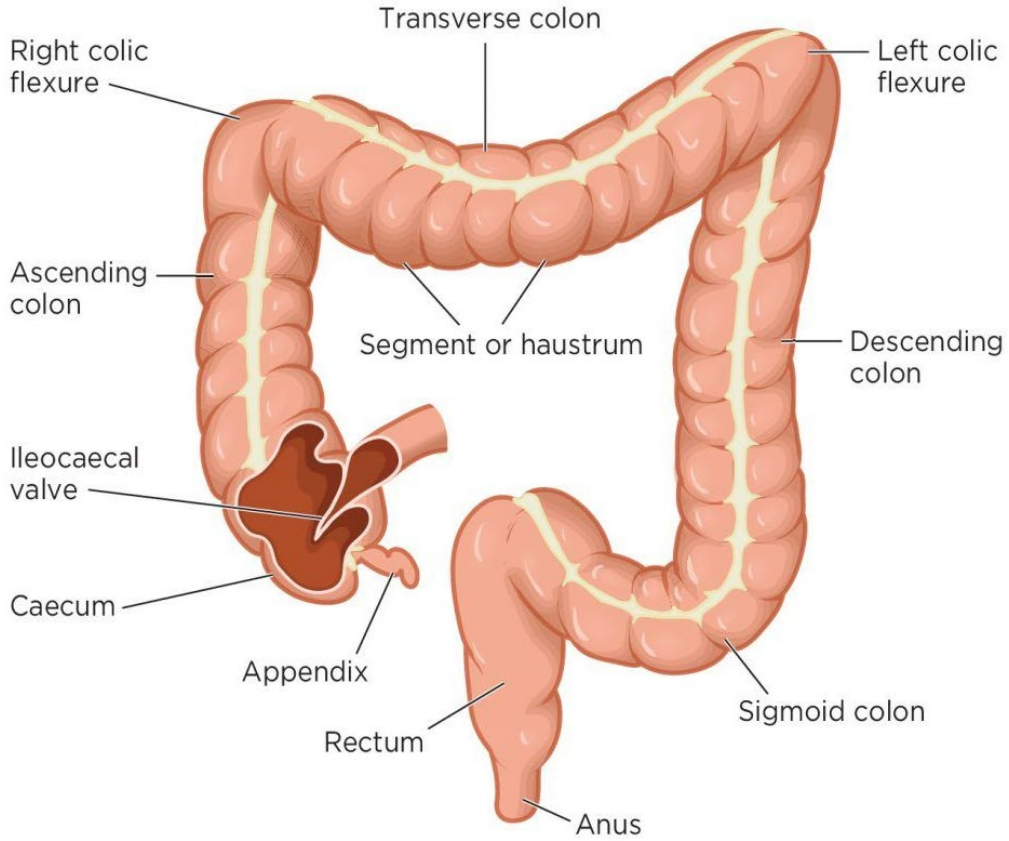


6. Large Intestine

The large intestine is the final part of the digestive system that absorbs water and electrolytes and forms and stores feces.

Parts

- Cecum
- Colon
- Rectum
- Anal canal



Large Intestine

Functions

- Water absorption
- Electrolyte absorption
- Formation of feces
- Bacterial vitamin production

Accessory Digestive Organs

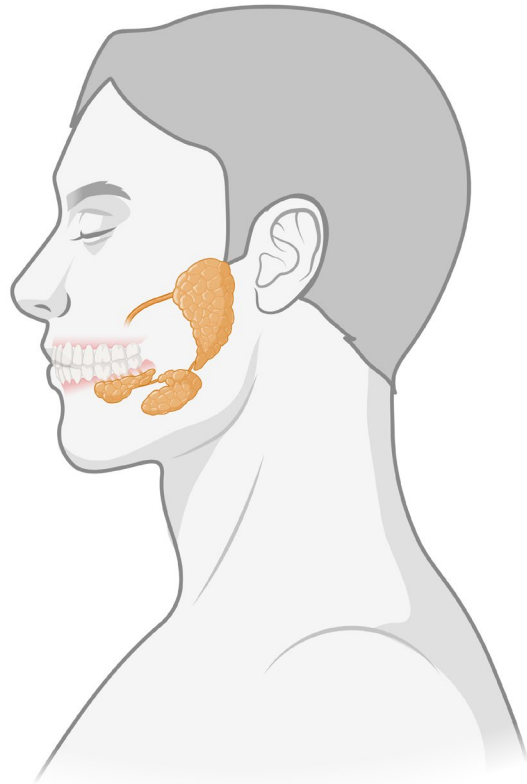
Accessory digestive organs are organs that assist digestion by producing or storing digestive secretions, but food does not pass through them directly.

