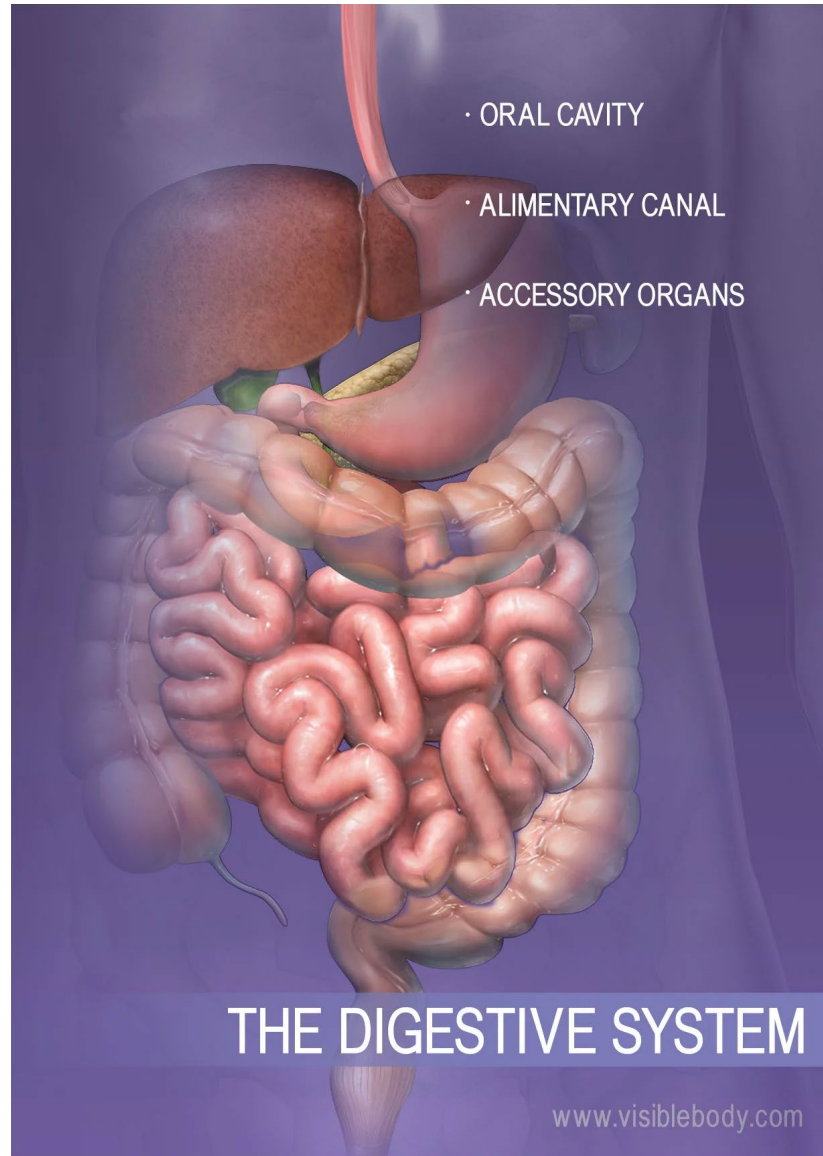


# THE DIGESTIVE SYSTEM

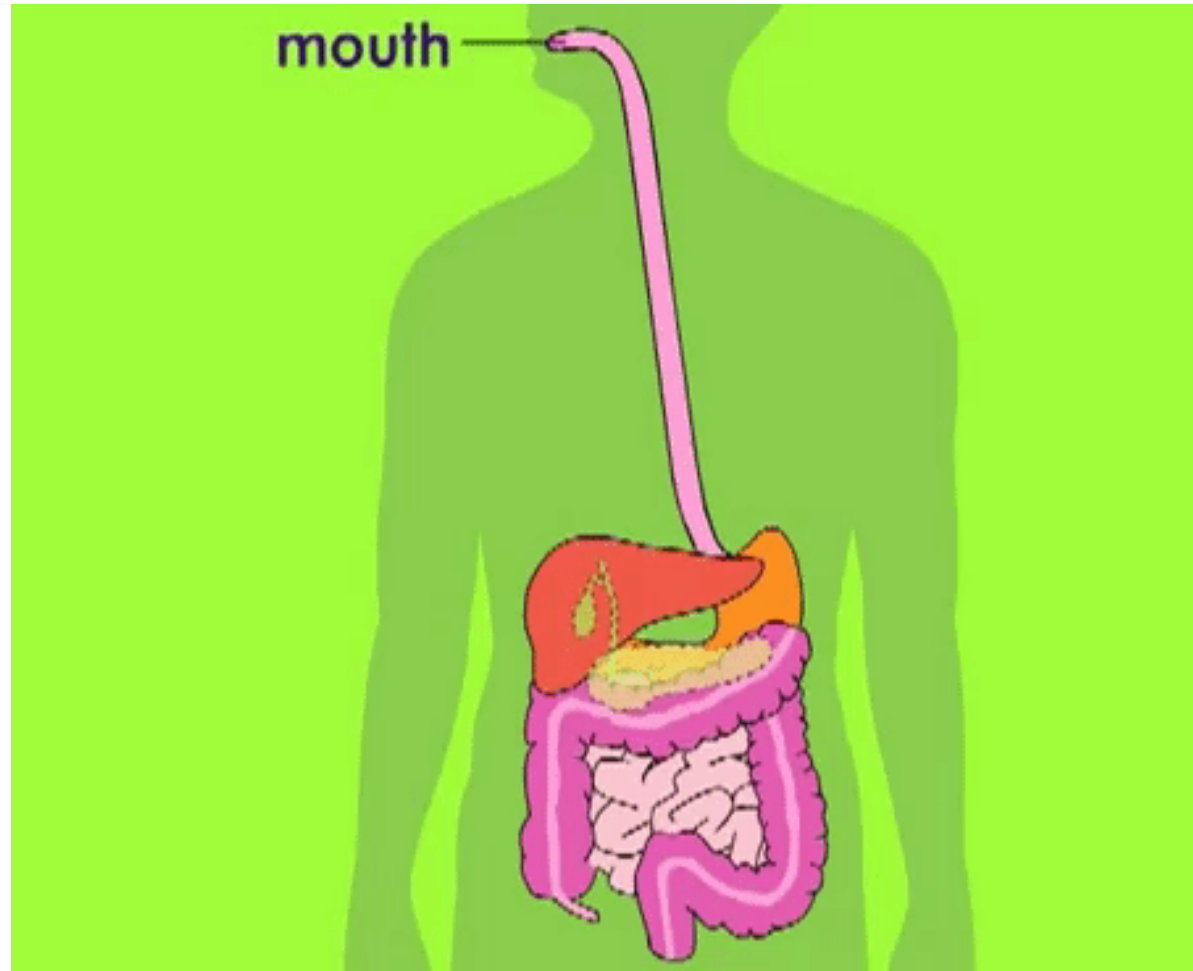


COMPILED BY HOWIE BAUM

# DIGESTIVE SYSTEM

People are probably more aware of their digestive system than of any other system, not least because of its frequent messages.

Hunger, thirst, appetite, gas 😊, and the frequency and nature of bowel movements, are all issues affecting daily life.



# The Digestive Tract

- **Six Functions of the Digestive System**

1. **Ingestion**

2. **Mechanical processing**

3. **Digestion**

4. **Secretion**

5. **Absorption**

6. **Excretion**

# The Digestive Tract

- **Ingestion**

- Occurs when materials enter digestive tract via the mouth

- **Mechanical Processing**

- Crushing and shearing

- Makes materials easier to propel along digestive tract

- **Digestion**

- The chemical breakdown of food into small organic fragments for absorption by digestive epithelium

# The Digestive Tract

- **Secretion**

- Is the release of water, acids, enzymes, buffers, and salts
- By epithelium of digestive tract
- By glandular organs

- **Absorption**

- Movement of organic substrates, electrolytes, vitamins, and water
- Across digestive epithelium tissue
- Into the interstitial fluid of digestive tract

- **Excretion**

- Removal of waste products from body fluids
- Process called **defecation** removes **feces**

