Carbohydrates - description, benefits, effects on the body and the best sources

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Abstract. The article discusses the basic properties of carbohydrates and their effects on the human body. A systematic review of modern specialized literature and current scientific data was carried out. The best natural sources of carbohydrates are indicated. The use of carbohydrates in various types of medicine and the effectiveness of their use in various diseases are considered. The potential adverse effects of carbohydrates on the human body under certain medical conditions and diseases are analyzed separately.

Key words: carbohydrates , benefits, harm, beneficial properties, contraindications, sources

Carbohydrates are natural organic substances whose formula contains carbon and water. Carbohydrates are able to provide our body with the energy necessary for its full functioning. Based on their chemical structure, carbohydrates are divided into **simple** and **complex** .

1. Simple carbohydrates include those found in milk; fruits and sweets - mono- and oligosaccharides.
2. Complex carbohydrates are compounds such as starch, glycogen and cellulose. They are found in cereals, corn, potatoes and animal cells.

Carbohydrate-rich foods:

See Appendix 1.

Daily requirement for carbohydrates

In order to feel comfortable, it is necessary that every cell in our body receives its required amount of energy. Without this, the brain will not be able to perform its analytical and coordination functions, and, therefore, will not transmit the appropriate command to the muscles, which will also be useless. In medicine, this disease is called ketosis .

To prevent this, you must include the required amount of carbohydrates in your daily diet. For a person leading an active lifestyle, their daily amount should be at least 125 grams.

If your lifestyle is less active, you can consume less carbohydrates, but their amount should not be lower than 100 grams / day. [1]

The need for carbohydrates increases:

Being the main sources of energy entering the body with food, carbohydrates are primarily used during active mental and physical activity. Consequently, during times of heavy workload, the need for carbohydrates is greatest. The need for carbohydrates increases during pregnancy, as well as during breastfeeding.

The need for carbohydrates decreases:

Low labor productivity and a passive lifestyle reduce the body's energy consumption , and, consequently, the need for carbohydrates. By spending weekends in front of the TV, reading fiction, or doing sedentary work that does not require serious energy expenditure , you can safely reduce the amount of carbohydrates within the maximum permissible limits, without harm to the body.

Digestibility of carbohydrates

As mentioned above, carbohydrates are divided into *simple* and *complex* . According to the degree of digestibility - into **fast-** , **slow-** and **non-digestible** carbohydrates.

The former include carbohydrates such as *glucose, fructose and galactose* . These carbohydrates belong to the class of so-called monosaccharides and are quickly absorbed by the body. Products containing quickly digestible carbohydrates: honey [2], caramel, bananas [3], chocolate, dates [4], etc.

The most important carbohydrate for us is glucose. It is she who is responsible for the energy supply of the body. But if you ask what happens to **fructose** and **galactose** , then don't worry, they don't go to waste. Under the influence of physicochemical reactions taking place in the body, they are again transformed into glucose molecules.

Now, regarding *complex carbohydrates* . They, as mentioned above, are found in animal cells and plant tissues and are usually absorbed slowly. Plant carbohydrates, in turn, are divided into digestible and indigestible . Digestible starch is composed of glucose molecules arranged in a special way so that they take longer to break down.

Cellulose , despite the fact that it also belongs to carbohydrates, does not supply energy to our body, since it is an insoluble part of the plant cell. However, it also takes an active part in the digestion process.

You have probably seen on the shelves of stores, pharmacies, or at distributors of chain companies, drugs that contain **plant fiber** . It is precisely this that is plant cellulose, which acts like a brush, cleaning the walls of our digestive tract from all kinds of contaminants. Glycogen stands apart. Released as needed, it plays the role of a kind of storage of glucose, which is deposited in granular

form in the cytoplasm of liver cells, as well as in muscle tissue. When the next portion of carbohydrates enters the body, some of them are immediately converted into glycogen, so to speak, “for a rainy day.” What has not been transformed into glycogen molecules goes for processing, the purpose of which is to obtain energy.

Beneficial properties of carbohydrates and their effect on the body

Carbohydrates are not only an excellent food source of energy for the body, but are also included in the structure of cell membranes, cleanse the body of toxins (cellulose), and participate in protecting the body from viruses and bacteria, playing an important role in creating strong immunity. Used in various types of production. In the food industry, for example, starch, glucose and pectin are used. Cellulose is used for the production of paper, textiles, and also as a food additive. Alcohols obtained by fermenting carbohydrates are used in medicine and pharmacology.

