Al Ameed University
College of Nursing
Subject: Nutrition and diet therapy
Stage: Third
Lecture: 3

Carbohydrates

Assist lect. Ehab A. Haider

Learning objectives

At the end of this chapter, the student should be able to:

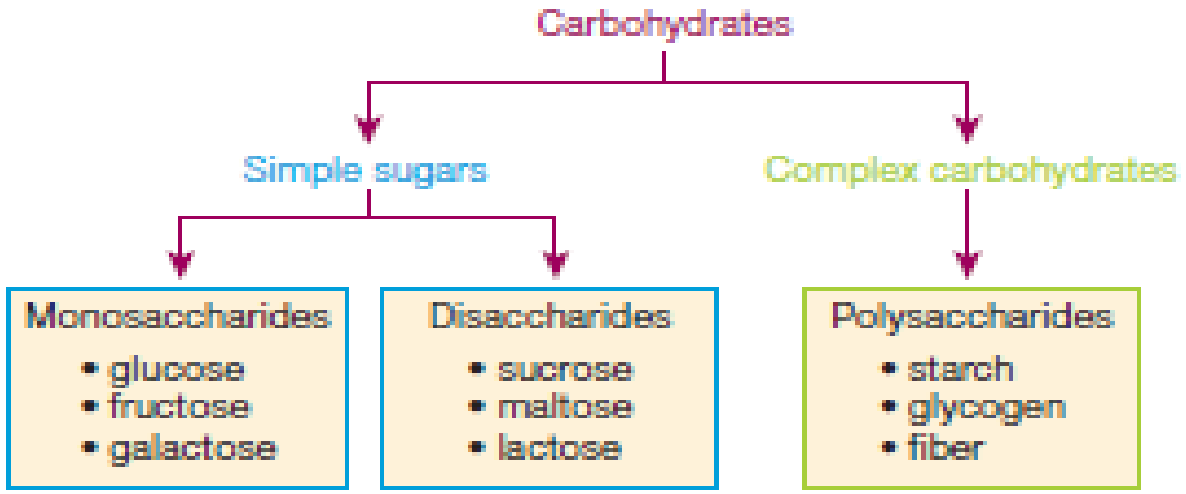
1. Define concepts.
2. Identify the functions of carbohydrates.
3. Describe the dietary sources of carbohydrates and fibers.
4. Compare between soluble and insoluble dietary fibers.

Carbohydrates

- Carbohydrates are organic compounds composed of carbon, hydrogen, and oxygen.
- They play a significant role in providing cells with energy and supporting the normal functioning of the body.
- Carbohydrates provide **4 calories** per gram, at least 50 to 100 g are needed daily.

Classification and Sources

- Carbohydrates are classified according to the **number of saccharides** (sugar units), as follows:



1. Simple carbohydrates are single sugar **(monosaccharides)**such as glucose, fructose and galactose found in fruits, honey and vegetables.

Classification and Sources

2. Double carbohydrates **(disaccharides)**such as sucrose, maltose and lactose. they are found in honey, cereals and milk.
3. Complex carbohydrates **(polysaccharides)** are composed of many single sugars joined together Those important in nutrition are starch, glycogen and dietary fiber (cellulose) These are found in grains legumes, potatoes and other vegetables.

Functions of Carbohydrates

1. Carbohydrates constitute the primary source of energy for the body, it store approximately one–half a day's supply of carbohydrates in the liver and muscles for use as needed.
2. Carbohydrates are needed to oxidize fats completely and for the synthesis of fatty acids and amino acids.
3. Fiber has been shown to protect against heart disease and diabetes by lowering cholesterol and glucose levels.

Carbohydrate Digestion

Table 12.2 Summary showing the sites of digestion and absorption of nutrients

			Small intestine	
	Mouth	**Stomach**	***Digestion***	***Absorption***
Carbohydrate	*Salivary amylase:* digestible starches to disaccharides	*Hydrochloric acid*: denatures and stops action of salivary amylase	*Pancreatic amylase*: digestible starches to disaccharides *Sucrase, maltase, lactase* (in enterocytes): disaccharides to monosaccharides (mainly glucose)	Into blood capillaries of villi

Carbohydrate Digestion

- **ptyalin (salivary amylase):** it’s an enzyme that starts to break starch down into monosaccharides while you are chewing.
- **pancreatic amylase** is secreted in the small intestine which breaks down the rest of the carbohydrates and the monosaccharides are then absorbed into the bloodstream

Carbohydrate Metabolism

- After the body breaks carbohydrates down into glucose, some glucose continues to circulate in the blood to maintain blood levels and provide a readily available source of energy. **Insulin,** a hormone secreted by the pancreas, enhances the transport of glucose into cells.
- **The remainder** is either stored in the liver and muscles as glycogen or converted and stored as fat

