

CHAPTER 17: DIGESTIVE SYSTEM

OBJECTIVES

1. Define the term *digestion* and explain its significance.
2. Distinguish between mechanical digestion and chemical digestion.
3. Discuss the five digestive processes that overview the many functions of the digestive system.
4. Distinguish between the alimentary canal and digestive accessory organs.
5. Name two synonyms for the alimentary canal.
6. List the organs that compose the alimentary canal and identify each on a diagram.
7. List the digestive accessory organs and identify each on a diagram.
8. Name the four layers that compose the wall of the alimentary canal from innermost (lining lumen) to outermost.
9. Compare and contrast the four layers of the alimentary canal wall (named above) in terms of their structure, function, and any distinguishing features.
10. Name the layer of the alimentary canal that is synonymous with visceral peritoneum.
11. Explain the significance of mesenteries or peritoneal extensions.
12. Describe how food is moved through the length of the alimentary canal and name the layer responsible for these actions.
13. Define the term *digestive sphincter muscle*, describe the structure of these muscles, name the function of these muscles, and denote the major five locations of digestive sphincter muscles.
14. Name two synonyms for the mouth.
15. Describe the overall structure and function of the mouth.

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OBJECTIVES (continued)

16. Discuss the three portions of the palate, in terms of location and give an overall function for the palate.
17. Name the tissue that composes the tonsils and name the overall function of tonsils.
18. Name the two sets of teeth we possess as humans, discuss the general structure of a tooth, and describe the four types of teeth we possess according to their location and function.
19. Name and locate the three sets of salivary glands in humans, name and describe the secretions from these glands, and name the two types of cells that compose these glands.
20. Discuss the enzyme "salivary amylase", in terms of its digestive function, location, and secretory gland.
21. Explain the process of deglutition.
22. Name the function of the epiglottis.
23. Define the term *peristalsis* and explain its digestive function.
24. Define the term *gastric*.
25. Describe the macroscopic structure of the stomach and locate it on a diagram or torso model.
26. Name the term used to describe the mucosal folds of the stomach lining and explain their significance.
27. Discuss the histology of the stomach wall.
28. Name the four types of cells that compose gastric glands, name the secretion(s) that each cell produce(s) that together compose gastric juice, and give the function of each component of gastric juice.
29. Define the term *chyme*.
30. Name one substance that is absorbed through the gastric mucosa.
31. Name the hormone that regulates the release of gastric juice, explain when it is released, and the results of its action.

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32. Using anatomical terminology, describe the location of the pancreas in the abdominal cavity.
33. Explain how the pancreas aids in digestion by listing the components in pancreatic juice, and naming the action of each of those components.
34. Name the site of pancreatic enzyme action.
35. Name the regulatory hormone responsible for the release of pancreatic juice into the duodenum, and explain when it is activated.
36. Using anatomical terminology, describe the location of the liver in the abdominal cavity.
37. Name the functional unit of the liver and describe its general structure.
38. Define the terms *hepatocyte* and *liver sinusoids*.
39. Describe the many functions of the liver.
40. Name the two blood vessels that supply the liver lobules with blood and track the flow of blood into and out of the liver lobule.
41. Name the components of a portal triad.
42. Explain the significance and location of Kupffer's cell.
43. Define the term *emulsification* and explain its role in digestion.
44. Using anatomical terminology, describe the location of the gallbladder in the abdominal cavity.
45. Name the function of the gallbladder.
46. Name the "common" route that bile travels from either the liver or gallbladder and name the site where bile is deposited.
47. Name the regulatory hormone that is responsible for the release of bile into the duodenum and explain when it is activated.

