

Journal of Healthy Nutrition and Dietetics

In issue:



Parsley



Dill



Basil



Sorrel



Spinach



Apricot



Black
currant

A detailed description of
the useful, healing and
dangerous properties of
each product



Calcium



Keto diet

Table of contents

<i>Yampolsky A., Eliseeva T. Parsley (Petroselinum crispum)</i>	2
<i>Tarantul A., Eliseeva T. Dill (Anethum)</i>	13
<i>Eliseeva T., Yampolsky A. Basil (Ócimum)</i>	25
<i>Yampolsky A., Eliseeva T. Sorrel (Rúmex)</i>	37
<i>Tarantul A., Eliseeva T. Spinach (Spinacia oleracea)</i>	48
<i>Eliseeva T., Yampolsky A. Apricot (Prunus armeniaca Lin.)</i>	60
<i>Yampolsky A., Eliseeva T. Blackcurrant (Ribes nigrum)</i>	71
<i>Mironenko A., Eliseeva T. Calium - description, effects on the body, best sources</i>	83
<i>Tkacheva N., Eliseeva T. Keto diet – scientific rationale, proven health benefits, advantages and disadvantages</i>	93



Parsley (lat. *Petroselinum crispum*)

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Abstract. The article discusses the main properties of parsley and its effect on the human body. A systematic review of modern specialized literature and relevant scientific data was carried out. The chemical composition and nutritional value of the product are indicated, the use of parsley in various types of medicine and the effectiveness of its use in various diseases are considered. The potentially adverse effects of parsley on the human body under certain medical conditions and diseases are analyzed separately. The scientific foundations of diets with its application are considered.

Beneficial features

Table 1. The chemical composition of parsley (according to [Food+](#)).

Main substances (g / 100 g):	fresh parsley ^[one]
Water	87.71
Carbohydrates	6.33
Squirrels	2.97
Alimentary fiber	3.3
Sugar	0.85
Fats	0.79
Calories (kcal)	36
Minerals (mg/100 g):	
Phosphorus	58
Calcium	138
Potassium	554
Sodium	56
Magnesium	fifty
Iron	6.2

Zinc	1.07
Copper	0.149
Vitamins (mg/100 g):	
Vitamin C	133
Vitamin B2	0.098
Vitamin A	0.42
Vitamin B6	0.09
Vitamin B1	0.086
Vitamin PP	1.313
Vitamin E	0.75

According to the given data, it can be seen that parsley contains about 2.5-3 times more vitamin C than lemon and almost the same amount of ascorbic acid as blackcurrant and sweet red pepper. Moreover, plants grown in the northern regions are much richer (sometimes 4-5 times) in vitamin C than their southern "relatives". In addition, parsley also contains vitamins of the P group, which in biological processes often act in tandem with ascorbic acid.

Depending on different growing conditions, parsley contains from 2 mg to 20 mg of carotene (vitamin A provitamin), B1 (thiamine), B2 (riboflavin), flavonoids, nicotinic acid. This greenery is also rich in vitamin K, which is involved in the synthesis of proteins necessary for normal blood clotting and metabolism in muscle and connective tissues. To get the daily requirement of vitamin K, it is enough to eat about 10 grams of parsley.

In the seeds of the plant, the highest (compared to other parts of parsley) concentration of essential oil is up to 7%. In fresh leaves, it is noticeably less (up to 0.3%), but even this is enough for culinary specialists to have a reason to attribute parsley to a fragrant spicy seasoning.

The main components of the essential oil are myristicin $C_{11}H_{12}O_3$ (37%) with antioxidant properties and apiol $C_{12}H_{14}O_4$ (16%), which is also called parsley camphor. It is thanks to apiol that the effect of contraction of smooth muscles occurs, which determines a number of specific properties of parsley. However, there is very little apiol in oils derived from the leafy part, so there are far fewer restrictions when using green "tops" than when using essential oils obtained from seeds or roots.

Medicinal properties

A thousand years ago, the famous Avicenna in his "Canon of Medicine" argued that with the help of parsley you can stop coughing, get rid of breathing problems and chest tightness, cure asthma, liver, spleen, and activate urogenital function.

Almost seven centuries later, in the "Cool Helix" clinic, among the healing properties of the plant, the ability of parsley to cure diseases of the liver and bladder, as well as to demonstrate a diuretic effect, was also mentioned. But, besides this, recommendations were given in the clinic on the use of parsley to normalize digestion, improve vision, heal gums and wounds on the body, restore kidneys and slow down inflammatory processes. And two centuries later (in the 19th century), they began to produce a drug from parsley seeds, which the doctors of that time prescribed for the treatment of malaria, neuralgia and getting rid of menstrual pain and menstrual irregularities.

Most of the listed medicinal properties of the plant are still used in various therapeutic practices today. Among the time-tested effects are the following:

- **Increased tone of smooth muscles.** Parsley increases the tone of the muscles of the bladder, intestines, uterus (the latter is not always safe, since the same property gives reason to use the plant in amateur abortion procedures).
- **Diuretic effect.** Leaves, roots and seeds of the plant activate the urethra, accompanied by increased release of sodium chloride and excretion of salts from the body. This property of parsley is used, for example, to relieve puffiness.
- **Choleretic effect.** Bile secretion is caused by both fresh leaves and concentrates of various parts of the plant. Some therapists in parsley decoction see a means of correcting dyskinesia - a violation of the outflow of bile caused by relaxation of the walls of the bladder and ducts (hypokinetic type). The choleretic effect of parsley is most pronounced in the first 2-3 hours after taking the herbal preparation, but manifests itself within 6 hours.
- **Improved digestive function and appetite.** Essential oils and extracts from different parts of parsley contribute to the activation of the digestive system (the secretion of saliva, gastric juice, enzymes, and increased intestinal motility). In addition, the fiber contained in parsley contributes to the stimulation of the digestive tract.
- **bactericidal effect.** The essential oil of the plant is able to suppress the putrefactive bacteria of the intestine and reduce gas formation.

Some publications claim that parsley juice and essential oils have a beneficial effect on the functionality of the heart muscle. It is also assumed that fresh juice can normalize the functioning of the thyroid gland and the adrenal cortex, and also that it can strengthen the walls of capillary blood vessels.

In medicine

In medical preparations, parsley is considered primarily as a diuretic and antispasmodic. Also, in the instructions for herbal remedies and dietary supplements based on parsley, manufacturers among the indications indicate the presence of edema, inflammation of the prostate gland and bladder mucosa (cystitis), and urolithiasis. Examples include the following drugs:

- **Phytolysin** is a paste-like complex herbal remedy based on plant extracts, which include parsley root extract. A suspension is prepared from the paste, designed to dissolve urinary calculi. The tool has a diuretic, analgesic and antimicrobial effect (inhibits the development of gram-positive microflora). Also, the drug exists in the form of capsules with a similar effect.
- **Uronefron** - a drug designed to dissolve urinary stones, is available in various forms (drops, tablets) and includes a complex of plant components, which include parsley root. It has a diuretic, antispasmodic and anti-inflammatory effect.
- **Nephrokea** is a Swiss drug belonging to the group of dietary supplements for the prevention of inflammation of the genitourinary system. Along with berry and herb extracts, it contains parsley leaf powder.
- **Tazalok** - drops with natural herbal ingredients are designed to correct menstrual disorders. For weight loss cycle and reduce the level of pain. The complex composition includes curly parsley root tincture.

There are other drugs with a similar effect. And although parsley is not considered as an independent and main drug in the fight against serious diseases, this plant can certainly expand the possibilities of therapeutic practices. For medicinal purposes, parsley is introduced into diets No. 2, 3, 5, 8-11, 15.

In folk medicine

Antispasmodic, bactericidal, urinary and choleretic and other effects of parsley, described in the previous sections, were first in demand in folk medicine in various countries around the world. As a

diuretic and laxative, all parts of the plant are used in Indian traditional medicine. In the same place, with the help of parsley, they dissolve and prevent the formation of oxalate stones in the gallbladder and bladder, and normalize menstruation. In Morocco, parsley healers treat cardiovascular diseases, and in Denmark they correct memory disorders.

In general, the entire spectrum of the use of parsley in folk therapy can be reduced to several key areas:

Problems of the urogenital area

In folk medicine, the diuretic effect is easily achieved thanks to the young shoots of the plant, which are added to salads. To do this, the seeds are planted on gauze in a flat plate, poured with water and, holding the dishes in a bright, warm place, simply wait for the sprouts to appear.

For the treatment of more serious problems, they usually resort to the manufacture of infusions and decoctions (mainly from seeds and roots). In diseases of the urological nature (pyelonephritis, cystitis, prostatitis, etc.), medicinal decoctions and infusions are prepared with the addition of a large amount of water. Seed decoctions are also commonly used to relieve edema caused by disruption of the cardiovascular system.

Following the ancient healers, traditional medicine uses parsley seeds to enhance potency, which are mixed either with sugar and ox bile (in equal proportions), or with unsalted butter. To get the result, it is recommended to take the medicine for three days in a row. True, at the same time (to consolidate the effect), healers advise eating meat and sex glands of a fat rooster.

Overgrown with details in folk therapeutic practice and ways to correct menstrual irregularities. So, in order to provoke the onset of menstruation, herbalists advise women to pluck greens and pull out parsley root not at any time of the month, but at the new moon, when the crescent of the moon is above the horizon.

Skin problems

Parsley root decoctions in folk medicine relieve not only cosmetic, but also medical problems. Lotions soaked in decoction or juice are applied to lichen, inflammation that appeared after an insect bite, and allergic redness. In addition, in ancient times, taking decoctions of parsley roots accelerated the transition to the next stage of smallpox and measles - it was believed that the decoction would contribute to the appearance of skin rashes in these diseases.

Problems of the gastrointestinal tract

Folk medicine caused choleric and carminative effects by means of preparations boiled from different parts of parsley, and used the antioxidant properties of the plant to prevent damage to the gastric mucosa by relieving oxidative stress. Parsley was also recommended to increase the acidity of gastric juice and to normalize the secretion of the gastrointestinal glands.

In ancient times, people were sure that parsley was able to slow down the rate of intoxication. In order to keep a clear mind longer during a feast, this plant began to be cultivated and diversified with its help in the diet. Today, parsley is also sometimes eaten to stay sober, although more often than not, this spicy herb is now just an effective breath freshener after alcohol, garlic or onions.

Decoctions and infusions

When it comes to concentrated decoctions and infusions of parsley? supporters of traditional and official medicine are often irreconcilable. The former base most therapeutic procedures on decoctions and infusions, the latter, as a rule, are categorically against the independent use of any parsley extracts, pointing out their danger to health (for more details on the risks of using concentrates, see the "Contraindications" section). Therefore, the recipes below are given, first of all, for example, and not for uncontrolled reproduction.

- **An example of the use of a decoction for urological problems.** Large amounts of water are used in such preparations, because it is important to reduce the concentration of urine and maximize the removal of waste products from the urinary tract. To prepare the product, take parsley root (1 pc.), Grind it together with herbs and boil for 30 minutes in a liter of water. Apply 100 ml twice a day. If the seeds of a plant are prepared in a similar way, then their decoction is drunk in a teaspoon twice a day, washed down with 2 glasses of water.
- **An example of the treatment of prostatitis.** The fresh root of the plant is finely chopped and poured with boiling water at the rate of 1 tbsp. l of raw materials per 100 ml. water. The remedy is infused for 10-12 hours, filtered and taken 1 tbsp. l. four times a day half an hour before meals. "Winter" dry parsley root for the same purposes is taken at the rate of 4 tsp. per 100 ml. water. The raw material is poured with boiling water in a thermos and infused for 8-10 hours. Take the mixture in the same way - 1 tbsp. l. half an hour before meals. The course lasts 2-2.5 months.
- **An example of the correction of menstrual manifestations.** In case of painful and / or untimely menstruation, parsley seeds (4 tsp) are poured into 250 ml of water and boiled for a quarter of an hour over very low heat. After cooling and filtering, the remedy is 1 tbsp. l. taken 5 times a day between meals.
- **An example of the removal of edema of a cardiovascular nature.** Cold infusion is prepared from parsley root. To do this, crushed roots and leaves (1 tablespoon) are poured with warm water (250 ml) and infused in this form for 8 hours. An infusion is taken three times a day, 1 tbsp. l. It is important not to forget that in case of cardiac edema, a herbal remedy based on parsley cannot replace synthetic drugs and cardiac glycosides. It is considered only as part of a complex of adjuvant therapy.

in oriental medicine

In Chinese Traditional Medicine, parsley is rated +1 on the Yin-Yang food scale (from -3 to +3, respectively), meaning it is considered a very balanced food with minimal Yang value. It is the products of the -1 / +1 groups that Chinese doctors advise eating as the basis for any obvious imbalance with a predominance of one of the principles.