# AN INTRODUCTION TO THE DIGESTIVE SYSTEM

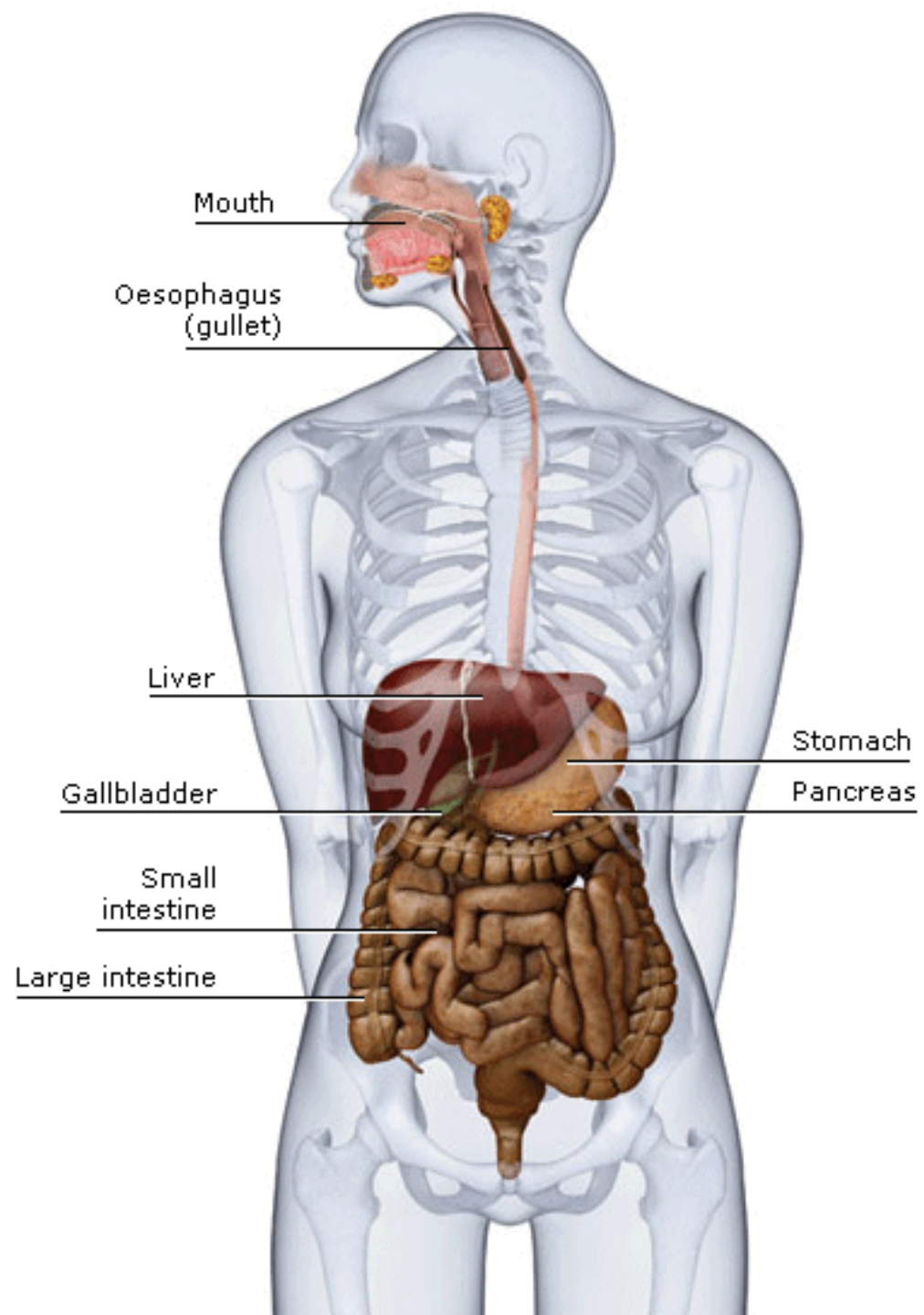
- The **Digestive Tract**

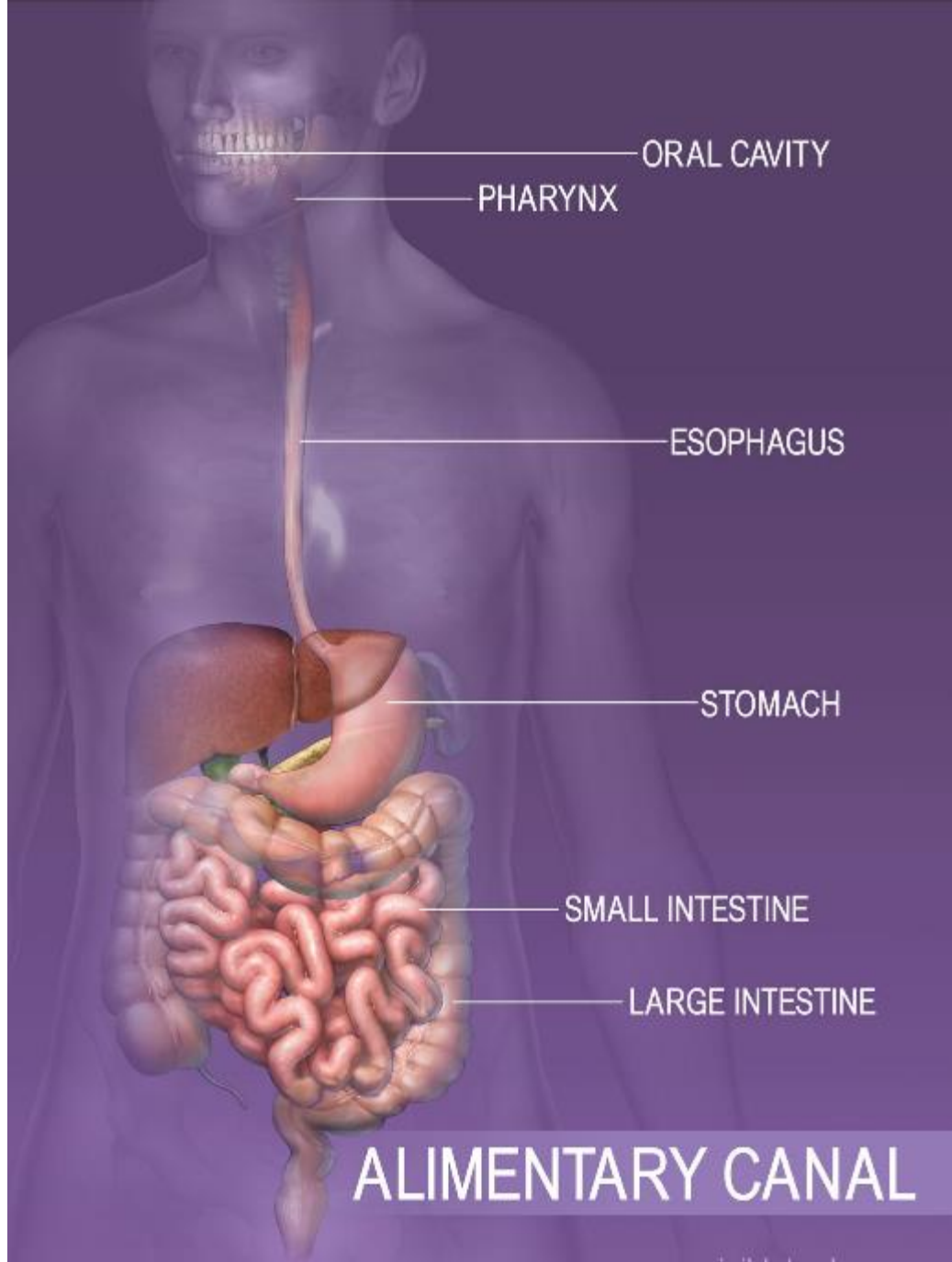
- Also called the gastrointestinal (GI) tract or alimentary canal
- Is a muscular tube
- Extends from our mouth to the anus
- Passes through the pharynx, esophagus, stomach, and small and large intestines

The digestive system is one of the most clearly defined in the body.

It consists of a long passageway, the digestive tract, and associated glands.

These include the liver and pancreas, which are connected to the main tract by ducts, or tubes, and empty their products, such as enzymes, into the tract.





ORAL CAVITY

PHARYNX

ESOPHAGUS

STOMACH

SMALL INTESTINE

LARGE INTESTINE

# ALIMENTARY CANAL



## Major Organs of the Digestive Tract

### Oral Cavity (Mouth)

Ingestion, mechanical processing with accessory organs (teeth and tongue), moistening, mixing with salivary secretions

