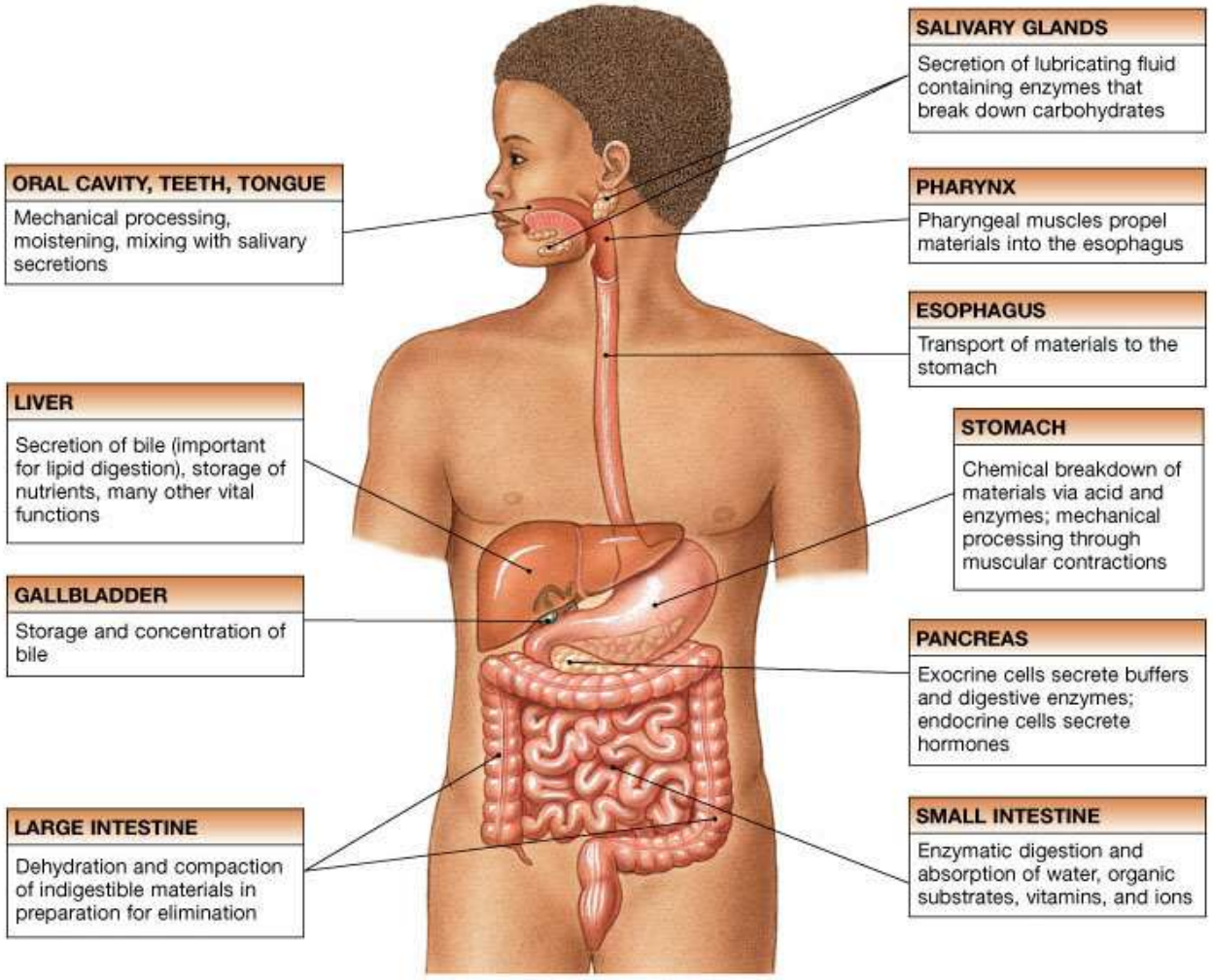
DIGESTION

From Start .....to Finish

FIGURE 24.1 THE COMPONENTS OF THE DIGESTIVE SYSTEM



ROLE OF THE DIGESTIVE SYSTEM

- Receive nutrients so the body can use them
- Eliminate the extra components the body cannot use
- Takes 12-48 hours
- Alimentary Canal: the digestive tract; 8 metres of tubing
- Digestion: chemical and physical (mechanical) breakdown of food and drink in a form your body can absorb for use. Through digestion, the nutrients are made available to supply you with energy.

ORDER OF DIGESTION

- Mouth
- Esophagus
- Stomach
- Small intestine
- Large intestine
- Rectum
- Accessory organs: liver; pancreas, gallbladder

FUNCTIONS OF THE DIGESTIVE SYSTEM

- Ingestion
- Mechanical processing
- Digestion
- Secretion
- Absorption
- Excretion

MEET PHIL

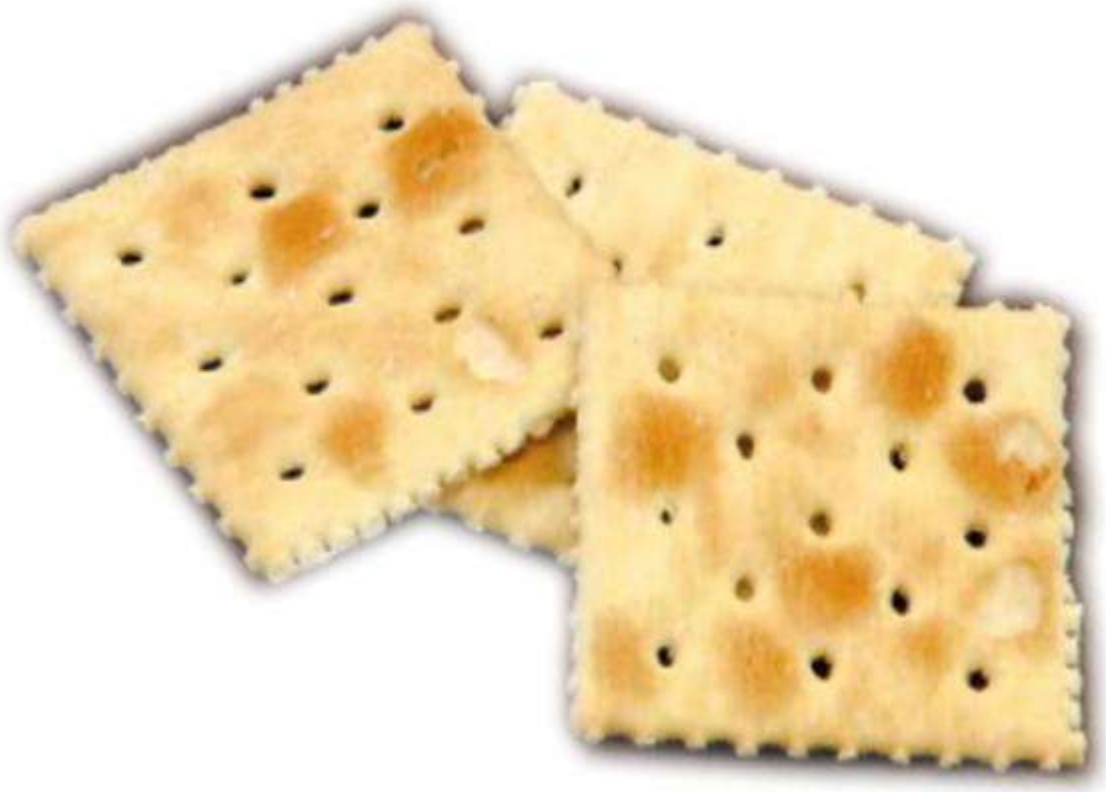
- We are going to get to know PHIL in depth and personal!

