Food & Nutrition Science

Interdisciplinary Major Paper (MJ)

Fundamental of Human Nutrition

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Dear Students, I welcome you all for our lecture series on **Fundament of Human Nutrition**. In today's lecture, let's make an attempt to know about "Macronutrients"**.**

MACRONUTRIENTS

Nutrients that are needed in large amounts are called ***macronutrients***. There are three classes of macronutrients: carbohydrates, lipids, and proteins. Water is also a macronutrient in the sense that

you require a large amount of it, but unlike the other macronutrients, it does not yield energy.

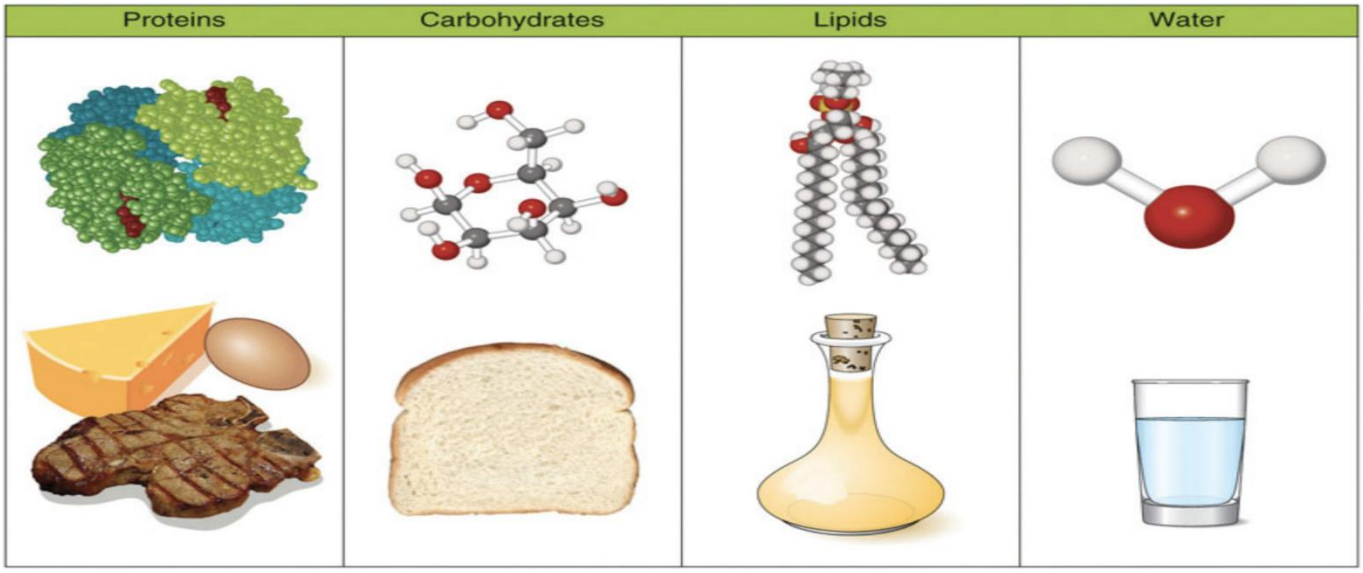

Figure: - Macronutrients include proteins, carbohydrates, lipids, and water. This figure illustrates each nutrient's chemical structure and examples of food sources.

Carbohydrates:

Carbohydrates are molecules composed of carbon, hydrogen, and oxygen. The major food sources of carbohydrates are grains, dairy products, fruits, legumes, and starchy vegetables, like potatoes. Non-starchy vegetables, like carrots, also contain carbohydrates, but in lesser quantities.

Carbohydrates are broadly classified into two groups based on their chemical structure: simple carbohydrates (often called simple sugars) and complex carbohydrates, which include fiber, starch, and glycogen. Carbohydrates are a major fuel source for all cells of the body, and certain cells, like cells of the central nervous system and red blood cells, rely solely on carbohydrates for energy.