At the same time, being part of folk medicines, parsley is used for almost the same indications as in traditional medicine of other peoples of the world:

- With violations of bile formation, bile excretion and congestion in the gastrointestinal tract with symptoms of pain and heaviness in the right hypochondrium, indigestion, nausea, vomiting.
- In diseases of the urinary and reproductive systems with metabolic disorders. Among such pathologies are prostatitis, menstrual irregularities, loss of the ability to contract the uterus (atony), urolithiasis, decreased diuresis.
- With edema provoked by diseases of the cardiovascular system (heart failure, decompensated heart disease, etc.).

In addition, parsley is prescribed for an excess or lack of vitamins, obesity, diabetes, muscular dystrophy. Outwardly, parsley is applied for pediculosis (its decoctions and juice remove lice), as well as for the occurrence of skin diseases provoked by malnutrition of tissues.

In scientific research

Today, the potential of parsley is being tested by researchers around the world. And often this plant becomes the object of research, precisely because of its centuries-old reputation in traditional medicine.

- **A diet including parsley has been shown to be effective in reversing gastric damage caused by oxidative stress ^[2].**

Because parsley is rich in antioxidants (flavonoids, carotenoids, and ascorbic acid), it has been tested for its ability to prevent oxidative stress, which plays a major role in the pathogenesis of gastric damage. The plant in the diet was compared with the efficacy of the anti-ulcer lansoprazole (LPZ) in the same diet, as well as with a diet without any experimental inclusions.

Male laboratory rats (40 animals) were divided into five groups (with the addition to the three listed also of the control group and the group of animals that did not experience dietary restrictions at the same level of oxidative stress). To create stressful conditions, the animals were subjected to starvation (for 72 hours) and exposure to cold in an immobilized state (8 hours).

In all animals, except for the control group, damage to the gastric mucosa was recorded, but in animals from the "stress + parsley" and "stress + LPZ" groups, the level of oxidative stress and fat peroxidation markers in the studied tissues was significantly lower. Thanks to parsley, the average level of glutathione, which exhibits antioxidant properties in cells, and the superoxide dismutase enzyme, which is characterized by similar manifestations, increased.

- **Precursors (precursor molecules) were isolated from parsley and dill seeds, from which, in turn, substances were synthesized that inhibited the growth of cancer cells ^[3].**

Russian scientists have developed a cheaper (due to the availability of raw materials) method for obtaining precursors, and have found a one and a half times shorter (than existed before) route for synthesizing an antimyotic called glaziovianin A. The therapeutic effect of this substance and several of its structural analogues were tested on rapidly dividing embryonic cells sea urchins and on human cells of cancers of various types: colon, prostate and breast, lung carcinoma, ovary, melanoma.

The results of the study showed that the most effective (compared to similar antimiotics) was the substance from the seeds of greens (parsley and dill), which showed anti-cancer activity against melanoma. At the same time, glaziovianin did not have a significant effect on blood cells.

- **Parsley methanol extract has shown biological activity against human melanoma A375 ^[4].**

In another study, the anti-inflammatory, antioxidant, and antitumor potential of Romanian parsley extract against A375 melanoma was compared with chamomile and celery extracts. The results showed that although all extracts were rich in polyphenolic compounds and flavonoids and could generate free radical scavenging capacity, only parsley extract had significant pro-apoptotic potential against A375 human melanoma cells. At the same time, unlike other tested substances, parsley extract did not suppress the reproduction of dendritic cells, which play an important role in the regulation of innate and acquired immune responses.

- **In experiments on laboratory animals, parsley extract has been shown to be effective in the treatment of type 1 diabetes mellitus ^[5].**

In an experiment on diabetic and healthy rats, scientists tested the effect of two plant extracts, among which was parsley extract. The effect of the extracts was evaluated by several parameters at once: body weight, plasma glucose, insulin, total antioxidant capacity (TAC), the level of malondialdehyde (MDA - an oxidation marker), etc.

As a result, it was found that parsley extract significantly reduced mean plasma glucose and a marker of fat peroxidation (MDA), and markedly increased mean plasma insulin and total antioxidant capacity (TAC). In parallel, an apparent increase in pancreatic weight and size of the islets of Langerhans was recorded in those groups that received plant extracts.

Unfortunately, not all studies confirm the effectiveness of the studied product, even if there are optimistic assumptions. For example, Brazilian scientists evaluated the antibacterial potential of parsley and rosemary against bacteria that cause urinary tract infections. They concluded that the use of crude extracts of parsley leaves and stems did not lead to satisfactory results in the suppression of the activity of most of the studied bacteria. Although a moderate antimicrobial effect has been found against some microorganisms ^[6].

Weight regulation

By itself, parsley is a low-calorie food containing about 30-40 kcal / 100 g. However, in nutrition this is a dependent product - you cannot build a mono-diet on it. Therefore, parsley is considered in weight loss programs, first of all, as an auxiliary nutrient that helps a person to receive the necessary amount of healthy substances.

So, parsley is part of a slimming cocktail called "Lightness of Princesses": 250 ml of mineral water are mixed with gruel from ground parsley (20 g), dill (20 g), cucumber without peel (1 piece of medium size). The juice of half a lemon is also often added to the mixture. It is believed that in the absence of contraindications, such a cocktail can be drunk up to 1 liter per day.

In addition, parsley can also affect weight as a diuretic: it removes swelling and helps to reduce salt intake without losing the taste of food. Finally, parsley activates digestion and metabolism, which, in turn, also contributes to weight control.

In cooking

In order to correctly "read recipes" for dishes with parsley, you must first figure out what kind of plant the authors of these recipes have in mind. As a rule, parsley is divided into two main subspecies:

- **Root parsley** is a plant with a thickened, fleshy root that has fragrant yellowish flesh. It is sometimes referred to as "white root" in recipes, and is used in much the same way as other root vegetables. They make stews, sauté, carpaccio from it, add it to salads and soups, stew and salt it, and use it when cooking fish. In chopped form, after sautéing, the root is added to soups and broths. To improve the color and make the broth more fragrant, the fresh root is often simply halved and baked without oil until a brown crust forms.

A. Averchenko's story "The Poem of a Hungry Man" describes a method of cooking horse parsley as a side dish for fried fish. There, the root crop was simply cut into pieces and deep-fried for a short time. Such a side dish is suitable not only for fish, but also for chicken or veal.

- **Leaf parsley** is a plant with developed "tops" and hard thin "roots". Its subspecies - Neapolitan parsley - is distinguished by very fragrant greens, and the leaves of the curly parsley subspecies, although less fragrant, look spectacular in a dish as a decoration. Plant greens are often added to cottage cheese, scrambled eggs, butter sandwich butter, pancakes, pies, meat cutlets, minced meat for dumplings.

Dried parsley can easily replace pepper, salt and other spices. In order not to forget about the alternative for everyday use, write, finely grind dried parsley and put it in a pepper shaker. True, when dried, the specific spicy smell partially disappears.

In salted form, greens are more often used in the absence of fresh shoots, adding it to stews, broths and minced meats. However, due to the fact that vitamins are destroyed when going into the brine, this is considered a less useful way to use the product. Although, for the smell, parsley umbrellas are willingly added to homemade marinades and pickles.

In some national dishes, parsley can become one of the key ingredients. In the Middle East, tabbouleh salad is prepared, in which, in addition to parsley, you can find bulgur, tomatoes, onions (garlic), mint, seasoned with olive oil and lemon juice. In French persillade sauce, finely chopped parsley is also mixed with garlic and olive oil, while in Italian gremolata, the plant's greens are combined with garlic and lemon juice or zest. In this combination, parsley neutralizes the smell of garlic, and the citrus component retains the spicy smell.

Parsley seeds are almost never used in cooking, since the high content of essential oils gives a strong bitterness to the finished dish.

In cosmetology

In cosmetologists, infusions and decoctions of parsley roots (sometimes mixed with lemon juice, sometimes in pure form) are known as one of the most popular means for whitening the face - removing freckles, age spots, tan marks.

Another area where a decoction of parsley is considered especially effective is the elimination of the effects of insect bites (mosquitoes, wasps, bees, etc.). For these purposes, green gruel or parsley juice is also often used, which are applied to the affected area of the skin in the form of a compress that eliminates itching, pain, redness, and swelling. But, since cockerel extracts themselves can cause allergic inflammation, before use, a test application of the decoction should be made on a small area of the skin (for example, behind the ear).

In home cosmetology, with the help of a mask of parsley ground into gruel, they solve the problems of fine wrinkles (especially around the eyes), as well as acne. There is a legend that Thais of Athens loved to "wear" such a rejuvenating and refreshing mask - hetaera and the second wife of the ruler of Egypt Ptolemy I, who had previously become famous for her relationship with Alexander the Great.

Today, less often, and in the old days, various parts of parsley were often used to increase hair strength. Back in 1788, in the Economic Store publication, a recipe was published by the then-famous agronomist A. Bolotov, who recommended that "so that the hair does not come out of the head" grind parsley seeds into powder and "powder much" with such vegetable powder hair for several days.

Dangerous properties of parsley and contraindications

Parsley concentrates (extracts, decoctions, infusions, oils) are contraindicated in inflammatory diseases of the kidneys and acute inflammation of the bladder. (First of all, we are talking about essential oil,

decoctions and infusions of seeds and roots). Apiol contained in essential oils in high uncontrolled concentrations can damage the tissues of the excretory organs. And an excess of oxalates can cause the growth of stones in the gallbladder and kidneys.

Even fresh parsley is not recommended for therapeutic diets No. 1, 1A, 1B in cases of exacerbation of gastric ulcer and duodenal ulcer. Exclude greens from diet number 4 for diarrhea caused by intestinal diseases. Limit on table number 7 with exacerbation of renal diseases.

It is also forbidden to use large quantities and concentrated preparations of different parts of parsley for epilepsy, salt metabolism disorders, gout, oxaluria due to the content of purines and oxalic acid in the plant.

Special attention should be paid to the use of parsley during pregnancy. The main danger to the gestating fetus is apiol, which is a strong antispasmodic. In concentrated form, it can provoke uterine contractions and abortion, even in food use.

Often, the antispasmodic property of parsley in terminating an unwanted pregnancy is used consciously. (As an abortifacient, parsley has been used since antiquity.) However, independent attempts to provoke a miscarriage can lead to the death of a woman.

In the form of ordinary shoots, parsley does not pose a serious danger. There is little apiol in greens (in the leaves of the plant there are 10-12 times less essential oils than in the seeds) and it is rather difficult to exceed the limits of the permissible amount. Nevertheless, pregnant women are still advised not to abuse apiol-containing food and limit the consumption of fresh parsley leaves to 10 grams.

In addition to apiol, essential oils contain myristicin (a derivative of elemicin), which is considered a psychoactive substance that can affect the clarity of consciousness. Because of it, in 2011, the fruits and essential oil of the plant were banned in Russia for use in the production of dietary supplements and were included in the list of parts of the plant that contain narcotic substances. The situation with the ban was repeatedly commented on by representatives of the drug control of the Russian Federation, focusing on the fact that parsley is not a drug and its circulation is not limited.