- Label your diagram of ‘Phil’ according to the numbers assigned to the different parts of the digestive system (i.e., 1 – mouth)

1. MOUTH

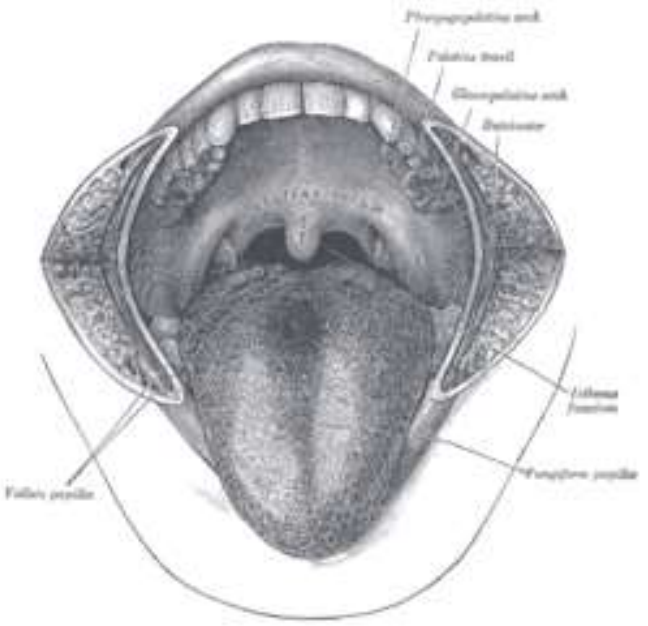
- Mechanical process that begins digestion, begins in the mouth.
- Via the teeth, the saliva (which contains mucus) and the tongue, food is softened and mulched in order to be easily pushed and digested through the rest of the organs.
- Chewing = mastication
- Chewing grinds, moistens, and increases surface area for chemical reactions

THE SODA CRACKER…



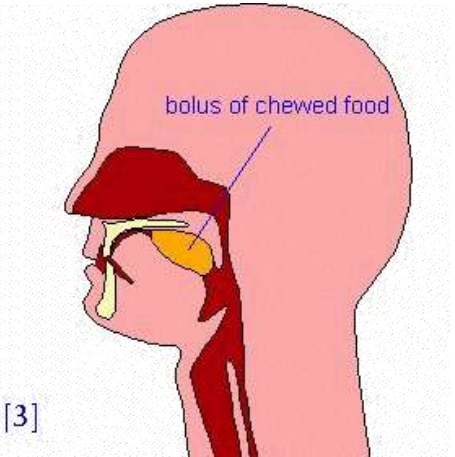
THE TONGUE

- primary functions include:
  - Mechanical processing
  - Assistance in chewing and swallowing
  - Sensory analysis by touch, temperature, and taste receptors



2. SALIVARY GLANDS

- Release saliva
- Softens food and begins to breakdown into food's nutrients
- Saliva contains the enzyme amylase which breaks down carbs into simple sugars
- Lubricates and binds food – helps to form a BOLUS (ball of food to be passed to the next part of the digestive system)



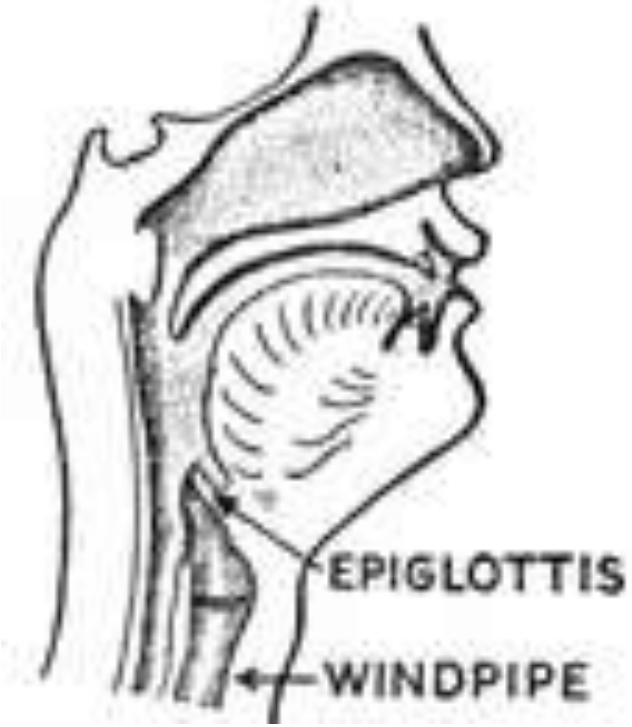
[3]

3. THE PHARYNX

- Common passageway for food, liquids, and air
- Pharyngeal muscles assist in swallowing
- Directs food from mouth to esophagus

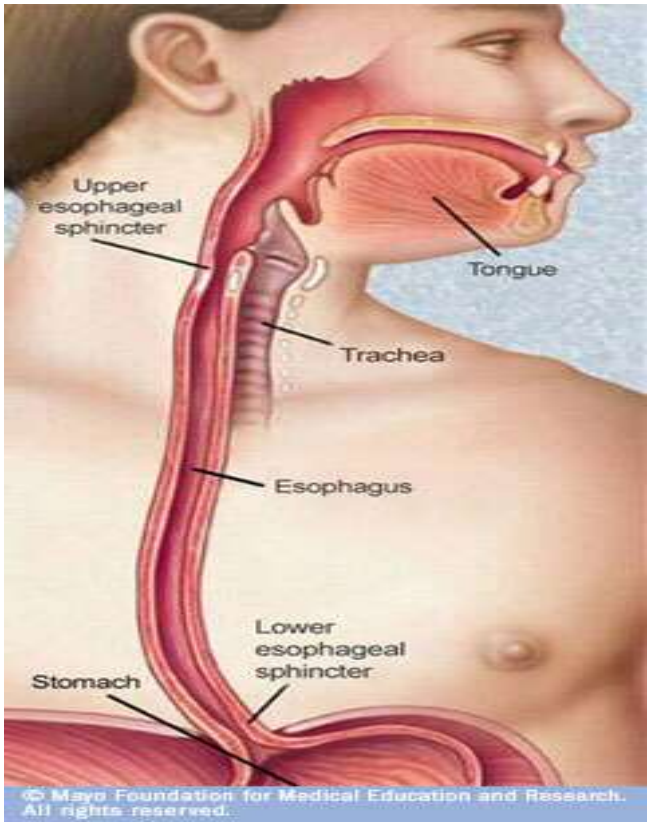
4. EPIGLOTTIS

- A flap that closes when swallowing so food goes down the right tube – protects airway
- If opens, you can choke