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48. Name the three parts of the small intestine, and locate each on a diagram or torso model.
49. Discuss the histology of the small intestinal wall.
50. Name the digestive enzymes that are secreted by the mucosa of the small intestines and explain the action of each.
51. Identify the simplest forms of food that are absorbed through the mucosa of the small intestine, name the transport process by which each is absorbed, and describe the fate of each absorbed nutrient.
52. Define the term *lacteal* and explain its significance.
53. Distinguish between the duodenum and the distal small intestine (i.e. jejunum and ileum) in terms of function.
54. Name the four parts of the large intestine and locate each on a diagram or torso model.
55. Name the four parts of the colon and locate each on a diagram or torso model.
56. Identify the major digestive function of the large intestine.
57. Explain how the movements in the large intestine differ from those throughout the rest of the alimentary canal.
58. Define the terms *feces* and *defecation*.
59. Name the sphincter muscles that open to the outside and explain how their action is controlled.
60. List the four major organic macromolecules that we ingest, and explain how each is broken down by various enzymes within the alimentary canal. Be sure to include enzyme names, the location of enzyme action, the breakdown products that result from the enzymatic action, and explain any hormonal control of the breakdown. Finally, explain how and where these simplest food forms are absorbed into the bloodstream or lymphatic system.

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I. INTRODUCTION

A. Definition: **Digestion**

The process by which food substances are changed into forms that can be absorbed through cell membranes.

B. Digestive Processes:

1. Ingestion = taking food into the mouth.
2. Movement of Food = the passage of food along the gastrointestinal (GI) tract.
3. Digestion = the breakdown of food by chemical and mechanical means.
4. Absorption = the passage of digested food from GI tract into bloodstream (and lymph) for distribution to cells.
5. Defecation = the elimination of undigested material from GI tract.

C. **Digestive Organs**

See Fig 17.1, page 657.

1. Two categories:

a. **Alimentary canal (GI Tract)** which extends from mouth to anus.

m Organs include:

1. mouth
2. pharynx
3. esophagus
4. stomach
5. small intestine
6. large intestine

b. **Accessory organs** release secretions into the alimentary canal that help digest food:

m Organs include:

1. salivary glands
2. liver
3. gall bladder
4. pancreas

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II. Characteristics of Alimentary Canal

A. **Wall Structure** = Four Distinct Layers

See Fig 17.3, page 659.

1. **mucosa** =innermost (surrounds lumen);
 - a. composed of epithelium + CT (areolar);
 - b. epithelium extends into lumen = villi increases digestive surface area);
 - c. contains many glands that secrete mucus (lubrication & protection from harmful action of digestive enzymes);
 - d. functions:
 - m protection
 - m secretion
 - m absorption (of nutrients).

2. **submucosa** = beneath mucosa;
 - a. composed of areolar CT, blood vessels, lymph vessels, and nerves;
 - b. functions:
 - m nourishment of mucosa;
 - m carrying absorbed nutrients away.

3. **muscularis** =2 layers of muscle
 - a. circular muscle layer around submucosa;
 - b. longitudinal layer around circular layer;
 - c. function: movements of food through canal (mixing & peristalsis).

4. **serosa** =outermost layer;
 - a. visceral peritoneum;
 - b. functions:
 - m lubrication
 - m free movement of canal in abdominal cavity

 - c. Intestinal peritoneal extensions = mesenteries.
 - m suspend the length of the intestine within abdominal cavity.

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II. Characteristics of Alimentary Canal (continued)

B. Movements of food through Alimentary Canal

See Figure 17.4, page 660.

1. Mixing:

- a. food + digestive juices + mucus
- b. circular muscle layer

2. Peristalsis:

- a. accomplished by movements of longitudinal muscle layer;
- b. propelling action;
- c. As food passes, one section of tube relaxes, opening next section & food moves on.

C. Sphincter Muscles play an important role in movements throughout the GI tract also.

1. Definition: Sphincter = a strong circular muscle which prevents regurgitation of food.
2. Locations: between (regions) organs of digestive tract.
 - a. esophagus and stomach
m gastroesophageal sphincter;
 - b. stomach and small intestine
m pyloric sphincter;
 - c. small and large intestine
m ileocecal valve;
 - d. large intestine to outside
m internal anal sphincter and
m external anal sphincter.

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III. Organs of the Digestive System

A. **The Mouth** (oral/buccal cavity):

See Fig 17.5, page 675 and Fig 17.7, page 661.

