



Metabolism of Carbohydrate and Its Clinical Significances

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ABOUT THE STUDY

Carbohydrates are a group of naturally occurring carbonyl compounds (aldehydes or ketones) that also contain multiple hydroxyl groups. It may also include those derivatives that produce such compounds upon hydrolysis. They are the most common organic molecules in nature and are also known as sugars. Sweet and water-soluble carbohydrates are also called sugars.

Metabolism of carbohydrate in the human body

Majorly carbohydrates in the human body have five main functions. They are energy production, energy storage, macromolecular construction, protein savings and support for fat metabolism.

Energy production

The main role of carbohydrates is to supply energy to all cells in the body. Many cells prefer glucose as an energy source over other compounds such as fatty acid. Red blood cells can only generate cellular energy from glucose. The brain is also very sensitive to hypoglycemia (except for extreme starvation) because it uses only glucose to produce energy and function. About 70% of the glucose that enters the body by digestion is redistributed into the blood by the liver for use in other tissues. Energy-hungry cells use membrane transport proteins to remove glucose from the blood.

Energy storage

When the body already has enough energy to support its function, excess glucose is stored as glycogen (most of which is stored in the muscles and liver). Glycogen molecules can contain over 50,000 individual glucose units and are highly branched, allowing rapid diffusion of glucose when cell energy needs to be generated.

Polymer structure

Most of the absorbed glucose is used for energy, but some of the glucose is converted to ribose and deoxyribose. These are essential components of important macromolecules such as RNA, DNA and ATP. Glucose is important for protection from oxidative stress and is also used to make the molecule Nicotinamide Adenine Dinucleotide Phosphate (NADP), which is used in many other chemical reactions in the body.

Save protein

In the absence of enough glucose to meet the body's needs, glucose is synthesized from amino acids. Due to the lack of amino acid storage molecules, this process requires the destruction of proteins primarily from muscle tissue.

Lipid metabolism

When blood sugar levels rise, the use of lipids as an energy source is banned. This is because elevated blood sugar stimulates the release of the hormone insulin, which directs cells to use glucose (instead of lipids) for energy. Sufficient glucose levels in the blood also prevent the development of ketosis. Ketosis is a metabolic disorder caused by an increase in ketone bodies in the blood.

Clinical significance

Two things that always affect the body are physical activity and diet. The diet should be nutritionally balanced, including the right type and amount of carbohydrates. Increasing or decreasing carbohydrates beyond the desired amount can affect both physiological and metabolic processes. A simple increase in carbohydrates can contribute to obesity. Obesity is a condition that further increases the risk of additional conditions such as cardiovascular disease. Carbohydrate intake also contributes to non-insulin-dependent diabetes mellitus and the epidemic is expanding. However, foods rich in non-starch polysaccharides and foods with a low glycemic index prevent diabetes. Eating too much sugar can lead to tooth decay.

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Types of carbohydrates

Simple carbohydrates: These carbohydrates are composed of sugars (such as fructose and glucose) that have a simple chemical structure consisting of only one sugar (monosaccharide) or two sugars (disaccharide). Due to their simple chemical structure, simple carbohydrates are easily and quickly used by the body for energy, which often leads to a faster increase in blood sugar and insulin secretion from the pancreas-it has a negative effect on health.

Complex carbohydrates: These carbohydrates have a more complex chemical structure with three or more sugars bound together which is known as oligosaccharides and polysaccharides. Many complex carbohydrate foods contain fiber, vitamins and minerals that take longer to digest. In other words, it has less immediate effect on blood sugar levels and slows down the rise in blood sugar levels. However, other so-called complex carbohydrate foods such as white bread and white potatoes are mostly starchy and have few fiber and other beneficial nutrients.