### Pharynx

Muscular propulsion of materials into the esophagus

### Esophagus

Transport of materials to the stomach

### Stomach

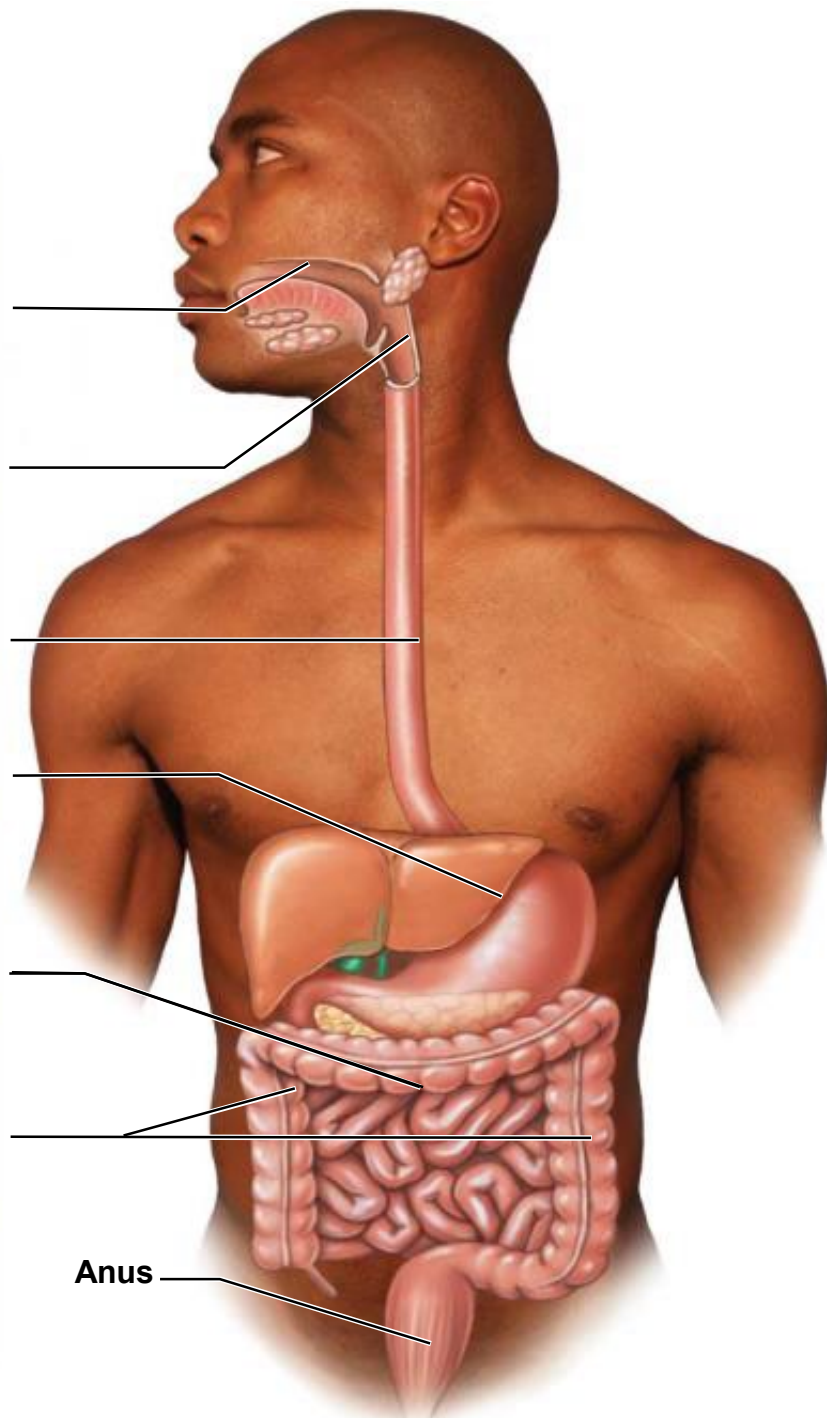
Chemical breakdown of materials by acid and enzymes; mechanical processing through muscular contractions

### Small Intestine

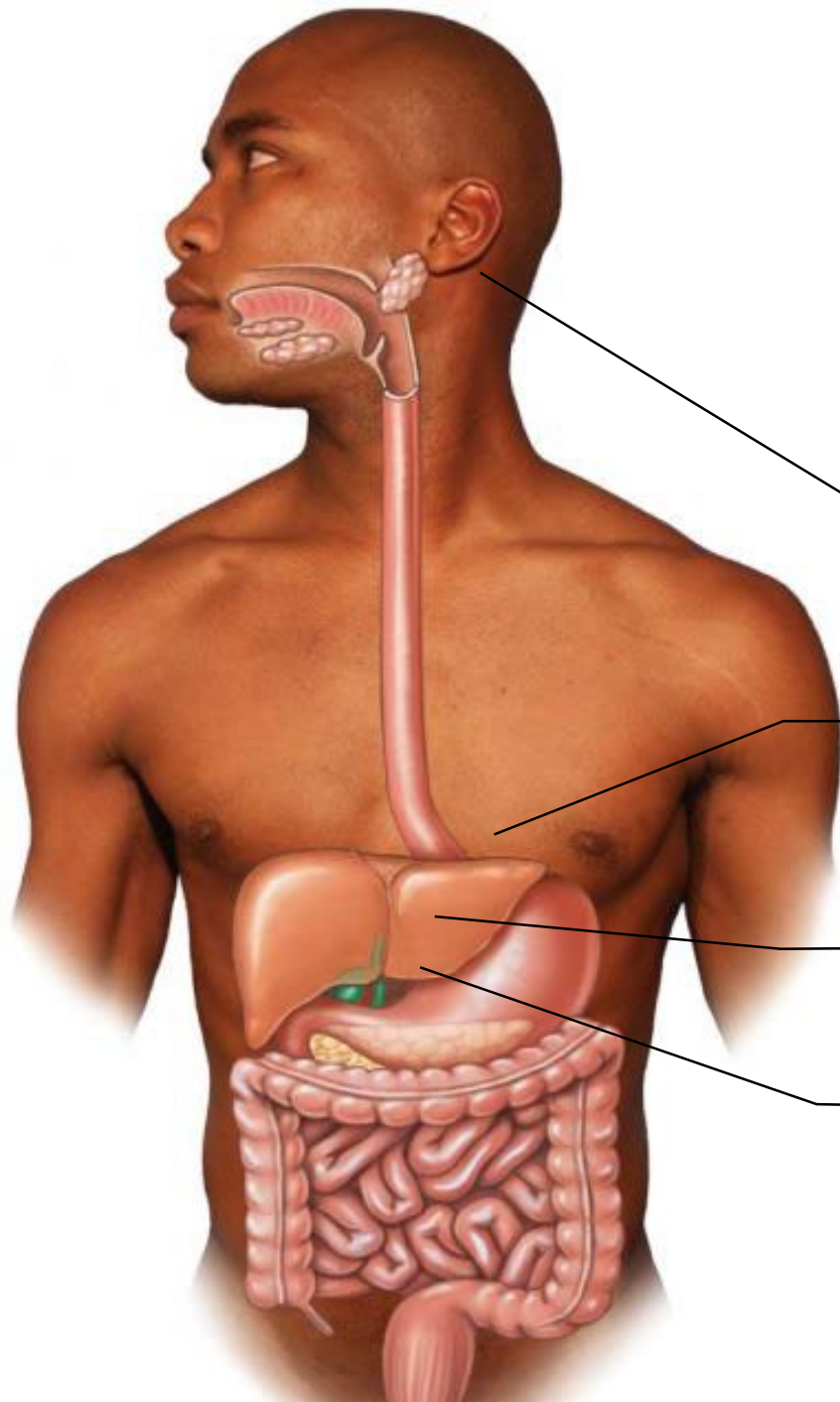
Enzymatic digestion and absorption of water, organic substrates, vitamins, and ions

### Large Intestine

Dehydration and compaction of indigestible materials in preparation for elimination



Anus



## Accessory Organs of the Digestive System

### Teeth

Mechanical processing by chewing (mastication)

### Tongue

Assists mechanical processing with teeth, sensory analysis

### Salivary Glands

Secretion of lubricating fluid containing enzymes that break down carbohydrates

### Liver

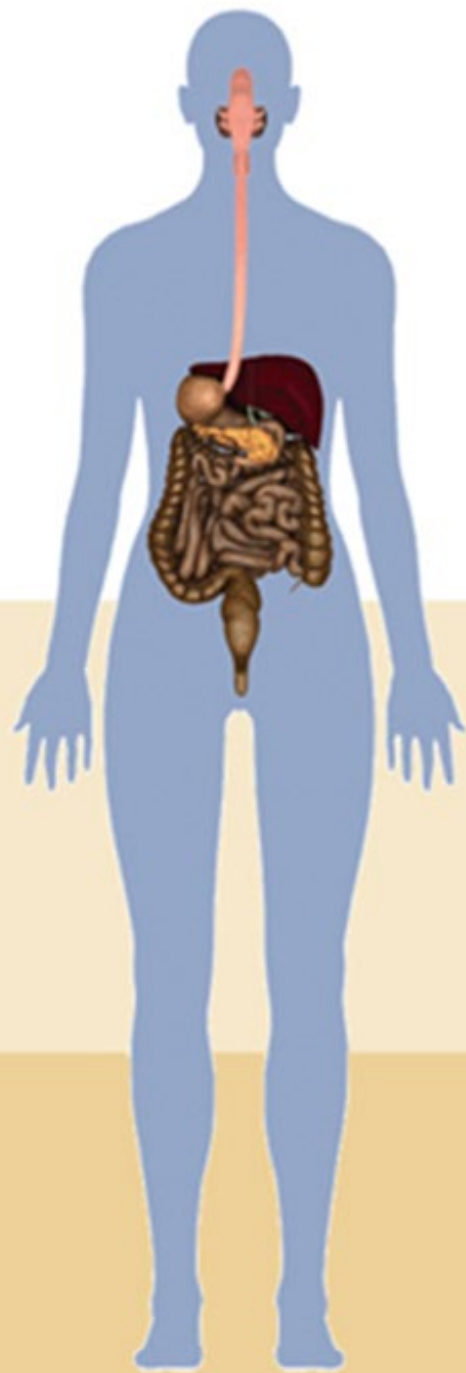
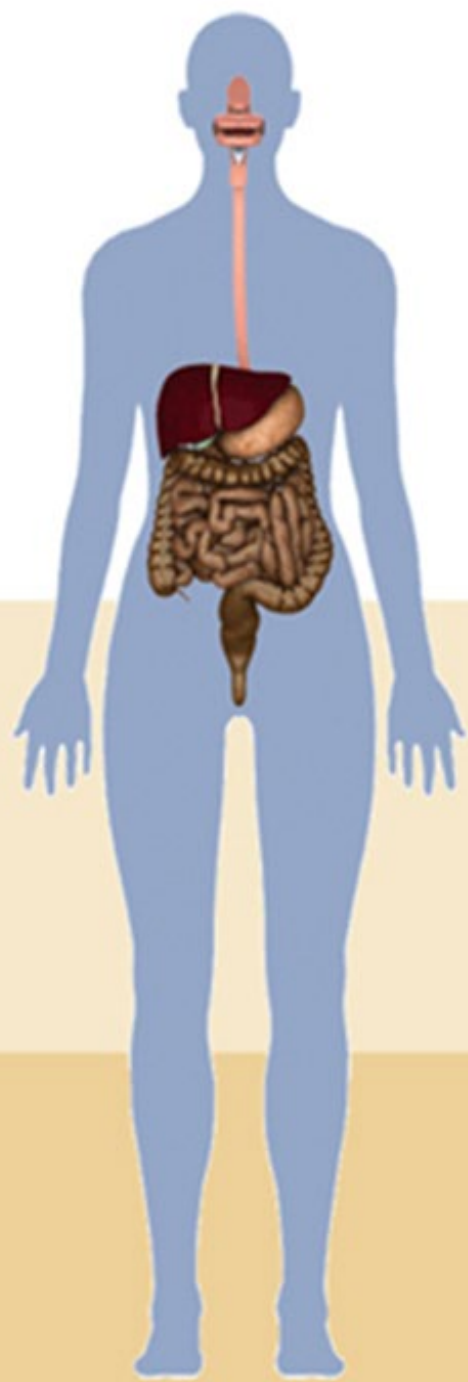
Secretion of bile (important for lipid digestion), storage of nutrients, many other vital functions