1. adapted to receive food and start digestion by chewing & mixing with saliva;
2. surrounded by cheeks, lips, tongue and palate:
 - a. **palate = roof of mouth**
 - m anterior portion = hard palate;
 - m posterior portion = soft palate;
 - m extension of soft palate = uvula.
 - m tonsils:
 1. **Palatine tonsils** = masses of lymphatic tissue lateral to palate;
 2. Pharyngeal tonsils = adenoids; lymphatic tissue on posterior pharynx
 3. Tonsillitis = inflammation of palatine tonsils
3. composed of **2 chambers**:
 - a. oral cavity proper = chamber that extends from teeth/gums to pharynx;
 - b. vestibule = narrow space between teeth, cheeks and lips
4. filled with **teeth**:
 - a. two sets of dentitions: See Fig 17.8 and Fig 17.9 page 662.
 - m deciduous teeth
 1. number 20,
 2. erupt from 6 - 32 months,
 3. lost between 6 - 12 years.
 - m permanent (secondary) teeth
 1. number 32,
 2. erupt from 6 yrs - adulthood.
 - b. function: to break food into smaller pieces.
 - m increasing surface area of food;
 - m increasing effectiveness of digestive enzymes.

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III A. 4. Oral Cavity/ **Teeth** (continued)

c. **4 types** with different functions:

See Fig 17.9, page 662.

m **incisors** = front teeth;

1. break food into bite-size pieces;

m **cuspid**s = canine (eye) teeth;

1. grasp and tear food;

m **bicuspid**s = grinding food particles;

m **molars** = grinding food particles

d. **Tooth Structure:**

See Fig 17.10, page 663.

m **crown** = exposed area of tooth;

m **root** = area below gum (gingiva);

m **enamel** = covering on crown; Ca⁺ salts; hardest substance in body;

m **dentin** = bulk of tooth.

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III. A. Oral Cavity (continued)

5. **Salivary Glands** secrete saliva.

See Fig 17.11, page 665.

a. digestive functions:

m lubrication,

m bind food together,

m begin digestion of carbohydrates.

1. **Enzyme = salivary amylase;**

2. breaks polysaccharides into disaccharides;

a. starch ----> disaccharides.

b. **three types** of salivary glands:

m **parotid** = largest; lies over masseter,

m **submandibular** = floor of mouth; lateral,

m **sublingual** = floor of mouth, medial.

c. Each salivary gland is composed of **2 types of cells:**

See Fig 17.12, page 666.

m **mucous cells** secrete mucus;

m **serous cells** secrete watery substance containing the enzyme salivary amylase.

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III. Digestive Organs (continued)

B. Pharynx: See Fig 17.14, page 668.

1. throat;
2. passageway of food into esophagus;
3. Swallowing mechanism (**deglutition**):
 - a. Chew food & mix with saliva into **bolus** at back of pharynx;
 - b. Swallowing reflex triggered (involuntary):
 - m epiglottis closes over larynx (no breathing),
 - m muscles in lower pharynx relax,
 - m esophagus opens & food moves in.

C. Esophagus: See Fig 17.15, and Fig 17.16, page 668.

1. passageway for food from pharynx to stomach;
2. location: mediastinum; behind trachea;
3. many mucous glands;
4. movement of food:
 - a. gravity;
 - b. peristaltic waves from esophagus meet **gastro- esophageal sphincter muscle**,
 - c. sphincter muscle relaxes,
 - d. food moves into stomach all at once.

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III. Digestive Organs (continued)

D. **Stomach (Gastric)** See Fig 17.17, page 669.

1. description = J-shaped, pouch-like organ;
2. location = under diaphragm; left side;
3. capacity = 1 liter;
4. **Parts of Stomach:**
 - a. **cardiac** region - around esophagus
 - b. **fundic** region - large ballooned area
 - c. **pyloric** region - near duodenum
 - m The pyloric region narrows into pyloric canal.
 - m The **pyloric sphincter muscle** lies between pylorus & duodenum.
 - d. greater curvature
 - e. lesser curvature
 - f. body
5. **Mucosal Structure**
 - a. Note the macroscopic **rugae** (mucosal folds) in Fig 17.17b, page 669.
 - b. Microscopically, these rugae are formed by:
See Fig 17.19 and Fig 17.20, page 671.
 - m **gastric villi** that project into the lumen which result in the formation of;
 - m **gastric pits** that are located between the gastric villi.
 1. **gastric glands** are located along these gastric pits ;
 - a. **gastric juice** is secreted by these gastric glands.