Which carbohydrates do you prefer?

In the diet, it is necessary to observe the proportion of quickly and slowly digestible carbohydrates. The first ones are good when it is necessary to quickly obtain a certain amount of energy intended to perform a specific job. For example, in order to prepare faster and better for exams. In this case, you can consume a certain amount of quickly digestible carbohydrates (honey, chocolate, candy, etc.). Athletes also consume “fast” carbohydrates during and after performances to quickly restore strength.

If the work may take a long time, then in this case it is better to consume “slow” carbohydrates. Since their splitting requires more time, the release of energy will extend over the entire period of work. If, in this case, you consume quickly digestible carbohydrates, and in the amount necessary to perform long-term work, irreparable things can happen.

Energy will be released quickly and massively. And a large amount of uncontrollable energy is like ball lightning, which can cause irreparable harm to health. Often, the nervous system suffers from such a release of energy, in which a simple short circuit can occur, as in conventional electrical networks. In this case, it begins to malfunction and the person turns into a nervous creature who is not able to perform precise actions involving fine motor skills of the hands.

Dangerous properties of carbohydrates and warnings

Signs of a lack of carbohydrates in the body

Depression, apathy, and loss of strength can be the first signals of a lack of carbohydrates in the body. If nutrition is not normalized by adjusting the diet with the required amount of carbohydrate foods, the condition may worsen. The next stage is the destruction of vital proteins in the body. All this is caused by toxic damage to the brain suffering from a lack of carbohydrates. Doctors call this disease ketosis .

Signs of excess carbohydrates in the body

Hyperactivity , excess weight, body tremors and inability to concentrate may indicate excess carbohydrates in the body. First of all, the nervous system suffers from an excess of carbohydrates.

The second organ suffering from an excess of energy is the pancreas. It is located in the left hypochondrium. The body of the gland is an elongated formation 14-22 cm long and 3-9 cm wide. In addition to the fact that it produces pancreatic juice, rich in enzymes necessary for digestion, it is also involved in carbohydrate metabolism. This occurs thanks to the so-called islets of Langenharts , which cover the entire outer surface of the gland. They produce a substance colloquially called insulin. It is

this pancreatic hormone that determines whether a person will have problems with carbohydrates or not.

Frequent and excessive consumption of foods that increase insulin levels in the blood ("fast" carbohydrates) can cause type II diabetes, hypertension and cardiovascular diseases.

What is the glycemic index?

Today, much attention is paid to the glycemic index of foods. Most often, such data is used by athletes and other people who dream of being healthy and getting slim. **The glycemic index** (GI) is a measure of how much a food raises blood sugar levels. Glucose is taken as the absolute value, with a GI of 100%. Foods with a high GI most often include foods containing simple carbohydrates; complex carbohydrate foods usually have a low GI.

Many of you are aware of a disease called diabetes. For some, fortunately, it has passed, while other people are forced to drink and give themselves insulin injections for many years. This disease is caused by insufficient amounts of the hormone insulin in the body.

What happens when the amount of glucose supplied is higher than the required level? Additional portions of insulin are sent for its processing. But it is necessary to take into account that the islets of Langengarts , responsible for its production, have one unpleasant feature. When the insulin contained in one or another islet rushes to meet a portion of carbohydrates, the islet itself shrinks and no longer produces insulin.

It would seem that other islands should take its place and continue its great mission. But no, as a result of modern ecology, our body has lost the ability to produce new islets. Therefore, to avoid diabetes at the very peak of your life, you should not consume large amounts of quickly digestible carbohydrates. It is better to think about those carbohydrates that will not harm you, and their consumption will bring you a good mood and an active lifestyle for many years.

Carbohydrates in the fight for slimness and beauty

For those who want to stay slim and fit, nutritionists recommend eating slowly digestible carbohydrates, which are found in vegetables, including legumes, some fruits and cereals. These foods take longer to be absorbed by the body and, therefore, the feeling of fullness is maintained for a long time.

As for the energy value of carbohydrates, it is calculated as follows.

Since 1 gram of carbohydrates is capable of producing energy in the amount of 4.1 kilocalories, then with an active lifestyle (daily norm - 125 grams), a person will receive 512.5 kilocalories from consumed carbohydrates. A less active person will need only 410 kilocalories, with a daily carbohydrate intake of 100 grams.

