

LECTURE OUTLINE, Chapter 3: The Remarkable Body

I How the human body is put together and organized

The human body is composed of billions of **cells** that need energy, water, _____
_____ and _____.

Cells are organized into **tissues** and tissues are grouped to form _____.

II Body Systems

What is the overall objective of ALL of these body systems (human AND plant)?

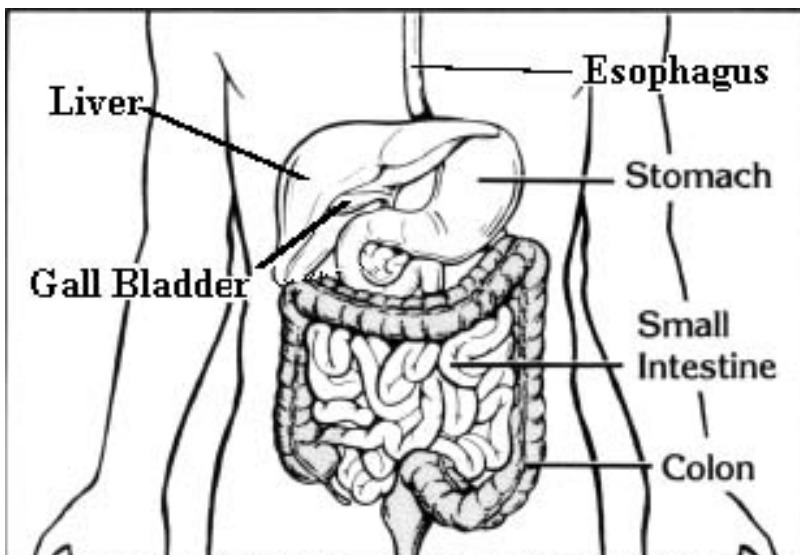
1. Communication Systems (*Hormonal* and *Nervous* Systems)

Hormones are chemical messengers secreted by one part of the body into _____ to tell another group of cells to do something.

2. System for **Digestion and Absorption** (p. ___ in text). What is the overall function of this system? _____



Label where the pancreas would be:



3. THE PARTS OF DIGESTION AND ABSORPTION: Mechanical & Chemical

- a. **Mechanical** Aspect of Digestion. Examples: _____, _____, _____,
- b. **Chemicals** that help digestion but do NOT break apart nutrients-
- i. *hydrochloric acid*-
What?

Why?
 - ii. *sodium bicarbonate*-
What?

Why?
 - iii. *bile*-
What?

Why?
- c. **Chemicals** that DO cause nutrients to be broken apart: _____

How do you name the enzyme needed to digest lactose? _____
(examples: _____)

the main chemical reaction during digestion is _____
(the splitting apart of one molecule into 2 with the help of water & _____)
- d. **Absorption**: from SI into **Villi** then into blood or lymph What are villi? Why are there villi?

4. *Circulatory* System

- a. Heart **pumps** blood through arteries, capillaries, and veins carrying oxygen and nutrients to the cells and removing _____ and other wastes.
- b. **Blood** that passes through the **villi** picks up water soluble nutrients like _____, _____, _____ and _____
- c. **Lymph** that passes through the **villi** picks up _____ and _____ and dumps it into the bloodstream near the heart.
- d. **Blood** leaving the digestive system goes to the _____ which can remove, change or _____
- e. Substances the cell needs have now arrived at the **cell**. What happens to them now?

5. *Storage System*

When you eat more than your body needs, what happens to the extra?

- a. Excess sugar and starch can be stored in the liver and muscle as _____.
- b. Excess sugar and starch as well as excess _____ & _____ can be stored as _____

What also has to be in excess for energy-yielding nutrients to get stored as fat?

6. *Excretory Systems*

- a. **Large Intestine** What is excreted?
- b. **Kidneys** What is excreted?
- c. **Lungs** What is excreted? _____

REVIEW:

- 1. Which of these are enzymes? a. insulin b. lactase c. bile
- 2. What is the difference between a hormone and an enzyme?

