Digestive system

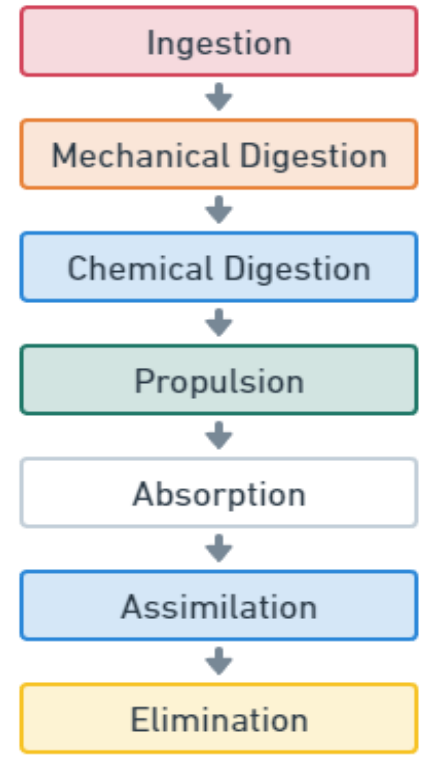
Introduction: Digestive system

- The **digestive system** is a **complex network of organs and glands** that processes food to provide the body with essential nutrients.
- It performs three primary functions:
    1. **Digestion** – breaking down food into smaller, absorbable components.
    2. **Absorption** – transferring nutrients into the bloodstream or lymph.
    3. **Elimination** – expelling undigested and waste materials.

Process of digestive system

- Digestion involves breaking down food, absorbing nutrients, and eliminating waste.

This process occurs in several stages:



1. Ingestion

- Food is taken into the mouth, initiating digestion.

2. Mechanical Digestion

- Physical breakdown of food through chewing (mastication).
- Increases surface area for enzyme action.

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3. Chemical Digestion

- Enzymes and digestive juices break food into simpler molecules.
- Saliva starts carbohydrate digestion in the mouth.
- Stomach secretes hydrochloric acid and pepsin to digest proteins.

4. Propulsion

- Muscular contractions (peristalsis) move food through the digestive tract.
- Food passes from mouth → esophagus → stomach → small intestine.

5. Absorption

- Occurs in the small intestine via villi and microvilli.
- Nutrients pass into the bloodstream for use by the body.

6. Assimilation

- Absorbed nutrients are delivered to cells for energy, growth, and repair.

7. Elimination

- Undigested waste moves to the large intestine.
- Water and electrolytes are reabsorbed.
- Feces are formed, stored in the rectum, and expelled through the anus.

Anatomy of GI Tract

- The **gastrointestinal (GI) tract**, also known as the **digestive tract**, is a continuous tube extending from the **mouth** to the **anus**.
- Its primary roles are:
  - **Digestion** of food
  - **Absorption** of nutrients
  - **Elimination** of waste

Layers of the GI Tract Wall

From the innermost to the outermost, the GI tract wall consists of four layers:

1. Mucosa

- Innermost layer involved in **secretion**, **absorption**, and **protection**
- Sub-layers:

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- **Epithelium**
- **Lamina propria**
- **Muscularis mucosae**

2. Submucosa

- Connective tissue layer containing **blood vessels**, **lymphatics**, **nerves**, and **glands**