Food Sources of Carbohydrates

There are so many sources of carbohydrates that we use as our foods or drinks. Grains like bread, noodles, pasta, crackers, cereals, and rice are common sources of carbohydrates. Fruits like apples, bananas, berries, mangoes, melons, and oranges provide carbohydrates along with essential vitamins and minerals. Dairy products including milk and yogurt are also sources of

carbohydrates in the form of lactose or natural sugar. Legumes such as dried beans, lentils, and peas are rich sources of carbohydrates as well as protein and fiber. Some Sources of Carbohydrates are mentioned below.

Carbohydrate Source	Carbohydrate per 100g	Sugar %	Starches %	Fiber %
Bread	40-60g	5-15%	30-50%	2-5%
Pasta	25-30g	1-5%	20-25%	2-5%
Rice	25-30g	1-5%	20-25%	1-3%
Cereals	60-80g	20-40%	30-50%	5-10%
Crackers	60-70g	5-15%	40-50%	1-5%
Noodles	25-30g	1-5%	20-25%	1-3%
Apples	10-15g	5-10%	5-10%	2-4%
Bananas	20-25g	15-20%	5-10%	2-4%
Berries	10-15g	5-10%	5-10%	3-6%
Mangoes	15-20g	10-15%	5-10%	2-4%
Melons	5-10g	5-10%	0-5%	1-3%
Oranges	10-15g	5-10%	5-10%	2-4%

Carbohydrate Source	Carbohydrate per 100g	Sugar %	Starches %	Fiber %
Milk	4-6g	4-6%	0-2%	0%
Yogurt	4-6g	4-6%	0-2%	0%
Dried beans	20-25g	5-10%	10-15%	5-10%
Lentils	20-25g	5-10%	10-15%	5-10%
Peas	15-20g	5-10%	5-10%	5-10%
Potatoes	15-20g	1-5%	10-15%	1-3%
Sweet potatoes	20-25g	5-10%	10-15%	2-4%
Vegetables	5-10g	1-5%	0-5%	1-3%

Animal and Plant Sources of Carbohydrates

Here are the Animal and Plant Sources of Carbohydrates as mentioned below.

Animal Sources Of Carbohydrates	Plant Sources Of Carbohydrates
• **Milk:** Contains lactose. • **Yogurt:** Yogurt contains lactose. • **Honey:** Consists of simple sugars like glucose and fructose. • **Eggs:** Contain a small amount of glycogen that is found in the egg white.	• **Grains:** Wheat, rice, oats, barley, and other grains. • **Fruits:** Apples, bananas, oranges, berries, and all other fruits. • **Vegetables**: Potatoes, corn, peas, carrots, and other starchy vegetables. • **Legumes:** Beans, lentils, chickpeas, and peas. • **Tubers:** Sweet potatoes and yams.

Animal Sources Of Carbohydrates	Plant Sources Of Carbohydrates
	• **Sugars:** Sugarcane, sugar beets, and maple syrup.

Types of Carbohydrates

There are two different types of Carbohydrates **on the basis of sugar molecules** i.e. Simple Carbohydrates and Complex Carbohydrates. The body can digest the simple carbohydrates so quickly. But, complex carbohydrates are high in fiber an digested slowly by the body.

The Simple Carbohydrates and Complex Carbohydrates can be divided into three more categories as mentioned below.

Sugars

Sugars are also known as **simple carbohydrates.** They are in the most basic form of carbohydrates. They can be added to different foods. They also include the different kinds of sugar that can be found naturally in different fruits, vegetables, and milk.

Starches

They are **complex carbohydrates** and are generally made of lots of simple sugars. The human body needs to break the starch into sugar to produce energy. Starches include the bread, cereal, pasta, etc. They also include some vegetables, like potatoes, peas, and corn.