1. Salivary glands
2. Liver
3. Gallbladder
4. Pancreas

Accessory Digestive Organs

1. Salivary gland

Salivary glands are accessory digestive organs that produce and secrete saliva into the mouth to help in lubrication, digestion, and oral protection.



Saliva

Contains: Water, Mucus, Salivary amylase

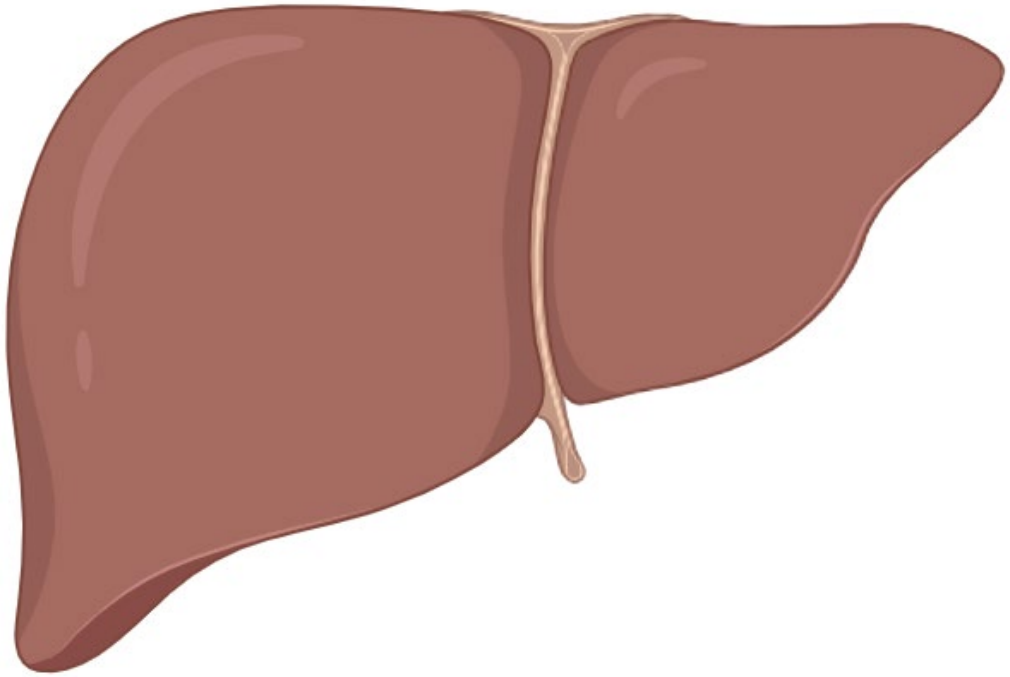
Salivary Amylase

Starts the digestion of starch into maltose.

Accessory Digestive Organs

2. Liver

The liver is the largest internal organ that produces bile, processes nutrients, detoxifies harmful substances, and performs many essential metabolic functions.



