

THE DIGESTIVE SYSTEM

LECTURE 3

**1ST YEAR-BIOLOGY SUBJECT –LABORATORY SCIENCE
DEPARTMENTS**

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Learning objectives

- 1. State the function of each organ of the gastrointestinal tract**
- 2. List the accessory organs and name the function of each**
- 3. Describe the processes that occur during the digestive process**
- 4. Knowing the Components of a Balanced Diet**

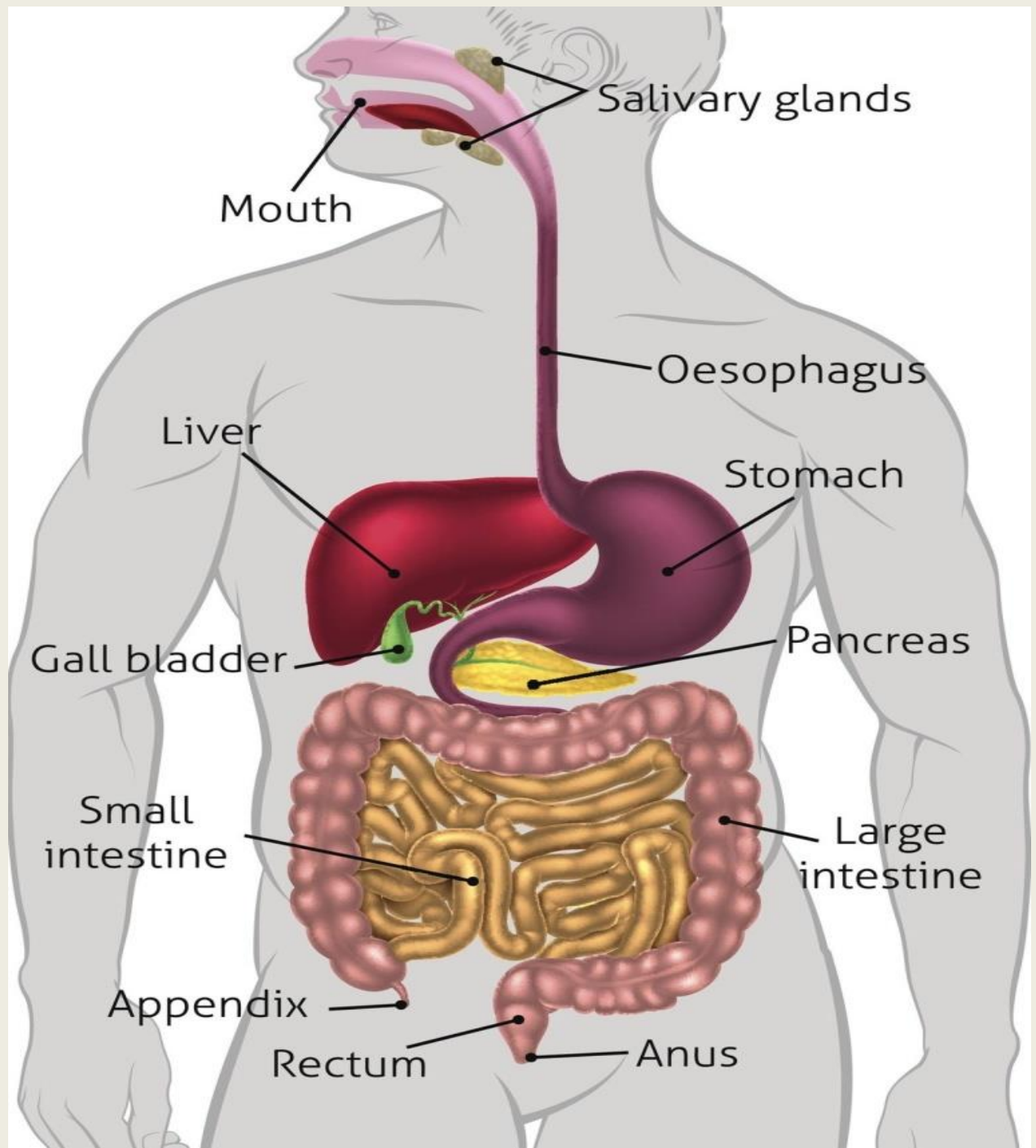
The Digestive System: An Overview

- in the human body The Digestive System responsible for **breaking down food into nutrients that the body can absorb and use for**
 1. **energy**
 2. **growth**
 3. **repair**
- **It involves a series of organs and processes working together in harmony.**

Functions of the Digestive System

1. **Ingestion:** Taking in food and liquids.
2. **Digestion:** Breaking down food into smaller components, **both mechanically (chewing) and chemically (enzymes and acids).**
3. **Absorption:** Transporting nutrients from the digestive tract into the bloodstream or lymph.
4. **Excretion:** Eliminating indigestible substances and waste products.