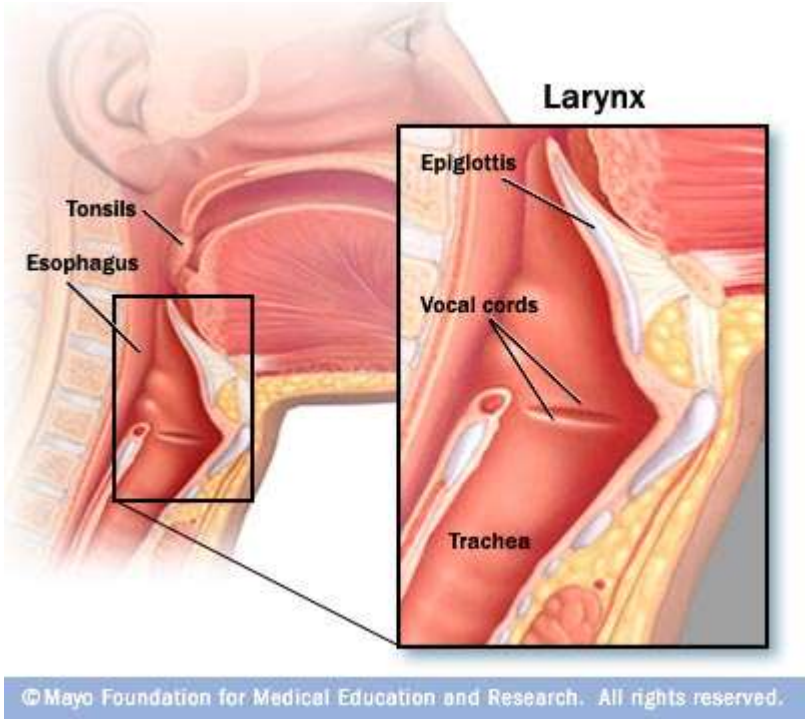
5. UPPER ESOPHAGEAL SPHINCTER

- Allow passage from mouth to esophagus
- Prevents backflow from esophagus to mouth



6. TRACHEA

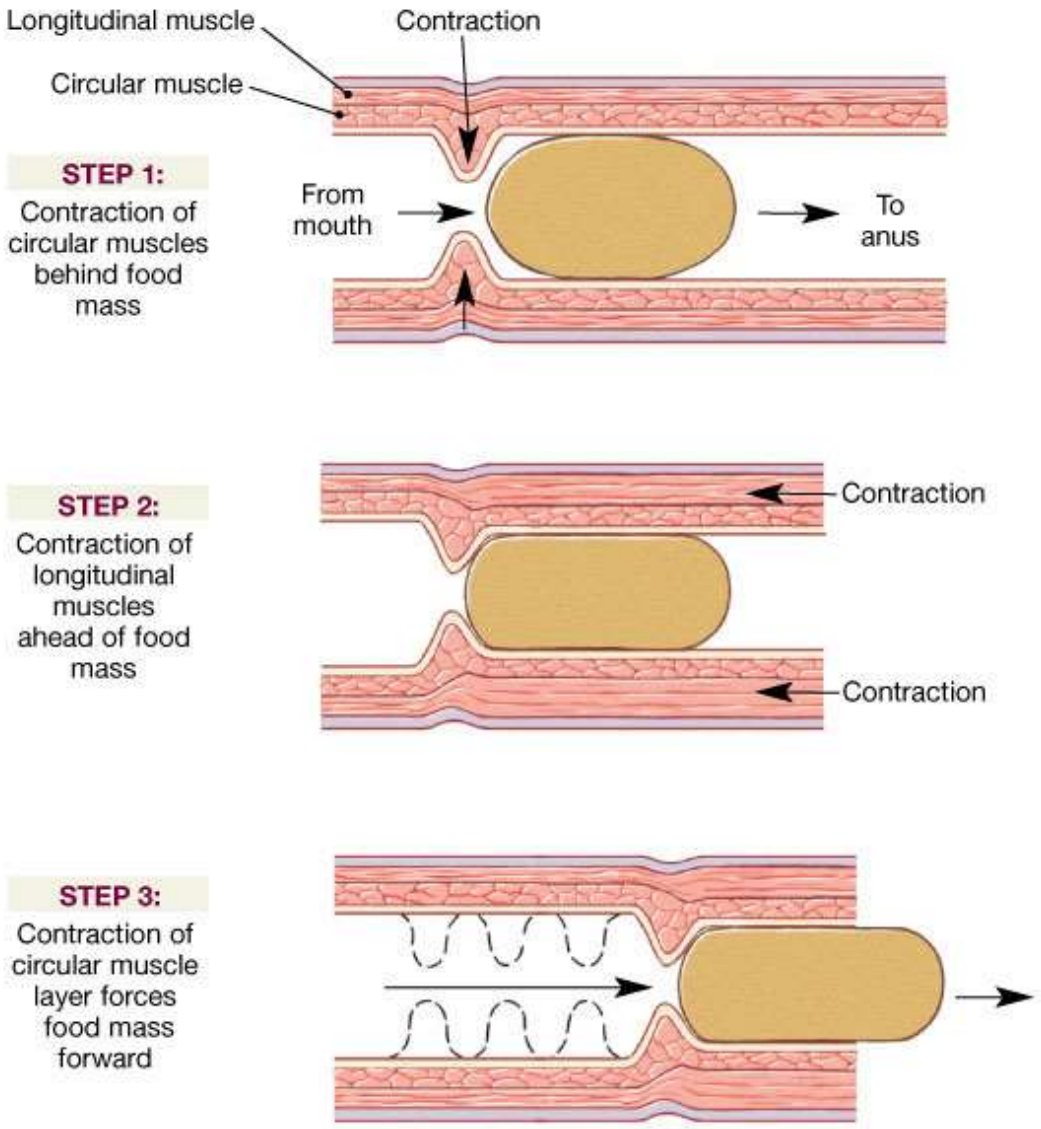
- Pipe that leads to the lungs
- Breathing
- Epiglottis protects the trachea when swallowing food



7. ESOPHAGUS

- Passes food from mouth to stomach
- Muscles in your esophagus push food down into the stomach
- This is called PERISTALSIS
- Esophagus is protected from crunchy and acidic food by mucus membranes (i.e., half-eaten chips)

