B vitamins - description, benefits, effects on the body and best sources

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

Key words: B vitamins , vitamin B , benefits, harm, beneficial properties, contraindications, sources

What is the B group of vitamins?

To date, the vitamin B complex includes 12 interconnected water-soluble substances. Eight of these are considered essential vitamins and should be included in the diet:

- B1 (thiamine);
- B2 (riboflavin);
- B3 (niacin, also known as vitamin P or vitamin PP);
- B5 (pantothenic acid);
- B6 (pyridoxine or pyridoxamine);
- B7 (biotin, or vitamin H);
- B9 (folic acid, or vitamin M, vitamin B-c);
- B12 (cobalamin).

Vitamin -like substances

It is easy to see that in the group of vitamins B, the numbers of vitamins have gaps - namely, there are no vitamins B4, B8, B10 and B11. These substances exist, and they were once also considered B complex vitamins . Later it was found that these organic compounds are either produced by the body itself, or are not vital (it is these qualities that determine vitamins). Thus, they came to be called

pseudovitamins , or vitamin -like substances. They are not included in the complex of vitamins of group B.

Choline (B4) is an essential component of nutrition for animals; a small amount of this substance is produced in the human body. It was first isolated in 1865 from bovine and porcine gallbladder and was named neurin. It helps produce and produce the neurotransmitter acetylcholine and also plays a role in fat metabolism. Choline is found in some foods - milk, eggs, liver, salmon and peanuts. In a healthy body, choline is produced on its own. Currently, scientists are considering the need to use choline as a supplement, as there is an opinion that there is not enough of its production in the body. In 1998, it was recognized as an essential substance.

Inositol (B8) is a substance important for cell signaling, the body's hormonal response, and nerve growth and function. Inositol is freely produced by the human body from glucose and is found in many body tissues. Despite this, it is also used in medicine to treat certain diseases. Inositol is widely used in industry.

Para - aminobenzoic acid (B10) is a widely distributed substance in nature, necessary for the growth of rats and poultry. It was first discovered as a remedy for depigmentation of the fur of laboratory mice. To date, it is believed that this compound is not a necessary factor for the human body.

Pteryl-hepta-glutamic acid (B11) is a substance that consists of several components and is considered one of the forms of folic acid. There is little information about this compound. It is believed that this is a growth factor for chicks [10, 21] .

Discovery history

Once upon a time, "vitamin B" was considered a single nutrient. Researchers later discovered that the extracts contained several vitamins, which were given distinctive numbers in the form of numbers. Missing numbers, such as B4 or B8, are either not vitamins (although they were considered as such when they were discovered), or are duplicates of other substances.

Vitamin B1 was discovered in the 1890s by the Dutch military doctor Christian Aikman , who was trying to find out what microorganism causes beriberi disease. Aikman observed that animals fed brown rice showed no signs of disease, while those fed rice without the husk. The reason for this was the presence in unpolished grains of a substance known today as thiamine.

Riboflavin, or vitamin B2 , was the second vitamin complex discovered. It was found in milk as a yellow-green fluorescent pigment necessary for the growth of rats. In the early 1930s, this pigment was named riboflavin.

Niacin, or vitamin B3 , was identified in 1915 when doctors concluded that its deficiency leads to pellagra disease. The Austro-American physician Joseph Goldberger learned while experimenting with inmates in a Mississippi prison that the missing factor was present in meat and milk, but not in corn. The chemical structure of niacin was discovered in 1937 by Conrad Arnold Elway .

Doctor R. Williams discovered **vitamin B5 (pantothenic acid)** in 1933 while studying the nutritional properties of yeast. Pantothenic acid is found in meat, vegetables, grains, eggs, and many other foods. Vitamin B5 is the precursor of coenzyme A, with its function in the metabolism of carbohydrates, proteins and lipids.

Vitamin B6 was discovered in 1934 by the Hungarian scientist Paul György , who was doing research on skin diseases in rats. By 1938, vitamin B6 had been isolated, and in 1939 it was given the name pyridoxine. Finally, in 1957, the required levels of vitamin B6 in the body were determined.