Main organs of the digestive system



organs of the digestive system

- **Major organs**

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

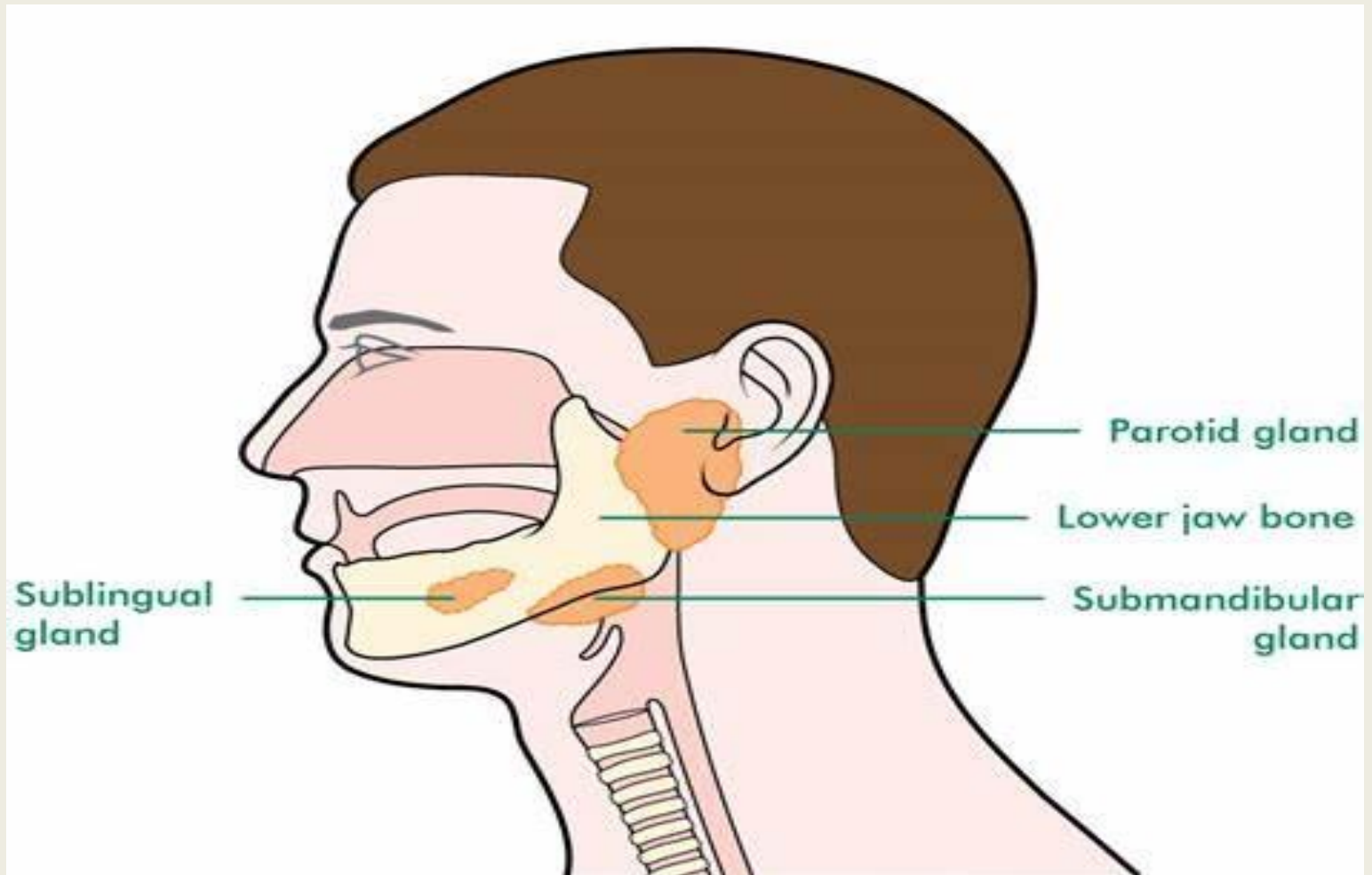
- **Accessory organs**

1. Liver
2. Gall bladder
3. pancreas

Mouth (Oral Cavity)

- First part of digestive system
- Functions:
 1. Mechanical digestion through chewing (mastication) by teeth
 2. chemical digestion through amylase enzyme in saliva.
- **Tongue:** Helps mix food with saliva.
- Contains taste buds for detecting sweet, sour, salty
- Saliva secreted from salivary glands & contains **amylase**, an enzyme that begins the breakdown of carbohydrates.

