# Lecture 18 Digestion System

## §1 Digestion: A Closer Look

### 1. The four stages of food processing

1° Ingestion: another word for eating

2° Digestion: the breakdown of food into molecules small enough for the body to absorb.

3° Absorption: the takeup of the small nutrient molecules by cells lining the digestive tract.

4° Elimination: the disposal of undigested food materials.

### 2. The importance of the dismantling of food molecules

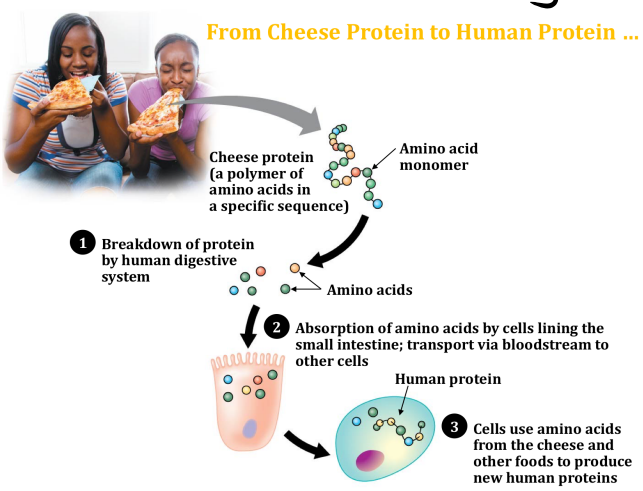
1° food molecules are too large to cross the membranes of animal cells.

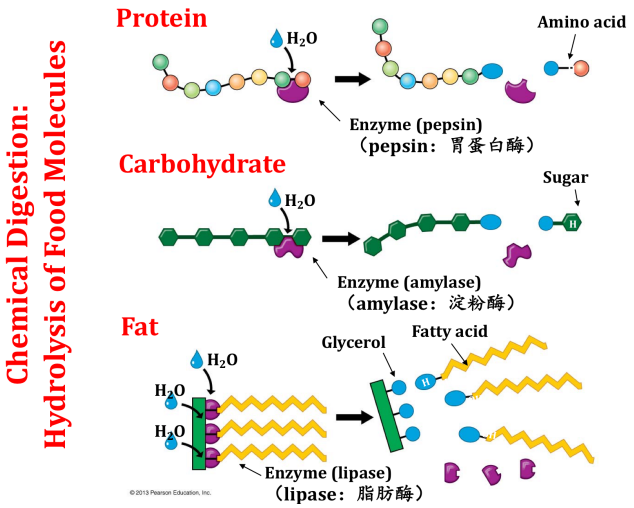
2° food molecules are different from the molecules that make up an animal's body.

### 3. Two kinds of digestions

1° Machanical digestion (like chewing)

2° Chemical digestion: the hydrolysis of food components by digestive enzymes.



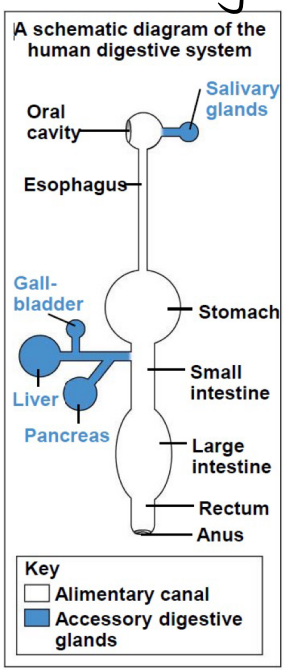
## 4. Human digestive system

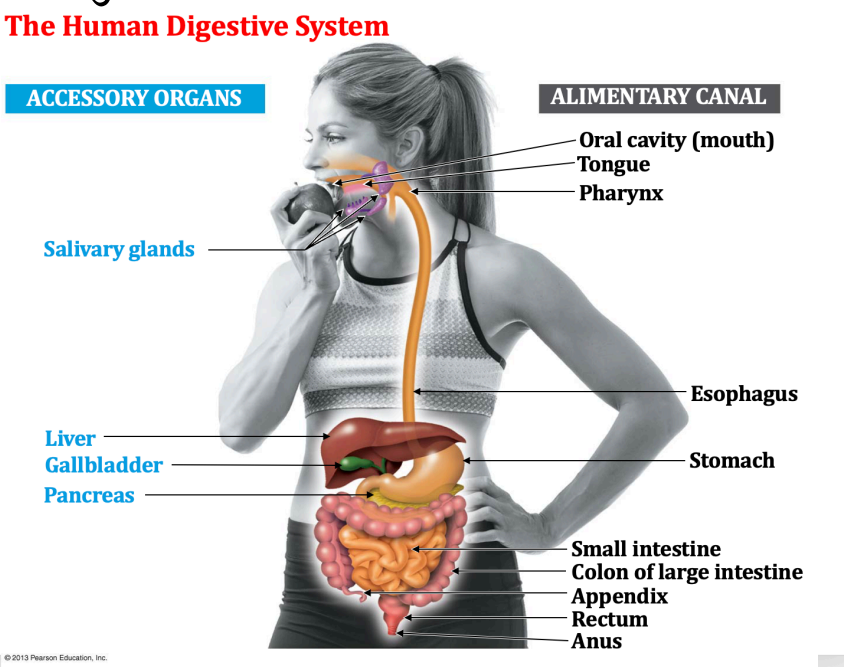
1° Components

① a digestive tube (消化道), the alimentary canal (or gut)

