



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

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

Key words: protein, benefit, harm, beneficial properties, contraindications, sources

Protein is an important **building material** of our body. Every cell of the body consists of it, it is part of all tissues and organs. In addition, a special type of proteins plays the role of *enzymes* and *hormones* in a living organism.

In addition to its construction function, protein can also be **a source of energy** . And in case of excess protein, the liver “prudently” converts the protein into fats, which are stored in reserve in the body.

The human body contains **22 amino acids** : the body can synthesize 13 amino acids independently from existing building materials, and 9 of them it can only obtain from food.

In the process of assimilation by the body, proteins break down into amino acids, which in turn are supplied to different parts of the body to perform their basic functions. Proteins (in the form of amino acids) are part of the blood, are components of the hormonal system, the thyroid gland, influence the growth and development of the body, regulate the water and acid-base balance of the body.

Protein-rich foods

See Appendix 1.

Daily protein requirement

The recommended protein requirement for an adult is 0.8 g per 1 kg of weight. This indicator can be found in tables for calculating ideal body weight. The actual weight of a person is not taken into account in this case, due to the fact that amino acids are intended for cellular mass of the body, and not for fat deposits. ^[1]

According to the rules of dietetics, protein foods should make up about 15% of the total calorie content of the daily diet. Although this indicator may vary depending on the type of activity of a person, as well as his state of health.

The need for proteins increases:

- During illness, especially after surgery, as well as during the recovery period.
- During work requiring strong physical stress.
- In the cold season, when the body spends more energy on heating.
- During intensive growth and development of the body.
- During sports competitions, as well as preparation for them.

Protein requirements decrease:

- During the warm season. This is due to chemical processes in the body that occur when exposed to heat.
- With age. In old age, the body renews itself more slowly, so less protein is required.
- For diseases associated with the digestibility of proteins. One such disease is gout. ^[2]

Protein digestibility

When a person consumes carbohydrates, the process of digesting them begins while they are in the mouth. With proteins, everything is different. Their digestion begins only in the stomach, with the help of hydrochloric acid. However, since protein molecules are very large, proteins are quite difficult to digest. To improve the absorption of proteins, it is necessary to consume foods that contain protein in its most digestible and light form. These include egg white, as well as protein contained in fermented milk products such as kefir, fermented baked milk ^[3], feta cheese, etc.

According to the theory of separate nutrition, protein foods go well with various greens and leafy vegetables. Modern nutritionists claim that protein is better absorbed in the presence of fats and carbohydrates, which are the main sources of energy for the body.

Since protein foods stay in the body much longer than carbohydrate foods, the feeling of fullness after eating proteins lasts much longer. ^[4]

Beneficial properties of protein and its effect on the body

Depending on their specialization, proteins perform various functions in the body. *Transport proteins*, for example, are involved in the delivery of vitamins, fat and minerals to all cells of the body. Catalyst proteins accelerate various chemical processes occurring in the body. There are also proteins that *fight various infections*, being antibodies to various diseases. In addition, proteins are *sources of important amino acids*, which are necessary as building materials for new cells and strengthening existing ones.

Interaction with essential elements

Everything in nature is interconnected, and everything also interacts in our body. Proteins, as part of the overall ecosystem, interact with other elements of our body - vitamins, fats and carbohydrates. Moreover, in addition to simple interaction, proteins are also involved in the transformation of one substance into another.

As for vitamins, for every gram of protein consumed, you need to consume 1 mg of vitamin C. If there is a lack of vitamin C, only the amount of protein that is enough for the vitamin contained in the body will be absorbed. ^[5]

Dangerous properties of proteins and warnings

Signs of lack of protein in the body

- Weakness, lack of energy. Loss of performance.
- Decreased libido. Medical tests may reveal a deficiency of certain sex hormones.
- Low resistance to various infections.
- Violation of the functions of the liver, nervous and circulatory systems, functioning of the intestines, pancreas, metabolic processes.
- Muscle atrophy develops, growth and development of the body in children slows down.

Signs of excess protein in the body

- Fragility of the skeletal system, resulting from acidification of the body, which leads to the leaching of calcium from the bones.
- Impaired water balance in the body, which can also lead to swelling and inability to absorb vitamins.
- The development of gout, which in the old days was called “rich people’s disease,” is also a direct consequence of excess protein in the body.
- Excess weight can also be a consequence of excessive protein consumption. This is due to the activity of the liver, which converts excess protein for the body into adipose tissue.
- Colon cancer, according to some scientific sources, can be a consequence of the increased content of purines in food.