There are 3 Salivary glands that opens into the oral cavity



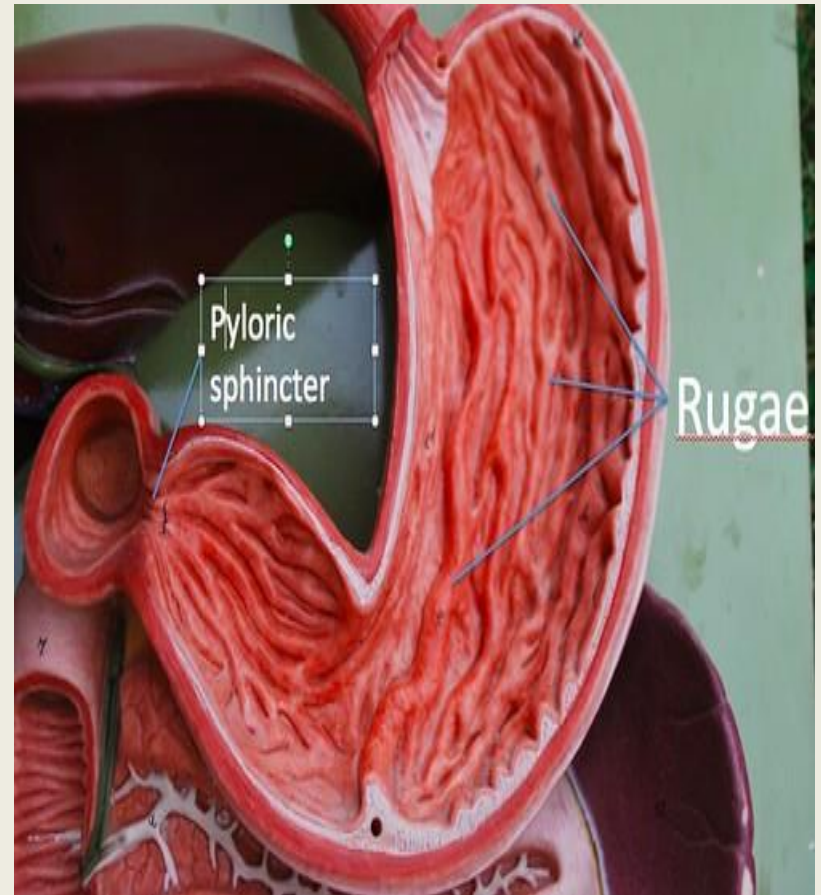
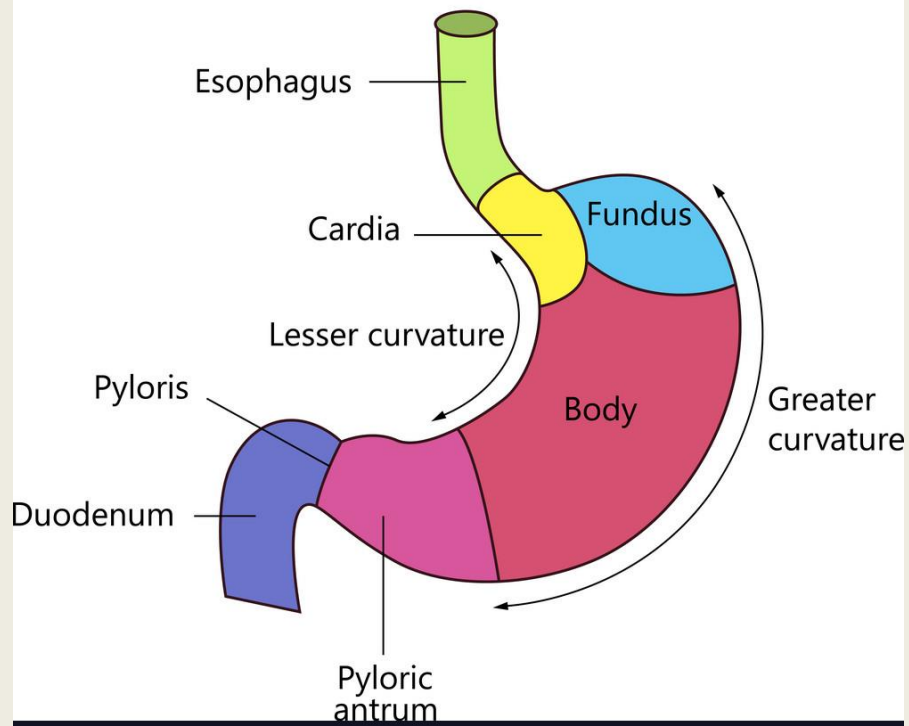
Esophagus

- **Esophagus:** a muscular tube connecting the mouth to the stomach , 25–30 cm (10–12 inches) long in adults.
- The esophagus uses peristalsis to move food to the stomach.
- It has Lower Esophageal Sphincter to Prevent stomach acid from refluxing into the esophagus.