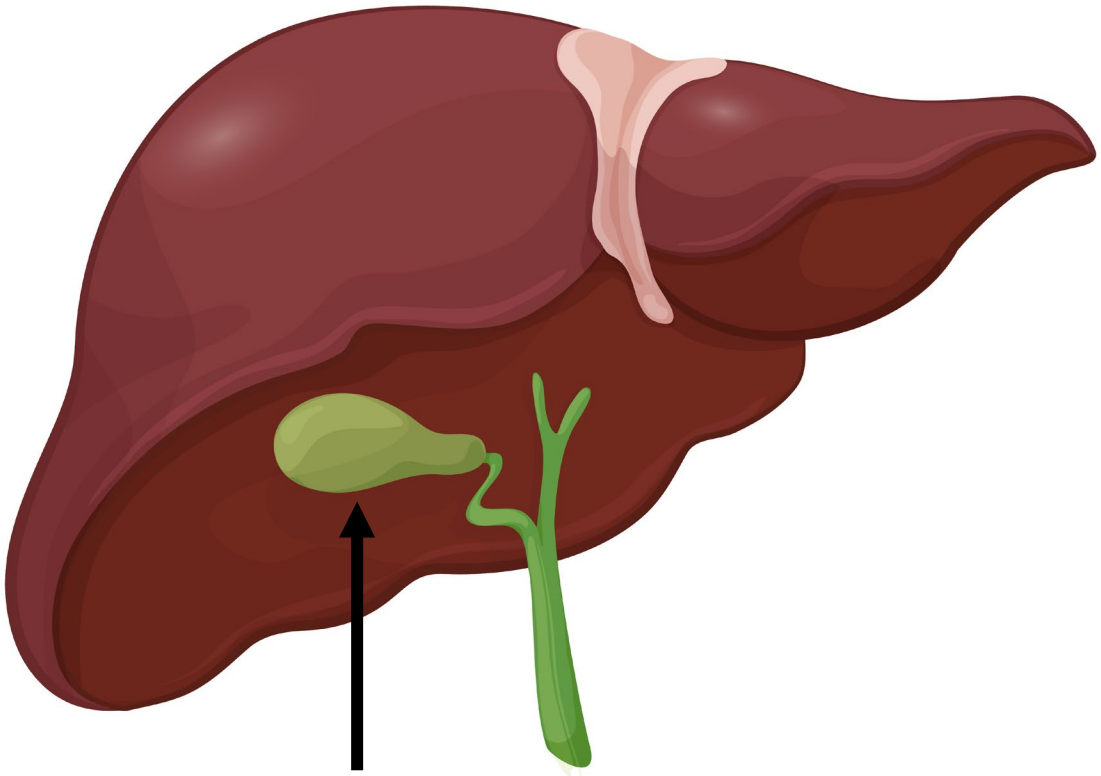
Functions

- Produces bile
- Metabolism of nutrients
- Detoxification
- Storage of glycogen and vitamins

Accessory Digestive Organs

3. Gallbladder

The gallbladder is a small sac-like organ



Function

- Stores and concentrates bile
- Releases bile into the duodenum

Bile

Bile emulsifies fats.

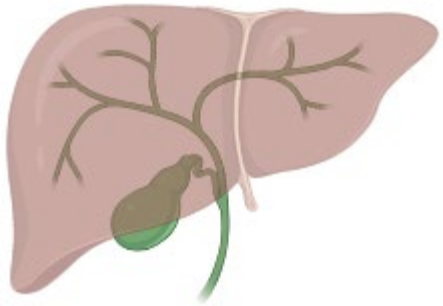
Emulsification

- Breaks large fat droplets into smaller droplets.
- This increases surface area for lipase action.

What is the role of bile in fat digestion?

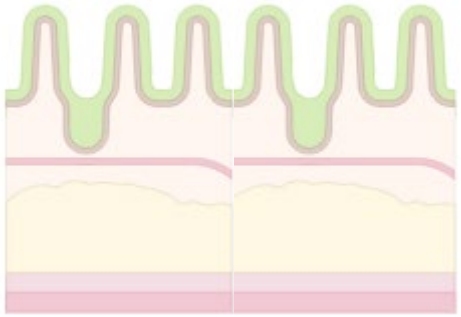
Normal fat digestion requirements:

Bile (from the Liver and Gallbladder)