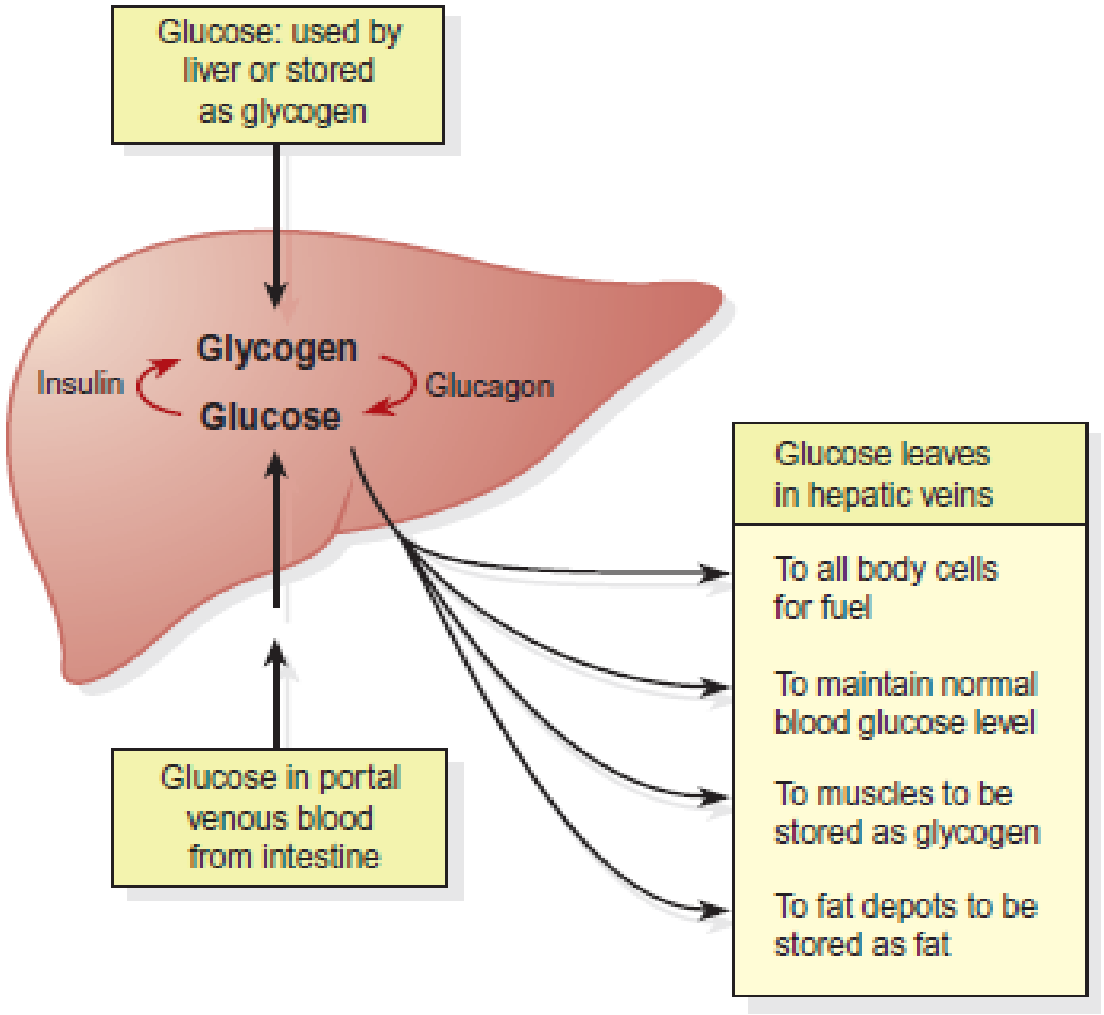


Figure 12.39 Summary of the source, distribution and use of glucose.

Signs of Deficiency and Excess

- **Deficiency of carbohydrates** can result in weight loss and fatigue. A diet seriously deficient in carbohydrates causes extra fat to be metabolized to meet the body's energy needs. Without carbohydrates, fat is incompletely oxidized, producing ketones, an acid by product, which accumulates in the blood and urine causing ketosis (acidosis).

-**Excess carbohydrates** consumption is one of the most common causes of obesity , tooth decay and irritate lining of the stomach.

Dietary fiber

- Dietary fiber is a complex mixture of plant materials that are resistant to breakdown (digestion) by human digestive enzymes.
- **There are two major kinds of dietary fiber:**

1. Insoluble (cellulose, hemicelluloses, and lignin) found in whole-grain products such as whole-wheat bread.

Insoluble fiber means it does not dissolve in water

Dietary fiber

Importance of insoluble fibers:

a. promotes intestine movement by providing bulk for stool formation and thus rapid the passage of the stool through the colon**.**

b. helps to satisfy appetite by creating a full feeling**.**

c. It also cannot be used by intestinal-colon bacteria as a food source, so these beneficial bacteria generally do not grow and produce intestinal gas.

Dietary fiber

2. **Soluble** (gums, pectins) fibers found in fruits, vegetables, dry beans and peas, and some cereals such as oats.

Importance of Soluble fibers:

a. Some studies indicate that soluble fibers may play a role in reducing the level of cholesterol in the blood.

b. It seems to bind up cholesterol allowing it to be eliminated with the stool (10-15%).

Dietary fiber

- **RDIS:** 20-35 grams of fiber every day for adults.
- Eating a variety of foods that contain dietary fiber is the best way to promote health.
- Fibers reduce the absorption of iron and some other minerals, so pregnant women, young children and others at risk of anemia should not eat too.