Stomach

- The stomach is a muscular, J-shaped organ that plays a central role in digestion .
- Located in the upper abdomen, slightly to the left side beneath the diaphragm.
- **Structure:**
 - Divided into the cardia, fundus, body, and pylorus.
 - Lined with rugae (folds) which increase the surface area for digestion

Stomach



Function of the stomach

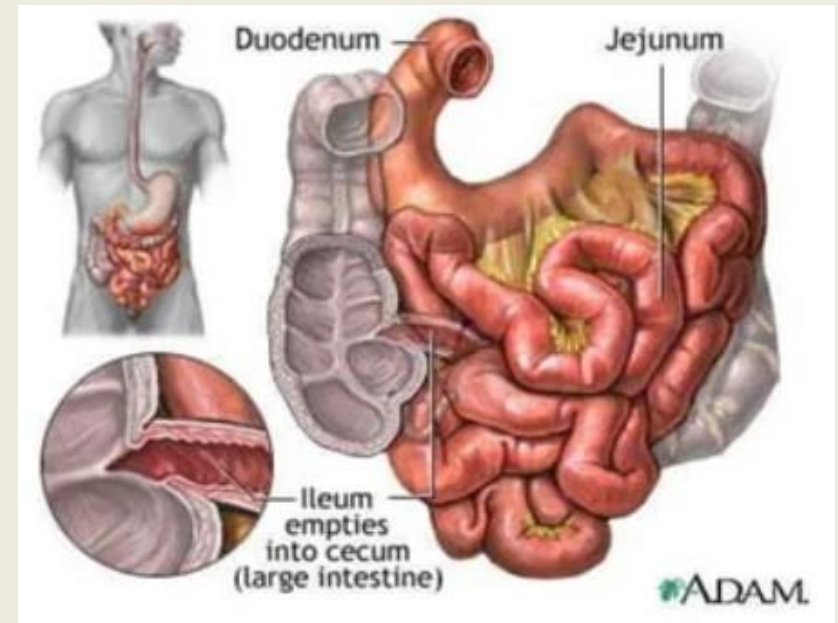
- **Mechanical Digestion**
 - The muscular layers of the stomach physically break down food into smaller particles.
- **Chemical Digestion**
- **By Gastric Juice Secretion which consist of :**
 - **Hydrochloric Acid (HCl):** Creates an acidic environment (pH ~2) to denature proteins and activate enzymes
 - **Pepsinogen:** converted into **pepsin** in the presence of HCl, which digests proteins.
 - **Lipase:** Begins the digestion of lipids.

Stomach

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- **Mucous Cells in the stomach produce** a thick mucus layer that Protect the stomach lining from acid
- The stomach turns food into a semi-liquid substance called **chyme**.

Small Intestine

- Its named so for its small
- Diameter compared to large
- Intestine
- Its about 6m in length



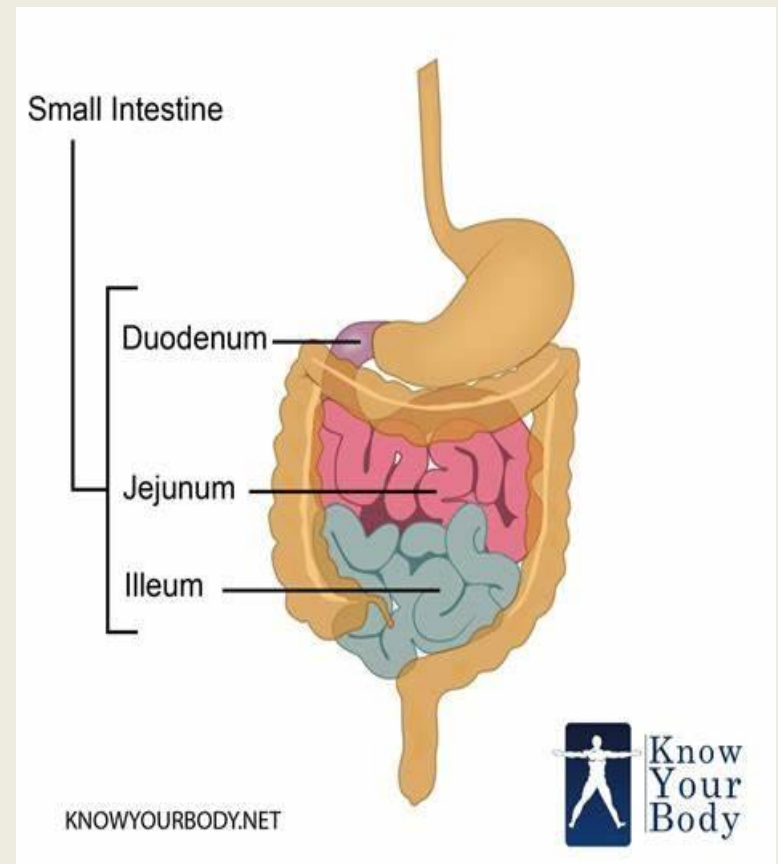
- **Small Intestine** :Divided into three parts: **duodenum**, **jejunum**, and **ileum**.
- **Function of small intestine :-**
- **The majority of digestion and nutrient absorption occurs here.**