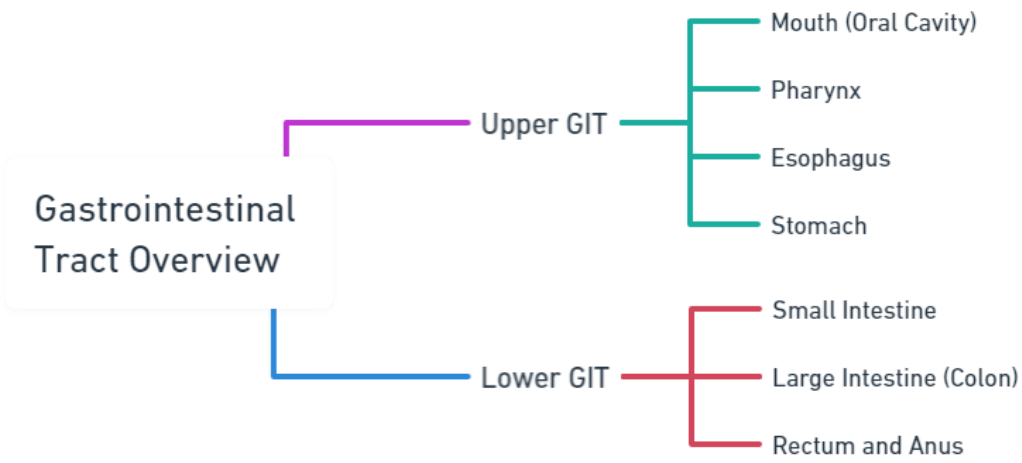
3. Muscularis Externa

- Smooth muscle responsible for **peristalsis**
- Layers:
  - **Inner circular layer**
  - **Outer longitudinal layer**
  - **Oblique layer** (present in the **stomach** only)

4. Serosa/Adventitia

- **Serosa** (in peritoneal regions): connective tissue + mesothelium
- **Adventitia** (in retroperitoneal regions): connective tissue only
- Anchors the GI tract to surrounding structures

Sections of the GI Tract



Upper GI Tract

1. Mouth (Oral Cavity)

- Starts the **mechanical** and **chemical digestion**
- Key structures:
  - **Lips, cheeks, palate, tongue, teeth**
  - **Salivary glands**:

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- Parotid
- Submandibular
- Sublingual

- Saliva contains **amylase** for carbohydrate digestion

2. Pharynx

- Connects the **mouth to the esophagus**
- Aids in **swallowing**
- **Epiglottis** prevents food from entering the **trachea**

3. Esophagus

- Muscular tube (~10 inches) transporting food to the stomach
- Moves food via **peristalsis**
- **Lower Esophageal Sphincter (LES)** prevents reflux

4. Stomach

- **J-shaped** muscular organ
- Stores, mixes, and partially digests food
- Divided into:
  - **Cardia**
  - **Fundus**
  - **Body (Corpus)**
  - **Pylorus**
- Secretes **gastric juice** (HCl + enzymes like **pepsin**)

Lower GI Tract

1. Small Intestine (~20 feet long)

- Divided into:
  - **Duodenum** – receives **chyme**, **bile**, and **pancreatic juice**
  - **Jejunum** – primary site for **nutrient absorption**
  - **Ileum** – absorbs nutrients and connects to large intestine

2. Large Intestine (Colon) (~5 feet long)

- Segments:

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- **Cecum**
- **Ascending colon**
- **Transverse colon**
- **Descending colon**
- **Sigmoid colon**
- **Rectum**

➢ Functions:

- Absorbs **water** and **electrolytes**
- Forms and stores **feces**
- Houses **gut bacteria** for vitamin synthesis and fermentation

3. Rectum and Anus

➢ **Rectum** stores feces

➢ **Anus** (with internal and external **sphincters**) controls **defecation**

Accessory Digestive Organs

These organs aid digestion but are **not part of the GI tract** itself:

1. Salivary Glands

➢ Secrete **saliva** containing enzymes like **amylase** for carbohydrate digestion

2. Liver

➢ Largest internal organ

➢ Functions:

- **Produces bile**
- **Detoxifies** chemicals
- Involved in **metabolism** and **nutrient storage**

3. Gallbladder

➢ Stores and **concentrates bile**

➢ Releases bile into the **duodenum** during digestion

4. Pancreas

➢ Produces **pancreatic juice** with digestive enzymes

➢ Secretes **bicarbonate** to neutralize stomach acid in the **duodenum**

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