Finally, another health threat posed by most garden plants is the contamination of parsley leaves with various pathogenic microorganisms and helminths. Therefore, greens collected from open ground are recommended to be washed as thoroughly as possible before use. This is especially important because fresh leaves are not always heat treated before being put on the table. In this sense, greenhouse plants growing on hydroponics in an isolated environment are much safer without the risk of animal feces, acid rain drops and other negative factors.

Selection and storage

Before you choose parsley, you should decide on its purpose. Stems with broad, large leaves are likely to be "Neapolitan" ("Italian") in appearance and will give a complex rich flavor in the dish. In order to feel it at the time of purchase, you should smell the stem at the cut point, where the smell is stronger.

The appearance of parsley should be "healthy", and the leaves should have a uniformly saturated color: without spots, dust, mold, parasitic organisms, lethargy, bruising, yellowness, stickiness. The cut points should be without a characteristic dry film and not dry. But there should also be no drops of moisture on the leaves (or packaging). Since parsley is bought in bunches, these rules apply to all stems in a bunch.

Fresh stems can be kept at home for up to 5-7 days if parsley is wrapped in a damp cloth or placed in the refrigerator in a plastic bag at a temperature of about 1-2°C. Parsley roots are also usually stored in the cold, covered with dry sand.

For a long time, fresh parsley is frozen with salt in oil. To do this, the greens are finely chopped, poured into molds, which are poured with oil, and put in the freezer. Frozen cubes are taken out as needed for seasoning broths or salads.

A more traditional way of harvesting parsley is to dry it. To do this, parsley greens are washed, large drops are shaken off, loosely tied into small bunches and hung in well-ventilated dry rooms in shaded corners. If the weather does not allow these conditions to be met and the storage places are too humid, then the parsley is dried in the oven at a temperature not exceeding 40-50 °C for better preservation of vitamins and essential oils. Small root crops for blanks are dried as a whole, and large ones are cut into 2-4 parts along the fibers. Fold the parsley prepared in this way in glass jars, tightly closing them with a lid.

Despite the ability to connect parsley to the solution of some economic problems, the main areas of its use still remain culinary and traditional medicine. A whole range of diseases associated with the urinary and genital areas, congestion in the gastrointestinal tract, bile formation, skin diseases can be treated thanks to parsley. And the successes of evidence-based medicine in recent years additionally demonstrate the hidden potential of this plant.

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[An extended HTML version of this article](#) is available on the website edaplus.info.

Parsley - useful properties, composition and contraindications

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Dill (lat. Anethum)

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Abstract. The article discusses the main properties of dill and its effect on the human body. A systematic review of modern specialized literature and relevant scientific data was carried out. The chemical composition and nutritional value of the product are indicated, the use of dill in various types of medicine and the effectiveness of its use in various diseases are considered. The potentially adverse effects of dill on the human body under certain medical conditions and diseases are analyzed separately. The scientific foundations of diets with its use are considered.

Keywords: dill, benefit, harm, beneficial properties, contraindications

Beneficial features

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Squirrels	3.46
Alimentary fiber	2.1
Fats	1.12
Calories (kcal)	43
Minerals (mg/100 g):	
Potassium	738
Calcium	208
Phosphorus	66
Magnesium	55
Sodium	61
Iron	6.59
Manganese	1.264
Zinc	0.91
Copper	0.146
Vitamins (mg/100 g):	
Vitamin C	85
Vitamin PP	1.57
Vitamin B6	0.185
Vitamin B1	0.058
Vitamin B2	0.296
Vitamin A	2.32

Dill is known in the therapeutic literature as a rich source of flavonoids, phenolic compounds, saponins, cardiac glycosides and terpenes, as well as some vitamins and minerals.

The table below shows that dill leaves contain various vitamins, among which vitamin C stands out. According to this indicator, dill is 1.5-2 times ahead of citrus fruits (lemon, orange), entering the top 20 vegetable products containing ascorbic acid. Vitamin PP (nicotinic acid), B1 (thiamine), B2 (riboflavin), a number of flavonoids, and a complex of mineral salts were found in dill.

Dill fruits are 15-20% fatty oil with the inclusion of oleic, petroselinic, linoleic, palmitic acids. Also, the fruits of the plant contain a lot of essential oils (approximately 3.5%), consisting mainly of kavron, limonel and alpha-phellandrene.

However, the seeds and leaves of dill are not the same in terms of their quantitative (and, in part, qualitative) composition, which means that they exhibit different therapeutic effects. For example, the concentration of D-carvone in the essential oil of fruits is several times higher than in the essential oil of the herbal part (30-50% versus 15-16%, respectively). And the concentration of alpha-phellandrene, on the contrary, is higher in greens.

Other factors also have a significant impact on the chemical composition of dill: growth stages, cultivation area, genotype and environmental conditions. For example, American dill oil contains a very high amount of alpha-phellandrene, while carvone and limonene form the basis of Asian and European dill essential oil. ^[2]

Medicinal properties

Dill is used in traditional herbal medicine for the treatment and prevention of diseases of the digestive system and the genitourinary system, to eliminate breathing problems, to activate lactation, and also to lower cholesterol and glucose levels.

Recently, dill has been talked about as a possible anti-cancer, anti-inflammatory, antimicrobial product that can normalize stomach function by eliminating irritation and discomfort. Moreover, in addition to the long-known medicinal properties of the plant, new manifestations are being discovered, which in the future may make it possible to include dill preparations in official medical protocols:

- the anticonvulsant effect of the water-alcohol extract can be used in the fight against epilepsy ^[3],
- the estrogenic properties of herb extracts will make it possible to use them for the treatment of primary dysmenorrhea ^[4] and for the correction of menstrual irregularities,
- broad-spectrum antibacterial activity of crude extracts against *S. aureus* (*Staphylococcus aureus*), *E. Coli* (*E. coli*), *P. Aeruginosa* (*Pseudomonas aeruginosa*), *Salmonella typhii* and *S. Typhimurium* (*Salmonella* species), *Shigella flexneri* (*Flexner's Shigella*)) has the potential to be used against a range of diseases from pneumonia to meningitis. ^[5]

There are studies showing that dill can reduce the incidence of diabetic complications. Experiments with essential oils, seed and leaf extracts in various diabetic models have shown significant reductions in triglycerides, glucose, total cholesterol, low and very low density lipoprotein cholesterol, and a concomitant increase in high density “good” cholesterol. ^[6]

It is assumed that the hypolipidemic effect of dill and its antidiabetic functions are provided by:

- inhibition of absorption of cholesterol in the intestine,
- increased fecal excretion,
- binding it to bile acids,
- increased production of bile acids in general.

In addition, rutin and quercetin (components of dill) may be responsible for lowering serum and liver cholesterol levels. Treatment of diabetic rats with aqueous and alcoholic dill extracts showed that they normalize lipid deposits in the liver, pancreas and heart. ^[7] And the use of carvone in laboratory therapy caused a decrease in the level of glycoproteins in plasma and stimulated insulin secretion. ^[eight]

The hypoglycemic and antioxidant activity of the components of dill also reduces the number of diabetic complications. The antioxidant manifestations of the plant here, apparently, are due to its phenolic proanthocyanidin and flavonoid components. Moreover, the extract of grass flowers has a greater antioxidant activity than the extract of seeds or leaves. It is believed that thanks to the dill extract, it is possible to provide greater protection of the gastric mucosa and prevent the occurrence of peptic ulcer. ^[9]

There are works considering the possibility of using plant concentrates for the prevention of Alzheimer's disease and the restoration of cognitive functions in old age. ^[10] Flower extracts and dill oil (topically) are tested for their ability to inhibit inflammation in burns and wounds. And an experiment with the use of aqueous extracts of the herb (1 ml three times a day) for five days showed effectiveness in the treatment of giardiasis (a parasitic lesion of the small intestine) in children. ^[eleven]

In medicine

Ayurveda researchers count more than fifty classic "old" preparations, which include dill or plant parts. The number of dill products produced by the modern pharmacological industry is much less. But among them you can find dill water, fruit extract, and essential oil.

- **"Dill water"**. The preparation consists of 1 part of essential oil of plant seeds and 1000 parts of purified water. It is intended to relieve spasm of the intestinal muscles and improve digestion. Water is especially effective in eliminating flatulence in children aged 2 weeks to 6 months. To do this, it is given 1 tablespoon three times a day, mixed in formula for feeding or breast milk.
- **Fruit extract "Anetin"**. An agent with an antispasmodic effect is prescribed for problems with the abdominal organs (chronic spastic colitis) and in case of chronic coronary insufficiency that occurs as a result of atherosclerotic processes in the coronary arteries. However, the drug is not intended to eliminate acute attacks of angina pectoris. The effect of Anetin comes slowly: when taken 0.1 g three times a day - for 0.5-1 week. Among the medicinal analogues of this plant extract are called Pastinacin and Daukarin obtained from carrot seeds.
- **Complex preparation "Solutan"**. The composition of this drug, intended for the treatment of bronchitis and bronchial asthma, includes dill oil.
- **Essential oil of dill**. The composition of the essential oil from different brands may vary, but almost all manufacturers recommend it for relieving the symptoms of acute catarrhal bronchitis, correcting digestive problems, normalizing painful menstruation, eliminating renal colic and gas formation disorders with recurrent discomfort in the upper abdomen (dyspepsia). In addition, it is positioned as a bile and diuretic.

In folk medicine

The concept of dill in folk medicine has evolved over time. In ancient times, it was believed that dill, both in the form of raw herbs and in the form of specially prepared concentrates (decoctions, infusions, oil extracts), was able to open organ blockages, dissolve internal tumors, eliminate pathological conditions associated with an increase in phlegm, save from poisoning (in combination with honey), relieve stomach weakness and restore bowel function. But since different parts of the plant in one or another preparation had, respectively, different pharmacological effects, the priorities in the use of "derivatives" of dill gradually began to stand out:

- The healing herb was included in the recipes for drugs for diseases of the liver and spleen, it was used to treat shortness of breath, drove urine, stimulated menstruation, and relieved hiccups. With crushed fresh grass, abscesses were "pulled out" (brought to maturity).
- Plant juice increased lactation, relieved ear pain (by instillation into the ear hole), treated sciatica, and provoked vomiting.
- Dill oil (externally) removed tumors of the extremities and "softened the members", used as a warming and soporific agent.
- A decoction of dill was used to treat the kidneys, intestines, bladder (including urolithiasis), stop nausea and "semen".
- The ash of the plant was applied to the affected areas to get rid of wounds, abrasions, hemorrhoidal cracks.
- Baths from dill decoction relieved the problems of the urogenital area: diseases of the testicles and uterus, the appearance of "winds" in the bladder and kidneys.
- Roasted seeds in the form of a powder were applied to wet wounds, and boiled in honey until thick, they were applied to the perineum to remove fecal stones.

A significant part of these ideas about the healing properties of dill have been preserved in modern folk medicine. Dill is still actively used for flatulence and digestive disorders, a diuretic effect is often

used to relieve edema, kidney and bladder diseases. And the essential oil of the seeds is in demand for relieving spasms in the intestines and helping to eliminate colic.

Less common, but also quite widely practiced in folk medicine, is the treatment of dill for benign prostatic hyperplasia, mental disorders, diseases of the upper respiratory tract, and lactation disorders in nursing mothers. An ointment based on dill seeds is sometimes used to remove lice, and a decoction is used to relieve itching on the skin with allergies.

Decoctions, infusions and oil extracts

For the treatment of the above diseases in folk medicine, as a rule, decoctions and infusions of dill seeds are used. Here are examples of some of them:

- **"Tea" for lactation.** Dill seeds (1 tablespoon) are ground in a coffee grinder, poured with boiling water (1 liter) and put on a slow fire for 5 minutes. Before drinking, the drink is filtered and cooled. It is taken an hour before feeding the child 5-6 times a day. Alternatively, you can make a "tea" from seeds (1 tsp), filled with boiling water (250 ml) and infused in this form for 2 hours - until cool.
- **Decoction of cystitis.** Seeds (2 tsp) are poured with water (250 ml) and boiled for 20 minutes over low heat. After straining, the decoction is drunk 5 times a day for a week as an auxiliary (to the main therapy) remedy.
- **Infusion of hypertension.** "Young" seeds (1 tsp) are poured with boiling water (300 ml) and infused for 3-4 hours. The infusion is taken as an additional means to reduce pressure after consultation with the doctor.

