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SEARCH

SPORT EDUCATION FOR ACTIVE
AND RESPONSIBLE CITIZENSHIP
THROUGH HEALTH CARING



MODULE 2

**ENCOURAGING
SPORTS PRACTICE
FOR ONE'S OWN
PSYCHO-PHYSICAL
WELLBEING AND
TO CONTROL
NATIONAL SOCIAL
AND HEALTH COSTS**



SEGMENT 5

Digestive System

Overview

Nutrients are required for normal body function:

- Carbohydrates, proteins, lipids, vitamins, minerals
- Derived from food
- Food we eat is too big to be directly passed into blood

Goals of digestive system:

- Digest food into smaller molecules
- Absorb smaller molecules into the blood

Overview

Mechanical digestion:

- Physical breakdown of food into smaller pieces
- Forms a greater surface area for contact with digestive enzymes

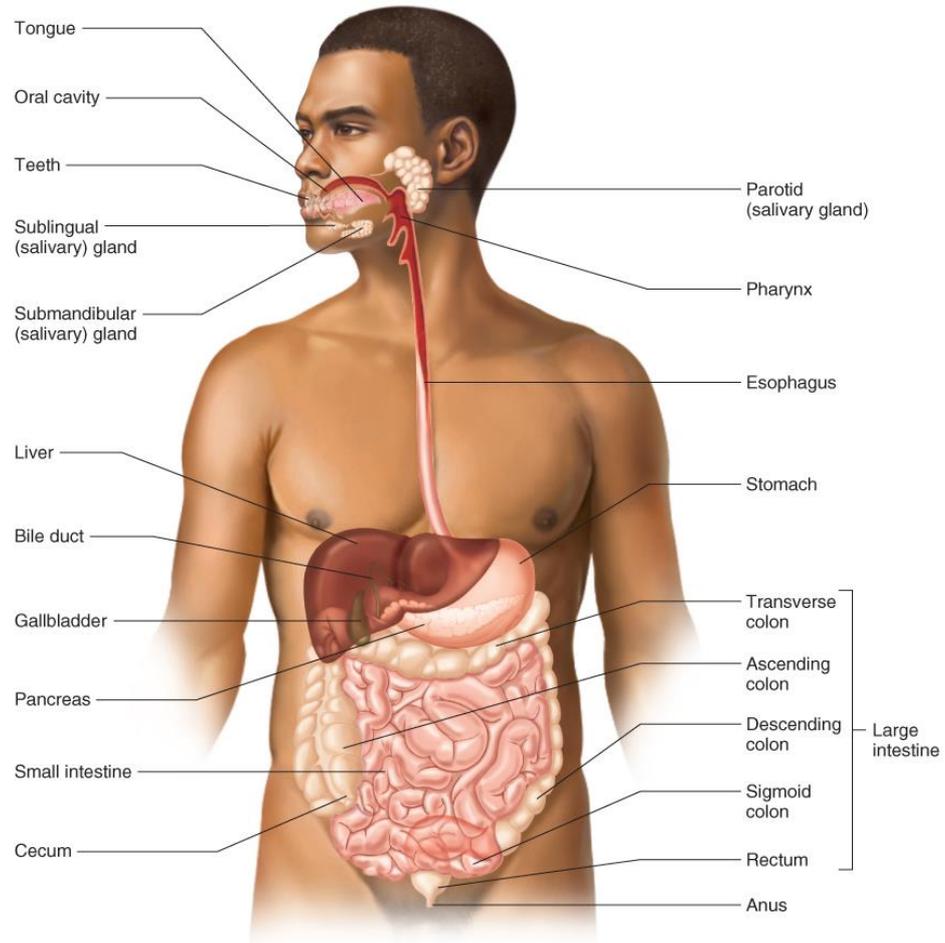
Chemical digestion:

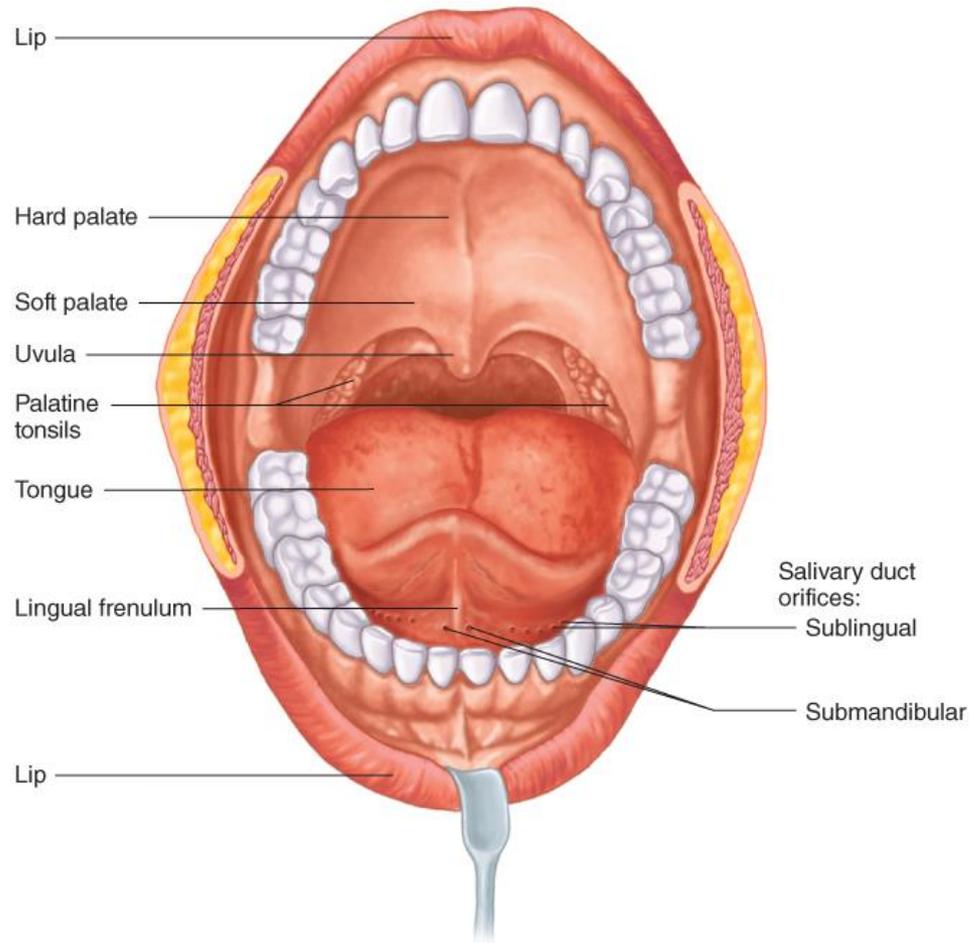
- Splitting of complex, non-absorbable food molecules into small, absorbable nutrient molecules by hydrolysis
- Enzymes speed up the reaction and enables digestion to occur