In 1901, scientists discovered that yeast required a specific growth factor they called " bios ". Over the next 30 years, the bios turned out to be a mixture of essential factors, one of which is **biotin or vitamin B7** . Finally, in 1931, scientist Paul György isolated biotin in the liver and named it vitamin H - where H is short for " Haut und Haar ", German words for "skin and hair". Biotin was isolated in 1935.

Despite the great progress that may have led to its discovery in the early 1930s, **vitamin B9** was only officially discovered in 1941 by Henry Mitchell. Also isolated in 1941. The name folic acid comes from " folium ", which is the Latin word for leaves, because it was first isolated from spinach. It wasn't until the 1960s that scientists linked vitamin B9 deficiency to birth defects.

Vitamin B12 was discovered in 1926 by George Richard Minot and William Parry . Murphy , who found that eating large amounts of liver restored red blood cells in patients with pernicious anemia (the inability to produce enough red blood cells). In 1934, both scientists, as well as George Whipple , received the Nobel Prize for their work in the treatment of pernicious anemia. Vitamin B12 was officially isolated only in 1948 [2,8,9] .

Products with the maximum content of B vitamins [3,4]:

Vitamin	Product	Content per 100 grams of product
B1 (Thiamin)	Lean pork	0.989 mg
	Peanut	0.64 mg
	Whole grain flour	0.502 mg
	Soya beans	0.435 mg
	Green pea	0.266 mg
	Tuna	0.251 mg
	Almond	0.205 mg
	Asparagus	0.141 mg
	Salmon	0.132 mg
	Sunflower seeds	0.106 mg
B2 (Riboflavin)	Beef liver (raw)	2.755 mg
	Almond	1.138 mg
	Egg	0.457 mg
	Mushrooms	0.402 mg
	Mutton	0.23 mg
	Spinach	0.189 mg
	Soya beans	0.175 mg
	Milk	0.169 mg
	Whole grain flour	0.165 mg
	natural yogurt	0.142 mg
B3 (Niacin)	Chicken breast	14.782 mg
	beef liver	13.175 mg
	Peanut	12.066 mg
	Tuna	8.654 mg

	Beef (stewed)	8.559 mg
	Turkey meat	8.1 mg
	Sunflower seeds	7.042 mg
	Mushrooms	3.607 mg
	Green pea	2.09 mg
	Avocado	1.738 mg
B5 (Pantothenic Acid)	Sunflower seeds	7.042 mg
	chicken liver	6.668mg
	Sun-dried tomatoes	2.087 mg
	Mushrooms	1.497 mg
	Avocado	1.389 mg
	Salmon	1.070 mg
	Corn	0.717 mg
	Cauliflower	0.667 mg
	Broccoli	0.573 mg
	natural yogurt	0.389 mg
B6 (Pyridoxine)	pistachios	1.700 mg
	Sunflower seeds	0.804 mg
	Sesame	0.790 mg
	Molasses	0.67 mg
	Turkey meat	0.652 mg
	Chicken breast	0.640 mg
	Beef (stewed)	0.604 mg
	Spotted beans (pinto)	0.474 mg
	Tuna	0.455 mg
	Avocado	0.257 mg
B7 (Biotin)	Beef liver, ready-made	40.5 mcg
	Egg (whole)	20 mcg
	Almond	4.4 mcg
	Yeast	2 mcg
	Hard Cheddar Cheese	1.42 mcg
	Avocado	0.97 mcg
	Broccoli	0.94 mcg
	Raspberry	0.17 mcg
	Cauliflower	0.15 mcg
	whole grain bread	0.06 mcg
B9 (Folic acid)	chickpeas	557 mcg
	Spotted beans (pinto)	525 mcg
	Lentils	479 mcg
	Leek	366 mcg
	beef liver	290 mcg
	Spinach	194 mcg
	Beet	109 mcg
	Avocado	81 mcg
	Broccoli	63 mcg
	Asparagus	52 mcg

B12 (cobalamin)	Beef liver, fried	83.13 mcg
	Beef liver, stewed	70.58 mcg
	Beef liver, raw	59.3 mcg
	Chicken liver, raw	16.58 mcg
	Mussels, raw	12 mcg
	shellfish	11.28 mcg
	Tuna, raw	9.43 mcg
	Sardines, canned in oil	8.94 mcg
	Atlantic mackerel, raw	8.71 mcg
	Rabbit	7.16 mcg