The greenery of the plant is also often used in the preparation of concentrates. For example, a **decoction of stones** is prepared from fresh dill grass (50 g) boiled in 250 ml of water for 5 minutes.

With the help of boiling and infusion at home, "**dill water**" is also prepared.

- *Method number 1.* Seeds (1 tsp) are poured with boiling water (200 ml), covered and infused for an hour. The infusion is taken after gauze filtering and cooling (under sterile conditions) to room temperature.
- *Method number 2.* Seeds (1 tsp) and water (200 ml) are placed in a water bath for half an hour, and then another 50 ml of boiled water is added to the strained and cooled infusion.

To obtain **dill oil**, you can also use different methods.

- *Method number 1.* Dill juice and olive oil, taken in equal proportions, are put on a slow fire until the water evaporates.
- *Method number 2.* Fresh dill greens are dipped in olive oil and kept in the sun until the grass loses its color. After filtering this portion of the infusion, the cycle is repeated with a new bunch of greens. Oil is considered ready for use after 3-5 repetitions.

in oriental medicine

The traditional Indian system of traditional medicine - Ayurveda - describes fennel seeds mainly as gastric (for abdominal discomfort, colic, indigestion, ulcers), wind and diuretic with ancient traditions of use. But in some sources, eye diseases, pain in the uterus, rheumatism are mentioned as indications for the use of dill. So, for example, in one classic work, a paste for external use from shatapushpa (dill), flaxseed and castor bean seeds, pounded with milk, and prescribed for rheumatic pains and

swelling of the joints, is recommended. And in another work, dill is considered as a tonic, rejuvenating and intellect-stimulating herb.

There is evidence that dill has been used in Asian medicine for centuries to treat diabetes and cardiovascular disease. Dill fruits are still in demand in traditional Chinese medicine as a biologically active tool for monitoring the state of “dense” organs (heart, spleen, liver, kidneys, lungs) and the conduction system.

In scientific research

Among researchers, dill is a very popular object. Grass and essential oils of greens and seeds are constantly being studied for use in the treatment of cardiovascular diseases, diabetes, epilepsy, liver diseases (including carcinoma), fungal diseases, and some pathologies of the gastrointestinal tract. The therapeutic effect is not always equally pronounced, but very often dill concentrates, according to research results, look like promising raw materials for creating effective drugs for these diseases.

- **Specially selected doses of hydroalcoholic extract of dill leaves have a protective effect on the dentate gyrus of the hippocampus in mice with epilepsy.** ^[12]

In this experiment, 40 mice were divided into 4 equal groups. In three groups, mice received an extract of dill leaves in the amount of 250, 500, 750 mg/kg, respectively, for 21 days, and in the fourth (control) group - a phosphate-saline solution. As a result of the study of the excised hippocampus, it was found that mice in the group that received the extract in a volume of 500 mg/kg had a significantly larger number of healthy neuronal cells in the dentate gyrus than in animals from other groups. In addition, the number of caspase-3-positive cells, which play an important role in inflammatory processes, necrosis and programmed cell death, was significantly lower. At the same time, in all epileptic mice treated with dill extract, the number of healthy neuronal cells was higher than in animals from the control group.

- **Dill essential oil has demonstrated a pronounced antifungal effect against *Aspergillus flavus*.** ^[13]

The fungus *Aspergillus flavus* produces organic compounds (aflatoxins) that can cause damage to the kidneys and liver, allergic bronchopulmonary aspergillosis, and some other lung diseases. The study examined the effect of dill oil at different concentrations on the plasma membrane and mitochondria of the fungus, as a result of which a significant antifungal activity of the extract was recorded. The mechanism of antifungal action was due to the ability of dill oil to destroy the plasma membrane permeability barrier and the creation of mitochondrial dysfunction due to the accumulation of reactive oxygen species.

- **Dill essential oil demonstrates anti-cancer potential against the HepG2 cell line, human hepatocellular carcinoma.** ^[fourteen]

The HepG2 cell line is widely used for testing tissue engineering materials and research. In this work, we not only analyzed the effect of dill essential oil on HepG2 cells, but also identified the main anti-cancer components of the oil, as well as their optimal concentration, necessary to reduce the viability and inhibit the growth of malignant tumor cells after 24-hour exposure to oil concentrates. In the course of the work, 20 active components were identified in dill oil (mainly carvone, dillapol, dihydrocarvone-2 and dihydrocarvone-1) and the assumption was confirmed that dill essential oil causes cell cycle arrest (in the pre-G1 and G2 / M phases) and apoptosis carcinoma cells.

- **Scientists are also considering the possibility of using dill plant extract in contraceptives.**

A group of scientists conducted a series of studies spanning several years in which female laboratory rats were exposed to dill seed extract. First, scientists established the very fact of the influence of water and ethanol extracts on the reproductive function of females. Then we studied which fractions of the dill extract can cause infertility in animals. ^[15] And, finally, we tried to establish the mechanism of the infertility effect by tracking the changes that occur in the eggs of the experimental subjects.

In the last part of the study, an experiment was carried out with 59 adult female rats, which were divided into 3 groups: the first group received low doses of the extract for 10 days, the second - high doses, the third - control - did not receive the extract. As a result, it was concluded that an aqueous extract of dill seeds, both at low and high doses, increased the duration of the estrous cycle, progesterone concentration and caused infertility without any significant adverse effects on the developmental potential of the egg, without leading to its structural or chemical changes. ^[16]

Weight regulation

The effectiveness of an aqueous extract of dill seeds on the rate of weight loss was tested in a study on overweight laboratory rats. The scientists added the extract to the food of the animals for five weeks, and by the end of the experiment, they were significantly “leaner”. The researchers suggest that the effect was due to an increase in the levels of serotonin (5-HT), its metabolite (5-hydroxyindoleacetic acid) and tryptophan in the brain and plasma of experimental animals. And elevated levels of 5-HT made the subjects feel full faster, suppressing the desire to overeat, which ultimately led to weight loss. ^[17]

The calorie content of dill is very low - only 40-45 kcal / 100 g of fresh herbs - and it is readily added to various diet programs aimed at losing weight and drying, using, among other things, the diuretic properties of the herb. At the same time, the effect of getting rid of extra pounds is also created due to the fact that dill in the diet reduces the need for salt, which retains water in the body.

In cooking

After the 2018 FIFA World Cup held in Russia, English journalists, speaking about the culinary features of the cuisine of the host country, noted the excessive, in their opinion, the presence of dill in many dishes, due to which the taste of the main ingredients was lost behind the taste of bitter-spicy herbs. From the reasoning of the journalists, it followed that, although dill is known in Europe, it is not as popular as it is in the countries of the post-Soviet space, but it still does not use it there.

Meanwhile, the traditions of using dill greens as a spice in the European part of the continent were known even in the days of Ancient Greece. Then the fragrant herb was “inherited” by the Romans and, with the expansion of the Roman Empire, spread far to the north as early as the first millennium of our era.

Today, aromatic herb is used not only to give a spicy smell to various foods and dishes - pickled and pickled cucumbers and tomatoes, salads, sauces, soups, boiled and fried meat, fish. Dill also plays the role of a preservative in preparations, since it is able to protect products from mold, inhibit the growth of colonies of bacteria such as staphylococcus aureus, streptococcus, E. coli, and some representatives of the Pseudomonas genus. In Germany, due to the widespread use of dill in canning, it is even called “borage”.

During cooking, dill seeds reveal the aroma better during heat treatment, so they are placed at the beginning of the process, and fresh herbs are usually added at the end to preserve the smell. The recommended daily intake of dill grass is about 25-30 grams per day, and the maximum allowable is 80-100 grams.

Dill in the flowering or fruiting phases is considered an important component of sour vinegar. Dried leaves of the herb are sometimes added to tea for a savory flavor. And some manufacturers of fermented milk products have begun to produce kefir and sourdough with dill and cucumber flavors. They say that marketers focused this product, first of all, on men, counting on the fact that on a hangover morning he could replace the brine.

At the same time, dill is no less popular among the people - a drinking 38-40-degree tincture. For its preparation at home, plant umbrellas (inflorescences with seeds) are used. Freshly cut raw materials give the drink a weaker aroma and greenish color, while dried raw materials add a yellow tint and provide a richer taste and smell.

To prepare a tincture with a volume of 0.5 liters, you will need two dill umbrellas with seeds and stems. Lovers of sharp tastes additionally put garlic in a jar, lovers of soft ones - honey or sugar. The tincture is kept closed in a warm and dark place from 4 to 7 days, although the exact time depends on the initial characteristics of the raw material.

In cosmetology

In cosmetics, dill is used mainly as an antiseptic agent and as an ingredient with a pronounced whitening effect.

In a recent study (2019), scientists tested the ability of dill extracts (and some other plants) to show skin whitening effects. Scientists became interested in dill due to its active biosynthesis of umbelliprenin, which had previously proven its potential in experimental skin whitening agents. The scientists were faced with the task of choosing the best solvent for the maximum yield of umbelliprenin (it turned out to be EtOH - ethyl alcohol), and finding the best proportion to demonstrate the effect on the cells of laboratory mice. The herbal extracts in this study proved to be as effective as the synthesized substance. ^[eighteen]

At home, you can also prepare a whitening mask with the addition of dill. To do this, you will need dill juice (2 tablespoons), cucumber pulp (2 tablespoons), and raw egg yolk (1 pc.). The components must be mixed and applied to the skin for a quarter of an hour. In combination with egg and lemon, dill is also used in tightening masks, and in combination with sour cream - in masks to eliminate fine wrinkles and moisturize the skin.

In the last decade, cosmetic ice from the seeds of the plant has become popular. First, dill seeds (20 g) are poured with boiling water (250 ml) and infused for 30 minutes. And then, in a cooled form, they are poured into ice molds and frozen in the freezer. With such ice cubes, to improve blood circulation and prevent acne, you can wipe your face both in the morning and in the evening.

In the cosmetic industry, seed and herb extracts are also used to prepare perfumery and cosmetic compositions that are introduced into creams, toilet waters, toothpastes, etc.

Dangerous properties of dill and contraindications

In ancient times, it was believed that you should not consume more than 25 grams of dill per day. Damage can be done to the bladder, kidneys, brain and reproductive function of a man (especially when eating fennel seeds). To avoid this, one should eat lemon, unripe grapes and honey with vinegar.

In modern official medicine, dill is not recommended for people with low blood pressure, urolithiasis and exacerbation of chronic urinary tract diseases.

Selection and storage

The quality of dill before buying can be determined by appearance, smell and touch.

1. **Outwardly, the stems and leaves of high-quality dill** are saturated green in color without yellowing, darkening, signs of self-warming and freezing. Dill in a bunch should be uniform in color, shape, and varietal affiliation without flower umbrellas (for store specimens). It is better that the stems are without creases, because the presence of mechanical damage reduces the shelf life. In addition, care must be taken to ensure that the grass inside the bundle is as fresh as the outside. The length of greenery should not exceed 25 cm (if you count from the end of the upper leaves to the neck of the root). If overgrown plants are found in a bunch, then their proportion cannot exceed 10%.
2. **The smell of high-quality dill** is clean, without foreign inclusions. If you rub a fresh leaf with your fingers, the smell will open more strongly. As a rule, in a garden plant it is more saturated than in a greenhouse grown in hydroponics. However, many other factors (from the dill variety to its age) can affect the intensity of the aroma, so the smell rating does not give an exhaustive picture.
3. **By touch**, you can determine the degree of lethargy-elasticity and moisture-dryness of the stem and / or leaves. The plant should be neither too wet nor too dry. Choose dill with elastic stems, but without signs of coarsening.