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III. Digestive Organs (continued)

D. Stomach (Gastric)

6. **Gastric Juice:** See Table 17.5, page 672.
 - a. composed of:
 - m **mucus,**
Function: lubrication, protection of mucosa from digestion;
 - m **digestive enzyme pepsin,**
Function: **protein digestion (into peptides);**
 - m **hydrochloric acid (HCl),**
Functions:
 1. denatures proteins,
 2. kills microbes in food,
 - m **intrinsic factor,**
Function: aids absorption of Vitamin B₁₂.
 - m **gastrin,**
Function: regulatory hormone.
7. **Four types of gastric cells** in Gastric Glands:
See Fig 17.19 & 17.20, page 671.
 - a. **Mucous** cells secrete mucus;
 - b. **Chief** cells secrete pepsin;
 - c. **Parietal** cells secrete HCl & intrinsic factor;
 - d. **G-cells** secrete gastrin.
8. **Regulation of Gastric Secretions: See Fig 17.21, page 673.**
 - a. **Hormone = Gastrin;**
 - b. When stomach fills, the hormone gastrin is released.
 - c. Actions:
 - m increases secretions from gastric glands;
 - m increases mixing action;
 - m contracts gastroesophageal sphincter;
 - m relaxes pyloric sphincter.
9. Gastric Absorption = Minimal (5%)
10. Gastric Movements: See Fig 17.22 & Fig 17.23, page 675.
 - a. mixing of bolus of food + gastric juice = **chyme;**
 - b. Peristaltic waves of stomach push chyme toward pyloric sphincter; it relaxes; food moves into duodenum **a little at a time!!!**

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III. Digestive Organs (continued)

E. **Pancreas** (See Fig 17.24, page 676)

1. Secretes pancreatic juice into a pancreatic duct; pancreatic duct leads to duodenum (small intestine);

2. Location: posterior to stomach; left side;

3. **Function of pancreatic juice:**

Contains four classes of enzymes that break down:

a. Carbohydrates

m (amylase) ---> disaccharides;

b. Fats/Triglycerides

m (lipases) ---> 2 fatty acids + monoglyceride;

c. Proteins

m (proteinases) ---> peptides;

d. Nucleic Acids

m (nucleases) ---> nucleotides.

4. **Regulation of pancreatic secretions: See Fig 17.25, page 677.**

a. **Hormone = Secretin;**

m causes release of pancreatic juice into duodenum;

b. Activation:

m When duodenum fills with acidic chyme,

m secretin is released,

m which stimulates the release of pancreatic juice into duodenum.

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III. Digestive Organs (continued)

F. **Liver (Hepatic)** See Fig 17.26-17.28, pages 678-679.

1. Location: below diaphragm / right side
2. Structure: 2 lobes: Fig 17.28, page 679.
 - a. large right & small left;
 - b. each lobe is made up of:
 - m **Hepatic lobules =functional unit of the liver**
 1. hexagon shaped around a central vein;
 2. See Fig 17.29a, page 679.
3. **Functions:**
 - a. **metabolism** of carbohydrates, lipids & proteins,
 - b. **storage** (glycogen, Vitamin A, B₁₂, D, iron),
 - c. **filtering of blood,**
 - d. **destruction of toxic chemicals,**
 - e. **production/secretion of bile.**

See Table 17.7, page 681 for more specifics on liver functions.

4. **Blood Supply:** See Figure 17.30, page 680.
 - a. from 2 sources:
 - m **hepatic artery** (oxygenated blood);
 - m **hepatic portal vein** (deoxygenated blood filled with newly absorbed nutrients from small intestine).
 - b. blood enters the liver sinusoids where hepatocytes remove the following:
 - m oxygen,
 - m nutrients (stored or used to make new materials),
 - m poisons (detoxified or stored).