Daily requirement for B vitamins

Each component of the vitamin complex has a unique structure and performs certain functions in the human body. Vitamins B1, B2, B3 and biotin are involved in various aspects of energy production, vitamin B6 is essential for amino acid metabolism, and vitamin B12 and folic acid are involved in the preparation steps for cell division. Each of the vitamins also has many additional functions. In some body processes, several B vitamins are involved at the same time, such as vitamin B12 and folic acid. However, there is not a single process that would require all the B vitamins together. As a rule, B vitamins are fairly easy to obtain from ordinary foods. Only in some cases it is necessary to introduce synthetic supplements into food (for example, vitamin B12, found only in animal products, should be consumed by vegetarians and vegans from other synthetic sources) [1] .

The daily allowance for each B vitamin varies from a few micrograms to several milligrams. On a day, the body should receive:

- **vitamin B1 (thiamine)** - 0.80 mg to 1.41 mg per day for adults, and 0.30 mg to 1.4 mg per day for children, depending on the level of daily activity - the more active the lifestyle, the more thiamine the body needs;
- **vitamin B2 (riboflavin)** - 1.3 mg per day for men over 14 years old, 1.1 mg per day for women over 14 years old (1.4 mg during pregnancy and 1.6 mg during lactation), 0.3 mg per day for newborns, 0.4 - 0.6 mg for children, 0.9 mg per day for adolescents from 9 to 13 years;
- **vitamin B3 (niacin)** - 5 mg per day for infants, 9 mg for children 1 to 3 years old, 11 mg for children 4-6 years old, 13 mg for children 7-10 years old, 14-15 mg for adolescents up to 14 years old , 14 mg for women over 15 years old, 18 mg for men over 15 years old;
- **vitamin B5 (pantothenic acid)** - on average, from 2 to 4 mg per day for children, 5 mg per day for adults, 7 mg during pregnancy and lactation;
- **vitamin B6 (pyridoxine)** - an average of 0.5 mg per day for children, 1 mg per day for adolescents 9-13 years old, for adults - 1.3 mg per day with an increase in dose to 2.0 mg during pregnancy and lactation;
- **vitamin B7 (biotin)** - 5 to 8 mcg per day for children under 4 years old, 12 mcg per day for children 9 to 13 years old, 20 mcg per day for adolescents 9 to 13 years old, 25 mcg per day for adolescents 14 to 18 years old years, 30 micrograms for adults. With lactation, the norm increases to 35 mcg per day;
- **vitamin B9 (folic acid)** - 65-80 mcg per day for infants, 150 mcg for children 1 to 3 years old, 200 mcg per day for children 4 to 8 years old, 300 mcg per day for adolescents 9 to 13 years old, 400 mcg for adults and adolescents from 14 years old. During pregnancy, the norm rises to 600 mcg, during lactation - 500 mcg;
- **vitamin B12 (cobalamin)** - 0.5 - 0.7 mcg per day for children under 3 years old, 1 mcg per day for children under 10 years old, 1.3 mcg for children from 11 to 14 years old, 1.4 mcg for

adolescents from 14 years of age and adults. Pregnant women are recommended to consume 1.6 micrograms of vitamin per day, lactating - 1.9 micrograms.

The need for B vitamins increases in the presence of the following factors:

- elderly age;
- strict vegan diet;
- frequent fasting diet;
- smoking, frequent alcohol consumption;
- surgical removal of sections of the digestive tract;
- taking certain drugs - corticosteroids, antidepressants, birth control and other medicines;
- pregnancy and lactation;
- increased physical activity;
- sickle cell anemia;
- chemotherapy [7] .

Chemical and physical properties

Numerous components of the B-vitamin complex are not chemically or physiologically related to each other, but still have several common features:

1. 1 all of them, with the exception of lipoic acid, are water-soluble;
2. 2 most, if not all, are coenzymes and play a vital role in metabolism;
3. 3 most of them can be obtained from one source - liver or yeast;
4. 4 most of them can be synthesized by intestinal bacteria.

