

# Therapeutic Nutrition

## LECTURE 2

# Carbohydrates (CHO)

By: Ahmed Sami Salman

# 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.

# Types of carbohydrates

- Sugar.** Sugar is the simplest form of carbohydrate. It occurs naturally in some foods, including fruits, vegetables, milk and milk products. Types of sugar include fruit sugar (fructose), table sugar (sucrose) and milk sugar (lactose). Added sugars can be found in many foods, such as cookies, sugary drinks and candy.
- Starch.** Starch is a complex carbohydrate. This means it is made of many sugar units bonded together. Starch occurs naturally in vegetables, grains, and cooked dry beans and peas.
- Fiber.** Fiber also is a complex carbohydrate. It occurs naturally in fruits, vegetables, whole grains, and cooked dry beans and peas.

# Carbohydrates Metabolism

Ptyalin (salivary amylase), pancreatic amylase, and the disaccharides 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, a large polymer (compound molecule) of glucose, or as fat (glucose that cannot be stored as glycogen is converted to fat), by a process called glycogenesis in the liver and skeletal muscles.

**Insulin:** a hormone secreted by the pancreas, enhances the transport of glucose into cells.

## How many carbs should I eat a day?

- The minimum recommended percentage of energy that comes from carbohydrates is 45%. It means that almost half of your energy should come from carbohydrates.
- The maximum recommended percentage is 65%. If you eat a higher percentage of carbs, you probably lack other macronutrients, such as proteins.

These percentages apply to **calories**. If you want to recalculate the recommended number of kcal in carbs to grams, you should use the following equation:

$$4 \text{ cal} = 1 \text{ g}$$

# Functions of carbohydrates in our body

## 1- Carbohydrates as energy source

Carbohydrates broken down to mainly glucose are the preferred source of energy for our body, as cells in our brain, muscle and all other tissues directly use monosaccharides for their energy needs.

## **2- The glycaemic response and glycaemic index**

When we eat a carbohydrate-containing food, blood glucose level rises and then decreases, a process known as the glycaemic response. It reflects the rate of digestion and absorption of glucose, as well as the effects of insulin in normalizing the blood glucose level.

# What does the GI value mean?

- The glycemic index (GI) is expressed as a ratio comparing the blood glucose increase caused by a test food to that of a reference food (usually glucose) for 2 hours following ingestion.

$$\frac{\text{Area Under the Curve for Test Food}}{\text{Area Under the Curve for Reference Food}} \times 100 = \text{GI}$$

GLYCEMIC INDEX	VALUE
Low GI	0 – 55
Moderate GI	56 – 69
High GI	≥ 70



THE GLYCAEMIC INDEX OF SOME COMMON FOODS (using glucose as standard)

<p>Foods with a very low GI (<math>\leq 40</math>)</p>	<p><b>Raw apple, Soybeans, Kidney beans, Cow's milk Carrots (boiled)</b></p>
<p>Foods with a low GI (41-55)</p>	<p><b>Noodles and pasta, Apple juice, Raw oranges/orange juice, Dates, Raw banana, Strawberry jam, Chocolate</b></p>
<p>Foods with an intermediate GI (56-70)</p>	<p><b>Brown rice, Rolled oats, Soft drinks, Pineapple, Honey</b></p>
<p>Foods with a high GI (<math>&gt; 70</math>)</p>	<p><b>White and whole meal bread, Boiled potato, Mashed potatoes, White rice</b></p>

### **3- Gut function and dietary fiber**

Although our small intestine is unable to digest dietary fiber, fiber helps to ensure good gut function by increasing the physical bulk in the bowel, and thereby stimulating the intestinal transit. Once the indigestible carbohydrates pass into the large intestine, some types of fiber such as gums, pectin's and oligosaccharides are broken down by the gut microflora. This increases the overall mass in the bowel and has a beneficial effect on the make-up of our gut microflora. It also leads to formation of bacterial waste products, like the short-chain fatty acids, which are released in the colon with beneficial effects on our health.

# Glycemic Load (GL)?

- The glycemic load (GL) takes into account the amount of carbohydrate (CHO) in a common serving in addition to its glycemic index (GI)

$$GL = (GI \text{ of CHO} \times \text{grams of CHO per serving}) \div 100$$

- Example: Carrots (peeled, boiled) have a GI of 47 and 5 g CHO per serving

The GL of carrots is:  $(47 \times 5) \div 100 = 2.4$

GLYCEMIC LOAD	VALUE
Low GL	0 – 10
Moderate GL	11 – 19
High GL	$\geq 20$



*Thank You!*