Fresh dill can be stored:

- up to 3 days at a temperature of 15-18°C and high (85-90%) relative humidity,
- up to 5 days at a temperature of 1-3°C and a humidity of 90-95%,
- up to a month - at a temperature of 0-3 ° C in hermetically sealed plastic bags.

Sometimes the shelf life at room temperature is slightly extended by placing the grass stalks in a glass of water, and the umbrellas under damp and regularly moistened gauze.

For preparations for the winter, dill is dried. Young grass, which has not yet thrown out tubes with a seed umbrella, is better suited for this. Such plants are harvested for drying in the morning after the dew has evaporated. It is not recommended to cut greens covered with dew or wet after rain for harvesting, since rotting processes can begin in it. For the same reason, they often don't wash their "tested" dill "for drying" after cutting, but it's better to rinse, shake off and blot with a paper towel when bought.

You can dry greens both in bunches and in crumbled form. In the first case, loosely connected bundles of 5-10 stems are hung with the leaves down, creating conditions for good ventilation and shading. In the second case, under similar conditions, the chopped grass is laid out in a thin layer on plates or pallets. Such blanks can be covered with gauze to protect dill from dust.

For a shorter period (up to 4 hours), dill can be dried in the oven on wax paper. In this case, it is better to open the oven door for air circulation, and set the temperature no higher than 40 ° C to preserve the beneficial properties of the plant. Turn the stems or stir in the chopped dill, preferably about every 30-40 minutes.

Modern people appreciate the beauty of dill much less than the ancients, but they know more about its beneficial and healing properties. Moreover, the scientific discoveries of recent years give a chance to use dill in the fight against very complex and intractable human diseases.

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Dill - useful properties, composition and contraindications

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Abstract. The article discusses the main properties of dill and its effect on the human body. A systematic review of modern specialized literature and relevant scientific data was carried out. The chemical composition and nutritional value of the product are indicated, the use of dill in various types of medicine and the effectiveness of its use in various diseases are considered. The potentially adverse effects of dill on the human body under certain medical conditions and diseases are analyzed separately. Considered scientific basics diets With his application .



Basil (lat. Ócimum)

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Abstract. The article discusses the main properties of basil and its effect on the human body. A systematic review of modern specialized literature and relevant scientific data was carried out. The

chemical composition and nutritional value of the product are indicated, the use of basil in various types of medicine and the effectiveness of its use in various diseases are considered. The potentially adverse effects of basil on the human body under certain medical conditions and diseases are analyzed separately. The scientific foundations of diets with its use are considered.

Keywords: basil, benefits, harm, beneficial properties, contraindications

Beneficial features

Table 1. Chemical composition of basil (according to [Food+](#)).

Main substances (g / 100 g):	Fresh basil ^[1]
Water	92.06
Carbohydrates	2.65
Sugar	0.3
Alimentary fiber	1.6
Squirrels	3.15
Fats	0.64
Calories (kcal)	23
Minerals (mg/100 g):	
Potassium	295
Sodium	four
Phosphorus	56
Calcium	177
Magnesium	64
Iron	3.17
Manganese	1.148
Zinc	0.81
Copper	0.385
Vitamins (mg/100 g):	
Vitamin C	eighteen
Vitamin PP	0.902
Vitamin E	0.8
Vitamin B6	0.155
Vitamin B2	0.076
Vitamin B1	0.034

In addition to vitamins and trace elements, basil leaves contain several biologically active compounds, including eugenol, ursolic acid, β -caryophyllene, linalool, 1,8-cineol, etc. Eugenol is considered the main biologically active metabolite, although the phytochemical composition of basil is very complex and can vary depending on a number of conditions. In addition, basil includes many other potentially active secondary metabolites - phenylpropanoids (methylugenol, rosmarinic acid), monoterpenes (ozimene), sesquiterpenes (germacrene) - which can both alone and synergistically improve the therapeutic characteristics of basil.

Medicinal properties

In the system of traditional medicine of South Asia, basil has been used for at least three millennia. During this time, it has gained a reputation as a multifunctional medicinal plant, which in the modern world is tested and re-tested by researchers and practitioners. Over the past decade, multiple therapeutic effects of basil have been confirmed: adaptogenic, antimicrobial, anti-inflammatory,

cardio- and hepatoprotective, immunomodulatory, metabolic anti-cancer, antioxidant, radioprotective, antidiabetic, antispasmodic.

Basil, thanks to a unique combination of pharmacological characteristics, is able to cope with stress of various nature:

- **physical** - relieving stress from prolonged physical exertion, exposure to cold and excessive noise,
- **chemical** - protecting organs and tissues from industrial pollutants and heavy metals,
- **metabolic** - normalizing blood glucose, blood pressure and lipid levels,
- **psychological** - positively affecting memory and cognitive functions, relieving anxiety, showing antidepressant properties.

The systematic use of basil reduces the risk of acute circulatory disorders in the brain and prevents its possible complications. ^[2]

The grass protects neurons from damage, prevents their death, restoring behavioral and cognitive functions. ^[3] Thanks to the leaves of basil, cognitive processes are activated and memory is strengthened, neuromuscular coordination improves. ^[4,5]

Basil extracts prevent the formation of blood clots, providing a vasodilating effect, which can be effectively used in the treatment of cardiovascular diseases. ^[6] They also prevent damage to myocardial cells during a heart attack. ^[7]

The plant oil exhibits antibacterial activity against staphylococcus, salmonella, Escherichia coli ^[8], enhancing the effectiveness of antibiotics. Also, basil oil can suppress the activity of Trichomonas (pathogens of trichomoniasis) and Giardia.

In the experiment "in vitro" (in a test tube), antiviral activity was detected against the causative agent of viral diarrhea ^[9], as well as against DNA-RNA viruses, enterovirus 71 (EV71) herpes virus (HSV), hepatitis B, adenovirus (ADV). ^[10] Both crude aqueous and ethanolic extracts of basil and isolated constituents, apigenin, linalool, and ursolic acid, demonstrate efficacy.

Thanks to the action of jasmine and arachidonic acids, basil exhibits anti-inflammatory properties. Over the past decades, the antioxidant activity of alcoholic extracts of the plant has been well studied (taking into account varietal differences) in vitro. ^[11] Due to its ability to protect liver cells from damage, basil acts as a hepatoprotector. Animal experiments show that the essential oil of the plant stops liver cirrhosis by blocking the effects of hepatotoxins. ^[12]

The betulinic acid contained in basil exhibits antitumor properties. Thanks to it, as well as a dozen other components, the essential oil of the plant in laboratory test tubes destroys cancer cells of the cervix, cells of epithelial carcinoma of the human larynx ^[13], and water-alcohol extracts of the plant demonstrate anti-melanoma activity in experiments on mice. ^[fourteen]

Basil oil eliminates bronchospasm and exhibits a moderate sedative effect, reducing the excitability of the cough center of the nervous system. Taking into account the fact that basil oil also has anti-inflammatory, secretolytic (expectorant), antiseptic effects, demonstrates antifungal and antiviral activity against adenoviruses that cause acute respiratory diseases, the herbal component is considered as a complex and multifunctional remedy in getting rid of both symptoms and causes respiratory diseases in children. ^[fifteen]

Already today, researchers are considering the possibility of using the pronounced antioxidant potential of basil to create a multi-purpose drug for diabetes, obesity and oxidative stress. ^[16]

In medicine

Basil oil is included in the "Broncholitin" as an additional component. The main effect of the drug, aimed at relaxing the smooth muscles of the bronchi, removing mucosal edema and suppressing the cough center, is due to the presence of the main components (glaucine and ephedrine), but basil oil also acts as an effect-enhancing agent.

One of the key components of basil essential oil, eugenol, has long been widely used in dentistry. It is part of zinc oxide eugenol cement and as such is used in insulating pads, temporary fillings, and impression material. Eugenol is also included in a number of painkillers and antiseptics.

Since essential oils in general and basil in particular have an active influence on the activity of the neuropsychic and cardiovascular systems, they are used in aromatherapy in the treatment of children with autonomic dysfunction (in cases of vagotonia). In a differentiated selection of oil, basil is recommended in the variant of autonomic dysfunction, accompanied by hypotension, fears (anxiety), difficulty falling asleep and mental overload. ^[17]

In folk medicine

In the recipes of traditional medicine, basil appeared in ancient India, Egypt and Greece. Not all doctors of that time recognized the healing potential of the basil - for example, the ancient Greek pharmacologist and military doctor Pedanius Dioscorides did not see any special medical value in it. However, with rare exceptions, representatives of ancient medicine actively included this herb in various drugs. Moreover, hairy basil was then considered the most effective in therapy, although other types of plants (small-leaved, garden, fibrous) are also found in recipes.

The plant was used in different ways (nutrition, aromatherapy, compresses) and in different forms (raw grass, infusion, juice, slurry, mixtures, powder of dry blanks).

- **Eating herbs.** In the most common use of basil, it was supposed to help with disorders of the cardiovascular system (caused by mucus and black bile), as well as problems of the head and nervous system: relieve pain, open blockages in the brain and give it strength.
- **Aromatherapy.** Inhaling the smell of grass was also supposed to improve brain function, relieve fears and neuroses, and remove one from a state of intoxication. In the same way, the patient's condition was relieved with a cold.
- **Porridge compresses.** It was believed that such compresses contribute to the maturation of the spleen tumor, when introduced into the vagina, they accelerate menstruation, and in combination with poppy seeds, they treat inflammation of the testicles.
- **Juice therapy.** They drank basil juice (sometimes with sugar) in order to improve heart function, reduce excessive salivation, and normalize lung function. When applied externally in the form of eye drops, it could help restore vision, and when instilled into the nose, it could stop nosebleeds and treat epilepsy (epilepsy). At the same time, it should be noted that today epilepsy, as a rule, falls into the list of diseases in which basil is contraindicated.
- **Treatment with basil powder.** Mixed with honey, dry basil powder was considered an excellent remedy for the rapid healing of bruises and bruises. Sometimes in the bath, in combination with henna, it was applied to the head to relieve pain. And with a mixture of vegetable powder with wax and oil in the form of compresses, both pain in the genitals and lung diseases were treated.

At the turn of the first and second millennia of our era, the famous Avicenna saved from gout with a mixture of basil and vinegar, and with a compress of the same mixture eliminated local inflammation after scorpion stings. Half a millennium later, the famous Armenian physician Amirdovlat Amasiatsi, at the court of the Turkish Sultan, used basil seeds in the treatment of toothaches, intestinal ulcers and diarrhea. To prevent toothache, the seeds of the plant simply had to be chewed several times a year - preferably during the period when the Sun passes the zodiac sign Aries. And as a fastening and antiulcer agent, fried seeds washed down with water were better suited. At the same time, according to the healer, it was not necessary to abuse such a remedy, since this led to memory problems in the patient.

Modern folk medicine has to some extent preserved the ancient traditions of the use of basil. Today, most often it is included in the composition of means for healing wounds (including bleeding gums), eliminating fungal infections, manifestations of the common cold, as well as for the treatment of the respiratory tract (for colds, bronchitis, asthma).

In Central Asia, the herb in the form of a distillate is used for diseases of the cardiovascular system. In Turkic folk medicine, the leaves of the plant are used for the same purpose.

In some peoples of Europe (for example, in the Bulgarian healing practice), basil juice, by instillation, relieves inflammation of the outer and middle ear. In the same place, the juice of the plant with daily use (in the amount of 2 tablespoons) is considered an effective contraceptive.

In different parts of the world, basil-based remedies correct various gastrointestinal disorders: diarrhea, inflammation of the intestinal mucosa, etc. And the astringent and carminative properties of this plant are in demand in the treatment of flatulence.