Thiamine is a white crystalline substance, easily soluble in water, slightly in ethyl alcohol, but insoluble in ether and chloroform. Its smell is reminiscent of yeast. Thiamine is destroyed at elevated temperatures if the pH is high. It can withstand short boils up to 100° C. Consequently , it is only partially lost during cooking or canning. Prolonged boiling or boiling in alkali destroys it. Stable in an acidic environment. Grinding wheat flour significantly reduces the thiamine content, sometimes even up to 80%. Therefore, in many cases, wheat flour is usually synthetically fortified with thiamine.

Riboflavin is a bright orange-yellow crystalline powder. It is soluble in water and ethanol, but insoluble in ether and chloroform. Resistant to heat and acids, but easily decomposed by alkalis and light. The aqueous solution has a yellow-green fluorescence. Withstands canning and cooking processes.

Pantothenic acid is a pale yellow viscous oil, soluble in water and ethyl acetate, but insoluble in chloroform. It is resistant to oxidizing and reducing agents, but is destroyed by heating in an acidic and alkaline environment.

Niacin is the simplest of all existing vitamins. It is a white crystalline substance, soluble in ethyl alcohol. Heat resistant. Nicotinamide , a derivative of niacin, occurs as white, needle-like crystals. It is soluble in water, resistant to heat and air. That is why cooking losses are usually minimal. Like thiamine, most of the vitamin B5 is lost during the grinding process.

The vitamin B6 group includes 3 compounds: pyridoxine, pyridoxal and pyridoxamine . All 3 forms of vitamin B6 are derivatives of pyridine, C_5H_5N and differ from each other in the nature of the substituent in the position of the 4th ring. All 3 forms are easily interchangeable biologically. Pyridoxine is a white crystalline substance and is soluble in water and alcohol, and slightly in fatty

solvents. It is sensitive to light and ultraviolet radiation. Resistant to heat in both acidic and alkaline solutions, while pyridoxal and pyridoxamine are destroyed at high temperatures.

Biotin has an unusual molecular structure. Two forms of biotin can exist: allobiotin and epibiotin . Biotin and thiamine are the only sulfur-containing vitamins isolated to date. Vitamin B7 crystallizes in the form of long needles. Soluble in water and ethyl alcohol, but insoluble in chloroform and ether. It is heat resistant and resistant to acids and alkalis. Has a melting point of 230°C.

The **folic acid molecule** consists of 3 units, its molecular formula is $C_{19}H_{19}O_6N_7$. The various B9 vitamins differ from each other in the number of glutamic acid groups present. Folic acid is a yellow crystalline substance, slightly soluble in water and insoluble in fatty solvents. It is resistant to heat only in alkaline or neutral solutions. Loses activity under the influence of sunlight.

Vitamin B12 can only be found in animal products, animal tissues contain it in varying amounts. Under certain dietary conditions, vitamin B12 can be synthesized by intestinal microorganisms. Cyanocobalamin is unique in that it is synthesized only by microorganisms, especially anaerobic ones. The structure of vitamin B12 is one of the most complex. It is a deep red crystalline substance. Let's dissolve in water, alcohol and acetone, but not in chloroform. B12 is resistant to heat in neutral solutions, but is destroyed by heat in acidic or alkaline solutions. [10] .

Useful properties of B vitamins

There are many opinions about the benefits of various B vitamins. Thiamine is supposed to help maintain the condition of people with Alzheimer's disease, a disease that is also associated with low levels of pyridoxine and cobalamin. High doses of niacin prescribed by a physician lower cholesterol levels and balance lipoproteins. Some evidence suggests that niacin may prevent juvenile diabetes (type 1, insulin dependent) in children at risk by maintaining pancreatic insulin excretion for longer than usual. Niacin is also used to relieve intermittent claudication and osteoarthritis, although using high doses for the latter can lead to liver problems. Migraine frequency can be significantly reduced and severity reduced by the use of supplemental riboflavin. Pyridoxine is used therapeutically to reduce the risk of heart disease, to relieve nausea during pregnancy, and to relieve symptoms of premenstrual syndrome. When combined with magnesium, pyridoxine may have some beneficial effects on the behavior of children with autism. Cobalamin supplementation has been shown to improve male fertility. Depression, dementia, and mental impairment are often associated with both cobalamin and folic acid deficiencies. Folic acid may reduce the chance of cervical or colon cancer in certain risk groups [7] .

vitamins play a key role in the processes of DNA formation, being responsible for the speed of some processes. Severe deficiency of B vitamins can lead to failures in the formation of new cells and their uncontrolled growth, which, in turn, can cause cancers.