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III. Digestive Organs (continued)

F. Liver (Hepatic) continued

4. Blood Supply (continued) : See Fig 17.30, page 680.

c. Blood leaving the liver cells (deoxygenated plus liver secretions) drains into **central veins**, which come together and leave the liver as the **hepatic vein**.

d. **Overall scheme of Liver Blood Flow:**

Hepatic Artery
(Oxygenated Blood)
from aorta)

Hepatic Portal Vein
(Deoxygenated Blood with
newly absorbed nutrients from
Small intestine)

Liver Sinusoids
(Exchange)

Central Vein of Hepatic Lobule

Hepatic Vein

Inferior Vena Cava

5. Liver Phagocytosis:

Kupffer's cells (liver macrophages) See Fig 17.30, page 680.

a. remove and destroy:
m microbes;
m foreign matter.

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III. Digestive Organs (continued)

F. Liver (Hepatic) continued

6. Bile

a. composition:

m **bile salts** (digestive function)

m bile pigments

m cholesterol

m electrolytes

b. function: Emulsification of fat molecules!

m Definition: Emulsification = breaking up of fat globules into small droplets (increases SA and increases effectiveness of lipases).

G. Gall Bladder (See Fig 17.28b, page 679 and Fig 17.31, page 683)

1. Stores bile between meals;

2. Location: underside of liver, connected via cystic duct;

3. Bile can flow to small intestine by either of 2 routes:
the liver or gall bladder (see below);

4. Bile secretion, storage, flow:

From liver:

From Gall Bladder:

Hepatic duct

Cystic Duct

COMMON * BILE DUCT

Duodenum

*Sphincter muscle usually keeps common bile duct closed.

5. Regulation of bile release: See Fig 17.32, page 683.

a. Hormone = **CHOLECYSTOKININ (CCK)**;

b. When small intestine fills with fatty chyme,

m cholecystokinin is released;

m sphincter in common bile duct opens;

m bile is released into duodenum to emulsify fat.

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III. Digestive Organs (continued)

G. Small Intestine (See Fig 17.33, page 685)

1. Parts of Small Intestine:

- a. **duodenum** - nearest stomach,
- b. **jejunum** - mid-region,
- c. **ileum** - near large intestine.

m The distal end of the ileum narrows to form the **ileocecal valve** (sphincter muscle between small & large intestine).

2. Mucosal Structure (See Fig 17.37 & 17.38, page 687)

- a. **intestinal villi** project into lumen (increasing SA);
- b. each villus is composed of simple columnar epithelium (with **microvilli**) and connective tissue with many blood & lymph vessels (**lacteals**);
- c. absorbed nutrients are carried away by blood & lacteals;
- d. intestinal glands are located between villi.

3. Secretions of Small Intestine

- a. **mucus**,
- b. digestive enzymes:

m **peptidases**

* peptides-----> amino acids;

m **sucrase, maltase, lactase**

* disaccharides-->monosaccharides;

m **lipases**

* TG-----> 2 fatty acids + monoglyceride.

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III. Digestive Organs (continued)

G. Small Intestine

4. Absorption in Small Intestine (90% of total)

- a. Intestinal villi (and microvilli) increase absorptive surface area;
- b. Simplest forms of ingested food molecules are absorbed into the intestinal mucosa:
 - m **monosaccharides**
 - 1. by facilitated diffusion;
 - 2. carried away by submucosal blood capillary.
 - m **amino acids**
 - 1. active transport;
 - 2. carried away by blood capillary.
 - m **fatty acids and monoglycerides**
 - 1. by simple diffusion into intestinal mucosa;
 - 2. Once in mucosal cells, the fats are reformed into chylomicrons
 - 3. which are absorbed by **lacteals (lymphatic capillary) and into the lymphatic system.**

Fig 17.44, pg 690.

5. Functions of Small Intestine

- a. Major site of chemical digestion (duodenum);
 - m bile deposition
 - m pancreatic juice deposition
 - m small intestinal digestive enzymes
- b. Secretions
 - m mucus
 - m digestive enzymes
- c. **Major site of ABSORPTION of Nutrients**
 - m about 90% of all;
 - m through the distal mucosa.