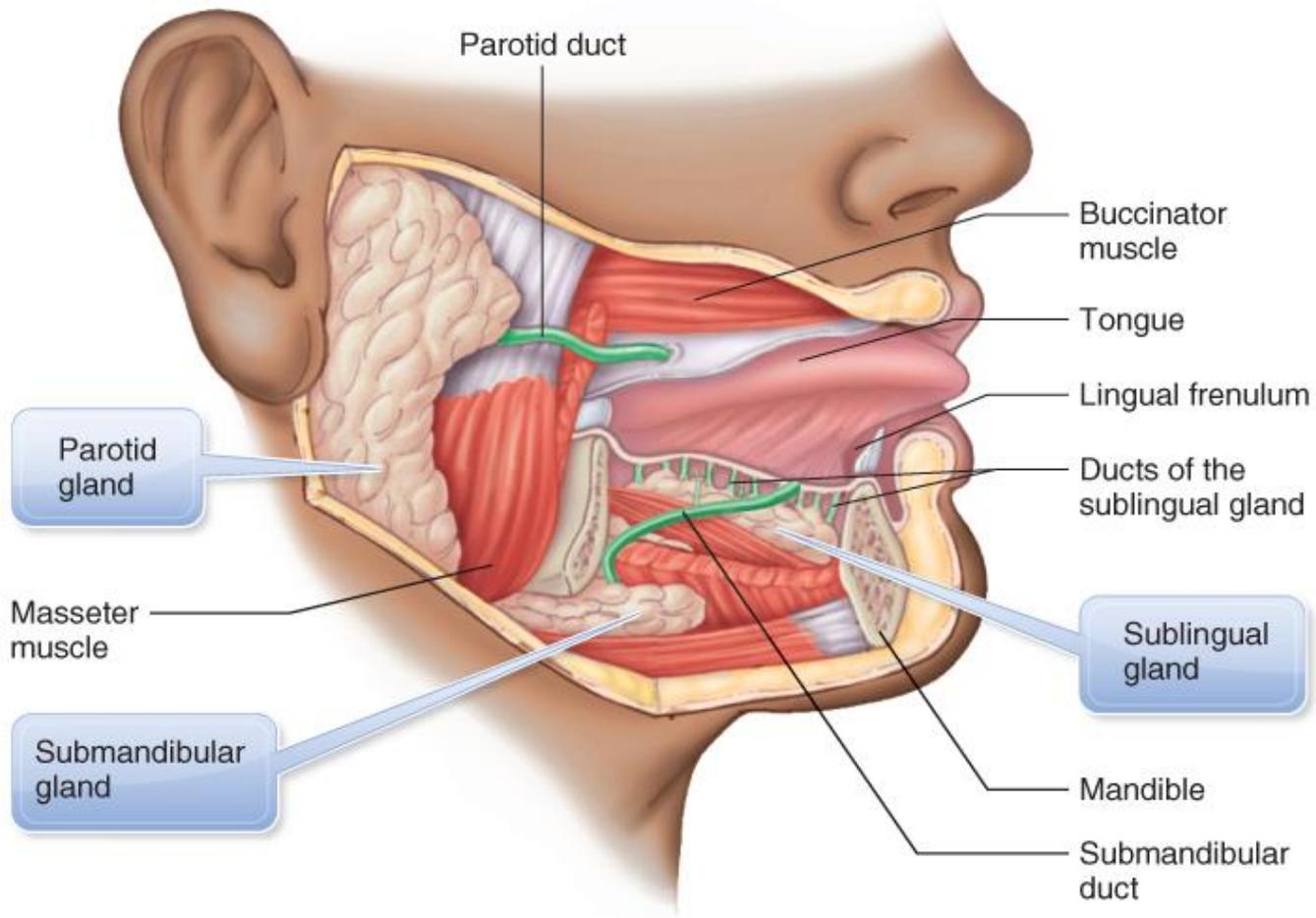
Anatomy and Physiology of the Digestive System

This system is characterized by a series of **hollow organs** (**alimentary canal**): *mouth, pharynx, esophagus, stomach, intestine*.

Furthermore, there are **accessory organs**: *salivary glands, liver, gallbladder, pancreas*, each of which has a specific and important function in the digestive and absorption mechanism.







Anatomy and Physiology of the Digestive System

Physiology of Digestion in the Mouth:

- Mechanical and chemical digestion takes place in the mouth.
- The masseter and temporalis muscles move the jaw for **mastication**.
- Amylase in saliva partially digests carbohydrates.
- Mucus mixes with the food to make it easier to swallow.
- The bite of food is called a **bolus** before it is swallowed.

Anatomy and Physiology of the Digestive System

Physiology of Digestion from the Mouth to the Stomach:

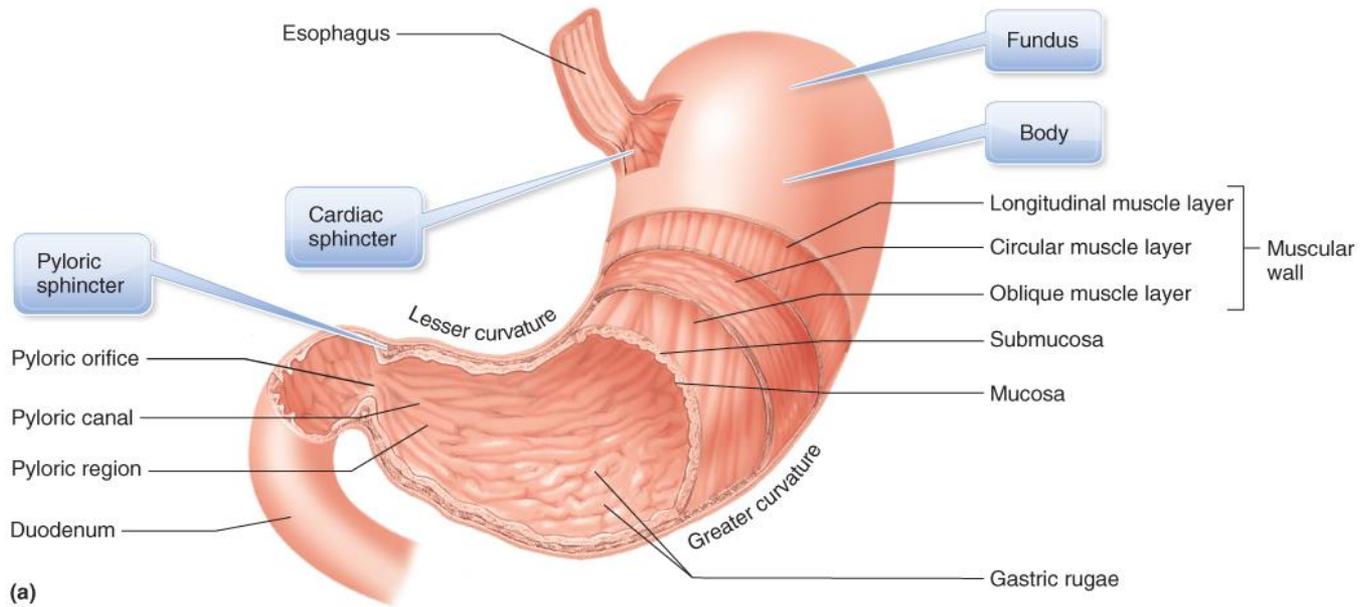
- **Deglutition** (swallowing) involves four cranial nerves.
- The epiglottis closes off the glottis so that the bolus moves to the esophagus.
- **Peristalsis** moves the bolus through the esophagus.

Anatomy and Physiology of the Digestive System

Anatomy of the Stomach:

- The stomach has three layers of smooth muscle in its walls, each oriented in a different direction.
- The lining of the stomach has rugae to enlarge the surface area and to accommodate gastric pits that lead to gastric glands.

The Stomach



Anatomy and Physiology of the Digestive System

Physiology of Digestion in the Stomach:

- During swallowing, the medulla oblongata sends signals to the stomach, telling it to relax.
- The cardiac sphincter opens to allow the bolus to enter.
- Stretching of the stomach walls starts peristaltic contractions.
- The pyloric sphincter remains closed until the pH of the stomach contents reaches 2.

Anatomy and Physiology of the Digestive System

Physiology of Digestion in the Stomach:

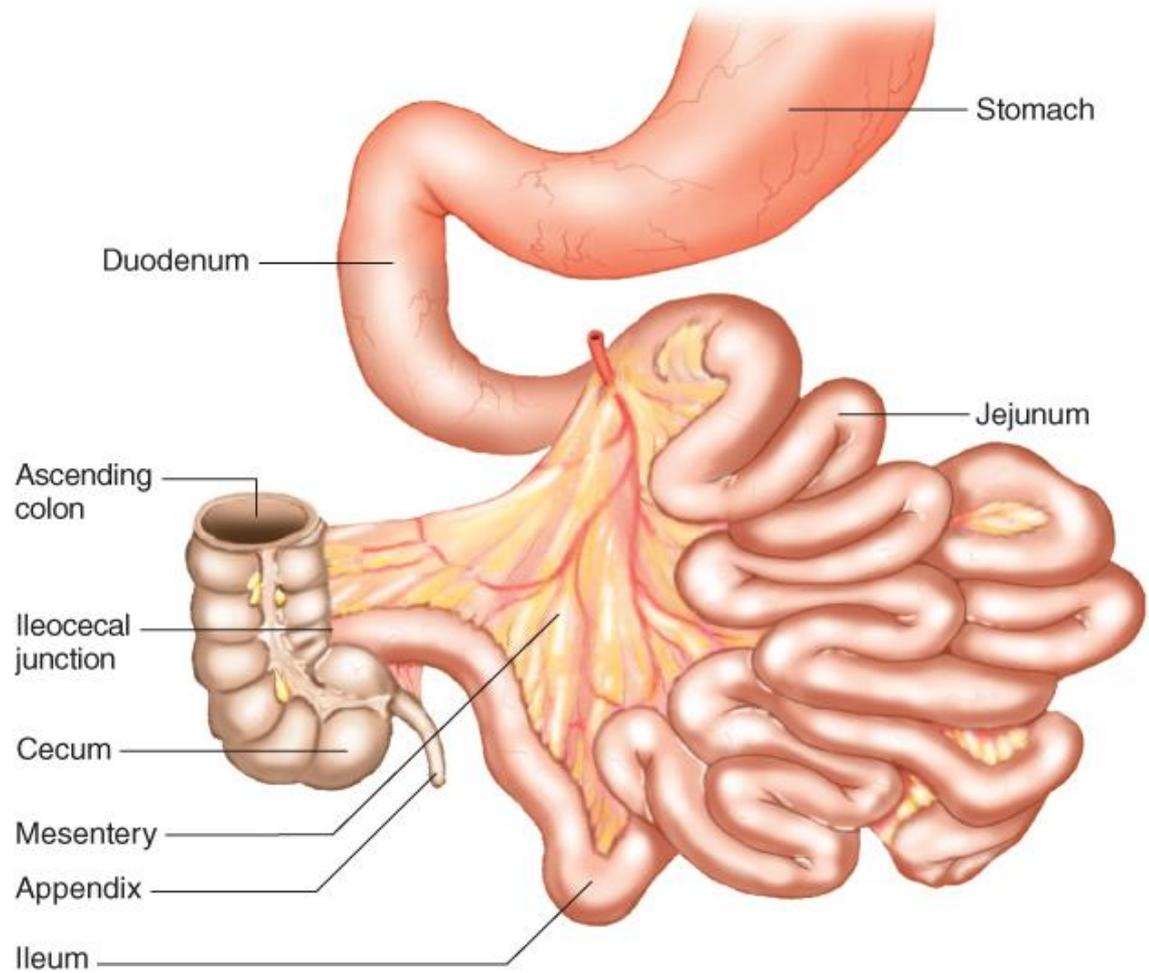
- Hydrochloric acid changes pepsinogen to pepsin so that proteins are partially digested.
- Hydrochloric acid activates lingual lipase, which partially digests lipids along with gastric lipase.
- Intrinsic factor binds to vitamin B₁₂ so that it can be absorbed later.
- Once gastric secretions are mixed with the bolus, it is called ***chyme***.

Anatomy and Physiology of the Digestive System

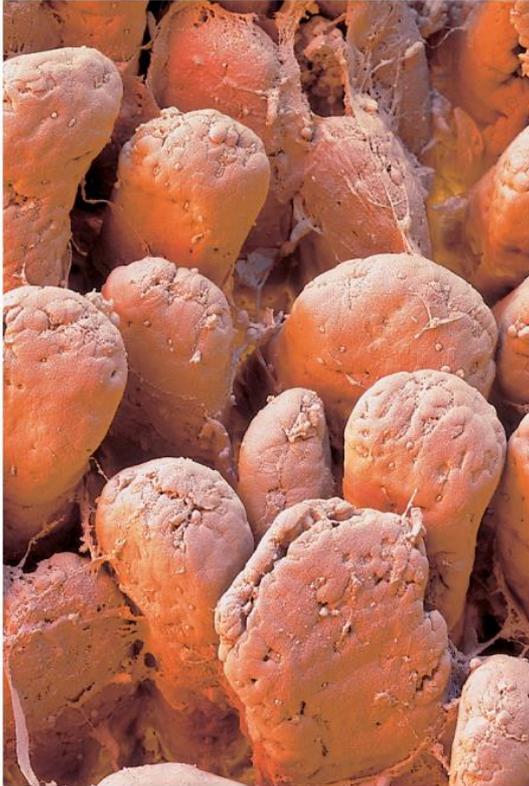
Anatomy of the Small Intestine:

- The small intestine is composed of the **duodenum**, the **jejunum**, and the **ileum**.
- All parts of the small intestine have smooth muscle in their walls and are lined by **villi**.
- Endocrine cells of the duodenum secrete **secretin** and **cholecystokinin**.
- The **ileocecal valve** controls the movement of materials from the small intestine to the colon.