B vitamins, among other substances (such as vitamins C, D, E, omega-3s, fats, coenzyme Q10, lipoic acid), are very important for heart health. Particularly noteworthy is the role played by folic acid, B6 and B12 in lowering homocysteine levels . Although it has not been officially confirmed by medicine, many studies have observed high levels of homocysteine in fat deposits on the endothelium (the thin layer of cells that line the inside of blood vessels), as well as in blood clots and in heart disease.

Psychiatrists are also increasingly turning to B vitamins as a treatment. Together with vitamin C, they help support an efficient adrenal response to stress. Many studies show that up to 30 percent of patients hospitalized with depression are deficient in B12. Several epidemiological studies have reported an association between low blood levels of folate , vitamins B6 and B12, and a higher prevalence of depressive symptoms. B-vitamin deficiency is also associated with anxiety disorder and, especially,

obsessive- compulsive disorder. Many physicians begin to treat OCD with therapeutic doses of the vitamin inositol .

Finally, it is impossible not to note the influence of the level of B vitamins on the amount of energy and vitality. Deficiency often leads to chronic fatigue, fatigue and drowsiness [11] .

Each B vitamin is either a cofactor (usually a coenzyme) for key metabolic processes or a precursor needed to carry them out. These vitamins are water-soluble, meaning they are not stored in the fatty tissues of the body, but are excreted in the urine. The absorption of B vitamins occurs in the digestive tract and usually requires certain substances (proteins) in the body to allow the vitamins to be absorbed.

Interaction with other elements

All processes in the body are interconnected, so some substances can increase the effectiveness of B vitamins, and some can reduce it.

Fats and proteins reduce the body's need for vitamin B1, while carbohydrates, on the contrary, increase it. Raw seafood (fish and shellfish) contains an enzyme (thiaminase) that breaks down thiamine in the body. Therefore, people who eat large amounts of these foods may experience symptoms of vitamin B1 deficiency. In addition, thiamine interacts with magnesium; without it, B1 cannot turn into its biologically active form. Riboflavin should not be taken with calcium, which reduces its absorption. Niacin works in tandem with zinc to provide higher levels of antioxidants and zinc in the liver. Copper increases the body's need for vitamin B5. Vitamin B6 (pyridoxine) is advised to be used with magnesium, among the positive effects of this combination is the relief of symptoms of premenstrual syndrome. Undesirable is the combination of pyridoxine and thiamine, as well as pyridoxine and vitamin B9. Folic acid is undesirable to use with zinc, as well as vitamin B12, as they mutually increase the body's need for each other. Cobalamin (B12) should not be taken with vitamin C, especially when taking thiamine and copper at the same time [12] .

The best food combinations for the absorption of B vitamins:

1. **Pumpkin pudding with chia seeds .** Ingredients: milk, pumpkin puree, chia seeds , maple syrup, sunflower seeds, almonds, fresh blueberries. Contains thiamine, biotin, proteins, fiber and many other beneficial substances.
2. **Salad with quinoa and kale.** Ingredients: quinoa, fresh kale, red cabbage, carrots, dill, boiled eggs, rice vinegar, extra virgin olive oil, ground black pepper. Contains riboflavin, biotin, folic acid and cobalamin.
3. **Gluten free salad with quinoa and broccoli.** Ingredients: Fresh Broccoli, Quinoa, Cucumber, Cherry Tomatoes, Pumpkin Seeds, Sea Salt, Ground Black Pepper, Dijon Mustard, Vinegar, Extra Virgin Olive Oil, Maple Syrup. Contains thiamine and riboflavin.
4. **Gluten-free stuffed peppers with quinoa.** Ingredients: quinoa, green bell peppers, canned lentils, fresh spinach, feta cheese , frozen corn kernels, salt, black pepper. Contains thiamine, riboflavin, pyridoxine, folic acid, pantothenic acid and cobalamin.