Parts of small intestine

Duodenum is the first part 25 cm length **Enzymes from the pancreas and bile from the liver are secreted into the duodenum & aid digestion..**

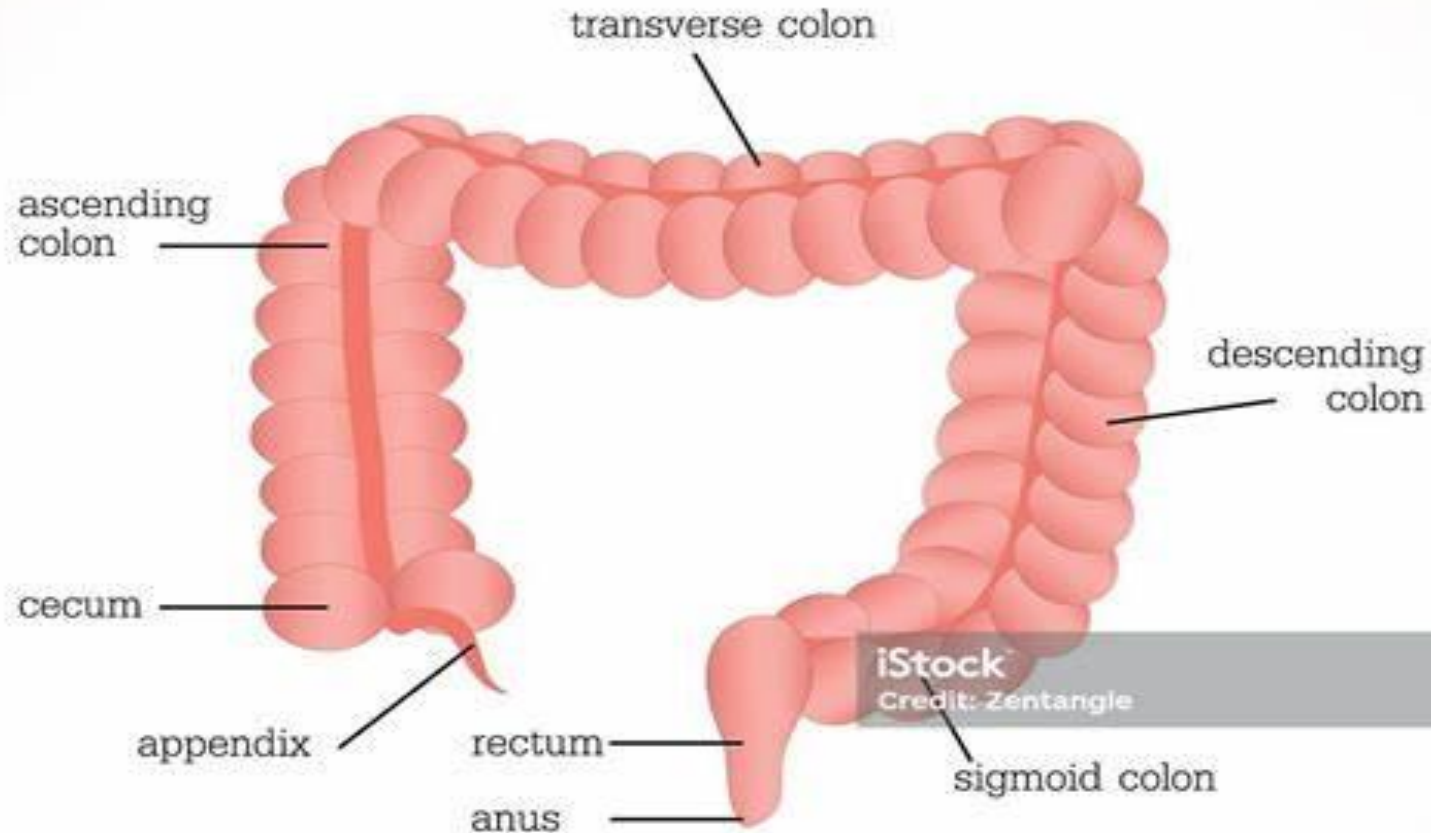
Jejunum: The middle portion, responsible for the majority of nutrient absorption.