6. Movements through Small Intestine

- a. Mixing of chyme + intestinal juices
- b. **Peristaltic waves** push residual chyme toward **ileocecal sphincter**; it relaxes, moving food into large intestine.

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III. Intestinal Organs (continued)

H. Large Intestine

1. Parts of Large Intestine: See Fig 17.45, page 693.
 - a. **cecum** - nearest ileum of small intestine; (appendix is a blind pouch in this region);
 - b. **colon** - majority of length;
 - c. **rectum** - distal region of colon;
 - d. **anal canal** - narrowing of rectum & opening to outside;
2. **Colon is divided into four (4) portions:**
 - a. **ascending colon** - from cecum to liver (right);
 - b. **transverse colon** - runs across top of abdomen;
 - c. **descending colon** - from spleen downward (left);
 - d. **sigmoid colon** - S-shaped portion which becomes rectum.
3. **Functions of Large Intestine:**
 - a. secretion = only mucus,
 - b. **absorption = water & electrolytes,**
 - c. **storage = feces.**
4. Movements in Large Intestine:
 - a. mass movements only 2-3 times a day;
 - b. Peristaltic waves of large intestine move residual chyme toward anal sphincter muscles.
5. Control of Anal Sphincter Muscles:
 - a. both voluntary & involuntary nervous control
6. **Feces:**
 - a. **undigested & unabsorbed material;**
 - b. color due to bile pigments;
 - c. odor due to intestinal bacteria & bacterial products formed in digestion;
 - d. 75% water.
7. **Defecation** = emptying of rectum.

CHAPTER 17: DIGESTIVE SYSTEM SUMMARY TABLE I (keyed on pages 371-376)

NAME OF DIGESTIVE ORGAN			
ALIMENTARY CANAL OR ACCESSORY?			
DESCRIPTION OF STRUCTURE			
SECRETIONS			
DIGESTIVE FUNCTION			
HORMONAL CONTROL OF SECRETIONS?			

CHAPTER 17: DIGESTIVE SYSTEM SUMMARY TABLE I (CONTINUED)

NAME OF DIGESTIVE ORGAN			
ALIMENTARY CANAL OR ACCESSORY?			
DESCRIPTION OF STRUCTURE			
SECRETIONS			
DIGESTIVE FUNCTION			
HORMONAL CONTROL OF SECRETIONS?			

CHAPTER 17: DIGESTIVE SYSTEM SUMMARY TABLE I (CONTINUED)

NAME OF DIGESTIVE ORGAN			
ALIMENTARY CANAL OR ACCESSORY?			
DESCRIPTION OF STRUCTURE			
SECRETIONS			
DIGESTIVE FUNCTION			
HORMONAL CONTROL OF SECRETIONS?			

CHAPTER 17: DIGESTIVE SYSTEM SUMMARY TABLE I (CONTINUED)

NAME OF DIGESTIVE ORGAN	
ALIMENTARY CANAL OR ACCESSORY?	
DESCRIPTION OF STRUCTURE	
SECRETIONS	
DIGESTIVE FUNCTION	
HORMONAL CONTROL OF SECRETIONS?	

CHAPTER 17: DIGESTIVE SYSTEM SUMMARY TABLE II (Keyed on page 377)

MACRO-MOLECULE INGESTED				
SITE OF DIGESTION				
DIGESTIVE ENZYME(S)				
END-PRODUCT(S)				
SITE AND MODE OF ABSORPTION				
ABSORBED INTO BLOOD OR LYMPH				
REGULATION				

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IV. Homeostatic Disorders/Diseases:

- A. Dental Caries (Clinical Application 17.1, page 664)
- B. Hiatal hernia (page 667)
- C. Hypertrophic pyloric stenosis (page 670)
- D. Stomach Aches (Clinical Application 17.2, page 674)
- E. Acute pancreatitis (page 677)
- F. Cystic Fibrosis (page 677)
- G. Hepatitis (Clinical Application 17.3, page 682)
- H. Gallbladder Disease (Clinical Application 17.4, page 684)
- I. Lactose Intolerance (page 688)
- J. Malabsorption (page 691)
- K. Appendicitis (page 692)
- L. Hemorrhoids (693)
- M. Disorders of the Large Intestine (Clinical Application 17.5, pages 696-697)
- N. Peptic Ulcer Disease

V. Innerconnections of the Digestive System

See Page 698.