In the absence of medical contraindications, diseases, and ethical preferences, B vitamins are best obtained from food. These vitamins are widely distributed in many foods and it is easy to find a diet that would replenish the supply of vitamins and appeal to anyone. The exception is vitamin B12, which can only be obtained from animal products and is therefore difficult to obtain in its natural form for vegans . In this case, under the supervision of a doctor, synthetic vitamins are prescribed. In spite of everything, the uncontrolled intake of synthetic vitamins can not only not bring benefits, but also harm. Therefore, it is recommended to consult a doctor before taking any vitamins.

Application in official medicine

Due to the fact that each vitamin of group B has its own functions, one or another vitamin is prescribed by a doctor, depending on the immediate indications.

Vitamin B complex is prescribed , first of all, with a clear deficiency, insufficient absorption or with a limited diet. I also often advise taking these vitamins in old age, as well as for people who drink alcohol or smoke. Folic acid is often prescribed during preparation or during pregnancy, as it contributes to the proper development of the fetus. In addition, a complex of B vitamins in the form of medicines is advised to be taken in such cases:

- to accelerate wound healing;
- with stomatitis;
- to improve the physical form of athletes;
- with stress;
- in anxiety states;
- as part of complex therapy for vitiligo;
- to relieve symptoms of premenstrual syndrome;
- hyperactivity and attention deficit syndrome [1] ;
- for the relief of acute pain [13] .

Currently, in pharmacies you can buy B vitamins both individually and in the form of a complex. Most often, multivitamins come in the form of tablets. As a rule, such vitamins are taken in courses, on average within one month. Separately, B vitamins can be found in the form of injections (intravenous and intramuscular) - they are prescribed to improve and accelerate the absorption of substances - and capsules.

B vitamins in traditional medicine

Traditional physicians, as in traditional medicine, recognize the importance of the B complex vitamins in energy production processes, overall body health, and skin, hair, and nail health. Ointments containing B vitamins (especially B6) are recommended for eczema. Rubbing with vitamins B1, B2 and B6 is used for arthritis. There are also folk recipes for treating anemia with foods containing high amounts of vitamin B12. An extract from the liver of a calf is considered especially useful, in which there are many vitamins, and the amount of fat and cholesterol is minimal [14] .

Latest scientific research on B vitamins

- Scientists at the University of Adelaide, Australia, have found that taking vitamin B6 can help people remember their dreams. The study, published online, included 100 Australian participants who took high-vitamin B supplements before bed for five consecutive days. Vitamin B6 did not affect the brightness, quirkiness or color of dreams, and other aspects. Some participants took a placebo drug, while the rest received 240 mg of vitamin B6 immediately before bedtime. Many subjects, who rarely remembered their dreams before, admitted that after taking the vitamin it was easier for them to remember what they dreamed about. However, study leaders warn that long-term use of such doses of pyridoxine should be carried out under the supervision of the attending physician [15] .
- A recent report published in the Journal of the Endocrine Society examines a case of misdiagnosis due to biotin supplementation. supplement known as vitamin B7. The patient was taking 5,000 micrograms of biotin daily, which resulted in erroneous clinical trials, unnecessary radiography, tests, and almost entailed a complex invasive procedure that is prescribed for hypercoagulability . This is because the doctors suspected that the patient had

hypercortisolemia or a testosterone-producing tumor. It turned out that the primary symptoms were caused by excessive consumption of biotin, which is traditionally considered a vitamin that improves the condition of the skin, hair and nails [16] .

- A review article published in the Journal of the American Institute of Cardiology hypothesizes that vitamin supplementation has no benefit in preventing or treating heart disease. The researchers found that data on the four most commonly used supplements— multivitamins , vitamin D, calcium, and vitamin C—did not show positive results for the prevention of cardiovascular disease, myocardial infarction, or stroke, and there was no change in death rates from all of the above causes. . The only exception was folic acid and group B multivitamins , in which folic acid was a component. Vitamin B9 has been shown to reduce the risk of stroke. At the same time, niacin (vitamin B3) and antioxidants have been associated with an increased risk of death from heart disease [17] .