Ileum: The final portion, which absorbs bile salts, vitamin B12, and any remaining nutrients.



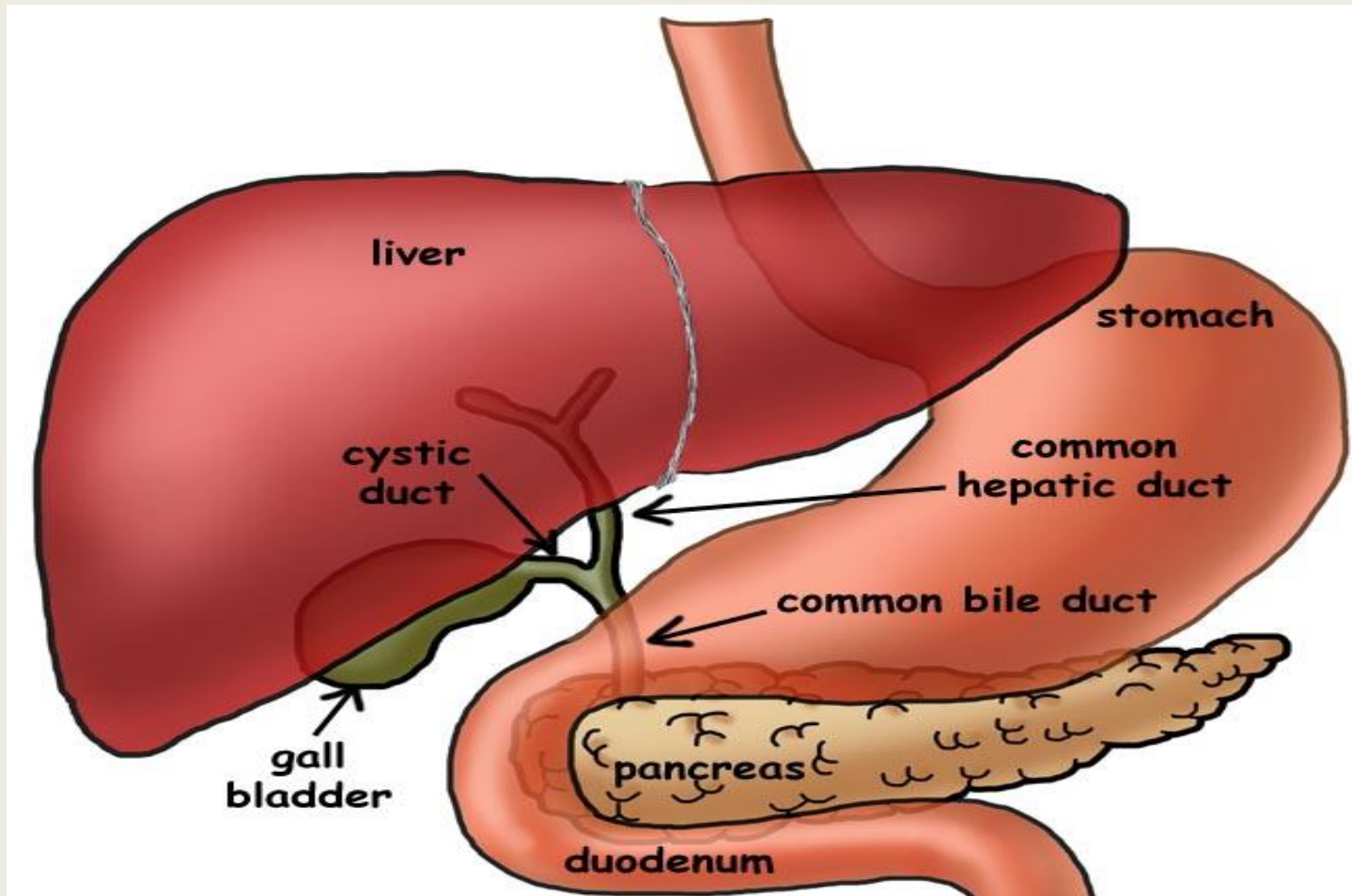
- The wall of SI has finger like projections called villi its **important for increase surface area for absorption**
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- **Large Intestine (Colon):-**
- The large intestine is about 1.5 meters (5 feet) long and has a larger diameter than the small intestine **only** Absorbs water and electrolytes, forming solid waste (feces).
- **Contains beneficial bacteria that help in fermentation of undigested carbohydrates.**
- **Rectum and Anus :** Store and regulate the expulsion of feces