FIGURE 24.4 PERISTALSIS



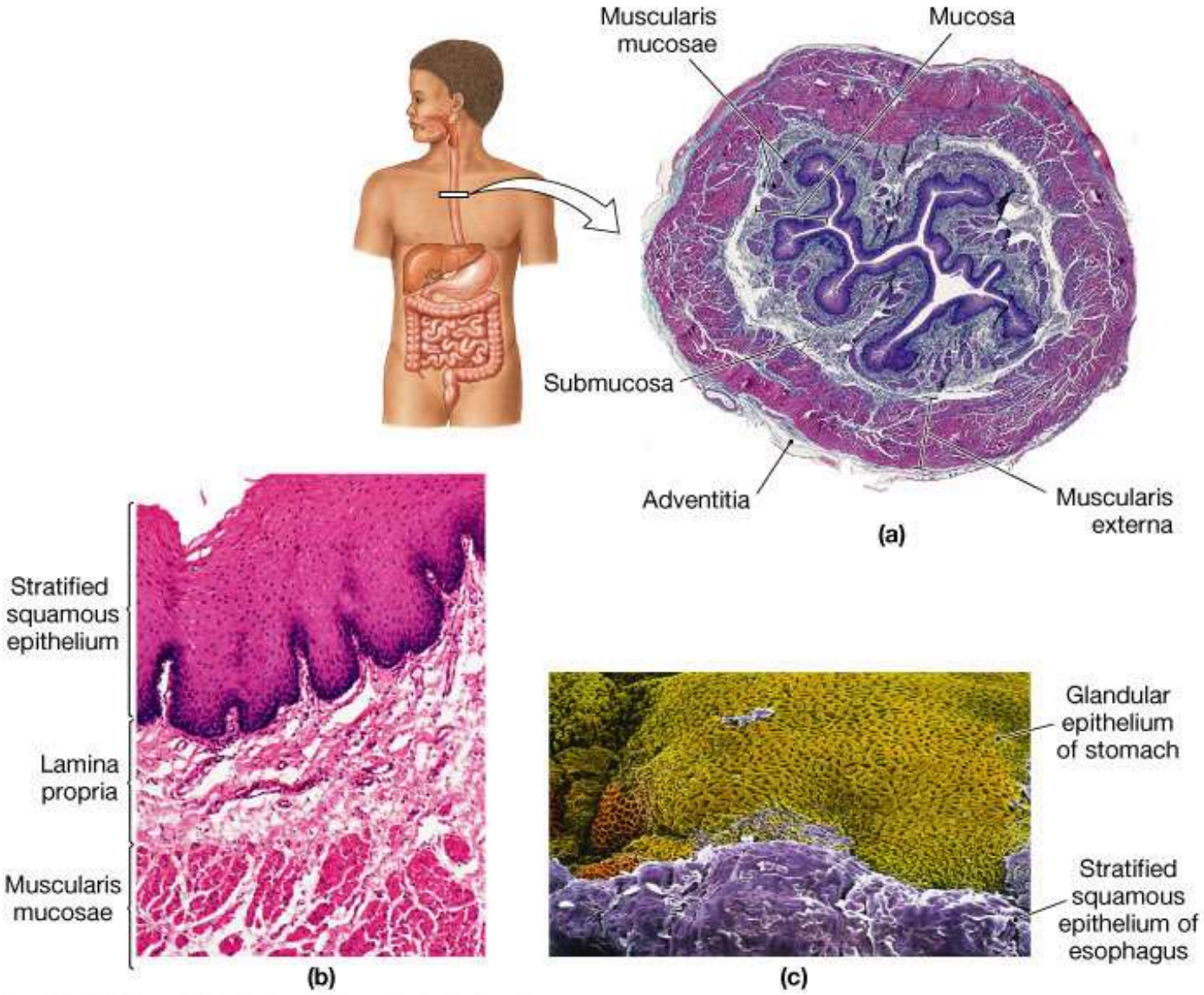


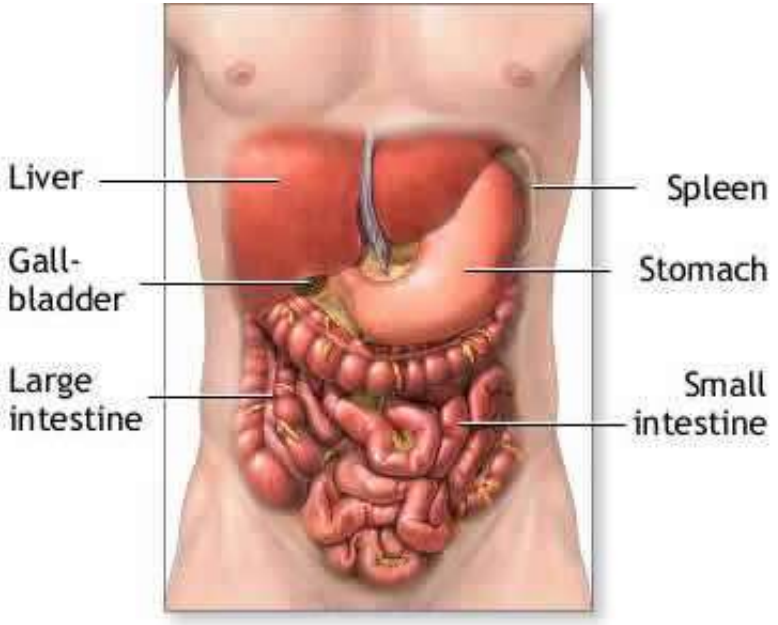
Figure 24.10a-c

8. CARDIAC SPHINCTER

- Lower esophageal sphincter
- Stomach acid/food coming up from stomach = heartburn
- Makes sure food does not go back up and out

9. THE LIVER

- BILE: a greenish liquid that helps fat mix with water in the intestine and enables the body to digest and absorb fat
- Breaks down toxins (i.e., alcohol) and acts as a filter for your blood
- Stores glycogen to be converted into glucose when needed



10. STOMACH

- Adds enzymes, acids, and fluids
- Churns, mixes, and grinds food into a liquid mass (Mechanical breakdown of food)
- Peristalsis continues to grind food up
- HCL attacks food
- Bulk storage of undigested food
- Lined with mucus membranes that stop the stomach from eating itself

FIGURE 24.12 THE STOMACH

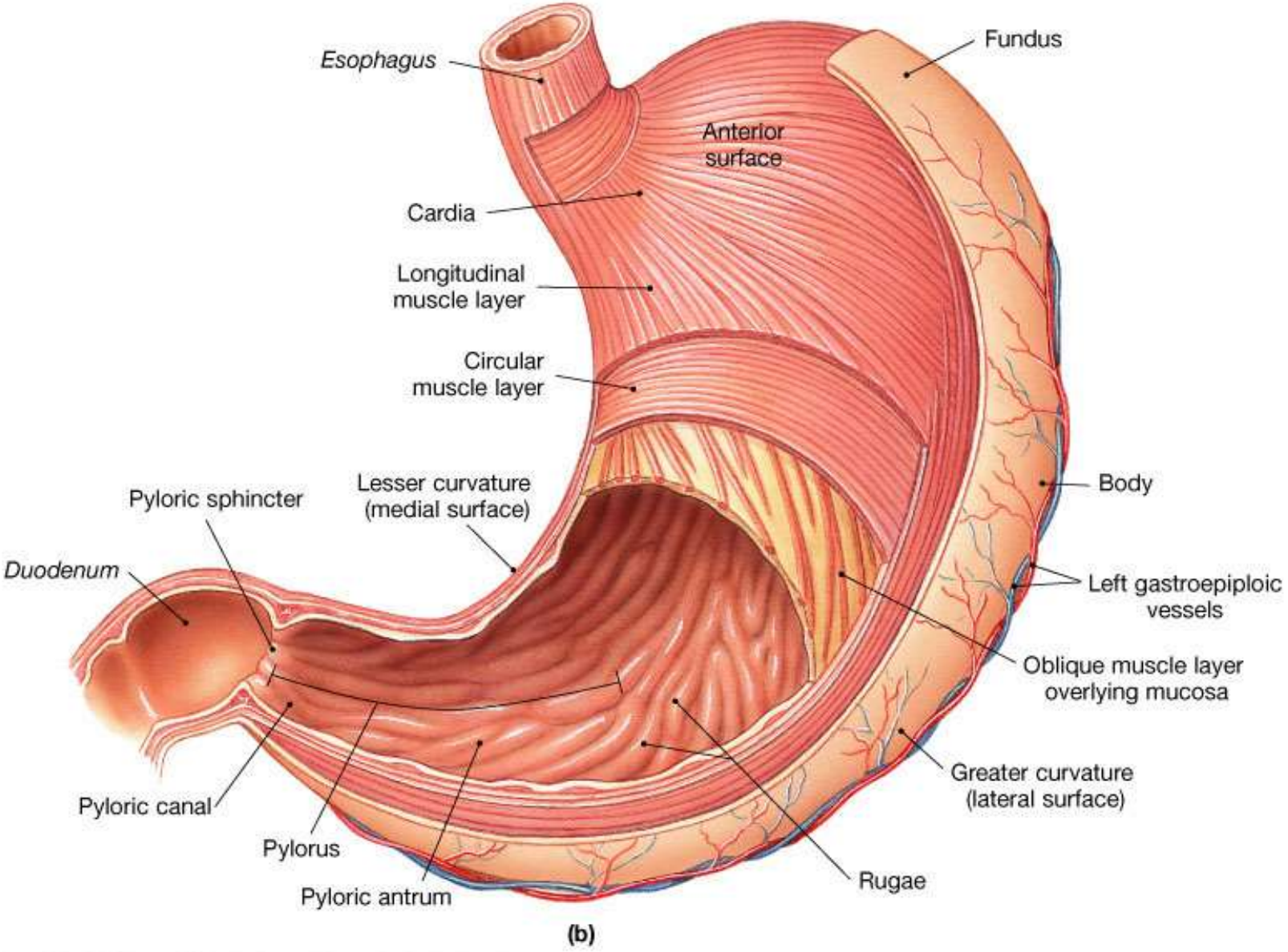


Figure 24.12b

ENZYMES

- Pepsin/rennin – breakdown proteins
- Gastric lipase – breakdown fats
- Amylase – continue breaking down carbs

- **DIGESTION TIME IN THE STOMACH**
- Carbs = 1-2 hrs.
- Protein = 3-5 hrs.
- Fats = up to 7 hrs.

