

Unit B

Understanding

Animal Body Systems

Lesson 4

Understanding Starch Digestion

by Enzymes

Terms

- Amylase
- Carbohydrates
- Carnivores
- Enzyme
- Herbivores
- Hydrolyzed
- Monosaccharides
- Omnivores
- Polysaccharides
- Substrate

What chemical processes are involved in the breakdown of food in the body?

- Most food for animals is in the form of complex molecules that must be broken down into smaller molecules before being used by the body.
- A. One purpose of food is to supply energy to the body. **Carnivores** are animals that eat the flesh of other animals for a food source. **Herbivores** are animals that feed exclusively on plant life for energy. **Omnivores** are animals, such as humans, that eat both meat and plants.

- **Carnivores – Meat**

- Foxes and Bears



- **Herbivores – Plants**

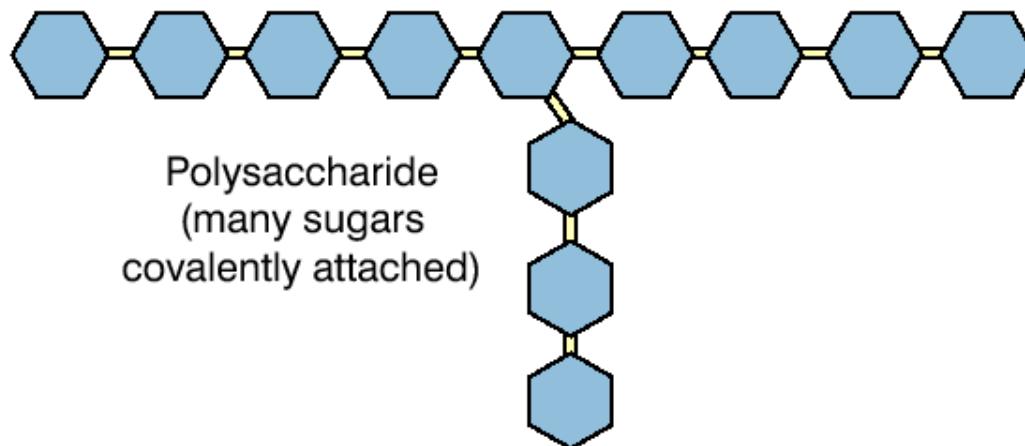
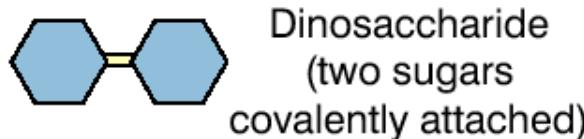
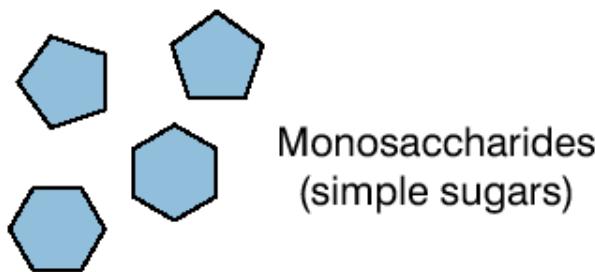
- Horses and Cows

- **Omnivores – Meat and Plants**

- Humans

- B. Energy from food comes in two forms: fats and carbohydrates. **Carbohydrates** are the body's primary source of energy and are made up of carbon, hydrogen, and oxygen atoms. The energy source in carbohydrates, glucose, is stored in polysaccharides called starches. **Polysaccharides** are long chains of sugar units often referred to as complex carbohydrates. **Monosaccharides** are the simplest form of carbohydrates, a one-sugar unit such as glucose.
- C. Because of their structure, starch units are quickly **hydrolyzed**, or broken down, into simpler sugar subunits that are used for energy. Mechanical breakdown by chewing is not enough to transform starch into the usable form of glucose. The body uses other substances to help breakdown starches.

POLYSACCHARIDES AND MONOSACCHARIDES



What is the role of enzymes in helping to digest starches?

- **Enzymes** are complex organic substances which act as catalysts that speed up a chemical reaction in the body without being changed themselves. A **substrate** is the molecule that undergoes a physical change as a result of enzyme interaction.