### Gallbladder

Storage and concentration of bile

### Pancreas

Exocrine cells secrete buffers and digestive enzymes; Endocrine cells secrete hormones



Your intestines are about 22 feet long– the surface area would cover almost 3000 square feet, the size of a tennis court!

## **There's a good reason for its size –**

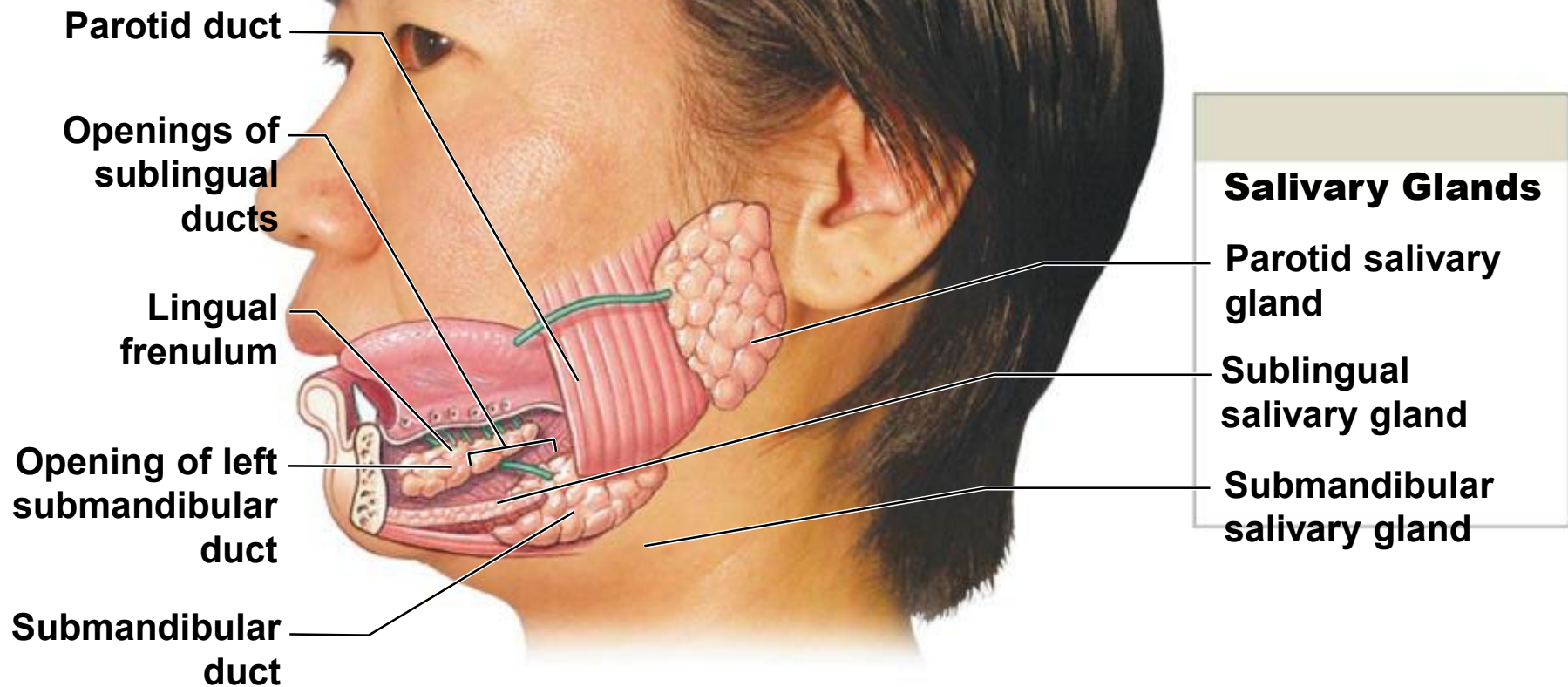
- ❖ Our digestive system is vital for our survival.
- ❖ It's our nutrient feed
- ❖ Our main defense system
- ❖ Our main elimination route for waste
- ❖ The location for a million different vital biochemical processes.

# The Oral Cavity

- Functions of the **Oral Cavity**
  1. Sensory analysis
    - Of material before swallowing
  2. Mechanical processing
    - Through actions of teeth, tongue, and palatal surfaces
  3. Lubrication
    - Mixing with mucus and salivary gland secretions
  4. Limited digestion
    - Of carbohydrates and lipids



Figure 24-7a The Salivary Glands.



The oral cavity is bounded by the teeth, tongue, hard palate, and soft palate. These structures make up the mouth and play a key role in the first step of digestion, called ingestion.

This is where the teeth and tongue work with salivary glands to break down food into small masses that can be swallowed, preparing them for the journey through the alimentary canal.

<https://www.visiblebody.com/learn/digestive/digestive-oral-cavity#saliva>

## Saliva Moistens Food & Begins the Process of Chemical Digestion

Saliva secreted by salivary glands aids the mechanical and chemical process of digestion.

Saliva is about 99% water and not only moistens food but cleanses the mouth, dissolves food chemicals so they can be tasted, and contains enzymes that start the chemical breakdown of starchy foods.

There are three pairs of salivary glands: parotid, sublingual, and submandibular (also called the submaxillary gland).



