

## Carbohydrates as a Source of Energy and an Essential Component of Food. The Most Important Role of Carbohydrates in Intestinal Function and the Formation of the Human Microbiome. Excess Carbohydrates as a Consequence of Overweight and Reduced Life Expectancy

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### Abstract

Such nutrient as carbohydrates is an important source of energy substrate for the human body as a whole and for each individual organ system separately. Thus, carbohydrates provide 60% of energy, which is directly related to the quality of human life, that is, this topic tends to be relevant, mainly due to the fact that violation of the amount of carbohydrates in the diet can cause a number of different pathological conditions of chronic genesis.

This study provides information on carbohydrates in general, focusing on the key functions of this nutrient and how much carbohydrate is considered optimal for the human body.

**Keywords:** Nutrition; Diet; Carbohydrates; Fiber; Glucose; Sugar; Human Body

First of all, it is necessary to deal directly with the term and concept of carbohydrates. Thus, carbohydrates are organic compounds of natural origin, including carbon molecules and water molecules. Functions of carbohydrates are represented very widely, but in my opinion, the most important one is the one that provides nutrition to the brain, thus the nervous system works in an optimal mode.

The approach to proper nutrition has recently undergone a lot of discussion, but it is necessary to start from the physiology of the human body, thus determining the necessary amount of each of the nutrients such as proteins, fats and carbohydrates. In the case of a balanced diet, we should also not forget about a proper water regimen.

The physiological importance of the carbohydrate component is precisely in the energy substrate, since the digestion of 1 g of carbohydrate releases 16.7 kJ of energy or 4 kcal, which is directed to the key mechanisms of vital activity of the human body, for example, the muscular apparatus, the central nervous system.

A balanced diet is the correct ratio of carbohydrates to fats and proteins in the diet. It is believed that the daily dietary intake of animal proteins should be at least 50% of the protein content. About 60% of the daily energy needs should be provided by carbohydrates.

A healthy adult should receive 450-500 grams of carbohydrates per day. The main source of carbohydrates in the human body is carbohydrates from food.

In the daily human dietary requirement for carbohydrates should provide 80-85% polysaccharides, 10-15% disaccharides and only about 5% - monosaccharides. Functions of carbohydrates in the human body:

- Energy (the oxidation of 1g of carbohydrates gives 17.2kJ (4.1kcal) of energy.
- Structural.
- Metabolic - compounds of other classes - lipids, amino acids, etc. can be synthesized from carbohydrates.
- Receptor - included in glycoproteins, glycolipids.
- Osmoregulatory.
- Protective - are part of immunoglobulins.

Depending on the function they perform, carbohydrates can be divided into two main groups:

- Carbohydrates with predominantly energy function: glucose, glycogen, starch.
- Carbohydrates with predominantly structural function: glycoproteins, glycolipids, glycosaminoglycans, in plants - fiber.

The importance of fiber in the human body:

- Regulates intestinal peristalsis.
- Participates in the formation of feces.
- Promotes the development of a sense of satiety when eating.
- Creates the necessary conditions for the functioning of normal intestinal microflora.
- Stimulates the excretion of cholesterol with bile.
- Reduces and delays glucose absorption (important for diabetic patients).
- It is a sorbent for toxic substances.

The daily requirement of fiber and pectin substances is about 25 g.

As you know, the intestines, both large and small, contribute to the advancement of food, which is directed from the stomach. During this process, the food lump can move quite slowly, resulting in the formation of a number of toxic substances for the body, thus

the metabolism undergoes negative changes. It is fiber that helps normalize the movement of the lump of food through all parts of the intestine.

In addition, fiber is extremely necessary for those microorganisms, which in their totality are the intestinal microbiota. If there is not enough fiber in the body, there is an increased risk of various infectious pathologies in the intestinal area.

It is important to understand that the quality of the diet directly affects the human microbiota, the actual state of the intestinal mucous layer, thereby determining the likelihood of the development and subsequent course of a number of diseases [4].

Proteins are broken down into amino acids, fats into fatty acids, and all carbohydrates into monosugars. It is important to have a general understanding of each of these.

Monosugar glucose is a fast carbohydrate.

Monosugar fructose is a slow carbohydrate.

Glucose is quickly absorbed into the blood, while fructose is slowly absorbed and gives 25% of the glucose effect (GI).

Lactose is a complex of fructose and glucose, that is, it is a disaccharide compound.

Glucose is responsible for the "fast" mechanism and fructose for the "slow" mechanism. The rapidity of the onset of the glycemic effect will depend on whether the glucose came alone or whether it came with other monosugars.

Because it takes time to detach one or two molecules of other monosaccharides from this glucose. So while they are being split off, the glucose is absorbed slowly, but if pure glucose came in, it is absorbed quickly.

Partial absorption of carbohydrate components takes place already at the stage of the oral cavity, which is largely facilitated by the enzyme amylase, whose source is the salivary glands. Next, the absorption of glucose takes place.

The reserve function of carbohydrates is to form such a substance as glycogen.

Glycogen is nothing but the main form of carbohydrate storage in the human body, which usually takes place in muscles and liver. In the muscles themselves, the amount of glycogen is greater, but its concentration is higher in the liver. This fact is explained by the fact that the muscle mass is greater than the liver mass. The function of muscle glycogen is to provide glucose to muscle fibers, which occurs during muscle contraction. Glycogen from the liver is important during fasting, namely it is necessary to exercise control of blood glucose levels [5].