Decoctions, infusions and distillates

In home treatment, basil is most often used in various concentrated forms:

- **Infusions** are recommended to be prepared in thermoses with glass flasks. For a weaker infusion, dry grass - in the proportion of 1 tsp. for 250 ml of boiling water - kept in a thermos for half an hour. For a more saturated - within an hour when laying 1 tbsp. spoons of raw materials. This infusion is then gargled with sore throat (2-3 times a day), impregnated with gauze for compresses in case of otitis, drink a quarter cup 3-4 times a day for coughing and inflammation of the urinary system.
- **A decoction** of basil is obtained from a glass of fresh basil leaves, filled with a liter of water. After the water boils, the raw material is kept on low heat for another quarter of an hour and infused for 30-60 minutes. After cooling and straining, decoctions are used to wipe infected wounds, rinse the feet with excessive sweating, take a soothing bath for stress and insomnia. In the case of urolithiasis, a decoction of basil is drunk half a cup three times a day.
- **Basil oil** at home is prepared by mixing the juice of the plant and olive oil in equal proportions, then slowly boiling the mixture to evaporate the water. This oil is applied to the body with paralysis, inhaled for migraines, instilled into the eyes when purulent inflammation occurs.
- **distillate** of the plant known as "basil vodka" (in Central Asia it is called "Araki raikhon") is prepared from fresh juice or from a thick saturated infusion. The raw materials are poured into a double boiler and boiled, and then, after cooling, the condensed basil vapors are collected. (In Asia, pressure cookers are commonly used to obtain distillate). The collected liquid is drunk 2-3 times a day for 1-2 tsp. to slow down palpitations, equalize rhythms, and in general for the treatment of various heart diseases.

in oriental medicine

Basil is considered the key medicinal plant in the ancient therapeutic system of the peoples of India - Ayurveda, which combines the physical and spiritual practices of maintaining and restoring health. As part of this teaching, basil is able to significantly increase a person's vital energy (Prana) by influencing the three fundamental changing doshas (primary elements responsible for the distribution of energies) - Pitta, Kapha and Vata. It's believed that:

- Basil helps to balance the dosha of Fire and Water, but it is not recommended for people of this type, as it can lead to an excess of energy.
- The plant reduces the energy of Kapha, removing it from the respiratory tract, and thereby cures colds, asthma, and coughs.
- The use of basil eliminates excess Vata energy in the digestive tract, improving the process of digestion and absorption of nutrients. With a clear imbalance of Vata, basil is used to treat candidiasis and hemorrhoids. With an increase in this energy, it is recommended to use decoctions and powders for inhalation. But an increased concentration of the herbal remedy can lead to arousal and provoke greed.

The complex regulation of the balance of energies over time has led to the creation of an extended therapeutic practice in which basil is presented as a multifunctional healing agent. Today, extracts of the leaves of the plant are used to treat bronchitis, rheumatism, hyperthermia, epilepsy, asthma, shortness of breath, hiccups, cough, hematological diseases, parasitic infections, neuralgia, headaches, wounds, inflammation, diseases of the oral cavity. The juice of the leaves is instilled for pain in the ears. The herbal infusion is used to treat stomach and liver disorders, while the roots and stems are used to treat mosquito and snake bites.

In scientific research

Thanks to its reputation as a proven medicinal plant, basil (its parts and derivatives) has recently been studied very actively. Studies are carried out both in vitro (in vitro), and in animals, and in humans, however, the proportion of experiments involving humans is noticeably smaller. At the same time, if we evaluate the range of interests of scientists, then researchers are most often interested in the effects of basil on metabolic disorders, immunity, and human neurocognitive functions.

Metabolic disorders

Studies over the years tested the effect of basil (30 ml juice, 300 mg extract, 2 g leaf powder) on various metabolic disorders associated with type 2 diabetes, blood glucose measurement, lipid levels, blood pressure, excess uric acid in people with gouty arthritis.

The effect of basil extracts was evaluated over a period of time from 2-5 to 12-13 weeks. Moreover, with an increase in the study period to 12-13 weeks, a sharper decrease in fasting blood glucose and postprandial glucose levels was observed compared to these indicators in the control group. In addition, the level of glycohemoglobin (a biochemical blood indicator that shows the content of sugar in the blood over a long period) decreased significantly (by 1.5-3.2 times) when basil was added to the hypoglycemic drug (compared to the indicators of using the drug alone).^[18] However, even a 4-week basil powder supplement already significantly reduced blood glucose, glycated proteins, uric acid, and improved lipid profiles in participants with type 2 diabetes.^[19] Overall, the combined basil-drug approach was most effective in reducing diabetes symptoms.

Some studies have reported a significant improvement in blood pressure in hypertensive patients who received 30 ml of fresh basil leaf juice once daily for 10 days or 30 ml twice daily for 12 days. But it is also important that the improvement in lipid parameters in the blood serum was also observed in

healthy adult participants in the experiment, who consumed 300 mg of the ethanol extract of the leaves for 4 weeks.^[twenty]

Immunomodulation and inflammation

An enhanced immune response to the introduction of basil into the diet has been observed in many clinical studies. One of them, a randomized, double-blind, placebo-controlled study, showed an enhanced immune response with an increase in natural killer (TK) and helper T cells in healthy adult participants compared with placebo volunteers after 4 weeks of taking 300 mg of an ethanolic leaf extract, daily taken before meals.^[21]

In other clinical trials, the effect of daily administration of 10 g of an aqueous extract of fresh basil leaves in the diet of patients with acute viral infections (hepatitis, encephalitis) was studied. In the first case, symptomatic improvement was reported after 2 weeks, in the second case, an increase in survival after 4 weeks in the basil group compared with patients in the dexamethasone group. Treatment with basil in asthmatic patients has shown that 500 mg of dried herb leaves thrice daily reduced asthmatic symptoms as early as 3 days.

Neurocognitive effect

In all studies of the neurocognitive effects of basil, subjects experienced significant improvements in mood and/or cognitive function, regardless of age or gender. For example, cognition was tested in a randomized, placebo-controlled clinical trial that showed improvement in mental flexibility, short-term memory, and attention in 40 healthy people (17-30 years old) after taking 300 mg of basil extract daily for 4 weeks. At the same time, positive effects were observed already from the 2nd week after the start of taking the drug.^[22]

A number of clinical studies have also demonstrated a significant reduction in anxiety and stress levels with higher doses of basil given over a long period of time. In some of them, a decrease in the number of manifestations of general symptoms associated with stress in patients with psychosomatic problems was recorded (by 32–39% compared with the control group).^[23]

Weight regulation

The effect of basil on the health of overweight people has been studied in various studies. Recently, there have been studies evaluating the effect of basil supplementation on body weight changes.

For example, a study by Indian scientists demonstrated the positive effect of basil on weight and obesity in 30 people (men and women) aged 17 to 30 years with a body mass index greater than 23 kg / m². Scientists have tried to exclude third-party factors in the form of concomitant diseases, alcohol, tobacco, drugs, etc. as much as possible. All participants in the study received basil capsule supplements twice daily for 8 weeks.

During the experiment, scientists assessed a variety of obesity-related characteristics (from cholesterol levels of various densities and the state of liver enzymes to insulin and blood glucose levels). But in this case, it is important that the diet with basil supplements led to a significant decrease in body weight in the participants of the experiment compared to the representatives of the control group.^[24]

In weight loss diets, basil is popular as a way to reduce salt intake and as a low-calorie food (only 20-25 kcal/100 g) in salads. In Asia, diets with the inclusion of Thai basil seeds in the diet are common. The peculiarity of basil seeds is that they absorb liquid, accumulating it around them in a kind of jelly-

like capsule. When ingested, such seeds become a natural absorbent, filling the stomach, improving digestion and cleansing the body.

The seeds filled with water have a slight grassy taste and aroma, but the shell after swelling looks unusual and aesthetically pleasing. Therefore, often, in order to prepare both tasty and beautiful desserts, juice, sugar, and fruits are added to basil seeds. However, since such desserts are often made too sweet (non-diet), weight loss programs usually use either seeds filled with low-fat kefir, or dry seeds in general, which are then washed down with tea or low-fat milk.

In cooking

Due to its bittersweet taste and piquant aroma, basil leaves are often added to salads, sandwich mixes, baked goods, marinades, vegetable and meat dishes, and desserts for a fresh mint note. In dried form, basil herb can replace pepper, be included in the composition of spices with which pasta, pizza, and eggs are served.

With basil herb at the base, Italy's favorite pesto sauce is prepared. In Azerbaijani cuisine, in addition to herbs, basil seeds are used to flavor salads, soups, pates. Also, recently, some confectionery enterprises have begun to mass-produce drinks thickly seasoned with basil seeds.

Different varieties of the plant are distinguished by their recognizable flavors, which are used by experienced chefs to create unexpected combinations: vanilla basil, as the name suggests, has a vanilla flavor, Baku has a mint flavor, Yerevan has a clove flavor and black tea aroma, and spoon-shaped basil resembles bay sheet.

In cosmetology

In ancient times, basil mixed with vinegar was smeared on the face in order to more effectively remove freckles and age spots. The body was rubbed with the same mixture to get rid of the smell of sweat.

Today, essential oil is more commonly used in cosmetology. Such an oil remedy relieves inflammation, heals damage, and has a rejuvenating effect by smoothing fine wrinkles. But, in addition to lotions and skin creams, fragrant basil oil can be found in hair rinses, as this herbal ingredient helps accelerate hair growth and eliminate dullness.

Dangerous properties of basil and contraindications

Among the main dangerous properties of basil, as a rule, is its toxicity, due to the content of mercury salts in the plant. Purple basil is especially often blamed for this. Despite the prevalence of such a statement, the question of whether there is mercury in the basilica still causes active controversy.

Indian researchers in their work assessed the amount and degree of distribution of heavy metals in different plant parts of three types of basil (sweet, black and dwarf), collected in Central India. For analysis, they took powder preparations (after drying) and medicinal infusions based on basil after extraction. Moreover, before studying, all samples were thoroughly washed with distilled water. ^[25]

The scientists did find that the concentrations of mercury (Hg) and lead (Pb) in the leaves of some plants exceeded the allowable level: by 0.05 mg/kg and 1.2 mg/kg, respectively. Moreover, heavy metals passed during extraction into aqueous infusions of basil. Depending on the type of plant, the concentration of mercury varied, but the amount of heavy metals in the leaves of the plant always exceeded their amount in flowers, stems, and especially roots. That is, the roots of the plant, in this respect, turned out to be the safest.

According to the results of the work, on average, the content of mercury in the flowers of basil of different types (in mg per 1 kg of dry weight) was 0.17-0.21 mg, and in the leaves - 1.2-2.1 mg. For lead, these figures were in the range of 5.3-15.3 mg (flowers) and 8-18.5 mg (leaves). But the researchers noted that the main sources of heavy metals should be considered as pollution of soil, groundwater, and dust. And, therefore, in environmentally friendly conditions, the risk of toxic contamination will be minimal.

Polish scientists, evaluating various factors affecting the accumulation of mercury in medicinal plants, analyzed 20 types of various medicinal raw materials collected in northern Poland. ^[26] Like the Indian researchers, they found the highest levels of mercury in the leaves of the collected samples. But besides this, they noted a number of other factors contributing to the increase in mercury concentrations:

- **Proximity to the road.** Proximity to the roadway significantly increases the mercury content.
- **collection time.** Samples collected in spring have less mercury than samples collected in autumn.
- **type of ontogeny.** There is less mercury in annual plants than in perennials. In this regard, it becomes important which type of basil is considered in a particular case as a raw material, since the genus Basil is represented by approximately 70 species of annual and perennial herbs and shrubs. (By the way, the most common basil in our country - it is also fragrant, garden and camphor - belongs to annual herbs, that is, it is safer).

Thus, the degree of contamination of basil with heavy metals is, to a greater extent, a matter of growing conditions, environmental conditions, place and time of collection of raw materials.

The restriction for pregnant women on the use of basil for food is also widespread on the Internet. The restriction is associated either with the content of mercury in the composition, or with a possible increase in the tone of the uterus. No reference is made to any studies demonstrating the side effects of moderate consumption of basil. Therefore, the rigid prohibitive position causes justified criticism.