Factors influencing protein content in the body

Composition and quantity of food . Since the body cannot synthesize essential amino acids on its own.

Age. It is known that in childhood the amount of protein necessary for the growth and development of the body is more than 2 times higher than the protein requirement of a middle-aged person! In old age, all metabolic processes proceed much more slowly, and, consequently, the body’s need for proteins is significantly reduced.

Physical labor and professional sports . To maintain tone and performance, athletes and people engaged in intense physical labor require a 2-fold increase in protein intake, since all metabolic processes occur very intensively in their body.

Protein food for health

As we have already said, there are 2 large groups of proteins: proteins that are sources of *nonessential* and *essential* amino acids. There are only 9 essential amino acids: threonine , methionine, tryptophan,

lysine, leucine, isoleucine, phenylalanine, valine. It is these amino acids that our body especially needs, since they are absorbed only from food.

In modern dietetics there is such a thing as **complete** and **incomplete protein**. A protein food that contains all the essential amino acids is called a complete protein; an incomplete protein is a food that contains only some of the essential amino acids.

Foods containing complete, high-quality protein include meat, dairy, seafood and soy. The top spot in the list of such products belongs to eggs^[6], which, according to medical criteria, are considered the gold standard of complete protein.

Incomplete protein is most often found in nuts, various seeds, cereals, vegetables, legumes, and some fruits.

By combining foods containing incomplete protein with complete protein in one meal, you can achieve maximum absorption of incomplete protein. To do this, it is enough to include only a small amount of animal products in your diet, and the benefits for the body will be significant.

Protein and vegetarianism

Some people, due to their moral and ethical convictions, completely excluded meat products from their diet. The most famous of them are Richard Gere, the star of The Blue Lagoon Brooke Shields, the magnificent Pamela Anderson, as well as the unrivaled Russian comedian Mikhail Zadornov.

However, in order for the body not to feel deprived, a complete replacement for fish and meat is necessary. For those who consume milk, cottage cheese^[7], eggs are, of course, lighter. Those who have completely abandoned animal proteins have to be very creative so that the body does not suffer from a lack of protein. This is especially true for children's fast-growing organisms, which, with a lack of amino acids, can slow down growth and normal development.^[8]

Thanks to certain studies related to the study of the absorption of plant protein by the body, it became known that certain combinations of such protein can provide the body with a full set of essential amino acids. These combinations are: mushrooms-cereals; mushrooms-nuts; legumes-cereals; legumes – nuts, as well as different types of legumes, combined in one meal.

But this is just a theory and it will take time before it is fully confirmed or refuted.

Among plant protein products, the title of “champion” in terms of protein content goes to soy. 100 grams of soy contains more than 30% complete protein. Japanese miso soup, soy meat and soy sauce are not all the delicacies that are prepared from this amazing product. Mushrooms, lentils^[9], beans^[10] and peas^[11] contain from 28 to 25% incomplete protein per 100 grams.

Avocado is comparable in protein content to fresh cow's milk (it contains about 14% protein).^[12] In addition, the fruit contains Omega-6 polyunsaturated fatty acids and dietary fiber. Nuts, buckwheat^[13], Brussels sprouts and cauliflower, as well as spinach^[14] and asparagus^[15] complete our list of foods rich in plant protein.

Proteins in the fight for slimness and beauty

For those who want to always remain fit and beautiful, nutritionists recommend adhering to a certain diet before and after training:

1. In order to **build muscle mass** and get an athletic figure, it is recommended to eat protein foods an hour before training. For example, half a plate of cottage cheese or another fermented milk product, chicken breast or turkey with rice, fish with salad, omelet with oatmeal. ^[16]
2. **To achieve a athletic figure** , eating is allowed within 20 minutes after training. Moreover, you should eat protein and carbohydrate foods, but not fats.
3. If the goal of the workout is **to gain slimness** and grace, without building muscle mass, then protein foods should be consumed no earlier than 2 hours after the end of the workout. Before training, do not eat protein for 5 hours at all. Last meal (carbohydrates) 2 hours before class.
4. And now about **maintaining proper metabolism** in the body. According to nutritionists, it is recommended to consume proteins in the afternoon. They maintain a feeling of fullness for a long time, and this is an excellent prevention of heavy night meals.
5. **Beautiful skin, lush and shiny hair, strong nails** are the result of a sufficient amount of essential amino acids in the diet, acting in conjunction with vitamins and microelements. ^[17]