② accessory organs that secrete digestive enzymes.

2° Human digestive system




# §2 Mouth

## 1. The Mouth (oral cavity (口腔))

1° Functions

① ingestion

② the preliminary (初步的) steps of digestion

2° Chemical digestion begins in the mouth with the secretion of saliva (唾液) from salivary glands (唾液腺)

Saliva moistens chewed food to form a bolus for easy swallowing.

## 2. The muscular tongue (舌)

1° tastes, speaks, chews

2° shapes food into a ball

3° pushes the food to the back of the month for swallowing.

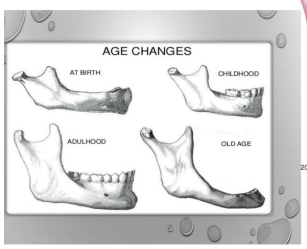
### 3. Teeth

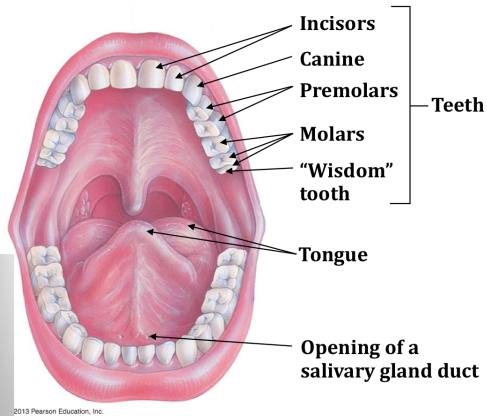
1° incisors (切牙,门牙): cutting

2° canine (犬牙): tearing

3° premolar (前磨牙) & molar (磨牙): grinding

Canine tooth




## §3 Pharynx

### 1. The pharynx (咽)

1° connects the mouth to the esophagus (食道)

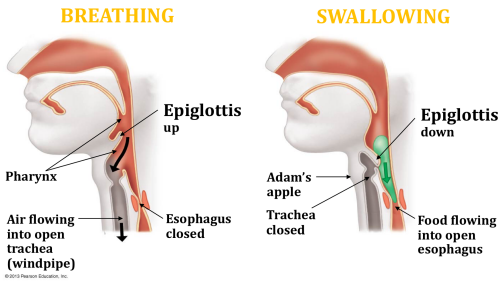
2° opens to the trachea (气管), which leads to the lungs.

### 2. A reflection during swallowing

1° moves the opening of the trachea upward

2° tips the epiglottis (会厌) to close the trachea entrance

The Epiglottis controls whether the pharynx is open to the lungs (left) or the stomach (right)



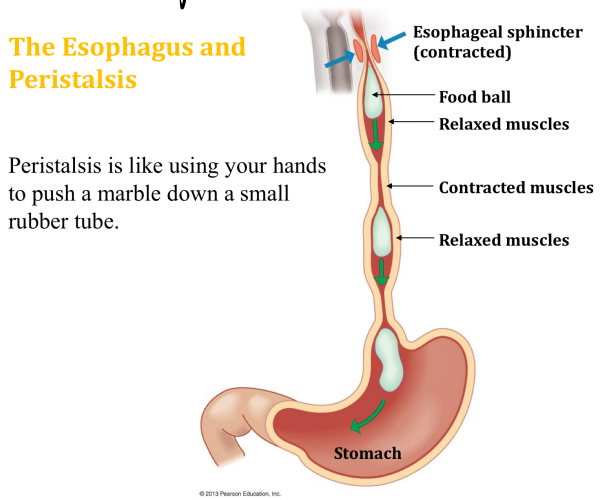
# §4 Esophagus

## 1. The esophagus (食道)

1° is a muscular tube

2° connects the pharynx to the stomach

3° moves food down by peristalsis (蠕动) (alternating (交替的) waves of muscular contraction and relaxation)




4° The muscles of different parts of esophagus are different.