Carbohydrates and health

Below we present a sample list of products that you should pay special attention to. These are slow-digesting carbohydrates that can provide maximum benefits to your health.

In first place we have oatmeal [5], rice [6] and buckwheat porridge [7]. Then come rye and wheat bread made from wholemeal flour. Next, our list continues with peas [8] and beans [9] . And it ends with potatoes and pasta made from durum wheat.

As for “fast” carbohydrates, instead of cakes and pastries, eat one banana, some dates, raisins, or a spoonful of buckwheat or linden honey. This amount will be enough to perform short, but energy-requiring work.

Table 1

Top 100 natural sources _ fat

The number of grams per 100 g of product is indicated [10,11]

No.	Product	g in 100 g
1	Fructose sugar substitute	100
2	Stevia (sweetener) sugar substitute	100
3	Granulated sugar	100
4	Brown sugar	98.1
5	Chewing gum	96.7
6	Dried apples	93.5
7	Fudge	93.2
8	Corn starch	91.3
9	Sucralose sugar substitute	91.2
10	Skittles candy	90.8
eleven	Iris	90.4
12	Puffed rice ready to eat	89.8
13	Saccharin sugar substitute	89.1
14	Aspartame sugar substitute	89.1
15	Dried plum	89.1
16	Dry tapioca	88.7
17	Dried bananas	88.3
18	Arrowroot flour	88.2
19	Unheated corn bran	85.6
20	Dried peach	83.2
21	Potato starch	83.1
22	Dried apricots low water content	82.9
23	Dried cranberries	82.8
24	Corn flour	82.8
25	Honey	82.4
26	Rye bread	82.2
27	Dry glutinous rice	81.7
28	Zephyr (marshmallow)	81.3
29	Dry potato flakes	81.2
thirty	Dry steamed rice	80.9
31	Cinnamon powder	80.6
32	Dry rice noodles	80.2
33	Rice flour	80.1

34	Dry long grain rice	80
35	Dry corn grits	79.9
36	Puffed wheat ready to eat	79.6
37	Dried carrots	79.6
38	Seedless raisins	79.5
39	Dry rice	79.3
40	Dry corn noodles	79.3
41	Pretzels without salt	79.2
42	Dry round grain rice	79.2
43	Onion powder	79.1
44	Caramel popcorn	79.1
45	Dry steamed brown rice	78.7
46	Dried mango	78.6
47	Malted barley flour	78.3
48	Semolina dry semolina	78
49	Popcorn without salt	77.9
50	Salted popcorn	77.8
51	Dry pearl barley	77.7
52	Dry couscous	77.4
53	Dried goji berries	77.1
54	Caramel	77
55	whole grain corn flour	76.9
56	whole grain corn flour	76.9
57	Sorghum flour	76.9
58	Rye flour	76.7
59	Whole grain sorghum flour	76.6
60	White corn flour	76.6
61	Brown rice flour	76.5
62	Agave syrup sugar substitute	76.4
63	All-purpose wheat flour	76.3
64	Dry long grain brown rice	76.3
65	Premium wheat flour	76.2
66	Dry brown rice	76.2
67	Dry bulgur cereal	75.9
68	Dry rye grain	75.9
69	Dried shiitake mushrooms	75.4
70	Dry wheat groats	75.2
71	Millet flour	75.1
72	Dates Deglet nur	75
73	Dates Majul	75
74	Bay leaf	75
75	Buckwheat dry brown buckwheat	75
76	Dry muesli with dried fruits and nuts	74.9

77	Dry wild rice	74.9
78	Molasses	74.7
79	Dry noodles (pasta, pasta)	74.7
80	Dry buckwheat noodles	74.6
81	Barley flour	74.5
82	Dry corn kernels	74.3
83	Dry wheat noodles	74.1
84	First grade wheat flour	73.8
85	Dry barley groats	73.5
86	Whole wheat noodles	73.4
87	Triticale flour	73.1
88	Dry teff cereal	73.1
89	Millet dry millet groats	72.9
90	Dried garlic	72.7
91	Second grade wheat flour	72.2
92	Triticale, uncooked (grain)	72.1
93	Ground allspice	72.1
94	Dry sorghum grains	72.1
95	Breadcrumbs	72
96	Whole grain wheat flour	72
97	Ginger extract powder	71.6
98	Dry green buckwheat	71.5
99	Dry egg noodles	71.3
100	Chocolate bar Milky Way	71.2

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