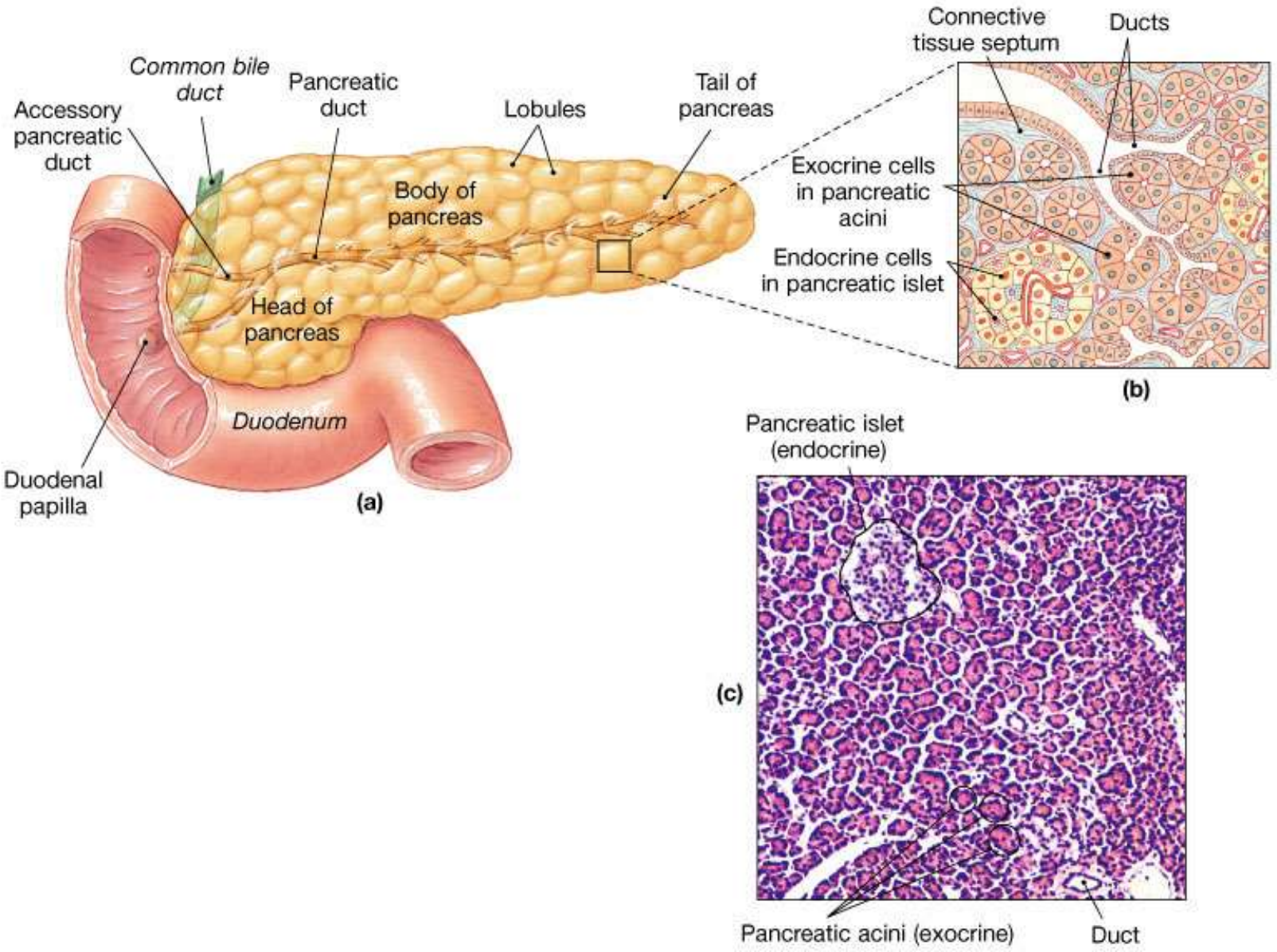
MOVING ON...

- Leaving the stomach, food is now a thick fluid called CHYME.
- The chyme passes through the pyloric sphincter
- The sphincter releases food a little at a time to help ensure the best possible absorption of nutrients in the small intestine

11. PANCREAS

- Secretes pancreatic juices, an enzyme-rich fluid (thousands of enzymes) that continues to reduce food to small molecules.
- It also releases bicarbonate to neutralize the acidic fluid from the stomach.
- Releases and monitors insulin and glucagon secretion - for glucose control

FIGURE 24.18 THE PANCREAS



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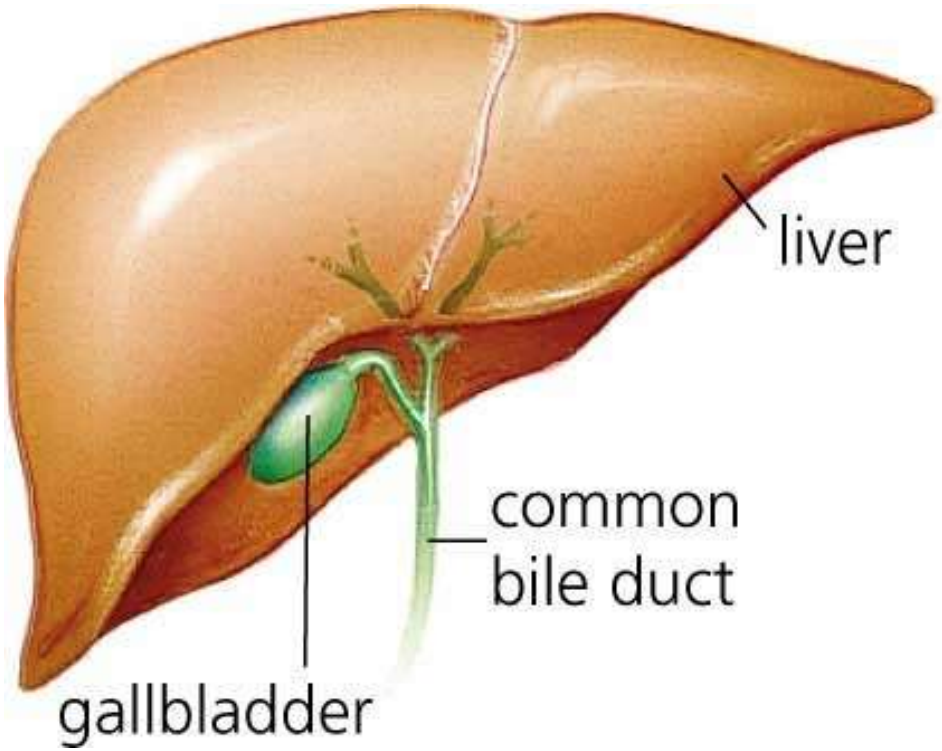
12. PANCREATIC DUCT

- Conducts pancreatic juices from the pancreas to the small intestine

13. GALLBLADDER

- Stores bile from the liver until needed.