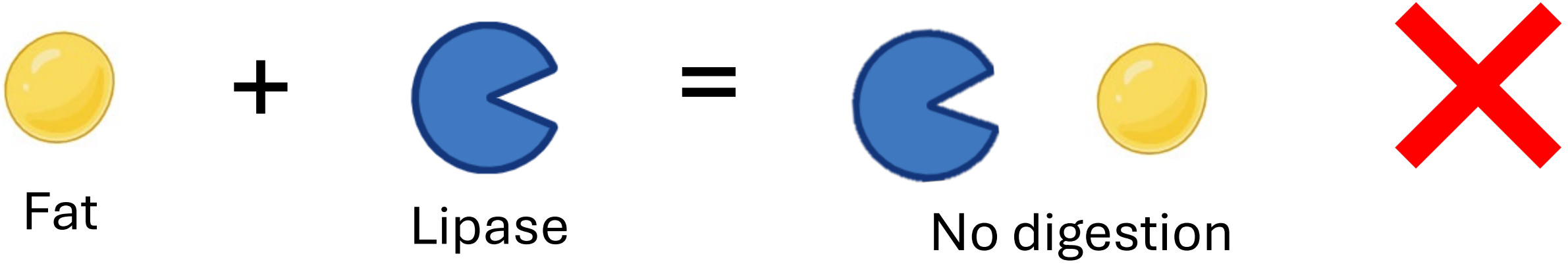


Pancreatic enzymes especially **lipase**

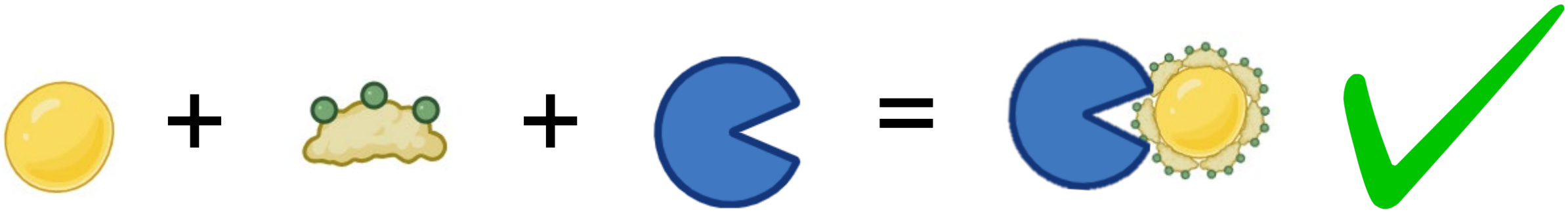
Intact intestinal mucosa



Digestion of Fat



Fat + Lipase = No digestion



Fat + Bile + Lipase = Digestion

Accessory Digestive Organs

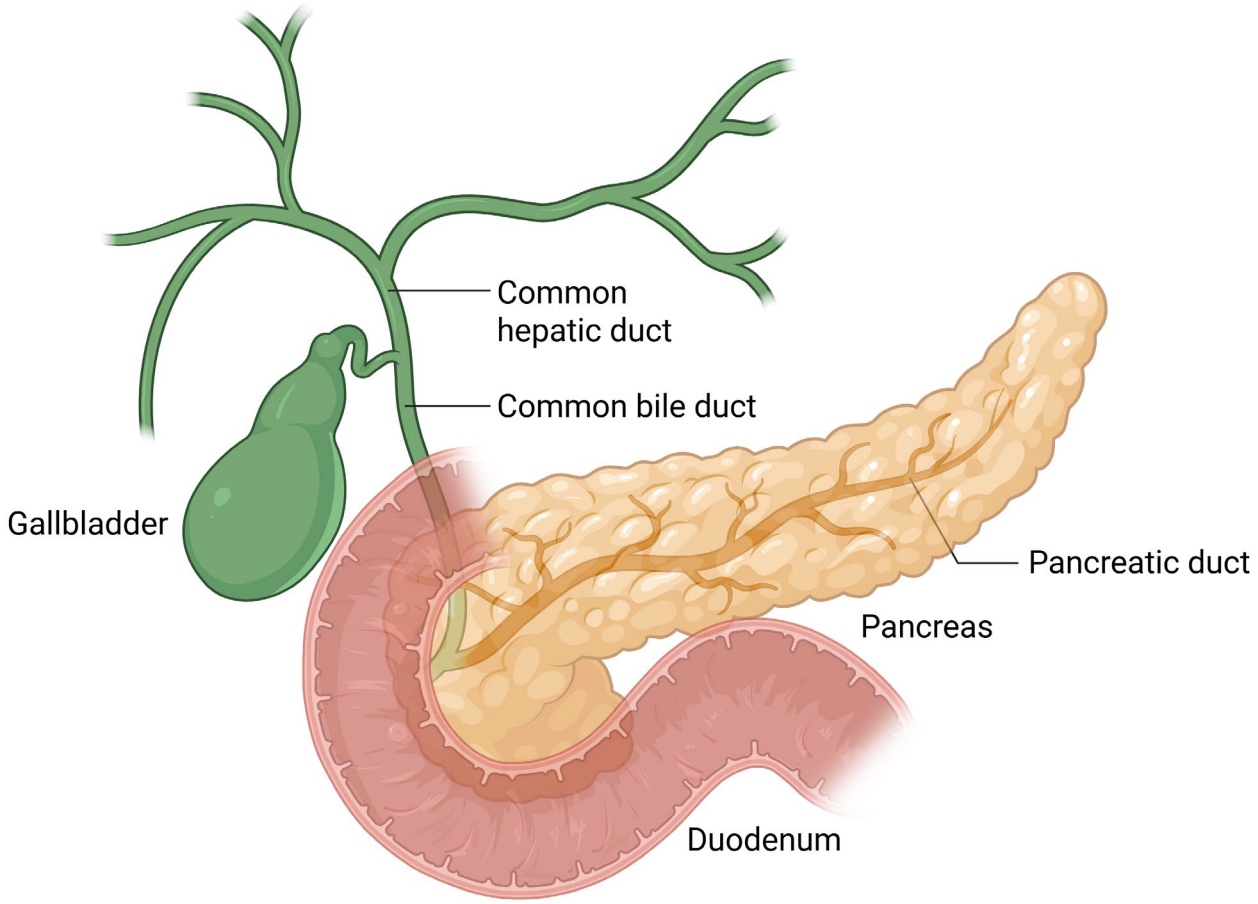
4. Pancreas

Exocrine Function

- Produces digestive enzymes.

Pancreatic Secretions

- Amylase
- Lipase
- Trypsin
- Bicarbonate ions
- Nuclease



What happens if pancreatic enzymes are not secreted properly?

Absorption in GI tract

Nutrient Absorption

Occurs mainly in the small intestine.

1. **Carbohydrates:** Absorbed as monosaccharides.
2. **Proteins:** Absorbed as amino acids.
3. **Fats:** Absorbed as fatty acids and glycerol.

Absorption in GI tract

Water Absorption

Most water is absorbed in:

- Small intestine
- Large intestine

Why is the small intestine considered the main site of absorption?