Large intestine



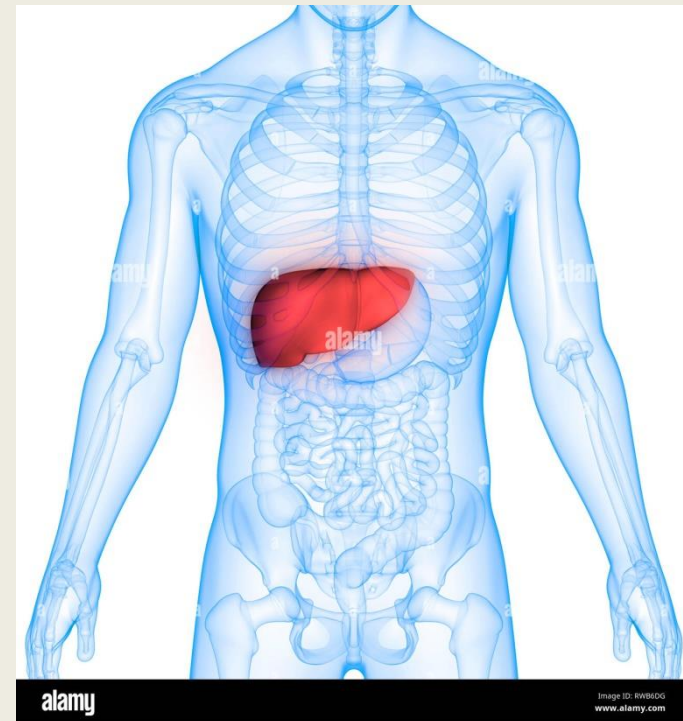
THE LARGE INTESTINE

the Accessory organs



liver

- Largest internal organ weighing approximately 1.4 to 1.6 kilograms in adult
- Lies in the right upper section of the abdominal cavity under the diaphragm



- **The liver is responsible for numerous essential functions related to**
 - 1. Metabolism eg carbohydrate & lipid metabolism**
 - 2. detoxification eg drug**
 - 3. storage of fat soluble vitamins (A,D, E ,K)
,iron**
 - 4. Synthesis of protein's , bile**