B vitamins in cosmetology

It can be said without a doubt that B vitamins are vital for the beauty and health of hair, skin and nails. That is why there are many recipes for masks, decoctions, lotions - both with natural ingredients and with the addition of pharmaceutical vitamins.

Hair masks, which include B vitamins, are most often positioned as strengthening, restoring and improving pigmentation. The most useful and commonly used natural products containing vitamins are raw egg and aloe vera juice. Various oils, honey and herbal decoctions are added to them. Thus, a mixture of substances necessary for hair (vitamins B, A and E) is obtained, which has antiseptic, antioxidant and conditioning properties. Such compositions, for example, are a mixture of egg yolk, burdock oil, honey and aloe juice. In addition, you can safely use pharmacy B vitamins in ampoules, adding them to vegetable oil and mixing with decoctions, for example, chamomile or nettle. The most effective pharmaceutical vitamins for hair are vitamins B1, B3, B6 and B12.

vitamins are indispensable for the beauty and health of the skin. They have healing and antioxidant properties. In addition, in combination with other components, they bring additional benefits as a rejuvenating, protective, moisturizing and antibacterial agent. The products used in face masks are egg, banana, spinach, almonds, oatmeal, avocado.

- An effective recipe for acne is considered a mask, which includes a pinch of sea salt, a pinch of turmeric, a teaspoon of honey, natural yogurt and half a mashed banana.
- For oily skin, a mask with 1 teaspoon of aloe vera juice, 1 teaspoon of chamomile decoction, half a teaspoon of lemon or apple cider vinegar, half a mashed banana and 1 teaspoon of starch is recommended.
- A homemade scrub can be made with 1 teaspoon honey, 1 teaspoon oatmeal, a pinch of salt, a pinch of brown sugar, 1 teaspoon of avocado or almond oil, and 1 teaspoon of mashed kiwi, pineapple, or papaya.
- For aging skin, an antioxidant mask with 1 teaspoon of argan oil, 1 teaspoon of honey, pureed guava, 1 teaspoon of sunflower oil, and 1 teaspoon of ground almonds may be suitable.

Biotin, vitamins B6 and B12 are very important for nail health. It is advised to use almond oil, avocado to strengthen the nail plate.

Do not forget that beauty comes primarily from within, and the most important thing is to ensure the access of all vitamins and minerals from food. A healthy body, in which there are enough necessary substances, looks beautiful and well-groomed.

B vitamins in animal husbandry

Just like for human health, B vitamins are vital for animals. They ensure the normal functioning of the nervous and immune systems, growth and development, energy production, metabolism in cells and organs, as well as a healthy appetite and digestion of the animal. All vitamins of the group are irreplaceably important, so it is necessary to provide access to the entire complex in the body. As a rule, industrial animal feeds are artificially enriched with vitamins and minerals. Particular attention should be paid to the presence of thiamine in the feed, as it is more susceptible to destruction [18].

B vitamins in crop production

There are several vitamins that act as plant biostimulants, but the most popular are B1, B2, B3 and B6 due to their positive effect on the plant's metabolism. Many microorganisms produce B-vitamins as natural by-products, but yeast extracts contain the highest concentrations. B-Vitamins work at the cellular level and are commonly found as supplements in cloning gels and cloning solutions, mineral bed preparation solution, and most commercial plant biostimulants.

One of the best uses for B vitamins is to help plants recover from transplanting. When a plant is transplanted, the microscopic root hairs are often damaged, making it difficult to get enough water and minerals. Adding B-vitamins to irrigation water gives plants the boost they need. B vitamins are also useful when transplanting from soil to hydroponics. To do this, before transplanting, the plant is immersed in water enriched with B vitamins [19].

Interesting facts about B vitamins

- Royal jelly contains a fairly complete vitamin B complex to the extent that it can be taken in the same way as dietary supplements.
- Thiamine deficiency is commonly found in countries where white rice is the staple food. In Western countries, it is most often caused by excessive drinking or a very unbalanced diet.
- Excessive consumption of raw egg whites, such as by bodybuilders, can interfere with the absorption of biotin and cause a deficiency.
- Studies show that people with low folic acid levels are more likely to experience hearing loss after age 50.