14. PYLORIC SPHINCTER

- Allows passage from stomach to small intestine.

15. BILE DUCT

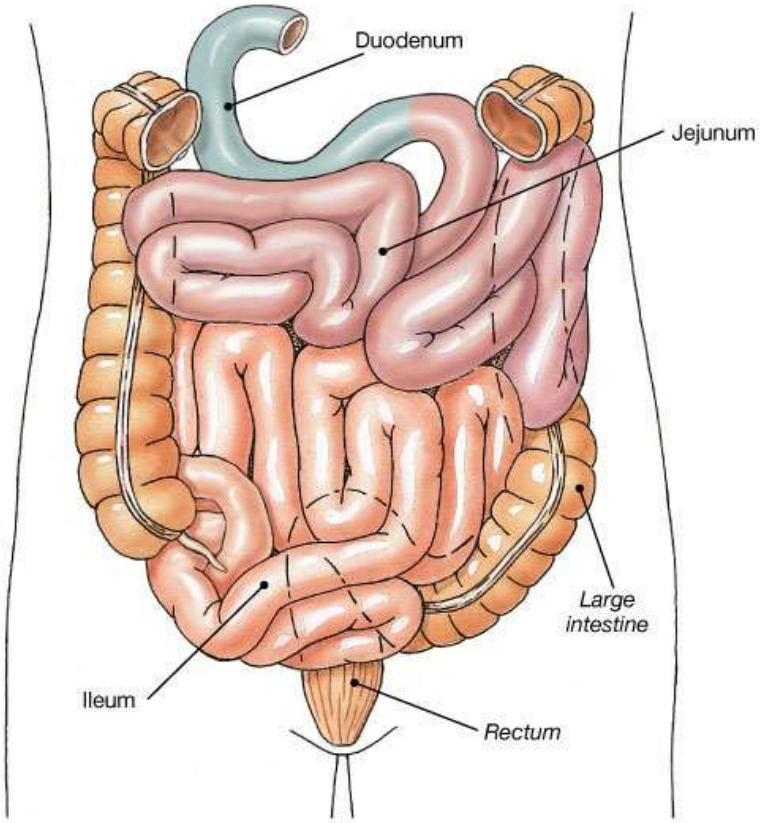
- Conducts bile from the gallbladder to the small intestine

16. SMALL INTESTINE

- Secretes enzymes that digest all energy-yielding nutrients and releases bicarbonate to neutralize acidic chyme that enters the small intestine.
- Smaller in diameter than the large intestine (10 feet in length)
- *digestion and absorption occur mainly in the small intestine
- Through absorption, nutrients are made available to the body cells in the small intestine

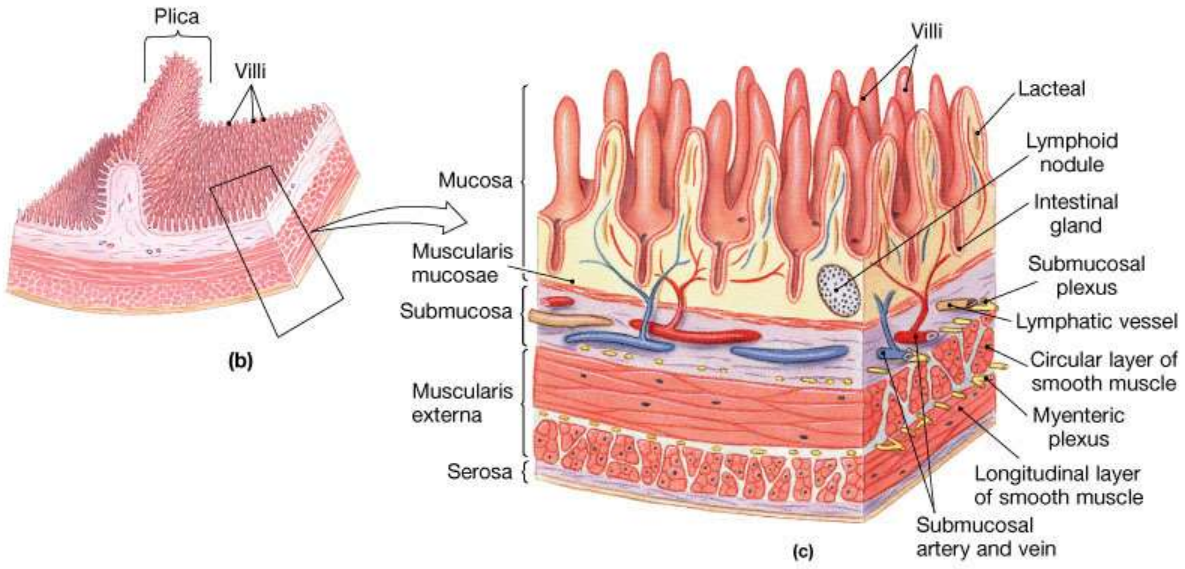
Three subdivisions:

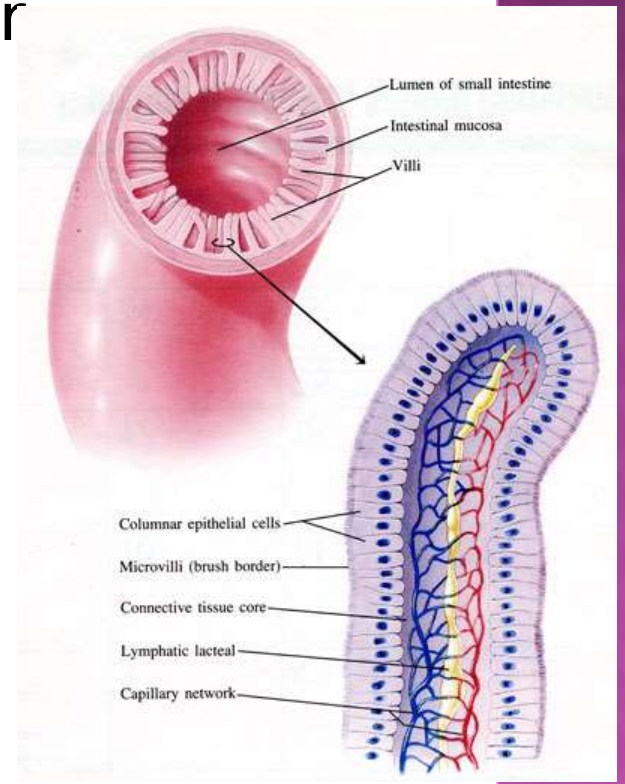
- Duodenum - most digestion takes place here
- Jejunum - absorption of nutrients
- Ileum - absorption of nutrients



(a)

- The large, tennis court size area allows for maximum absorption
- Numerous folds in the intestine are called VILLI, and in turn they are covered with more projections called MICROVILLI
- Each microvilli is designed to absorb a certain nutrient and not any other





ABSORPTION IN THE S.I.

