

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 are classified according to the number of saccharides (sugar units), as follows:
 - a. **Monosaccharides** (simple sugars) include glucose, galactose, and fructose.
 - b. **Disaccharides** (double sugars) include sucrose, lactose, and maltose.
 - c. **Polysaccharides** (complex sugars) include glycogen, cellulose (fiber), and starch.

• Classification of carbohydrates

1. Simple carbohydrates (sugars)

2. Complex carbohydrates (starches and fibers).

Types of Carbohydrates

a. Sugars: Sugars, the simplest of all carbohydrates, are water soluble and are produced naturally by both plants and animals. Sugars may be monosaccharaides (single molecules such as glucose-the most simple sugar- fructose, and galactose) or disaccharides (double molecules).

- Most sugars are produced naturally by plants, especially fruits, sugar cane, and sugar beets. However, other sugars are from an animal source. For example, lactose, a combination of glucose and galactose, is found in animal milk.
- Processed or refined sugars (e.g., table sugar, molasses, and corn syrup) have been extracted and concentrated from natural sources.

b. Starches: Starches (polysaccharides) are the insoluble, non-sweet forms of carbohydrate. They are composed of branched chains of dozens or hundreds of glucose molecules. Like sugars, nearly all starches exist naturally in plants, such as grains and potatoes. Other foods, such as cereals, breads, flour, and puddings, are processed from starches.

C. Fibers: Fibers, a complex carbohydrate derived from plants, supplies roughage, or bulk, to the diet. However, fibers cannot be digested by humans but satisfies the appetite and helps the digestive tract to function effectively and eliminate waste. Fiber is present in the outer layer of grains, bran, and in the skin, seeds, and pulp of many vegetables and fruits.

Natural sources of carbohydrates also supply vital nutrients, such as protein, vitamins, and minerals that are not found in processed foods.

Carbohydrate Metabolism.

- **Major enzymes include:**

- **Ptyalin (salivary amylase), pancreatic amylase, and the disaccharidases-(maltase, sucrase, and lactase)** and are used in carbohydrate digestion.
- The desired end products of carbohydrate digestion are monosaccharides, which are absorbed by the small intestine in a healthy person.
- After the body breaks carbohydrates down into glucose, some glucose continues to circulate in the blood to maintain blood levels and to provide a readily available source of energy.
- The remainder is either used as energy or stored, either as glycogen, which is a large polymer (compound molecule) of glucose by a process called glycogenesis in the liver and skeletal muscles, or as fat (glucose that cannot be stored as glycogen is converted to fat).
- **Insulin**, a hormone secreted by the pancreas, enhances the transport of glucose into cells.

Function of Carbohydrates.

•To some extent every body cell depends on glucose. The cells of the nervous system and the brain almost exclusively use glucose for energy.

- **Dietary fiber**

- Fibers are different than starches in that they cannot be broken down by the digestive system, and therefore they provide little or no energy for the body.
- Fiber has been shown to protect against heart disease and diabetes by lowering cholesterol and glucose levels.
- Fiber has also been shown to help provide a feeling of fullness, and promote proper bowel function.
- Some examples of good sources of fiber are bran cereals, okra, butter beans, kidney beans, navy beans, sweet potatoes.
 - Dietary fiber is a complex mixture of plant materials that are resistant to breakdown (digestion) by the 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.

Importance of insoluble fibers.

- a. promotes normal elimination by providing bulk for stool formation and thus hastening 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.

2. Soluble (gums, pectin's) 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%).

Eating a variety of foods that contain dietary fiber is the best way to promote health.

Breads, cereals, other grain products, fruits, vegetables, meat, poultry, fish and alternates are the sources.

Fibers as therapeutic diet.

Problems/disease	Clinical features	Importance of fiber diet
Irritable bowel syndrome (IBS)	<ul style="list-style-type: none"> altered bowel habits, constipation, diarrhea, or both alternately. bloating, abdominal pain, cramping, and spasm. An attack of IBS can be triggered by emotional. Tension and anxiety, poor dietary habits, and certain medications. 	<ul style="list-style-type: none"> help to relieve the symptoms of irritable bowel syndrome by producing soft bulky stools. helps to normalize the time it takes for the stool to pass through the colon
Colon Polyps/Cancer	According to severity and stage	<ul style="list-style-type: none"> Fibers produce a large bulky stool may act to dilute the carcinogens by moving them through the bowel more quickly.

Diverticulosis

- **These pockets usually cause no problems.**
- **or infection or inflammation of the sac lining the abdomen (peritonitis).**

- **A high-fiber diet may increase the bulk in the stool and thereby reduce the pressure within the colon.**
- **A high-fiber diet reduce the formation of pocket.**

Sources of carbohydrates

Carbohydrates are found in a wide array of both healthy and unhealthy foods—bread, beans, milk, popcorn, potatoes, cookies, spaghetti, soft drinks, corn, and cherry pie. They also come in a variety of forms. The most common and abundant forms are sugars, fibers, and starches.

Dietary carbohydrate and disease

- **Obesity.** The frequency of obesity has increased dramatically in many developed and developing countries.
- **Non-insulin dependent diabetes mellitus (NIDDM)** ...
- **Cardiovascular disease.**
- **Cancer** It's true that too many calories from carbohydrates can lead to weight gain, obesity and increased risk for diseases, including certain types of cancer like **breast and colon cancer**. And carbohydrates with a high glycemic index have been linked to increased lung cancer risk.
- **Gastrointestinal diseases** other than cancer.
- **Dental caries.**

A carbohydrate-deficient diet may cause **headaches, fatigue, weakness, difficulty concentrating, nausea, constipation, bad breath and vitamin and mineral deficiencies.**