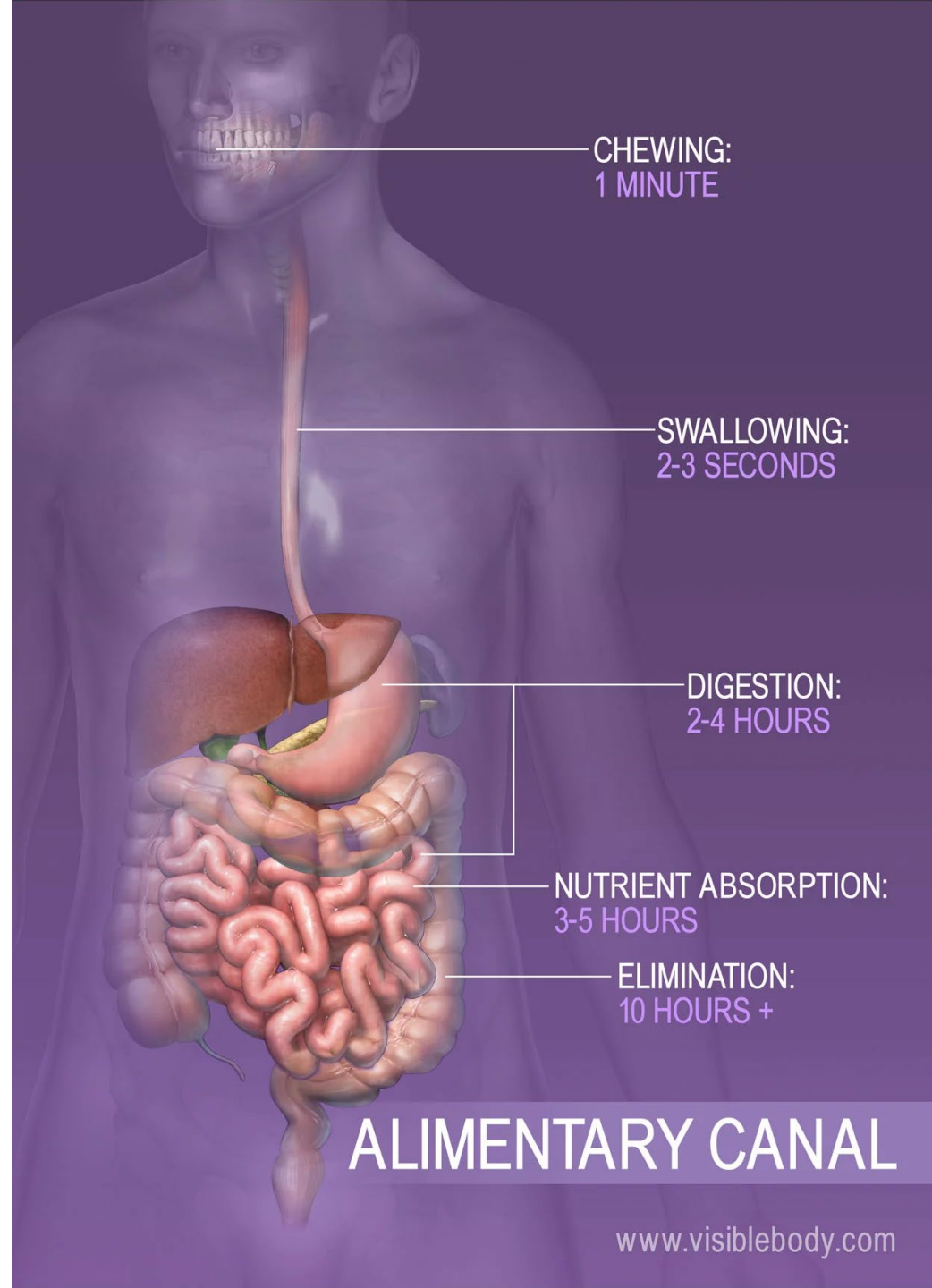


The Tongue Creates a Bolus of food so it can travel down the Pharynx and Esophagus

[https://www.youtube.com/watch?time\\_continue=13&v=6PymJS97XdY](https://www.youtube.com/watch?time_continue=13&v=6PymJS97XdY)



# Peristaltic Waves Move Nutrients and Waste Through the Intestines

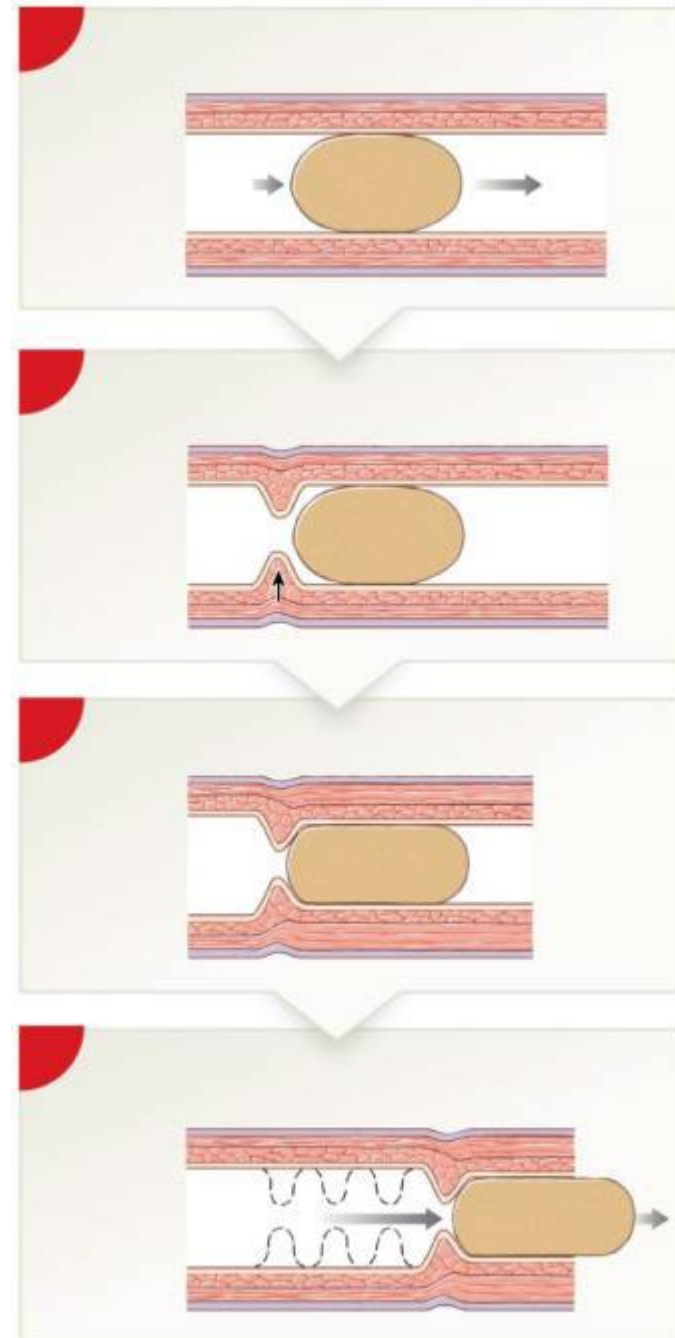


- **Peristalsis**

- Consists of waves of muscular contractions
- Moves a **bolus** along the length of the digestive tract

- Peristaltic Motion

1. Circular muscles contract behind bolus
  - While circular muscles ahead of bolus relax
2. Longitudinal muscles ahead of bolus contract
  - Shortening adjacent segments
3. Wave of contraction in circular muscles
  - Forces bolus forward

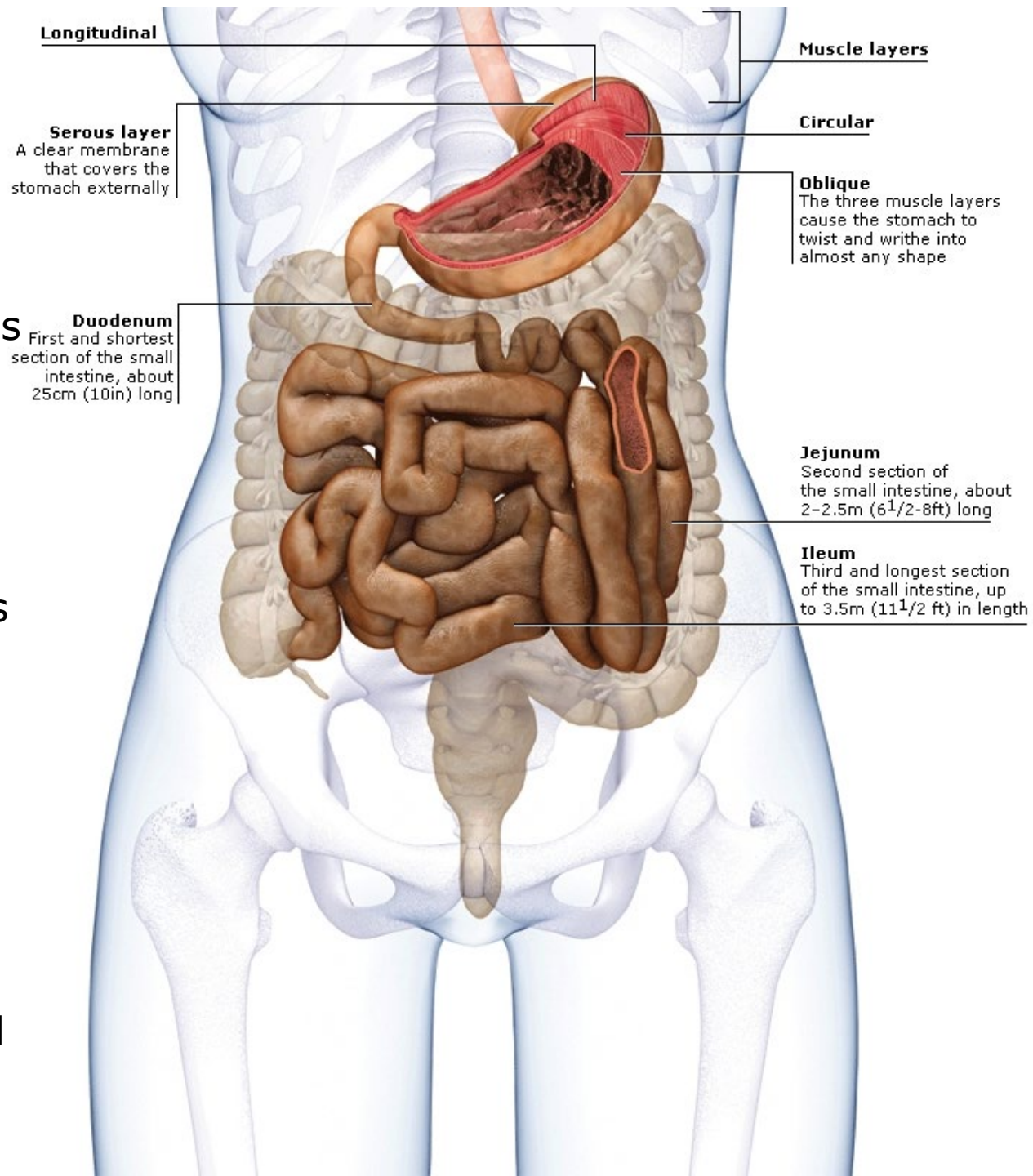


# STOMACH STRUCTURE

The stomach is the widest part of the digestive tube. It is a muscular-walled, J-shaped sac in which food is stored, churned, and mixed with gastric juices secreted by its lining.

This process begins moments after food enters the stomach from the oesophagus, through the gastro-oesophageal junction.