- The simplest of nutrients are absorbed first, and the more complex are absorbed further down the intestine
- By the time the food reaches the end of the small intestine, it is mostly water, dissolved minerals and indigestible fibre.
- These substances are absorbed ‘as is’
- Sugars/carbs are broken down first, then proteins, then fats (just like in the stomach)

17. ILEOCECAL VALVE (SPHINCTER)

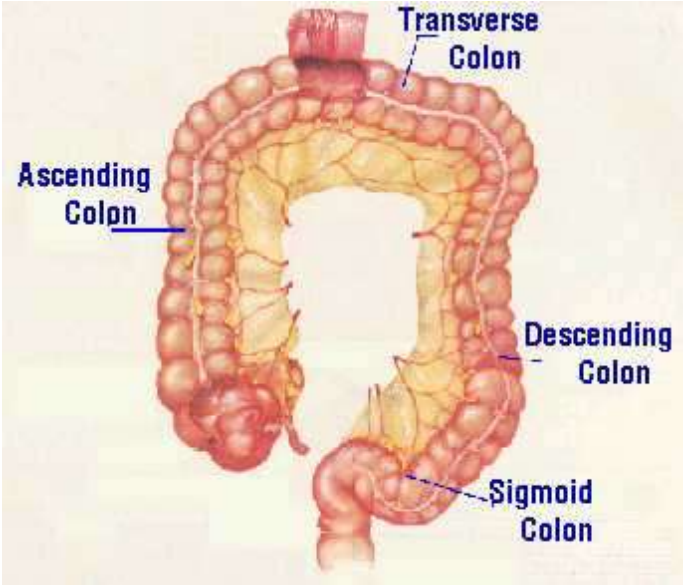
- Allows passage from the small intestine to the large intestine
- Prevents backflow from the large intestine

18. APPENDIX

- Stores lymph cells
- Shrunken remainder of a large and normal intestine of a remote ancestor

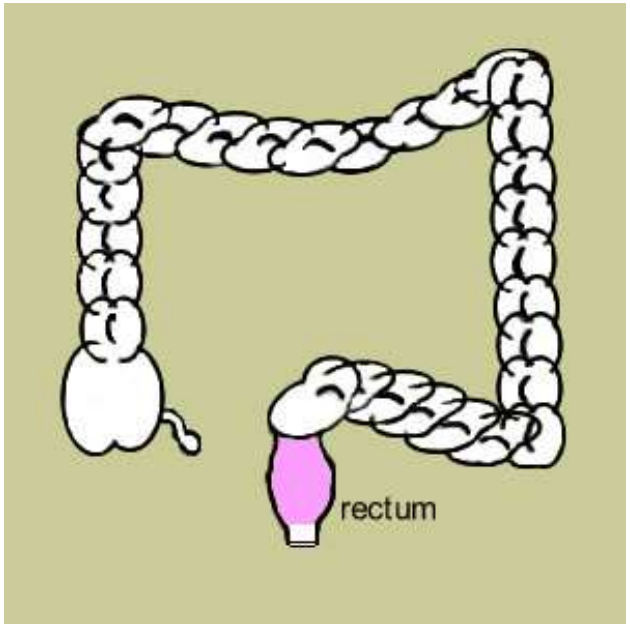
19. LARGE INTESTINE (COLON)

- Reabsorb water and compact material into feces
- Absorb vitamins produced by bacteria (K, B12)
- Store fecal matter prior to defecation



20. RECTUM

- Last portion of the digestive tract
- Terminates at the anal canal
- Internal and external anal sphincters
- Stores feces prior to elimination



21. ANUS

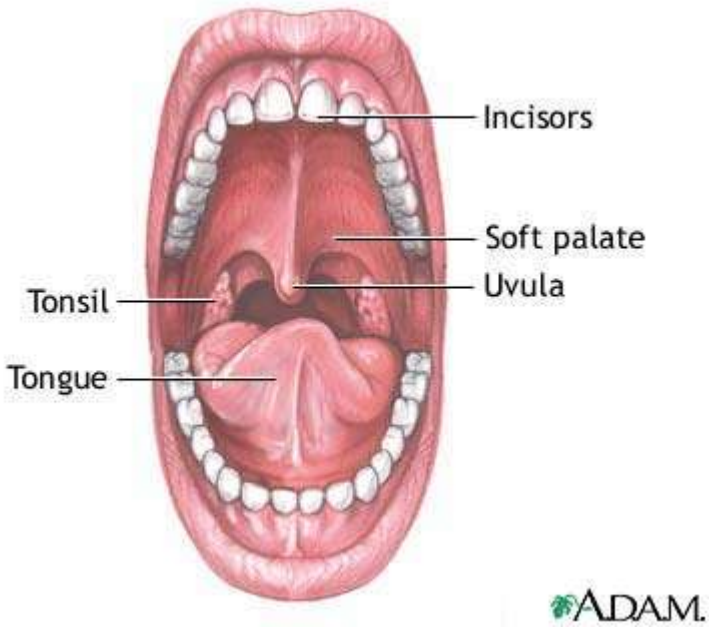
- Holds rectum closed and opens to allow elimination

DIGESTION

Basic Overview of Target Areas

MOUTH

- Chewing and swallowing with little digestion
- Carbohydrate digestion begins

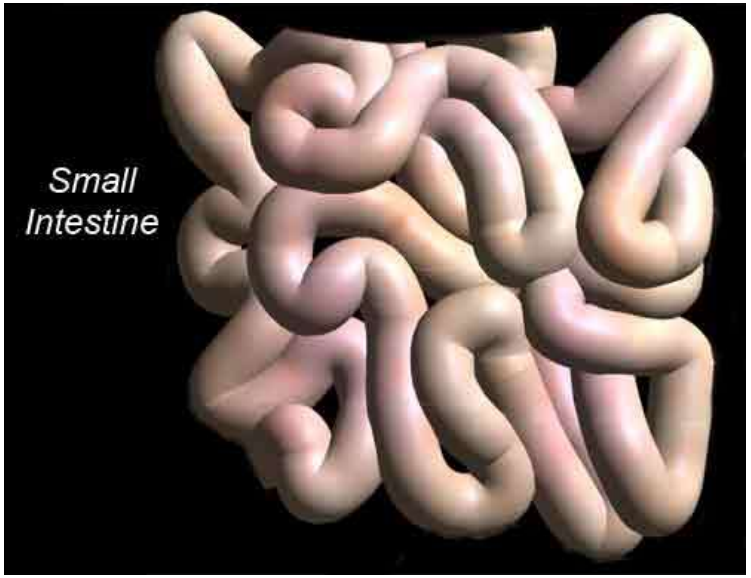


STOMACH

- Collecting and churning with some digestion
- Carb digestion continues
- Proteins begin to digest
- Fat separates from water

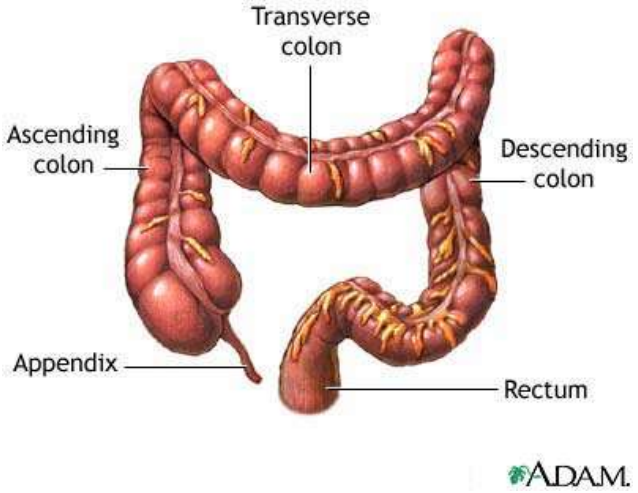
SMALL INTESTINE

- Digesting and absorbing
- Sugars begin to be absorbed
- Fat emulsified – broken down – absorbed
- Protein – broken down and absorbed
- Vitamins and minerals – absorbed as is