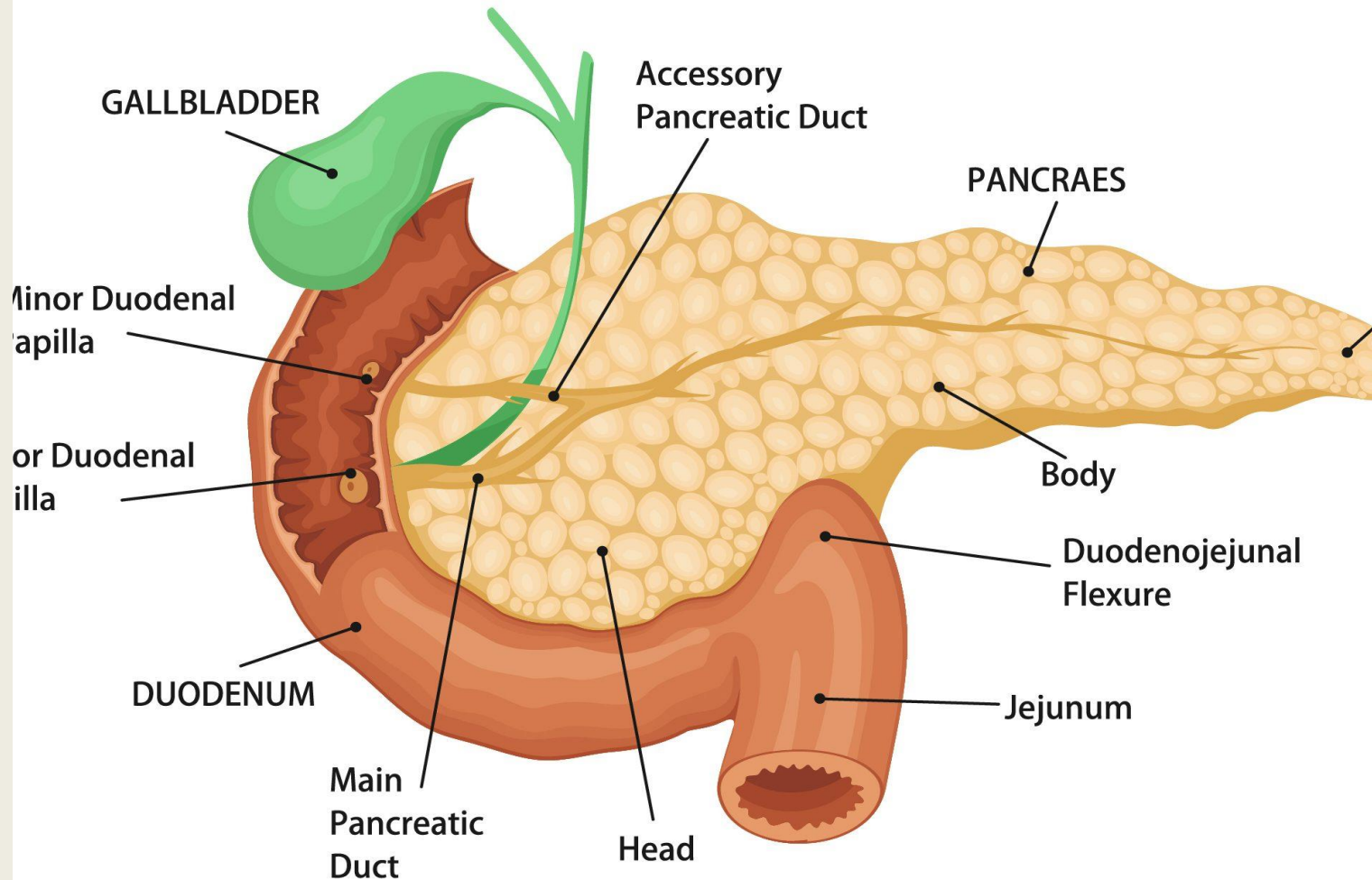
Role of the Liver in Digestion

- Produces bile, which contains:
 - **Bile Salts:** Aid in the emulsification and digestion of fats.
 - **Bilirubin:** A waste product from the breakdown of hemoglobin.
- Bile is stored in the gallbladder and released into the duodenum during digestion.

Pancreas

- **Pancreas:** is a fish shape spongy organ located in the upper abdomen behind the stomach
- It has both **exocrine** (digestive enzymes) & **endocrine** (insulin, glucagon) functions.
- It can be divided into head , body , tail

PANCRAES



Role of pancreas in the Digestion

1. The pancreas secretes enzymes into the duodenum to aid in digestion:

- **Amylase**: Breaks down carbohydrates
- **Lipase**: Breaks down fats
- **Proteases** :- Break down proteins

2. Bicarbonate Secretion:

- Neutralizes acidic chyme from the stomach to create an optimal environment for digestive enzymes

The Process of Digestion

1. **Mouth:** Food is chewed and mixed with saliva, beginning the digestion of **carbohydrates**.
2. **Esophagus:** Peristalsis moves the food to the stomach.
3. **Stomach:** Gastric juices begin **breaking down proteins into peptides**.
4. **Small Intestine:**
 1. Chyme enters the duodenum, where bile and pancreatic enzymes complete digestion.
 2. Nutrients are absorbed into the bloodstream or lymph
5. **Large Intestine:** Water and salts are absorbed, and gut bacteria further process undigested material.
6. **Rectum and Anus:** Waste is expelled as feces.

Human Nutrition

- Human nutrition is the study of how the body uses nutrients from food to sustain life and promote health
- **Components of a Balanced Diet**
 1. **Carbohydrates (55-60%):** Primary energy source.
 - **Sources:** Bread, rice
 - 2 - **Proteins (10-15%):** for growth ,Repair and maintenance.
 - **Sources:** Meat, fish, eggs

Components of a Balanced Diet

3 -Fats (20-25%): Energy storage and hormonal functions

- cell membrane structure.

4 –Minerals :Example Calcium strengthens bones and teeth.

- Iron is important for hemoglobin in red blood cells.

5- Fiber: Promotes healthy digestion.

6 -Water: Vital for hydration and metabolic processes.

7 - Vitamins

- **Fat-Soluble Vitamins:** Stored in the liver and fatty tissues.
 - **Examples:** Vitamin A (vision), Vitamin D (bone health), Vitamin E (antioxidant), Vitamin K (blood clotting).
- **Water-Soluble Vitamins:** Not stored; excess is excreted in urine.
 - **Examples:** Vitamin C (immune function), B-complex vitamins (energy metabolism, nerve function).

THANK YOU
ANY QUESTIONS
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