CHAPTER 17: DIGESTIVE SYSTEM SUMMARY TABLE I: (outline pages 365-368)

NAME OF DIGESTIVE ORGAN	ORAL CAVITY	SALIVARY GLANDS	PHARYNX
ALIMENTARY CANAL OR ACCESSORY?	ALIMENTARY CANAL	ACCESSORY	ALIMENTARY CANAL
DESCRIPTION OF STRUCTURE	SEE OUTLINE	SEE OUTLINE	SEE OUTLINE
SECRETIONS	MUCUS	SALIVA WITH AMYLASE	MUCUS
DIGESTIVE FUNCTION	MECHANICAL	BREAKDOWN OF STARCH TO DISACCHARIDES	NONE
HORMONAL CONTROL OF SECRETIONS?	N/A	N/A	N/A

CHAPTER 17: DIGESTIVE SYSTEM SUMMARY TABLE I:(outline pages 365-368)

NAME OF DIGESTIVE ORGAN	ESOPHAGUS	STOMACH (GASTRIC)	LIVER
ALIMENTARY CANAL OR ACCESSORY?	ALIMENTARY CANAL	ALIMENTARY CANAL	ACCESSORY
DESCRIPTION OF STRUCTURE	SEE OUTLINE	SEE OUTLINE	SEE OUTLINE
SECRETIONS	MUCUS	MUCUS; PEPSIN; HYDROCHLORIC ACID; INTRINSIC FACTOR; GASTRIN	BILE
DIGESTIVE FUNCTION	NONE	PEPSIN BREAKS PROTEINS INTO PEPTIDES; HCl DENATURES THE PROTEINS	EMULSIFICATION OF FATS
HORMONAL CONTROL OF SECRETIONS?	N/A	GASTRIN SECRETED BY G-CELLS PROMOTES RELEASE OF GASTRIC JUICE, ETC.	CHOLCYSYTO-KININ (CCK) OPENS COMMON BILE DUCT WHEN FATTY CHYME FILLS DUODENUM

CHAPTER 17: DIGESTIVE SYSTEM SUMMARY TABLE I: (outline pages 365-368)

NAME OF DIGESTIVE ORGAN	ORAL CAVITY	SALIVARY GLANDS	PHARYNX
ALIMENTARY CANAL OR ACCESSORY?	ALIMENTARY CANAL	ACCESSORY	ALIMENTARY CANAL
DESCRIPTION OF STRUCTURE	SEE OUTLINE	SEE OUTLINE	SEE OUTLINE
SECRETIONS	MUCUS	SALIVA WITH AMYLASE	MUCUS
DIGESTIVE FUNCTION	MECHANICAL	BREAKDOWN OF STARCH TO DISACCHARIDES	NONE
HORMONAL CONTROL OF SECRETIONS?	N/A	N/A	N/A

CHAPTER 17: DIGESTIVE SYSTEM SUMMARY TABLE I:(outline pages 365-368)

NAME OF DIGESTIVE ORGAN	ESOPHAGUS	STOMACH (GASTRIC)	LIVER
ALIMENTARY CANAL OR ACCESSORY?	ALIMENTARY CANAL	ALIMENTARY CANAL	ACCESSORY
DESCRIPTION OF STRUCTURE	SEE OUTLINE	SEE OUTLINE	SEE OUTLINE
SECRETIONS	MUCUS	MUCUS; PEPSIN; HYDROCHLORIC ACID; INTRINSIC FACTOR; GASTRIN	BILE
DIGESTIVE FUNCTION	NONE	PEPSIN BREAKS PROTEINS INTO PEPTIDES; HCl DENATURES THE PROTEINS	EMULSIFICATION OF FATS
HORMONAL CONTROL OF SECRETIONS?	N/A	GASTRIN SECRETED BY G-CELLS PROMOTES RELEASE OF GASTRIC JUICE, ETC.	CHOLCYTOKININ (CCK) OPENS COMMON BILE DUCT WHEN FATTY CHYME FILLS DUODENUM