Table 1**Top 100 natural sources protein**

The number of grams per 100 g of product is indicated ^[18,19]

No.	Product	g in 100 g
1	Soy protein (isolate) powder	88.3
2	Chicken egg white powder	81.1
3	Whey protein powder	78.1
4	Gluten (wheat gluten) in dry form	75.2
5	Soy protein (concentrate) powder	63.6
6	spirulina (in powder form)	57.5
7	Soy protein powder	55.6
8	Powdered egg replacers	55.5
9	Milk Protein Supplement Powder	50
10	Soybean cake	49.2
eleven	Sunflower flour	48.1
12	Soy flour	37.8
13	Soybeans, mature, dry	36.5
14	Lupine (lupine beans) dry	36.2
15	Parmesan cheese	35.8
16	Beaver meat cooked	34.9
17	Peanut flour	33.8
18	Chicken egg yolk in powder form	33.6
19	Cooked cuttlefish	32.5
20	Cooked bear meat	32.4
21	Cooked pheasant	32.4
22	Chicken breast, boiled or stewed	32.1
23	Veal cooked	31.9
24	Pecorino Romano cheese	31.8
25	Hemp seed	31.6

26	Sesame flour	30.8
27	Cooked beefalo meat	30.7
28	Fried chicken	30.6
29	Baked chicken breast (skinless)	30.5
thirty	Chicken gizzards , boiled or stewed	30.4
31	Peeled pumpkin seeds	30.2
32	Venison cooked	30.2
33	Cooked elk meat	30.2
34	Boiled turkey breast (fillet)	30.1
35	Baked turkey drumstick (without skin)	30.1
36	Cooked beef (meat without fat)	29.9
37	Boiled octopus	29.8
38	Gruyère cheese	29.8
39	Yellowtail (lacedra) baked	29.7
40	Cooked pork fillet	29.5
41	Antelope meat cooked	29.5
42	Fried cooked pork	29.4
43	Cooked stewed pork	29.2
44	Beef liver, stewed or fried	29.1
45	Baked turkey meat (whole carcass meat)	29.1
46	Cooked rabbit meat	29.1
47	Baked chicken	28.9
48	Canned anchovies (in oil)	28.9
49	Caviar, red or black, cooked	28.6
50	Chicken drumstick (without skin) fried	28.6
51	Roasted turkey (meat and skin of the whole carcass)	28.6
52	Pork pancreas, cooked	28.5
53	Boiled beef heart	28.5
54	Cooked wild boar meat	28.3
55	Pork spleen cooked	28.2
56	Cooked lamb	28.2
57	Cooked horse meat	28.1
58	Baked turkey thigh (fillet)	27.7
59	Chicken drumstick (without skin), stewed or boiled	27.5
60	Boiled or stewed chicken	27.3
61	Boiled beef kidneys	27.3
62	Baked pork loin	27.2
63	Cooked goat meat	27.1
64	Stewed turkey liver	27
65	Fried chicken drumstick (meat with skin)	27
66	Swiss cheese	27
67	Fried chicken legs (meat with skin)	26.8
68	Fried chicken thighs (meat with skin)	26.8

69	Baked trout	26.6
70	Dried parsley	26.6
71	Pork baked in the oven	26.6
72	Baked sockeye salmon	26.5
73	Stewed turkey gizzards	26.5
74	Cooked chicken hearts	26.4
75	Milkfish (hanos) baked	26.3
76	Powdered milk	26.3
77	Baked snapper (berix)	26.3
78	Baked tilapia	26.2
79	Beans, raw, mature	26.1
80	Fried chicken wings	26.1
81	Mustard seeds ground mustard	26.1
82	Pork liver fried or stewed	26
83	Baked chum salmon	25.8
84	Peanuts raw	25.8
85	Fried chicken liver	25.8
86	Baked chinook salmon	25.7
87	Cooked minced pork (20% fat)	25.7
88	Cheese Fontina	25.6
89	Provolone cheese	25.6
90	Boiled shellfish	25.6
91	Bison meat cooked	25.5
92	Baked salmon	25.4
93	Stewed pork kidneys	25.4
94	Chicken drumstick, stewed or boiled (meat with skin)	25.3
95	Baked goose	25.2
96	Skinless chicken thighs, boiled or stewed	25
97	Edam cheese	25
98	Gouda cheese	24.9
99	Baked pollock	24.9
100	Butternut	24.9

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