Fiber

Fibers are a **complex form of carbohydrates.** The human body takes time to break down most fibers. Eating this type of food can help us to feel full. These carbohydrates help us to prevent stomach or intestinal problems, such as constipation.

Based on the chemical structure Simple Carbohydrates and Complex Carbohydrates can be divided into different types as mentioned below.

Monosaccharides	Monosaccharides are single sugar molecules including glucose, fructose, and galactose. They serve as the building blocks of carbohydrates and can be aldoses, ketoses, or their derivatives.
Disaccharides	Disaccharides consist of two monosaccharide units joined together **by a glycosidic bond.** Common examples are sucrose, lactose, and maltose. They are formed through condensation reactions, where water is released during the bonding process.
Polysaccharides	Polysaccharides are the **complex carbohydrates**. They are generally made up of long chains of monosaccharide units. These monosaccharide units linked together **by glycosidic linkages.** They are the primary form of carbohydrates in food and can be broken down into constituent sugars by amylase enzymes.

Carbohydrates Functions

Some major functions of carbohydrates are mentioned below.

- Carbohydrates breakdown the protein molecules and eliminates ketosis.
- It is the primary energy sources that provides energy to the human cell.
- It helps in the regulation of glucose in blood.
- Carbohydrates provide the carbon skeleton to perform the synthesis of some non-essential amino acids.
- They have a role in fat metabolism and also help reduce blood cholesterol levels.

Carbohydrates Examples

Carbohydrates are organic molecules that are **made of carbon, hydrogen, and oxygen.** They are one of the three micronutrients that the human body uses to acquire energy.

- The most common forms of carbohydrates are sugars, fibers, and starches.
- Carbohydrates are found in many foods, including Bread, Beans, Milk, Popcorn, Potatoes, Cookies, Spaghetti, Soft drinks, Corn, Cherry pie.

How Does the Body Process Carbohydrates?

The human digestive system breaks the carbs down into glucose or the blood sugar. The bloodstream absorbs the glucose and uses it source of energy for the body. The pancreas releases insulin to facilitate the uptake of glucose by cells, where it is used for energy or stored for future

use. The amount of carbohydrates we consume can affect our blood sugar. Taking in a lot of carbohydrates can raise our blood sugar levels. High blood sugar is called **hyperglycemia.** It can increase the risk of diabetes. Not eating enough carbs can lead to low blood sugar which is known as **hypoglycemia**.

Difference Between Simple Carbohydrates and Complex Carbohydrates

The major differences between Simple Carbohydrates and Complex Carbohydrates are mentioned below.

Features	**Simple Carbohydrates**	**Complex Carbohydrates**
Chemical Structure	Made of one or two sugar molecules.	Made of three or more sugar molecules bonded together.
Digestion	Quickly digested and absorbed into the bloodstream.	Digested slowly, providing sustained energy release.
Blood Sugar Impact	Spike blood sugar levels quickly.	Raise blood sugar levels gradually and steadily.
Energy	Provide quick bursts of energy.	Provide long-lasting energy without sudden spikes.
Fiber Content	Generally low in fiber.	High in fiber.
Nutrient Density	Often lack essential nutrients.	Rich in vitamins, minerals, and other nutrients.
Health Effects	Associated with weight gain, diabetes, and dental issues.	Associated with better weight management, improved blood sugar control, and reduced risk of chronic diseases.

Features	Simple Carbohydrates	Complex Carbohydrates
Examples	White sugar, honey, fruit juices, candy.	Whole grains, vegetables, legumes, oats, brown rice.

Conclusion - Sources of Carbohydrates

Carbohydrates are the major macronutrient found in various foods. It provides the energy for the body's functions. They are majorly found in two main forms simple and complex carbohydrates. Simple carbohydrates are quick in digestion but can lead to spikes in blood sugar levels. On the other hand, complex carbohydrates digest more slowly and provide more energy with essential nutrients and fiber. For a balanced diet, it is recommended to have more complex carbohydrate sources for improved overall health and energy management.