Esophagus ← skeletal muscle
mixture of skeletal and smooth muscles
smooth muscle

# §5 Stomach

## 1. The stomach (胃)

1° can store food for several hours

2° churns (搅拌) food into a thick soup called chyme (食糜)

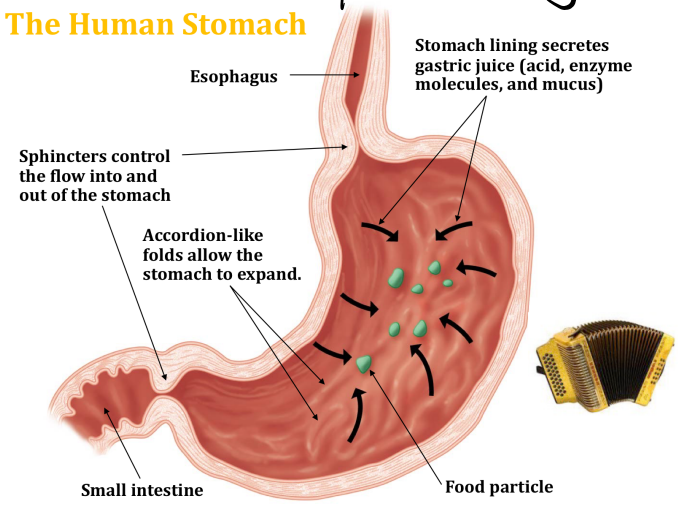
## 2. Gastric juice (胃液)

Fluid in the stomach contains gastric juice, made of

① strong acid (HCl, pH 1~3)

② digestive enzymes (such as pepsin)

③ mucus (黏液) (protective layer)




3. Stomach ailments (胃部疾病)

1° Heartburn (胃灼热): caused by backflow of chyme into the esophagus.

2° Gastric ulcers (胃溃病): ① erosions of stomach lining (胃黏膜)

② often caused by the bacterium Helicobacter pylori (幽门螺杆菌)

## §6 Small Intestine

1. The small intestine (小肠)

1° the longest part of the alimentary canal (6-7m, 2.5cm in diameter)

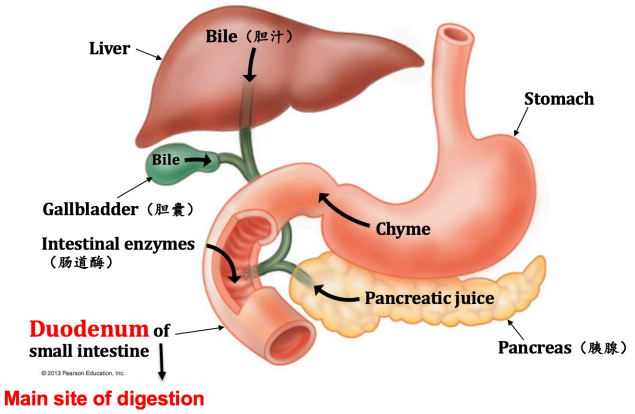
2° the major organ for chemical digestion and absorption of nutrients into the bloodstream.

2. The duodenum (十二指肠)

1° Most chemical digestion occurs in the duodenum, the first part of small intestine.

## The Duodenum（十二指肠）

Length of Duodenum = width of 12 fingers (around 25-38 cm)

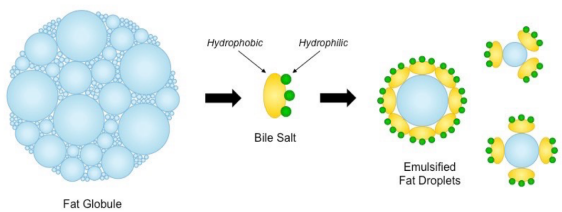



Main site of digestion

2° In duodenum, chyme from the stomach mixes with
① pancreatic juice (胰液)
② bile (胆汁)
③ a digestive juice secreted by the intestinal lining.

3° The pancreas (胰腺) secretes juice that
① neutralizes stomach acids ($NaHCO_3$)
② contains digestive enzymes

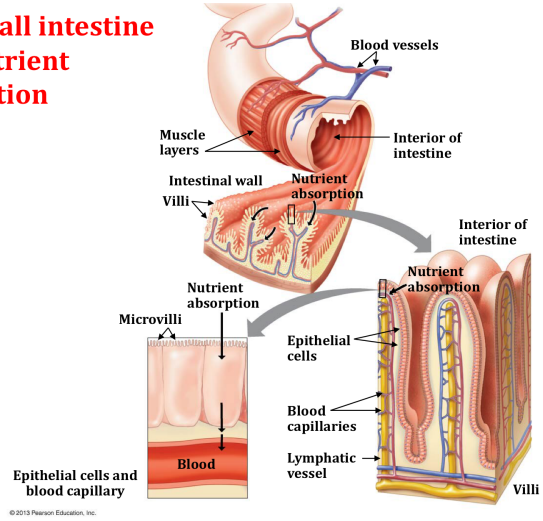
4° Bile
① secreted by liver
② stored in the gallbladder (胆囊)
③ helps digest fat



