

Chapter 10

NUTRITION II

OVERVIEW: The human digestive system will be the representation of the vertebrate nutrition. Because digestion is centralized in the body, a circulatory system is needed to transport digested food and other substances to the extremities of the body. The digestive and circulatory systems are a marvelous creation. Each individual has the stewardship responsibility to make good nutritional choices.

BLUEPRINT: Read Chapter 10, pages 207-212. Our major emphasis will be upon the human digestive and circulatory systems. However, pages 212-217 emphasize personal stewardship of the body through proper nutritional habits; please skim these pages.

VOCABULARY: You should learn to identify, locate, and describe each of the following structures, and relate each structure to the processes listed below:

<u>Structures:</u>	small intestine	<u>Secretions:</u>	<u>Processes:</u>
exocrine glands (e.g. salivary)	large intestine	saliva (with amylase)	digestion
endocrine glands	villi	pepsin	peristalsis
stomach	arteries/arterioles	bile	secretion
pancreas	veins/venules	lipase	absorption
gall bladder	capillary beds		
	lymph/lymph nodes		

LEARNING GOALS: You can measure your mastery of this assignment by completing the following, remembering to relate your lab experience where possible:

1. Distinguish *physical digestion* from *chemical digestion*. Distinguish *oral, gastric, and intestinal digestion*. In what ways are these very closely related?
2. Use the VOCABULARY above to discuss the digestive process in sequence. See attached Lecture Outline.
3. What is meant by pH? Why is regulation of pH important in digestion? Which part of your digestive tract is most extreme in pH and how is this condition produced?
4. What is the function of villi? How is their structure suggestive of (complementary to) their function?
5. Describe the main parts of the human circulatory system and the role of each. Describe the path of the blood from the heart to the tissues of the body – e.g. working muscles. How is each cell supplied?
6. List two or more aspects of the nutritional process that you can control voluntarily. Two that are under involuntary control. What are the implications for proper stewardship of bodily health?

NETWORK: See “BIO 100 Web Links” Page for Nutrition-related links under Assignment #16, 17.

STUDY SUGGESTION:: Complete your answer to Question #5 (Text, Chapter 10) and answer #6.

REVIEW FOR EXAM II: See “Review Suggestions for Exam I.” Adapt these suggestions to the content of Part II, realizing that the content of Part I applies to "population biology" included in Part II. Adjust the emphasis of your study and your approach in light of your performance on Exam I.

STUDY OUTLINE: Nutrition II (Human Digestion and Circulation)

I. **VERTEBRATE ANIMALS** – Animals with internal skeletal system and vertebral column (backbone); we will consider the Human (*Homo sapiens*) as our representative of this group, biologically speaking.

II. **HUMAN DIGESTION** – two major aspects: **PHYSICAL** and **CHEMICAL**

A. Physical Digestion:

1. Oral
 - a. Teeth –
 - b. Salivary Glands are **E**_____ Glands – i.e. they secrete through ducts
 - c. Saliva – its physical role is to _____
2. Gastric (stomach) – physically churning the digesting food via **P**_____
3. Intestinal (colon) – removal of **W**_____ ; contents move by peristalsis to anus

B. Chemical Digestion

1. Exocrine Glands – positioned along the digestive tract; release digestive secretions
 - a. Salivary Glands –
 - b. Liver (with Gallbladder) – secretes **B**_____ which emulsifies **L**_____
 - c. Pancreas –
 - d. Stomach (Lining) –
2. pH Scale – expression of the acidity (below pH 7, neutral) and alkalinity (above pH 7)
3. Enzymes, location, and pH

Enzyme	Location	Food Substrate	pH Optimum
AMYLASE	ORAL		
PEPSIN	GASTRIC		
LIPASE			
AMYLASE			

C. Uptake (assimilation) of Digested Food:

1. Small Intestine
2. Villi (with microvilli)

III. Transport in Vertebrates -- features the following parts:

- a. Pumping Organ and Vessels (arteries and veins)
- b. Blood – a liquid (plasma) containing a suspension of cells
- c. Exchange system – to allow substances to be exchanged between blood and tissues
 1. Progression: Artery → arterioles (with sphinctors to control flow) → capillary bed
 2. Capillary Beds
 3. Lymph
 4. Lymph Capillaries

Consider: How does the circulatory system of vertebrates compensate for the fact that, unlike the unicellular organisms such as *Paramecium* which are in continual contact with the outside environment, most vertebrate cells are far from an outside supply of air, water, food, *etc.*?

TAKE-AT-HOME QUIZ #5**Lab Section (Day of Week and Hour – e.g. W-3) = _____**

INSTRUCTIONS: Select the correct choice in response to each question and, in the correspondingly numbered box near the bottom of the quiz, write the UPPER CASE letter of the correct choice. Do NOT score your answers by circling or otherwise making marks on the letters of the individual choices. Otherwise, you may write on the quiz if it helps your thinking process. **You should have this quiz completed and ready to hand in when requested during lecture either on or after the date of the assignment to which this quiz is attached. You may complete the quiz alone or work with others, but be sure you are mentally involved in answering the questions. You must be present on the day the quiz is requested to receive credit.**

1. All of the following are involved in digestion within the small intestine except
 - a. villi
 - b. lipase
 - c. microvilli
 - d. acidic pH
 - e. absorption of digested food into the bloodstream

2. In *Hydra* and planaria, the most specific site of intracellular digestion is the
 - a. gullet
 - b. mouth
 - c. nematocyst
 - d. food vacuole
 - e. gastrovascular cavity

3. Phloem tissue is to the plant as the _____ is (are) to the vertebrate animal.
 - a. heart
 - b. intestines
 - c. blood vessels
 - d. digestive system
 - e. circulatory system

4. Which of the following molecules would you expect to be among those being absorbed into the bloodstream from the intestinal tract?
 - a. fats
 - b. starch
 - c. fatty acids
 - d. protein
 - e. bile

5. Which of the following is a common feature among **hydra, earthworm, and humans**?
 - a. at least two opening to the digestive cavity
 - b. intracellular digestion
 - c. extracellular digestion
 - d. gastrovascular cavity
 - d. stomach

Score Answers Here -->	1.	2.	3.	4.	5.
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