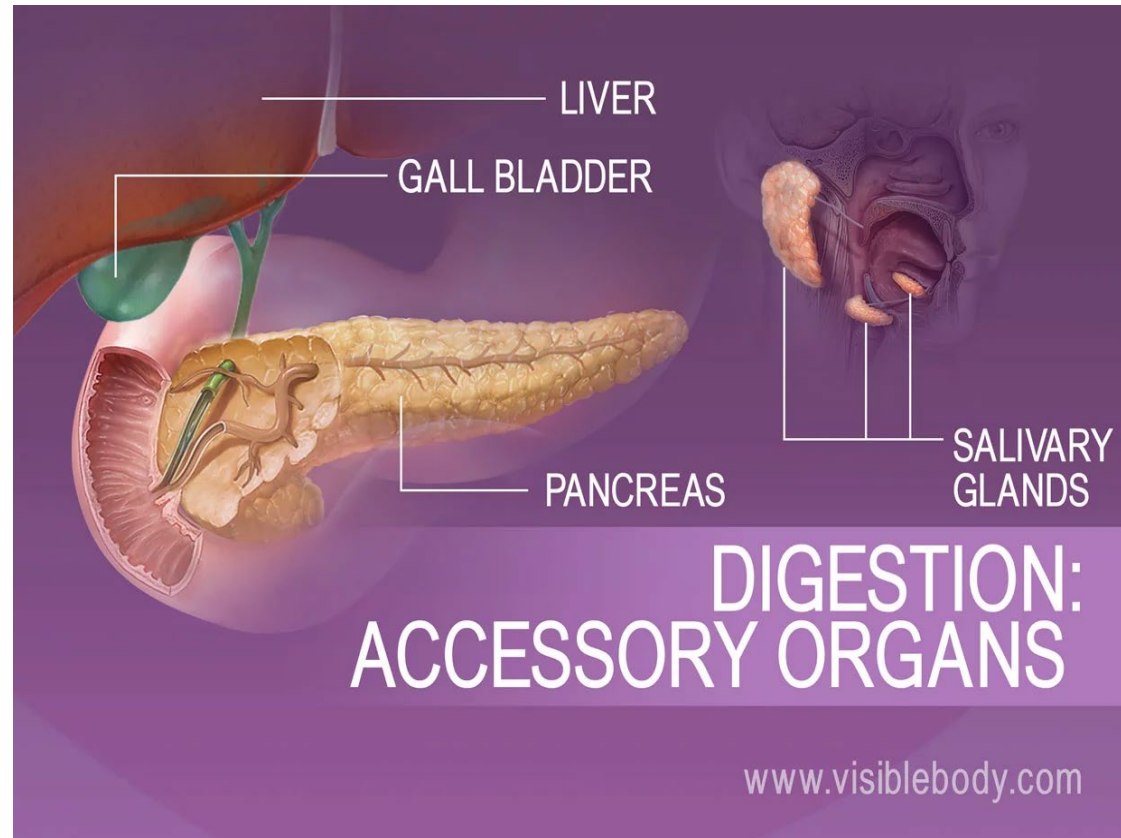
Gastric juices include digestive enzymes and hydrochloric acid, which not only breaks down food but also kills potentially harmful microbes.



Food that is chewed in the oral cavity then swallowed ends up in the stomach where it is further digested so its nutrients can be absorbed in the small intestine.

The salivary glands, liver and gall bladder, and the pancreas aid the processes of ingestion, digestion, and absorption.

These accessory organs of digestion play key roles in the digestive process. Each of these organs either secretes or stores substances that pass through ducts into the alimentary canal.



<https://www.visiblebody.com/learn/digestive/digestive-accessory-organs#saliva>

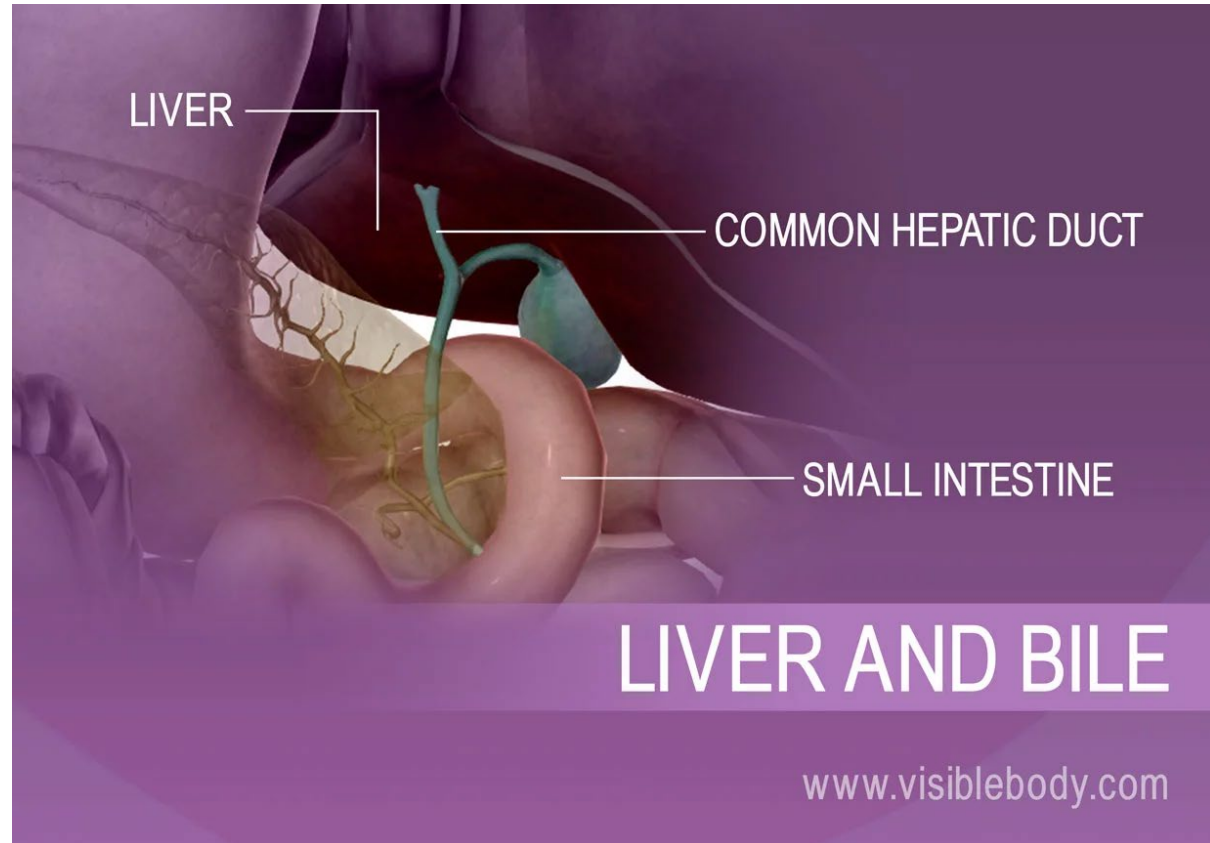


# The Liver Secretes Bile to Emulsify Fats in the Small Intestine

The liver is one of the largest organs in the body and it is continuously producing bile.

This yellowish-brown fluid aids chemical digestion by emulsifying fats in the duodenum.

Bile flows out of the liver into the right and left hepatic ducts, into the common hepatic ducts, and toward the small intestine to help with digestion and the absorption of fats.