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DIGESTION- What's The Point?

In order for cells to accomplish the many tasks of daily life, both the plants and the animals whose parts we eat for food must make carbohydrates, proteins and fats. For example, a corn plant photosynthesizes glucose (a carbohydrate) to capture energy for its growth. It next bonds together hundreds of these glucose molecules to make starch so the seeds will have an energy source for sprouting. A cow manufactures proteins that help its muscles work and fats to provide energy for their activities.

A plant or animal's carbohydrates, proteins and fats are different than the ones human cells need to make for daily tasks. Most of these macronutrients from food can't squeeze through the selective openings in the small intestine. These openings are selective to prevent poisons and other foreign chemicals from entering the body.

With the help of enzymes that are made by the body, the digestive system breaks down most carbohydrates, proteins and fats from food into smaller units that can pass into the cells lining the small intestine. The **carbohydrates** (starches and sugars) in food are mostly broken down to **glucose**. **Proteins** in food are broken down to **amino acids**. Most **fats** in food are broken down to **fatty acids**. (These are the parts of fat that can be saturated or unsaturated.). **Vitamins** and **minerals** are not broken down because we need them as they are in their natural state and they are able to pass into the cells lining the small intestine.

After entering into the cells lining the small intestine, the **glucose**, **amino acids** and **fatty acids** can then enter the bloodstream and travel to the cells all over the body where (1) energy can be released from the units or (2) the units can be used for building blocks to make the carbohydrates, proteins and fats that the human body needs. The **vitamins** and **minerals** travel in the blood to the cells all over the body where they are used to (1) help the cells function [like vitamin A which can be used to help eyesight] or used to (2) build something the body needs [like calcium used to help build bones].

How Do the Organs of the Digestive Tract Help Aide with Digestion? Look at *Figure 3-8 "The Digestive System"* to fill out this table.

Digestive Organ	How it Participates in Digestion
Mouth & Salivary Glands	
Esophagus	
Stomach	
Small Intestine	
Large Intestine	
Pancreas	
Liver	
Gallbladder	

Our Ancestor's Diet

Because of all of the new information about nutrition the authors wanted to include, the past few editions of the text have left out a section called “Should We Be Eating the ‘Natural Foods’ of Ancient Diets?” This section (page 88 of the 2000 edition) described how we have “an ancient body in a modern world”. Our body “handles food and physical activity in virtually the same way as [our] ancient ancestors’ bodies did. It goes on to say that “People have farmed the land for 10,000 years or more.” This “may seem like a long time, but try a second comparison. Imagine that all of the 3-million-year history of human existence on earth compressed into the last 24 hours. Then the agricultural (farming) era would have only begun 3 1/2 minutes ago and the industrial era would have begun 4 seconds ago.”

Characteristics of Humans and their Eating:

1. Humans are omnivores (eat foods from plants as well as animals).

Stone Age Advantage: *They could eat whatever was edible, in season and available.*

2. Humans can store extra calories as fat.

Stone Age Advantage: *They could easily store fat to use for energy during times when food was scarce.*

3. Humans get hungry every 4 to 6 hours.

Stone Age Advantage: *Even when they had eaten plenty of food earlier in the day, their hunger made them look for more food. This helped them keep looking for food to store fat so they'd have it for the “lean times”.*

4. Humans really like high fat and sugar foods for energy. They also seek out salt and new foods.

Stone Age Advantage: *They instinctively were attracted to foods dense in calories.*

5. Human beings need exercise to keep muscles strong.

Stone Age Advantage: *The stronger muscles made them even better at getting food and water.*

Researchers have come up with a probable diet for Stone Age people based on fossilized remains and from analyzing the diet of people today who follow a hunter/gatherer type lifestyle.

Intake of Selected Nutrients:

	THE STONE AGE DIET	MODERN DIET
Calories	3,000 kcals	2,000 kcals
Calcium	1,500 mg	800 mg
Vitamin C	400 mg	100 mg
Fiber	45 g	20 g
Protein	2-5X more than now	