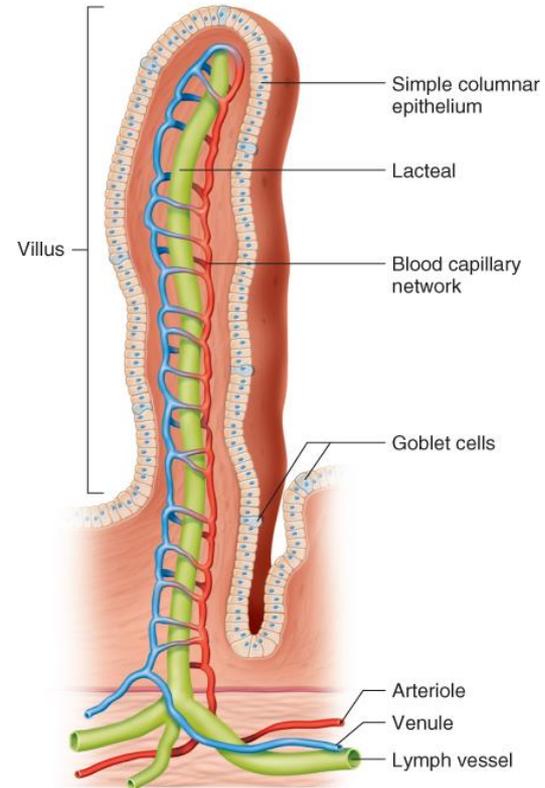
Small Intestine



Intestinal Villi



(a)



(b)

Anatomy and Physiology of the Digestive System

Physiology of Digestion in the Small Intestine:

- Secretin is released from endocrine cells of the duodenum in response to the acidic chyme.
- Secretin tells the pancreas to release bicarbonate ions to neutralize the chyme in the duodenum.

Anatomy and Physiology of the Digestive System

Physiology of Digestion in the Small Intestine:

- Cholecystokinin is secreted by endocrine cells in the duodenum in response to the presence of lipids.
- Cholecystokinin targets the gallbladder (telling it to release bile) and the hepatopancreatic duct (telling it to relax).

Anatomy and Physiology of the Digestive System

Physiology of Digestion in the Small Intestine:

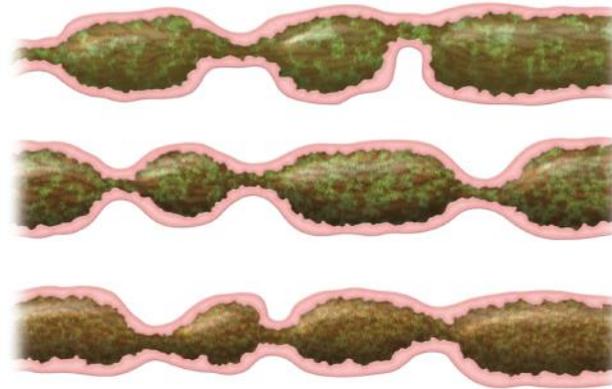
- The release of bicarbonate ions from the pancreas carries the digestive enzymes through the pancreatic duct to the duodenum, where all further chemical digestion is completed.