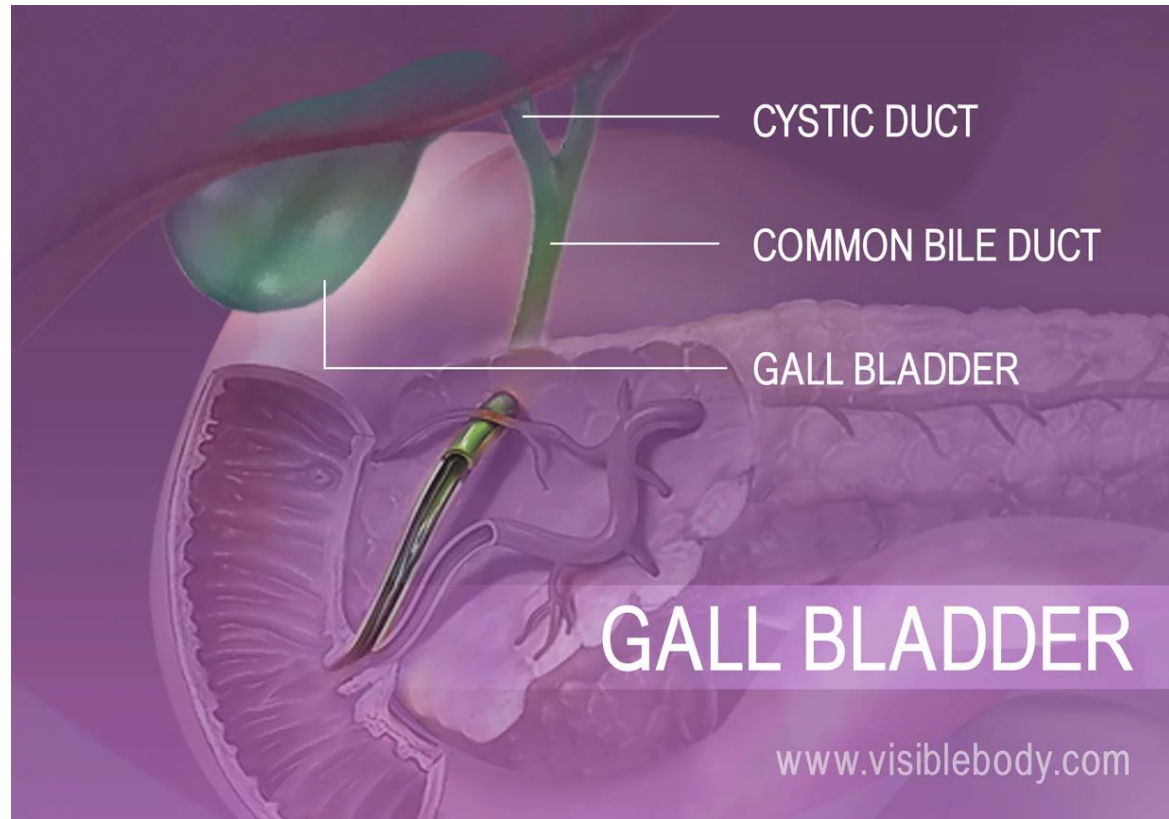


## The Gall Bladder Stores Bile

If bile is not immediately needed for digestion, it flows up the cystic duct to the gall bladder.

The gall bladder is a green, pear-shaped sac about 10 cm or 4 in. long that stores and concentrates excess bile secreted by the liver.

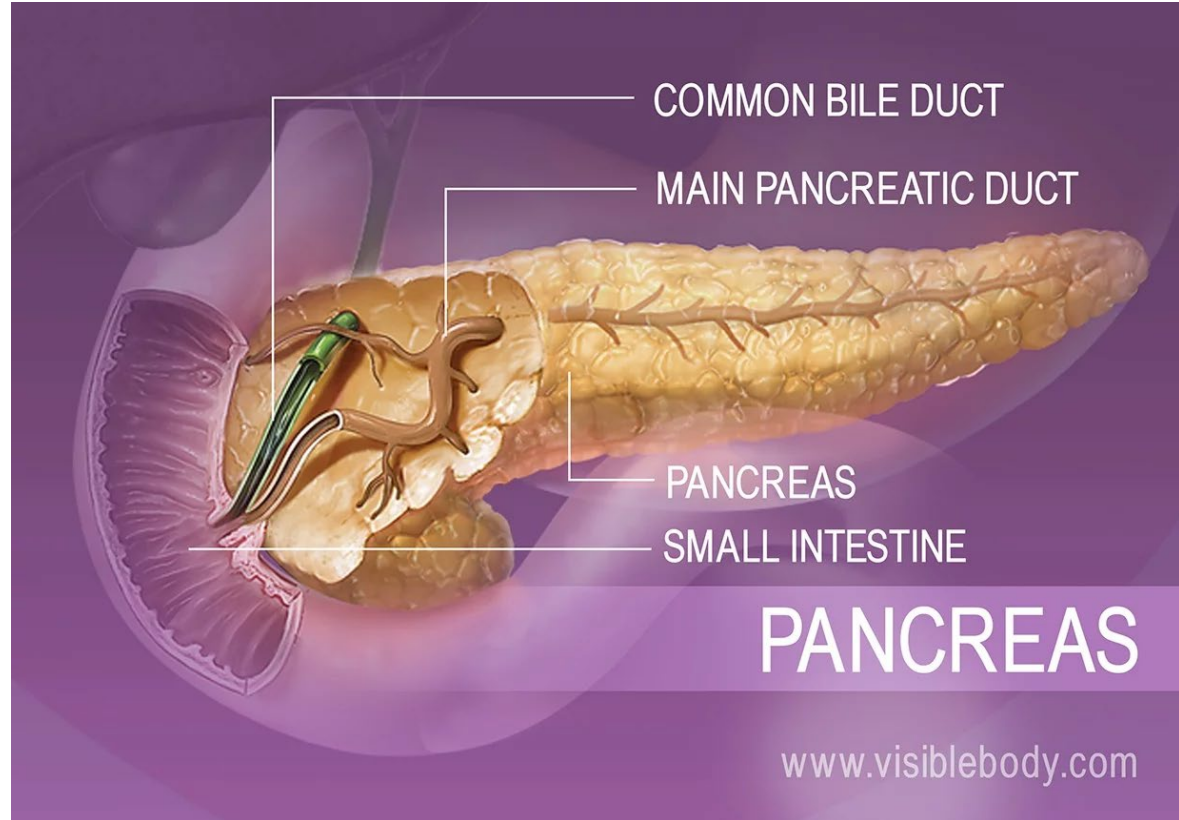
Bile is released by the gall bladder as needed into the small intestine.



The pancreas secretes pancreatic juice, a mix of digestive enzymes, water, buffers (bicarbonates), and electrolytes produced by acinar and epithelial cells.

Pancreatic juice drains through the main pancreatic duct (duct of Wirsung) into the common bile duct and then into the small intestine.

There it buffers stomach acids and breaks down protein, fats, and carbohydrates.





# ABSORPTION AND ELIMINATION

[www.visiblebody.com](http://www.visiblebody.com)



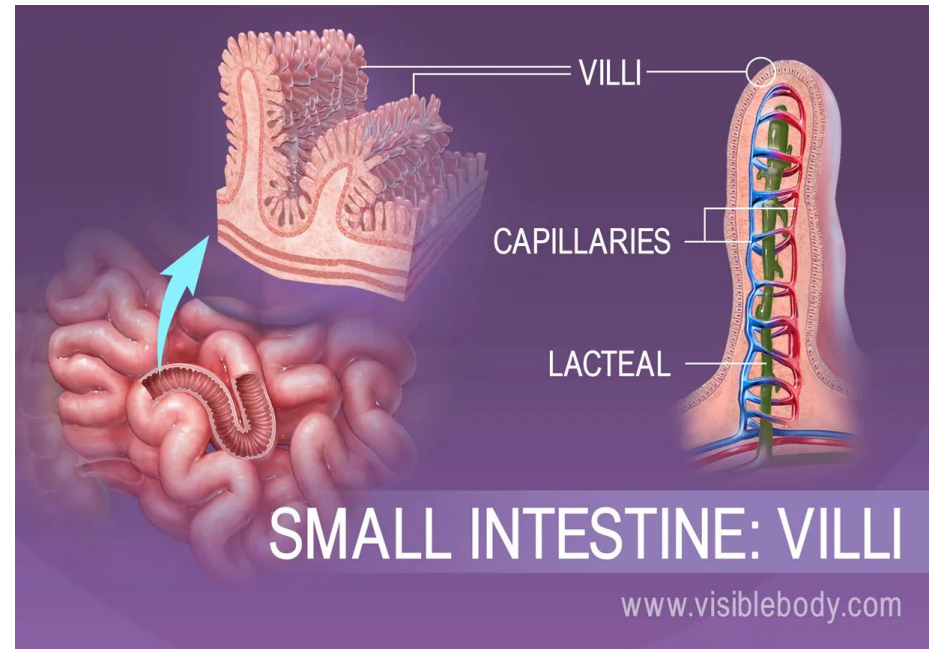
# Nutrients In, Waste Out: How the Human Body Absorbs Nutrients and Eliminates Waste

Villi that line the walls of the small intestine absorb nutrients into capillaries of the circulatory system and lacteals of the lymphatic system.

Villi contain capillary beds, as well as lymphatic vessels called lacteals.