- A. Enzymes involved in digestion include amylase, sucrase, maltase, and lactase.
Amylase, the enzyme that breaks down starches (polysaccharides) into glucose (monosaccharide) is active in two parts of the animal body, depending on digestive tract.
 - 1. Non-ruminant animals have amylase present in both the saliva and the pancreas.
 - 2. Ruminant animals only have amylase present in the pancreas.

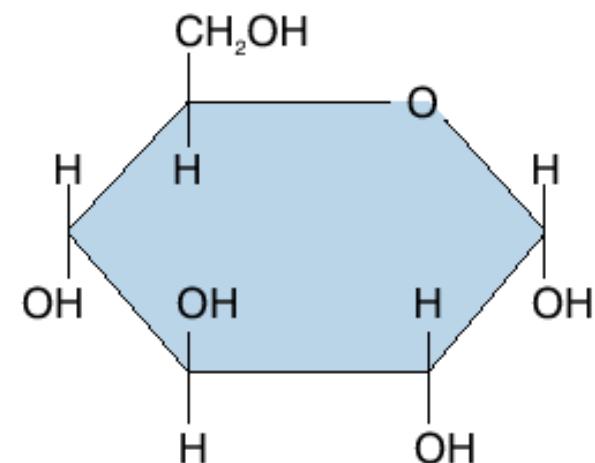
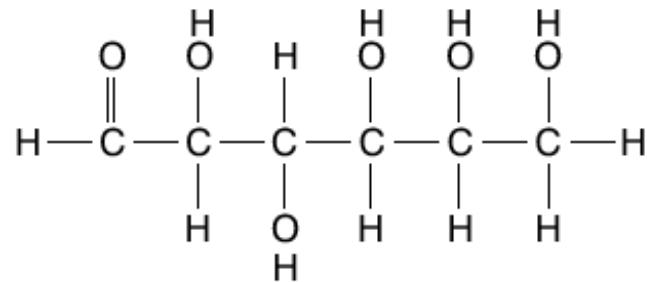
B. Other enzymes and what they break down include:

1. Sucrase, breaking down sucrose into glucose.
2. Maltase, breaking down maltose into glucose.
3. Lactase, breaking down lactose into glucose.

ENZYME ACTION

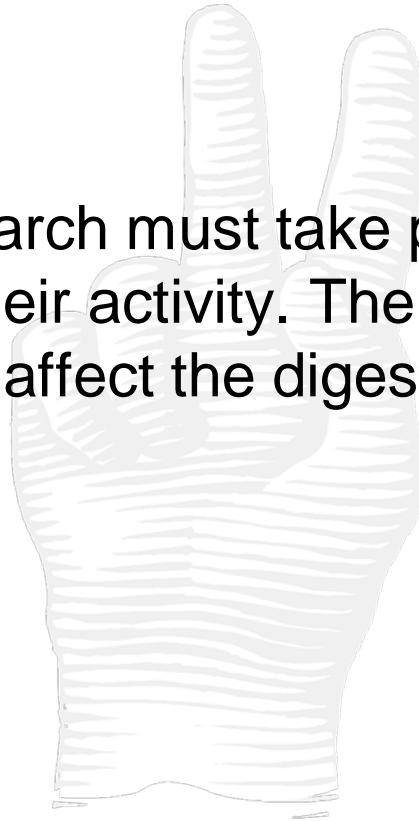
Enzyme Action on Complex Molecules

Enzyme	Breaks Down
Amylase	Amylose
Maltase	Maltose
Sucrase	Sucrose
Lactase	Lactose



What are the conditions necessary for the digestion of starches?

- The digestion of starch must take place in conditions that are favorable for their activity. There are two general conditions that will affect the digestion of starches by enzymes.



What are the conditions necessary for the digestion of starches?

- A. **pH.** Amylase functions best in a pH range near 8.0 (slightly alkaline). Acidic pH conditions (less than 7.0) denature, or disrupt, the enzyme and its activity is halted.
- B. **Temperature.** Enzyme activity is optimal at a temperature of approximately 40° C (104° F). Even a brief exposure to high temperature will destroy the enzyme and halt activity.

CONDITIONS NECESSARY FOR STARCH DIGESTION OF ENZYMES

- ◆ pH
 - Near 8.0
 - Slightly Alkaline

- ◆ Temperature:
 - Near 104°
 - Avoid Extremes