However, the constituents of basil in a concentrated dosage form have the potential to cause a number of complications during pregnancy. For example, basil oil (especially eugenol basil) contains up to 70-80% eugenol, which can have a negative impact on the development of the fetus. The seeds of the plant (and especially their decoctions and extracts) can increase blood flow and slow down blood clotting, which increases the risk of bleeding not only in pregnant women, but in all people with bleeding disorders.

Thus, it is now considered safe to moderate the introduction of fresh basil leaves into the diet of pregnant and lactating women, and unsafe - the use of plant seeds and their concentrated forms: infusions, decoctions, extracts, oils and medicines.

Due to the ability of basil extracts to lower blood pressure, they are not advised to use hypotensive patients.

The potential danger of infection by parasitic organisms remains with the use of poorly washed basil. In particular, outbreaks of cyclosporiasis that occurred in Sweden, the United States and Canada after the export of basil, lettuce and raspberries infected with the parasite *Cyclospora cayetanensis* from endemic countries are described. The disease presents with watery diarrhea, flatulence, abdominal pain, fever, and loss of appetite. ^[27]

Selection and storage

To select fresh and fragrant basil, you should look for plants with evenly saturated leaf color. The color of the leaves may vary depending on the variety (it happens to be green, purple, blue, brown), but there should be no growths, no spots (gray, white, green), no yellow streaks on them. Spots can indicate contamination with chemicals during the growing process, growths can indicate a disease, and veins can indicate that the plant has begun to dry out. Individual sluggish leaves in a bunch of basil are also a reason to refuse to buy, because there is a high probability that the rest of the plants in the bunch have begun to deteriorate.

Before buying basil, it's a good idea to tear off one leaf to make sure it's not sticky (a sign of improper growing or storage) and to sniff it. The smell is better revealed if you lose the leaf in your hands. A rich and strong aroma without putrefactive notes indicates the freshness of the plant.

The younger the plant, the more tender and sweeter its taste, the older, the rougher and sharper it is. In addition, the leaves of overripe grass begin to be very bitter, so before buying it is advisable not only to smell, but also to taste the basil. The difficulty is that for tasting the plant must be washed, and in a store or in the market this is far from always possible. Therefore, the freshness of basil is often evaluated only in appearance and aroma.

You can store basil in many ways:

1. Place the bunch in the water, after cutting the stems.
2. Place the basil in the refrigerator, wrapping it in cling film (in this and previous cases, for up to a week).
3. Place the washed and dried bunch in the freezer (whole or chopped) in a glass jar for a long time.
4. In dry form - for this, the grass is collected in small bunches and hung in a dark, ventilated room.

Subsequently, basil, thanks to its healing properties and widespread use in cooking, has already created a good name for itself. Today, with the help of basil, people have learned to solve a number of physical and psychological problems, and the list of proven medicinal properties of the herb only grows over time.

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Basil - useful properties, composition and contraindications

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Abstract. The article discusses the main properties of basil and its effect on the human body. A systematic review of modern specialized literature and relevant scientific data was carried out. The chemical composition and nutritional value of the product are indicated, the use of basil in various types of medicine and the effectiveness of its use in various diseases are considered. The potentially adverse effects of basil on the human body under certain medical conditions and diseases are analyzed separately. Considered scientific basics diets With his application .



Sorrel (lat. Rúmex)

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Abstract. The article discusses the main properties of sorrel and its effect on the human body. A systematic review of modern specialized literature and relevant scientific data was carried out. The chemical composition and nutritional value of the product are indicated, the use of sorrel in various types of medicine and the effectiveness of its use in various diseases are considered. The potentially adverse effects of sorrel on the human body under certain medical conditions and diseases are analyzed separately. The scientific foundations of diets with its use are considered.

Key words: sorrel, benefit, harm, beneficial properties, contraindications

Beneficial features

Table 1. Chemical composition of sorrel (according to [Food+](#)).

Main substances (g / 100 g):	Fresh sorrel ^[1]
Water	93
Carbohydrates	3.2
Alimentary fiber	2.9
Squirrels	2
Fats	0.7
Calories (kcal)	22
Minerals (mg/100 g):	
Potassium	390
Sodium	four
Phosphorus	63
Calcium	44
Magnesium	103
Iron	2.4
Manganese	0.349
Zinc	0.2

Copper	0.131
Vitamins (mg/100 g):	
Vitamin C	48
Vitamin PP	0.5
Vitamin B6	0.122
Vitamin B2	0.1
Vitamin B1	0.04
AT 9	13

The genus *Sorrel* (*Rumex L*) has more than 150 species, the chemical composition and consumer characteristics of which may differ from each other. But, in general, regardless of the species, the plant is rich in anthraquinones, naphthalenes, flavonoids, stilbenoids, triterpenes, carotenoids and phenolic acids. For the preparation of medicinal raw materials, all parts of the sorrel are used.

The leaves of the plant are a source of flavonoids, carotene, ascorbic acid (which is also present in the flowers of the plant). Sorrel roots contain emodin, chrysophanic acid and other anthraquinone derivatives (up to 4%), tannins (up to 15%), oxalic, coffee and other organic acids, flavonoids, vitamin K. Tannins and anthraquinone derivatives are also found in fruits. At the same time, all parts of sorrel are distinguished by a high content of calcium oxalate, which, first of all, is associated with a number of contraindications when eating the plant.

Medicinal properties

Aerial parts of sorrel and roots are used (or considered as a candidate for use) in the treatment of a number of diseases and pathological conditions, which include gastrointestinal problems (constipation, diarrhea, bloody diarrhea, helminthic infestations), diseases of the gallbladder and liver, including infectious nature (for example, jaundice), colitis and enterocolitis, edema, hemorrhoids, diabetes, as well as skin lesions (ulcers, wounds, burns).

A variety of medicinal properties of sorrel are used to treat and / or eliminate the symptoms of these diseases. When used in certain quantities and concentrations, sorrel is able to reduce blood pressure, anesthetize, activate the excretion of urine and the movement of bile, soothe and relieve inflammation, stop bleeding, exfoliate dead cells and regenerate skin tissues.

In restoring the functioning of the gastrointestinal tract, large doses of sorrel preparations (0.5-1 g three times a day and more often) are prescribed for a laxative effect, and small doses (up to 0.25 g three times a day) **for an astringent effect**. All parts of the plant, when taken orally, increase the peristalsis of the large intestine, soften the feces and reduce the absorption time of food.

Various sorrel extracts show antioxidant, antibacterial, antifungal, and anticancer effects: ^[2]

- **Ethanol and methanol** extracts of sorrel leaves have powerful antioxidant potential. Also, antioxidant properties were found in different extracts of sorrel roots: the most pronounced and multispectral ones are in butanol and methanol extracts, but the chloroform fraction shows itself better than others in removing free radicals of hydrogen peroxide. ^[3]
- **Ethanol and hexane** extracts are able to inhibit a wide range of bacteria, showing multidrug resistance. Water sorrel extracts by suppressing the activity of *H. Pylori* are able to prevent damage to the gastric mucosa. ^[four]
- **Methanol, chloroform and hexane** oxalic extracts can successfully inhibit the growth of pathogenic fungal strains.

- **The ethanol** extract shows the highest (compared to the rest of the concentrates) cytotoxicity against the cell lines MCF-7 (invasive breast ductal adenocarcinoma), DU-145 (prostate cancer) when analyzed with the lowest IC50 - 47.3 µg / ml (indicator IC50 shows how much inhibitor is needed to suppress the bioprocess by 50%).

The ability of sorrel preparations to provoke the death of cancer cells has been confirmed in other studies.^[5] Depending on the dosage, ethanol extracts of 6 species of sorrel demonstrated in vitro cytotoxic activity against leukemia cell lines.

Thus, sorrel potentially claims to be a medicine for both microbial infections and some oncological diseases.

Common sorrel extract has shown high antiplatelet activity (via modulation of the MAPK, PI3K/Akt signaling pathways) and therefore may be considered as a drug candidate in the therapy of platelet-related CVD.^[6]

Also, modern studies indirectly confirm the tradition of using sorrel preparations for the treatment of liver diseases, restoration of liver functions and prevention of liver cirrhosis. The hepatoprotective properties of sorrel are clearly demonstrated in laboratory animals with impaired liver function caused by the intake of carbon tetrachloride^[7], or, for example, in animals with type 2 diabetes.^[eight]

At the same time, sorrel, due to the nepodin contained in it, has some independent antidiabetic properties, which appear both “in vitro” and in experiments on mice.^[9] The same nepodin in sorrel exhibited antimalarial activity and prolonged survival time in the ethanol extract treatment group.^[ten]

In medicine

Sorrel preparations in the supplement industry come in a variety of forms, from capsules to liquid extracts. When harvesting medicinal raw materials, all parts of the plant are used: leaves with petioles, root, fruits in panicles. Harvesting of roots is carried out in the fall after the death of the above-ground green mass.

Manufacturers in the list of indications for use indicate hepatitis, liver failure, cholecystitis, colitis, hemo- and enterocolitis, hemorrhoids, infection with worms, bleeding stomach ulcers, inflammation of the gums (gingivitis) and oral mucosa (stomatitis). According to the instructions, a liquid extract of horse sorrel roots should be used to reduce pressure in hypertension of the 1st and 2nd stages.

Also, small doses of drugs are recommended to activate the movement of bile and stop diarrhea. Large doses - to stimulate the contractile function of the muscles of the large intestine and enhance the excretion of feces. At the same time, it is stipulated that the laxative effect does not occur immediately, but after 8-12 hours after taking the drug, and with prolonged use, addiction may occur.

Sorrel is included in the mixture prescribed by Zdrenko, intended for the treatment of bladder papillomatosis and gastritis with low acidity, in which the cells that produce hydrochloric acid begin to atrophy (anacid type).

In folk medicine

Even during the formation of a systematic approach to herbal therapy, sorrel was used to relieve pain, normalize the functioning of the gastrointestinal tract, stop bleeding and get rid of skin pathologies.

- **Digestive organs.** A thousand years ago, Avicenna already knew that both sorrel leaves (to a lesser extent) and its seeds have a "fixing" effect. Moreover, preference in such therapy was given to the seeds of "large species".
The tradition of using weak non-concentrated decoctions to get rid of diarrhea has been preserved in folk medicine to this day. Similarly, not only seeds are used, but also plant roots containing 19-27% tannins (the indicators are given for common sorrel, but pronounced astringent properties are also characteristic of horse sorrel, water sorrel and a number of other species). To create an astringent effect in folk medicine, the flowers of the plant were also used in the form of a powder. As part of a complex remedy for stopping diarrhea, sorrel fried in olive oil was combined with pomegranate juice, zira (cumin, or Roman cumin) and dill. To get rid of constipation, large doses of decoctions of sorrel leaves are used, which increase intestinal motility and create a laxative effect. Raw leaves without processing are recommended by herbalists to improve digestion in general.
- **Liver, gallbladder, spleen.** From the early Middle Ages, sorrel leaves mixed with vinegar fought against diseases of the spleen, small doses of sorrel preparations and plant juice provoked a choleric effect, and long-term use of extracts treated jaundice.
- **Skin covers.** Sorrel leaves boiled in wine, applied as a compress, coped with lichen, and water decoctions were used for scabies. For the same purposes, a decoction of the roots or a powdered root mixed with fat (lard, badger fat, etc.) was also used externally. To accelerate the maturation of abscesses and the healing of wounds, fresh crushed plant roots were applied, which were ground into a gruel with sour milk or cream. For skin ulcers, a mixture of crushed sorrel, rose oil and saffron was used. In the simplest version, skin lesions were simply smeared with juice squeezed from sorrel.
- **Oral cavity and upper respiratory tract.** For toothache, folk medicine practiced rinsing the mouth with the juice of fresh leaves. To strengthen teeth and gums, sorrel leaves were simply chewed. A decoction of the roots healed the pharynx and larynx in case of irritation and coughing, and treated a runny nose.

In addition, in various folk traditions, decoctions of sorrel (leaves, roots, seeds) and / or its juice were used to treat scurvy, rheumatism, local tumors, inflammation of the large and small intestines, to stop bleeding (including hemorrhoidal, ulcerative, pulmonary and mother). With a headache, the juice of the plant was rubbed into the temples.