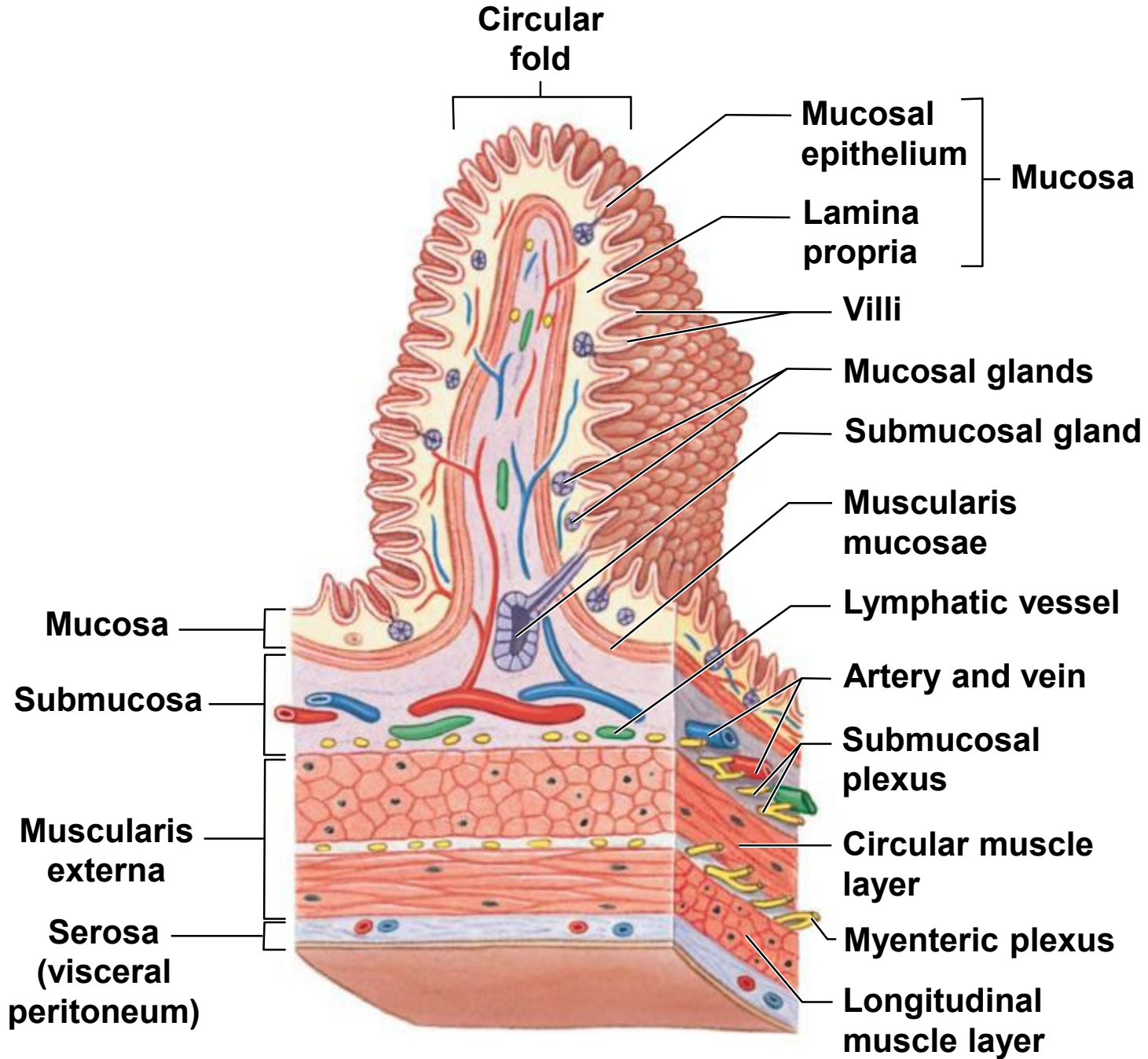
Fatty acids absorbed from broken-down chyme pass into the lacteals.

Other absorbed nutrients enter the bloodstream through the capillary beds and are taken directly to the liver, via the hepatic vein, for processing.



[Nutrients In, Waste Out: How the Human Body Absorbs Nutrients and Eliminates Waste](#)

Figure 24-3 The Structure of the Digestive Tract (Part 2 of 2).



Chyme passes from the small intestine through the ileocecal valve and into the cecum of the large intestine.

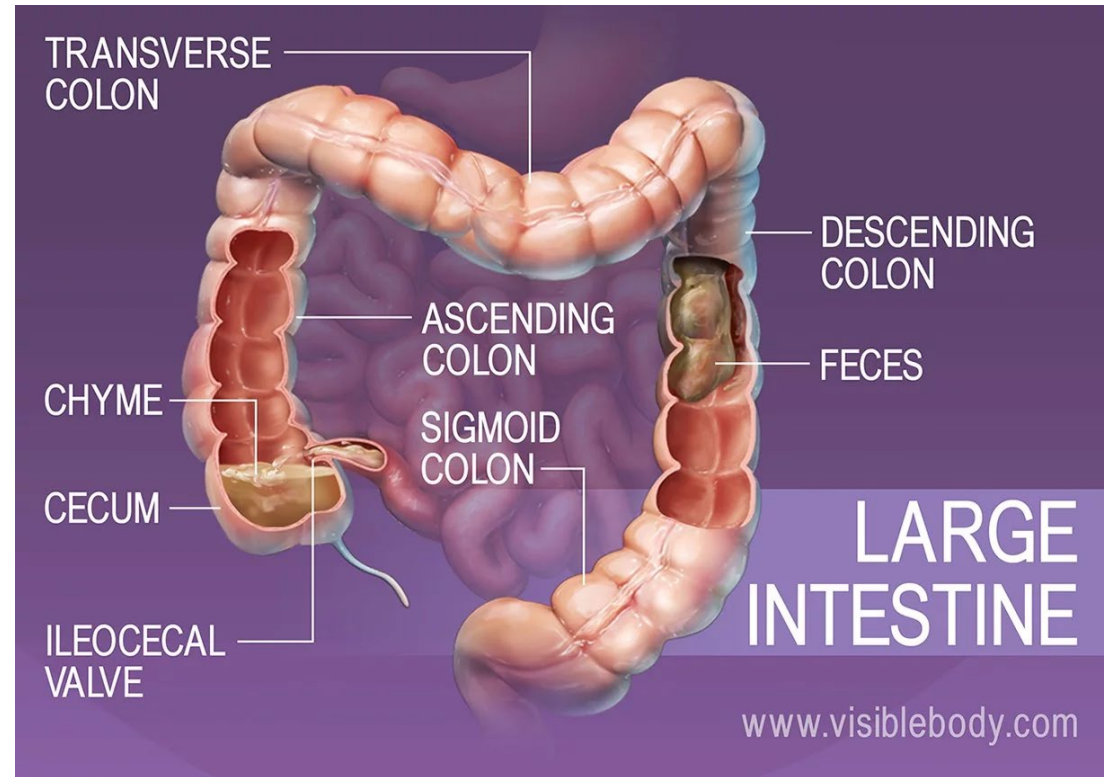
Any remaining nutrients and some water are absorbed as peristaltic waves move the chyme into the ascending and transverse colons.

This dehydration, combined with peristaltic waves, helps compact the chyme.

The solid waste formed is called feces.

It continues to move through the descending and sigmoid colons.

The large intestine temporarily stores the feces prior to elimination.

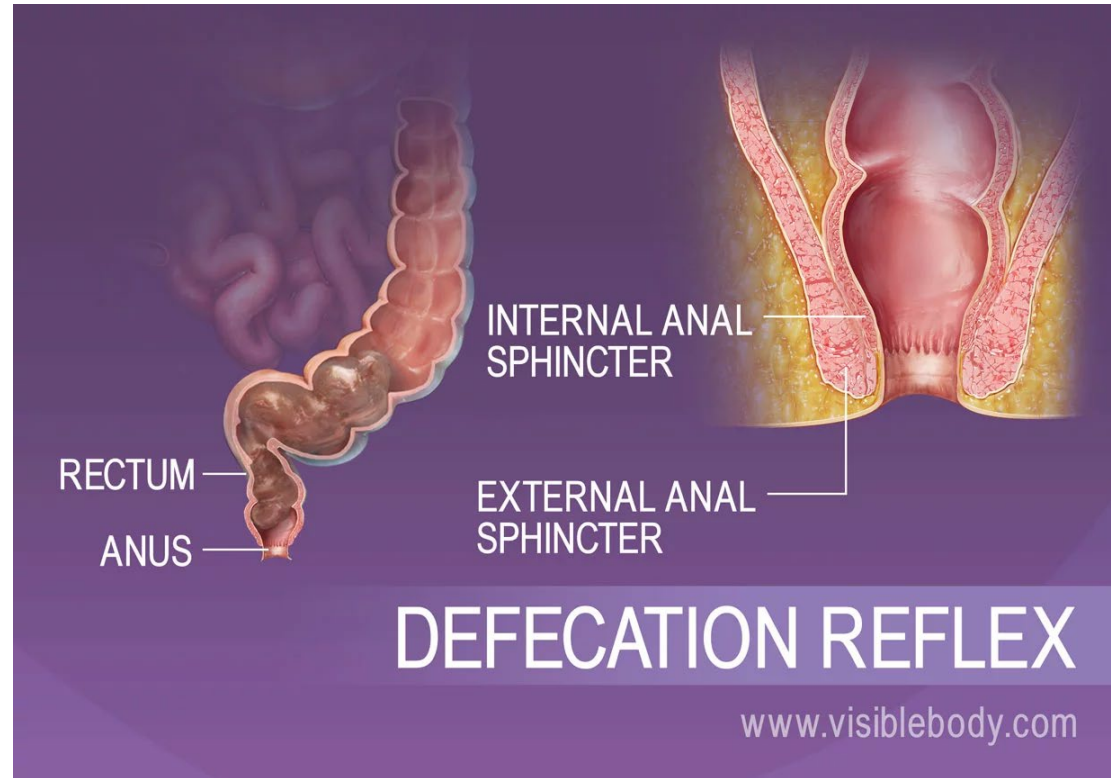


The body expels waste products from digestion through the rectum and anus.

This process, called defecation, involves contraction of rectal muscles, relaxation of the internal anal sphincter, and an initial contraction of the skeletal muscle of the external anal sphincter.

The defecation reflex is mostly involuntary, under the command of the autonomic nervous system.

But the somatic nervous system also plays a role to control the timing of elimination.



<https://www.youtube.com/watch?v= exsrs OSTtU> 3-1/2 minutes

[WHAT HAPPENS IN 1 MINUTE](https://www.youtube.com/watch?v=GjSTiWcqyF I)

<https://www.youtube.com/watch?v=GjSTiWcqyF I>



**THE END !!**