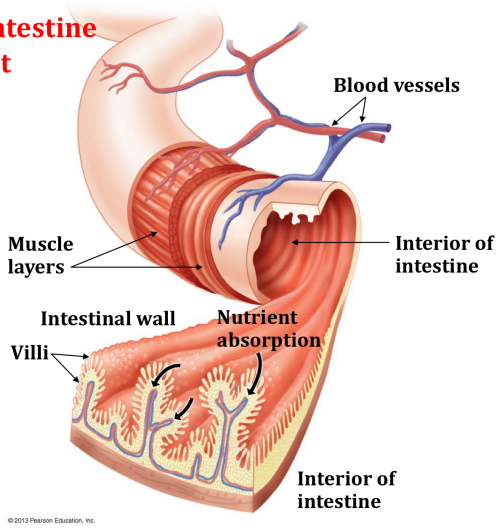

## 3. Absorption of nutrients

Villi (绒毛) and microvilli on the surface of the small intestine
1° increase the surface area
2° increase capacity for absorption of nutrients

The small intestine and nutrient absorption




The small intestine and nutrient absorption

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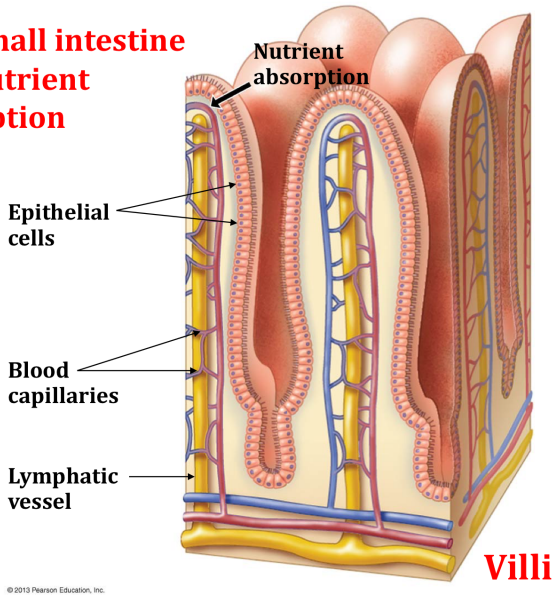
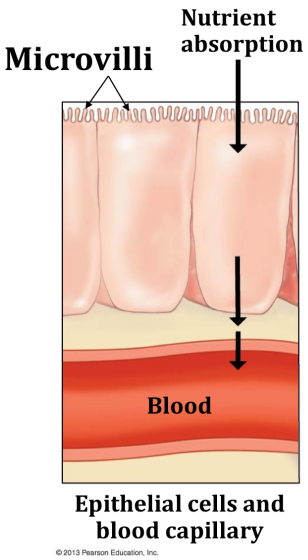



The small intestine and nutrient absorption




# §7 Large Intestine

## 1. The large intestine

1° about 1.5m in length. 5cm in diameter

## 2. Appendix (阑尾)

1° A small, finger-like extension at the junction of the small and large intestine

2° Contains white blood cells that make minor contributions to the immune system.

3° Appendictis (阑尾炎) is a bacterial infection of the appendix.

## 3. The colon (结肠)

1° forms the main portion of the large intestine

2° absorbs water from the alimentary canal

3° produce feces (排泄物)

4. The rectum (直肠)

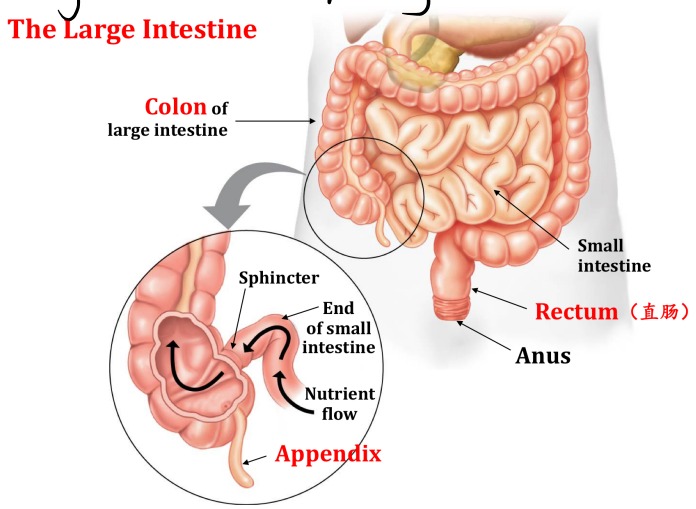
1° forms the last 15 cm (6 inches) of the large intestine

2° stores feces until elimination

5. The anus (肛门)

1° consists of two sphincters (括约肌)

2° regulates the opening of the rectum.




## §8 Food Processing

Food processing takes place along the alimentary canal