Anatomy and Physiology of the Digestive System

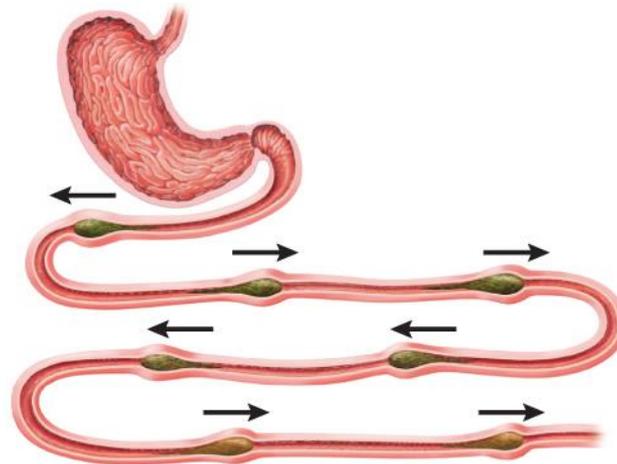
Physiology of Digestion in the Small Intestine:

- **Segmentation** ensures that all the contents of the small intestine come in contact with villi for absorption.
- **Peristalsis** further moves the contents through the jejunum and ileum to the ileocecal valve.

Segmentation and peristalsis of the small intestine



(a)



(b)

Anatomy and Physiology of the Digestive System

Absorption of Nutrients in the Small Intestine:

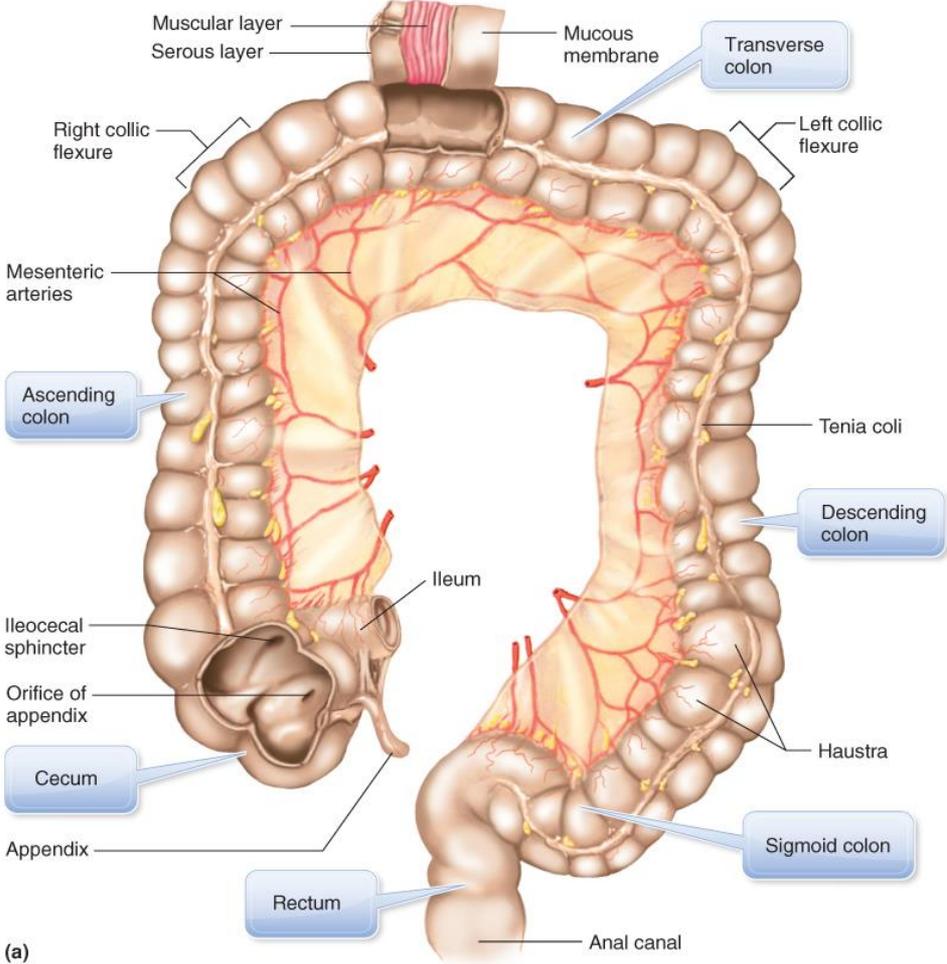
- Monosaccharides and amino acids are absorbed through the epithelium of the villi into capillaries by facilitated diffusion.
- Fatty acids and glycerides are absorbed across the epithelial membranes of the villi by diffusion, coated with proteins, and exocytosed to lacteals.