Dangerous properties of B vitamins, their contraindications and warnings

Deficiency of each of the vitamins of the complex manifests itself in the form of certain symptoms, in each case they may differ. And only a doctor, after conducting special studies, will be able to say whether you have a deficiency of a particular vitamin. However, there are the most common symptoms of a B vitamin deficiency, including:

- nervous disorders;
- visual disturbances, conjunctivitis;
- inflammation of the tongue, skin, lips;
- dermatitis;
- anemia;
- depression, anxiety, fatigue;
- confusion of consciousness;
- hair loss;
- sleep disturbance;
- slow wound healing [20].

In many cases, large doses of water-soluble vitamins can be taken without side effects because excess amounts are easily excreted from the body. However, when taking more than 500 mg of niacin daily,

inflammation of the liver can develop. Niacin can also cause problems with blood sugar control in diabetics, as well as increase uric acid levels, which can aggravate gout. In addition, excess niacin increases the secretion of gastric juice and lowers blood pressure. However, the form of niacin known as inositol hexaniacinate does not generally cause these effects.

High doses of pyridoxine can cause liver inflammation or permanent nerve damage.

High doses of vitamin B2 can lead to discoloration of urine, this is a normal side effect and does not pose a danger to the body.

In general, B vitamins are not toxic, and no severe side effects have been noted when exceeding the daily allowance. However, any vitamin preparations should be taken with caution and consult with your doctor about contraindications and interactions with other drugs [7] .

Literature

1. Vitamin B Complex. Michigan Medicine. University of Michigan , source
2. Vitamin B. New World Encyclopedia, source
3. USDA Food Composition Databases. United States Department of Agriculture, source
4. Determination of the biotin content of select foods using accurate and sensitive HPLC/ avidin binding. CG Staggs, WM Sealey and others. DOI: 10.1016/j.jfca.2003.09.015
5. National Institutes of Health. Office of Dietary Supplements. US Department of Health & Human Services, source
6. Nutri -Facts. Understanding Vitamins & More, source
7. Vitamin B complex. Encyclopedia.com, source
8. Factsheet B6, B7, B9, B12. vitamins in motion , source
9. types of Vitamin B, source
10. JL Jain, Sunjay Jain, Nitin Jain. Fundamentals of Biochemistry. Chapter 34 pp. 988-1024 . S. Chand & Company ltd . Ram Nagar , New Del - 110 055. 2005.
11. All About B Vitamins , source
12. Vitamin and Mineral Interactions: The Complex Relationship of Essential Nutrients. Dr. _ Deanna Minich , source
13. B vitamins in the complex therapy of pain syndromes. O. A. Shavlovskaya . DOI: 10.17116/jnevro201711791118-123
14. G. N. Uzhegov . Complete encyclopedia of first aid. OLMA Mediagroup . Moscow, 2006.
15. Denholm J. Aspy , Natasha A. Madden, Paul Delfabbro . Effects of Vitamin B6 (Pyridoxine) and a B Complex Preparation on Dreaming and Sleep. DOI: 10.1177/0031512518770326
16. Heather M Stieglitz, Nichole Korpi -Steiner, Brooke Katzman , Jennifer E Mersereau , Maya Styner . Suspected Testosterone-Producing Tumor in a Patient Taking Biotin Supplements. Journal of the Endocrine Society , 2018; DOI: 10.1210/js.2018-00069.
17. David JA Jenkins, J. David Spence, and others. Supplemental Vitamins and Minerals for CVD Prevention and Treatment. Journal of the American College of Cardiology, 2018; DOI: 10.1016/j.jacc.2018.04.020
18. “Why Your Pet's Heart, Brain and Nervous System May Need Extra B Vitamins, No Matter What Kind of Food You Feed”, source
19. B-VITAMINS, source
20. Vitamin B complex. CHEMICAL COMPOUNDS. Encyclopaedia Britannica , source
21. Listing of vitamins. Harvard Health Publishing. Harvard Medical school , source

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Vitamin B - useful properties, composition and contraindications

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