From the statement considered, we can conclude that the amount of glycogen in an organ such as the liver is significantly reduced during starvation, in the case of a concept such as a caloric deficit, which contributes to weight loss. Muscle glycogen decreases during training activities, specifically in those muscles that are working.

The glycogen reserve in terms of the concept of calories is much smaller than that of triglycerides, so increasing the amount of fatty acids in plasma conditions is a mechanism for the preservation of skeletal muscle glycogen, which takes place in the training process.

It is important to understand that in the course of the next time interval the body uses up almost all the glycogen reserve, so that the fat component becomes the main source of energy, which can be demonstrated by the following data:

Triglycerides in blood plasma and triglycerides stored by muscle tissue (similar to glycogen) are the main sources of energy for muscle fatty acids. That is, subcutaneous fat does not burn directly on the treadmill, it burns the fat that you ate before the workout, or the fat that is already in the muscles, and it gets there from the subcutaneous fat only with a caloric deficit. Also, the more trained a person is, the more their muscles are able to "burn" stores of fat and carbohydrates per workout [2,3].

Glycogen is needed for intensive, aerobic, i.e. oxygen-supplied, physical activity.

The absorption of different types of carbohydrates is different because they have different chemical structures and therefore different rates of absorption. Under the action of different enzymes, complex carbohydrates are broken down into simple and less complex sugars, which have several types.

### Why does the digestion rate of different carbohydrates differ?

The Glycemic Index (GI) is a system for classifying the glycemic potential of carbohydrates in different foods. Essentially, this system looks at how a particular product affects blood glucose levels.

To illustrate: if we eat 50 grams of sugar (50% glucose/ 50% fructose) and 50 grams of glucose and check blood glucose levels after 2 hours, the GI of sugar will be lower than that of pure glucose, because its amount in sugar is lower.

GI is a relative value, and it is measured relative to the effect of glucose on glycemia.

By choosing foods with low GI, we will consciously avoid sudden changes in blood glucose levels, thereby maintaining a constant energy balance in the body.

We can affect glucose levels by choosing foods that are not only low GI, but also low carbohydrate, which is called glycemic load (GH).

The GI of a product takes into account both the GI of the product and the amount of glucose that will enter the bloodstream when it is consumed. For example, it is not uncommon for foods with high GI to have low GH.

A person who sets as a goal to lose excess weight should keep in mind that extra pounds can be removed by reconsidering the choice of food, that is, do not necessarily restrict themselves in food.

It has been found that foods with a lower GI are the ones that promote weight loss, which is achieved because a low GI helps to induce a persistent feeling of satiety. In addition, in the case of high GI there is an increase in insulin, which promotes the migration of glucose to the muscles, liver, fat cells, thereby glucose in the blood is less and less, which causes hunger, and thus a new meal, which can be exactly unnecessary [1].

There are several important aspects to consider that will help you consume carbohydrates in the most appropriate and rational way.

In particular, there is a dependence on the crushing of the product and its GI, i.e., a more crushed product is characterized by a higher GI. There is also a similar dependence in the case of fiber content, i.e., a higher amount of fiber implies a lower GI.

Vegetables are considered an important type of food in the human diet, which is especially important in the process of losing weight. Thus, the GI of raw vegetables is quite low compared to cooked vegetables. This rule should be considered especially in the case of foods with high starch content, such as potatoes, carrots, and beets. This fact is explained by the fact that part of the starch when boiled converts to maltose, which is a disaccharide and is quickly digested. That is, even when boiling vegetables, they should not be heavily boiled, it is better to keep their solid state.

Combining proteins with carbohydrates lowers the GI of a serving. Protein, on the one hand, slows down the absorption of simple sugars into the blood, and on the other hand, the very presence of carbohydrates contributes to the best digestibility of proteins. In addition, vegetables also contain fiber, which is good for the body.

Natural foods, unlike juices, contain fiber and thus lower GI. Moreover, it is advisable to eat fruits and vegetables with the peel, not only because the peel is fiber, but also because most of the vitamins adhere directly to the peel.

A fairly common pathology is diabetes mellitus, which involves an increased content of glucose in the blood, that is, for a number of specific reasons it is not assimilated by the tissues. These reasons determine the type of diabetes mellitus, which can be type 1 diabetes or young adult diabetes and type 2 diabetes, which is most characteristic of older people. Blood glucose levels are affected by hormones, one of which is insulin.

As a rule, there are both low blood glucose levels and high blood glucose levels. A normal blood glucose count is 3.3-5.5 mmol/l. This is on an empty stomach. If such a number as 5.6-6.6 mmol/l is registered, then there is a statement of such a phenomenon as impaired glucose tolerance. This condition cannot be equated with diabetes mellitus, only a correction should be made to eliminate the risk of progression. If the fasting blood glucose content is more than 6.7 mmol/l, then the diagnosis of diabetes mellitus should be made. But there can also be a low blood sugar level, e.g. below 3.3

mmol/l, in which case a condition such as hypoglycemia should be recorded, which also needs urgent correction otherwise a coma may develop.

### Conclusion

Thus, it is necessary to have a competent approach to the issue of carbohydrate intake, it is not necessary to limit their weight loss sharply, it is necessary to calculate the individual requirement, which will certainly help to avoid a number of pathological conditions.

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