Anatomy and Physiology of the Digestive System

Anatomy of the Large Intestine:

- The **colon** is composed of the **cecum**, the **ascending colon**, the **transverse colon**, the **descending colon**, the **sigmoid colon**, and the **rectum**.
- The **anus** contains two sphincter muscles: the smooth muscle **internal anal sphincter**, controlled by the autonomic nervous system and the skeletal muscle **external anal sphincter**, controlled by the somatic nervous system.

The Large Intestine



Anatomy and Physiology of the Digestive System

Physiology of Digestion in the Large Intestine:

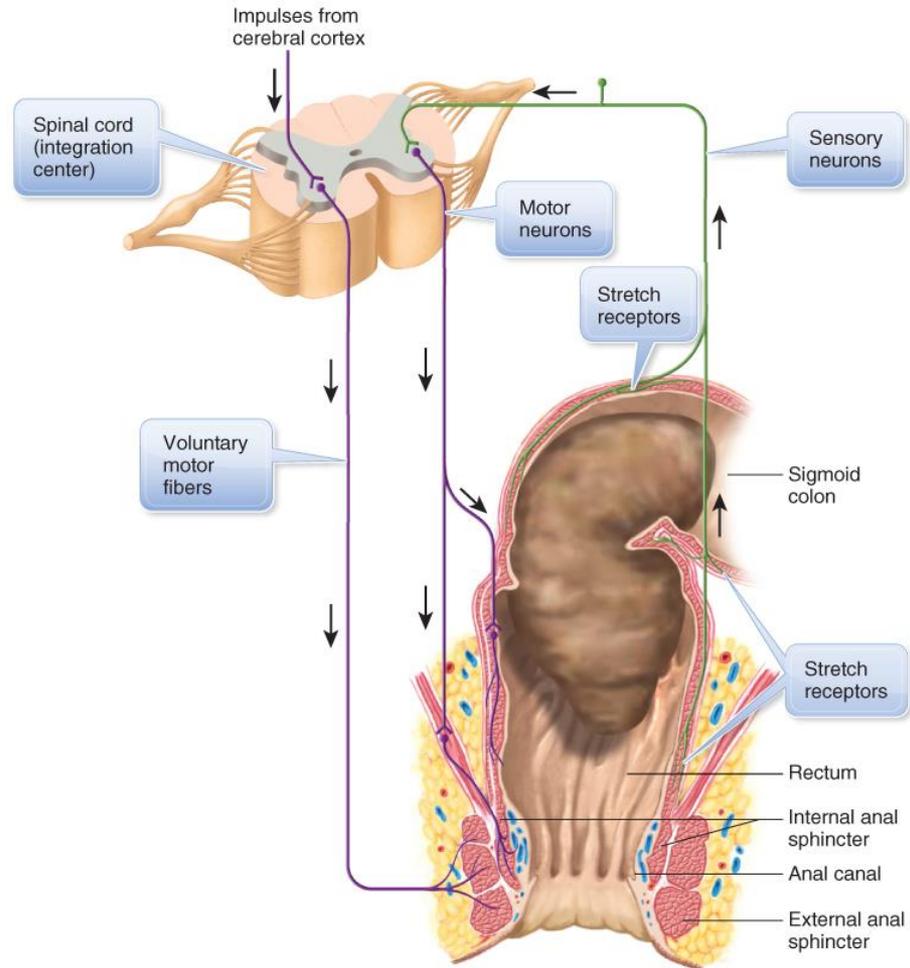
- The large intestine absorbs water, compacts materials to form feces and then stores the feces until they are removed through defecation.
- Bacteria living in the large intestine produce vitamin K and flatus.

Anatomy and Physiology of the Digestive System

Physiology of Digestion in the Large Intestine:

- Stretching of the stomach and duodenum causes a mass movement of fecal material from the transverse colon to the rectum.
- Stretch receptors in the rectal walls initiate the **defecation reflex**.
- Defecation happens voluntarily when the external anal sphincter is relaxed.

Reflex arc for the defecation reflex



KEYWORDS

Digestive

System

Nutritional

Principles

Digestion

Secretion

Chewing

Swallowing

Gastric Juice

Salivation

Digestive Fluid

Small Intestine

Large Intestine