CHAPTER 17: DIGESTIVE SYSTEM SUMMARY TABLE I: (outline pages 365-368)

NAME OF DIGESTIVE ORGAN	GALL BLADDER	PANCREAS	SMALL INTESTINE
ALIMENTARY CANAL OR ACCESSORY?	ACCESSORY	ACCESSORY	ALIMENTARY CANAL
DESCRIPTION OF STRUCTURE	SEE OUTLINE	SEE OUTLINE	SEE OUTLINE
SECRETIONS	STORED BILE PRODUCED IN LIVER	AMYLASE; PROTEASES (PROTEINASES); LIPASES; NUCLEASES	PEPTIDASES; SUCRASE; MALTASE; LACTASE
DIGESTIVE FUNCTION	EMULSIFICATION OF FATS	AMYLASE: STARCH TO DISACCHS; PROTEASES: PROTEINS TO PEPTIDES; LIPASES: TRIGLYCERIDES TO FATTY ACIDS & MONOGLYCERIDES; NUCLEASES: NUCLEIC ACIDS TO NUCLEOTIDES	PEPTIDASES: PEPTIDES TO AMINO ACIDS; SUCRASE, MALTASE, LACTASE: DISACCHARIDES TO MONOSACCHARIDES
HORMONAL CONTROL OF SECRETIONS?	CCK OPENS COMMON BILE DUCT WHEN FATTY CHYME FILLS DUODENUM	SECRETIN CAUSES PANCREATIC JUICE TO BE DEPOSITED INTO DUODENUM	N/A

CHAPTER 17: DIGESTIVE SYSTEM SUMMARY TABLE I: (outline pages 365-368)

NAME OF DIGESTIVE ORGAN	LARGE INTESTINE
ALIMENTARY CANAL OR ACCESSORY?	ALIMENTARY CANAL
DESCRIPTION OF STRUCTURE	SEE OUTLINE
SECRETIONS	MUCUS
DIGESTIVE FUNCTION	REABSORPTION OF WATER FROM CHYME
HORMONAL CONTROL OF SECRETIONS?	N/A

CHAPTER 17: DIGESTIVE SYSTEM SUMMARY TABLE II:(outline page 369)

MACRO-MOLECULE INGESTED	CARBO-HYDRATES	PROTEINS	FATS (TRI-GLYCERIDES OR TG)	NUCLEIC ACIDS
SITE OF DIGESTION	1.MOUTH; 2.DUODENUM	1.STOMACH; 2.DUODENUM	DUODENUM	DUODENUM
DIGESTIVE ENZYME(S)	1. SALIVARY AMYLASE 2. PANC. AMYLASE, SUCRASE, LACTASE, MALTASE	1.PEPSIN; *HCl 2.PANC. PROTEASES; PEPTIDASES;	LIPASES *BILE	PANCREATIC NUCLEASES
END-PRODUCT(S)	STARCH TO DISACCS; DISACCS TO MONO-SACCS	HCl DENATURES PROTEINS; PROTEINS TO PEPTIDES; PEPTIDES TO AMINO ACIDS	BILE EMULSIFIES TG'S; LIPASES BREAK TG'S INTO FATTY ACIDS & MONOGLY-CERIDES	NUCLEO-TIDES
SITE AND MODE OF ABSORPTION	DISTAL SM. INTESTINE; FACILITATED DIFFUSION	DISTAL SM. INTESTINE; ACTIVE TRANSPORT	DISTAL SM. INTESTINE; SIMPLE DIFFUSION	DISTAL SM. INTESTINE
ABSORBED INTO BLOOD OR LYMPH	BLOOD	BLOOD	LYMPH BY LACTEAL	BLOOD
REGULATION	SECRETIN FOR PANC. AMYLASE	GASTRIN FOR PEPSIN	CCK FOR BILE; SECRETIN FOR PANC. LIPASES	SECRETIN FOR PANC. NUCLEASES