LARGE INTESTINE

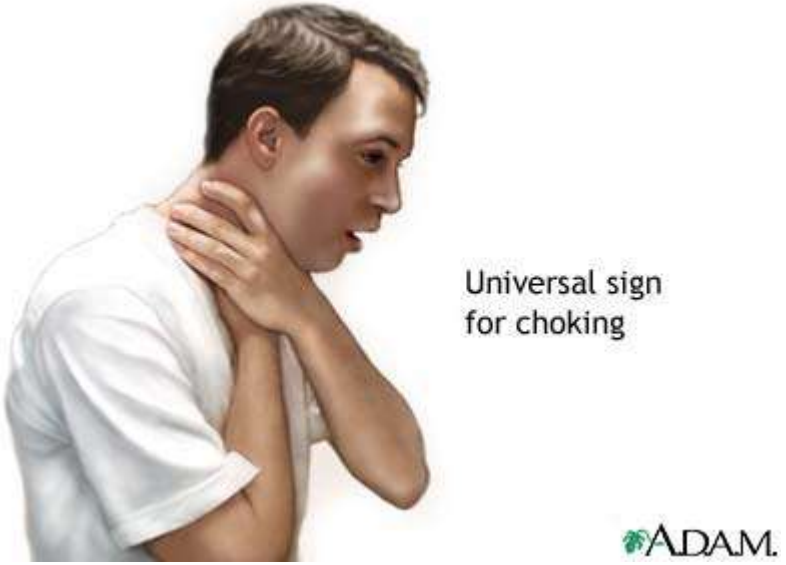
- Reabsorbing and eliminating
- Fluid and some minerals are absorbed
- Most fibres not digested – push through digestive tract
- Excreted as feces
- Some fat and cholesterol bind to fibre and are also excreted



COMMON DIGESTIVE PROBLEMS

CHOKING

- When a piece of food slips into the trachea and becomes lodged



VOMITING

- Waves of peristalsis in the reverse direction
- ‘reverse peristalsis’
- Contents of stomach are propelled up through esophagus to mouth
- Adaptive mechanisms to rid itself of something irritating
- If severe and long enough – extend beyond the stomach and carry contents of the duodenum with its green bile up the esophagus – very acidic

DIARRHEA

- Frequent, loose watery stools
- Intestinal contents have moved too quickly through intestines for fluid absorption to take place
- Causes: food, medications, stress, etc.

- Colitis: refers to an inflammation of the colon and is often used to describe an inflammation of the large intestine
- Symptoms of colitis may include: abdominal pain, loss of appetite, fatgue, diarrhea, cramping, urgency,and bloating.

- Irritable bowel syndrome: characterized most commonly by cramping, abdominal pain, bloating, constipation, and diarrhea.
- Normal motility, or movement, may not be present in the colon of a person who has IBS. It can be spasmodic or can even stop working temporarily. Spasms are sudden strong muscle contractions that come and go.

CONSTIPATION

- Pass stools that are difficult or painful to expel, or reduced frequency of bowel movements
- Some causes: too busy (water removed), lack of physical activity, lack of fibre
- Fibre helps to prevent constipation
- Diverticulosis: intestinal walls develop bulges in weakened areas – bulging pockets entrap feces and then become painfully infected and inflamed
- Laxatives and enemas are unnecessary

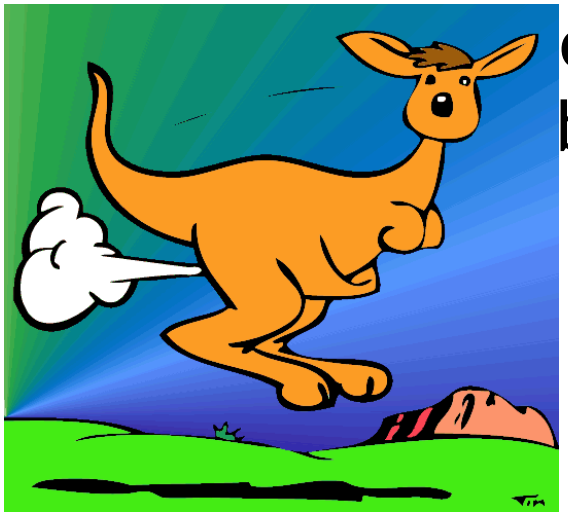
BELCHING & GAS

- **Belching:** results from swallowing air (eating slowly can help prevent that)

- Carbonation and chewing gum can exacerbate the problem

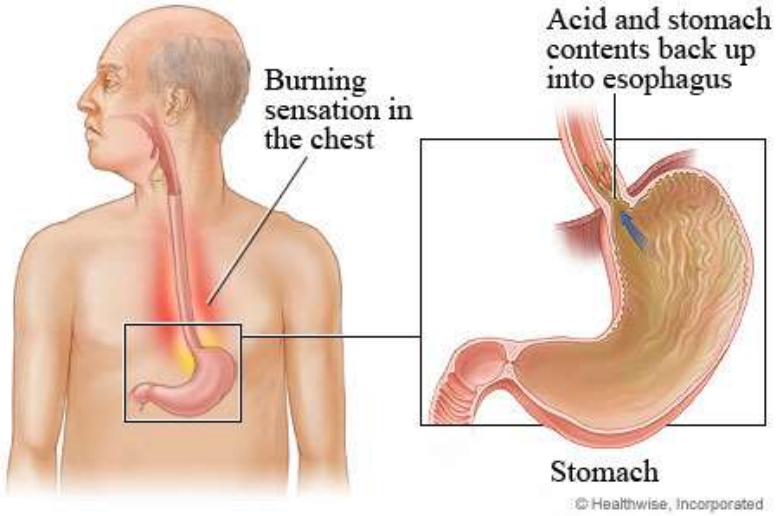
FLATULENCE/GAS

- **Gas (flatulence):** is the expulsion through the rectum of a mixture of gases that are by-products of the digestion process
- Flatus (gas) is brought to the rectum by the same peristaltic process which causes feces to descend from the large intestine. The noises commonly associated with flatulence are caused by the vibration of the anal sphincter, and occasionally by the closed buttocks



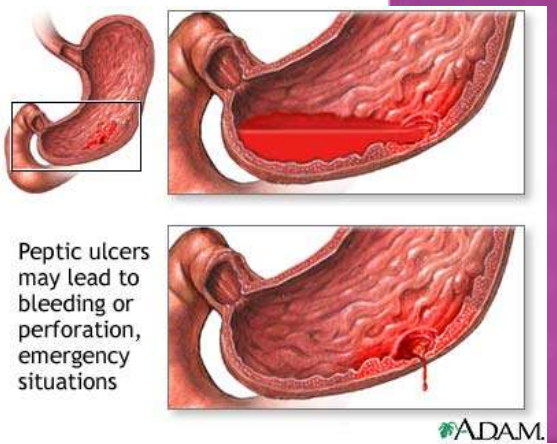
HEARTBURN (GASTROESOPHAGEAL REFLUX)

- Painful sensation a person feels behind the breastbone when the lower espophageal sphincter allows the stomach contents to reflux into the esophagus
- Causes: eat or drink too much, tight clothing, food intolerances



ULCERS

- Erosion of the top layer of cells from an area (stomach or duodenum)
- Erosion leaves underlying layers of cells unprotected and exposed to gastric juices
- Sensitivities, disease promoting diets, infection, excessive gastric acid secretion, and stress can be causes
- Burning or gnawing feeling in the stomach area lasting between 30 minutes and 3 hours commonly accompanies ulcers.
- Pain is usually caused by the ulcer but it aggravated by the stomach acid when it into contact with the ulcerated area.



DIGESTIVE SYSTEM

- http://health.howstuffworks.com/human-body/systems/digestive/adam-200142.htm