Decoctions and infusions

There are many similar folk recipes for decoctions and infusions of sorrel roots and leaves, examples of which are given below:

- **Decoction for rinsing with stomatitis and gingivitis.** Crushed fresh sorrel leaves (1 tablespoon) are first poured with boiling water (250 ml) and kept on low heat for a quarter of an hour, and then insisted for another hour. Strained broth should rinse the mouth 4-5 times a day until the inflammation of the gums is relieved and the oral mucosa heals.
- **A decoction of the roots for intestinal disorders.** Crushed roots (2 tbsp.) Pour a glass of water and boil for half an hour. Before use, the raw material is squeezed out, and the broth is cooled and filtered. You need to take such a drink in a third of a glass three times a day before meals.
- **Baths with decoction for cystitis.** With inflammation of the bladder mucosa, herbalists recommend taking baths with the addition of sorrel decoction. To do this, the leaves of the plant (500 g) are poured with a liter of boiling water and put in a water bath for 10-15 minutes. Strained broth is added to a daily relaxing bath.

- **Infusion to alleviate the symptoms of menopause.** Dried leaves of the plant (1 tablespoon) are poured with a glass of boiling water (200-250 ml) and kept for 3 hours until cool. Ready infusion is drunk per day, 70-80 ml in three doses half an hour before meals, and the whole course lasts a week.

in oriental medicine

Japanese sorrel (Rumex japonicus Houtt) is common in Korea, Japan and China. Its root is traditionally used in all these countries to treat constipation and more complex gastrointestinal disorders, jaundice, hematemesis, dysfunctional uterine bleeding.

In classical Tibetan medicine, with the help of sorrel, they relieve the “heat of wounds”, heal the liver, inhibit putrefactive fermentation in the intestines, expel helminths and stop ulcer bleeding. In particular, as an antihelminthic and hemostatic agent, decoctions of fresh leaves (1 tablespoon) are prepared, which are first boiled in 2 glasses of water, then insisted for two hours and drunk in strained form three times a day for half a glass.

In India, oxalic preparations purify the blood and lymph, in Mongolia they are used to relieve high fever and treat tuberculosis, and in China, decoctions of the root help get rid of skin pathologies.

In scientific research

Although there are about 150 species in the genus Sorrel, most phytochemical and pharmacological studies have been conducted on about 50 of them. The following are just some of the work of the last three years, which explores the potential of sorrel in the treatment of colitis, liver fibrosis, breast cancer, colon cancer, and human hepatocellular carcinoma.

- **Japanese sorrel has medicinal potential in the treatment of colitis .** ^[eleven]

In this study in laboratory mice, scientists evaluated the protective effect of methanolic sorrel extracts, which were used to treat dextran sulfate sodium (DSS) colitis.

8-week-old male mice were given methanolic sorrel extract for 14 days, followed by a week of 2.5% sodium dextran sulfate, which causes inflammatory bowel disease and reproduces the manifestations of ulcerative colitis, characterized by an abnormal immune response and dysfunction of the epithelial barrier. After dissecting laboratory mice and examining a number of factors, sorrel was found to be effective in suppressing DSS-induced colitis by protecting the tight junctions in the colon.

- **Complex treatment with various fractions of sorrel leaves in the experiment regulates markers of oxidative dysfunctions and shows the ability to restore liver damage caused by carbon tetrachloride.** ^[12]

Carbon tetrachloride (CCl₄) is used in laboratory experiments as a substance that causes oxidative damage and fibrosis of liver cells. In this study, the scientists administered it to 48 male rats divided into 8 groups, each of which received different doses of CCl₄ and then different forms of medicinal sorrel extracts.

The scientists found that all extracts of oxalic leaves to some extent, but especially ethanol and methyl extracts, reduced DNA damage in rat liver tissues, and the complex administration of various plant fractions revealed a significant increase in the level of the antioxidant enzyme compared to the control group. Also, the complex use of sorrel preparations completely changed the level of enzymes and the

lipid profile to a normal level. Thus, it was concluded that sorrel leaves are a strong antioxidant and are able to protect the liver from CCl 4-induced fibrosis.

- **Sorrel stem chloroform extract shows anti-cancer activity against cell lines of several types of cancer.** ^[13]

The crude extract of sorrel leaves, stems and flowers was evaluated for human breast cancer (MCF7), human colon cancer (Lovo and Caco-2), human hepatocellular carcinoma (HepG2) cell lines. Most of the crude extracts did not show significant levels of cytotoxicity in the cancer cell line tested. But the stem chloroform extract showed strong anti-cancer activity in all tested lines. And this gives grounds for conducting clinical trials to study the therapeutic potential of the stem extract as an effective and safe natural anti-cancer product.

Not all studies lead to evidence-based confirmation of the effect expected by scientists. A recent example of a “negative result” is the outcome of a paper published in April 2020. The authors tried to evaluate the effects of seed and leaf extracts of the common sorrel (*Rumex obtusifolius*) on the amoeba *Acanthamoeba*, which, penetrating into the cornea of the eye (usually while bathing a person), causes visual impairment, blindness, and can also lead to CNS disorders. ^[fourteen]

Despite some encouraging intermediate results, the researchers were unable to identify sorrel extracts as promising candidates for the treatment of acanthamoebiasis. However, this does not mean that studies like this one should be considered ineffective, since in science a reliable negative result is no less useful.

Weight regulation

The calorie content of sorrel, like most other herbs, is low - about 22 kcal per 100 g of raw product. But sorrel is not used as the basis of a dietary program. Due to the abundance of oxalic acid (which can provoke an exacerbation of a number of diseases), it is not even safe to introduce it in large quantities into salads and / or fill the volume of the stomach with low-calorie leaves, as is sometimes practiced at the risk of health during unloading periods.

Since sorrel exhibits astringent properties in small safe amounts, and a laxative effect occurs with increasing doses, it is not entirely safe to use it for a long time in bowel cleansing programs. But if this product is not abused, then in the absence of contraindications, it is quite possible to diversify the main diet menu.

In cooking

In the cuisines of different nations of the world, sorrel is added to soups and borscht (shchi), flatbreads, casseroles, stews, salads and complex sauces, and is used as a filling for pies. But the specifics of the use of herbs in cooking may be due to the type of sorrel growing in the region:

- **Sparrow sorrel**, bitter in taste, has a pronounced lemon flavor, so in local cuisines it is often put in salads. As a curdling agent, it can be used in the preparation of cheeses.
- **Spinach sorrel**, as the name suggests, is eaten in a similar way to spinach, both raw and boiled. In recipes, it is sometimes referred to as "English spinach".
- **Horse sorrel** in Armenia and Azerbaijan is more often used in dried form, because during fermentation the bitterness disappears and a pleasant sour taste appears. In Uzbekistan, cuttings and leaves of a young plant of this species are eaten. During lean periods, its ground stems were added to flour when baking bread.

In combination with other products, sorrel goes well with potatoes, fish, and meat. For example, if you grind it and add it to mashed potatoes, the dish will not only acquire a slight sourness, but also change color to a delicate green. Sometimes this ability to "tint" the main product is used to make "sorrel" cocktails or ice cream.

In cosmetology

Sorrel extracts are used in both medical and skin care cosmetics. Therapeutic is intended mainly for the elimination of age spots (lightening serums and creams), the treatment of acne and fungal infections (including dandruff). In cosmetics, sorrel can be found in cleansing gels, lotions and tonics, as well as in bath products. So, Oriflame has a whole group of creams with sorrel extracts (Rumex Occidentalis Extract), which even out skin tone with varying degrees of protective effect, an anti-wrinkle cream, a multifunctional CC cream, etc.

As part of brightening agents to combat pigmentation, freckles, sunburn, age spots, as a rule, complex formulas are used that enhance the moderate effectiveness of pure sorrel preparations. At the same time, a randomized, double-blind, placebo-controlled study testing a 3% ointment based on Rumex Occidentalis showed that in the treatment of melasma, oxalic preparation is no less effective than a 4% hydroquinone cream traditionally used to get rid of acquired melasma spots on the skin. face, neck and hands. ^[fifteen]

The lightening mild effect is better manifested with prolonged use of sorrel preparations, which, by blocking the activity of the tyrosinase enzyme, inhibit the synthesis of the melanin pigment. But the peculiarity of the oxalic component is that anti-melasma activity is manifested even on the skin of Asians (45 Filipinos took part in the study described above). In addition, the alignment of skin tone also occurs due to a decrease in redness caused by a rush of blood to the capillaries (that is, by reducing the severity of erythema).

As part of medical cosmetics, sorrel extracts are also used to treat fungal diseases. At home, to create an antifungal effect, a slurry of ground roots is usually prepared, which, when applied as a compress, reduces itching and pain. The same sorrel gruel is also used to combat dandruff (the product is rubbed into the scalp for several minutes, and then washed off with water). During the preparation of the gruel, the sorrel is thoroughly washed, crushed and poured over with boiling water. But before the first application of such a remedy, you should always conduct a half-hour test on a small sensitive area of the skin (for example, on the wrist) to see if the sorrel gruel will cause an allergic reaction.

Less commonly, sorrel is now used in products intended for oral care, although more recently, a root-based powder intended for polishing tooth enamel has been common.

Dangerous properties of sorrel and contraindications

The dangerous properties of sorrel are associated primarily with the abundance of oxalic acid in most species of this plant. Both the acid itself and its salts, oxalates that are poorly soluble in water, are not mutagenic or carcinogenic, but toxic. So, magnesium oxalate and especially calcium linger in the renal pelvis, bladder, urinary tract, eventually acquiring the form of sand or stones of complex crystalline shape. The isolated concentrated oxalic acid is dangerous both by external contact and if swallowed, as it causes chemical burns, burning, spasms, swelling of the larynx, bronchi or lungs. A large amount of this substance can even lead to the death of a person.

However, the danger of death occurs after swallowing 15 grams or more of oxalic acid, and this amount does not come with food. 100 g of green leaves contains 600-800 mg. In a normal diet, a

person eats up to 1200 mg (and vegetarians up to 2000 mg) of oxalate every day. But, given that the safe level of oxalic acid for a healthy person is about 50 mg per 100 g of food, it is better not to abuse sorrel. Moreover, there are a lot of oxalates not only in sorrel, but also in other products - in cocoa beans, chocolate, spinach, rhubarb, etc.

An excess of oxalates in a person most often manifests itself in the form of pain (cutting) in the stomach, in the side, in the lower abdomen, an increase in the volume of urine and / or pain when urinating, and rapid fatigue. But the main health risks are still associated not with a one-time overeating of sorrel, but with the systematic use of extracts from different parts of the plant.

A recent study evaluated the chronic effects of aqueous and ethanolic extracts of spinach sorrel seeds on male and female laboratory rats. Scientists have observed adverse changes occurring in the kidneys, liver and lungs after a 14-week administration of oxalic preparations. Moreover, males were more susceptible than females to the same doses of extracts. However, after a 15-day rehabilitation period without oxal supplementation, most of the animals returned to normal.

In general, the application of the aqueous extract did not lead to irreversible effects, and sorrel extracts caused pathological changes only at very high doses (4000 mg/kg). Lower doses and aqueous extracts produced either minor or reversible changes.^[16]

However, there are often recommendations for the period of treatment with sorrel preparations to eliminate the "oxalate effect" in parallel to use lemon juice or add apple cider vinegar to dishes. These products help to lower the pH of urine to 3.5-4.5, which speeds up the dissolution of oxalates and their elimination from the urinary tract. Also, to bind oxalic acid, it is recommended to combine sorrel with fermented milk products (sour cream, kefir).

Due to the fact that sorrel root extract can have a stimulating effect on the smooth muscles of the uterus, taking these drugs is contraindicated during pregnancy. The aerial part of the plant, rich in anthraquinones, is also not recommended during pregnancy, and the introduction of sorrel into the diet in this case requires consultation with a doctor.

Selection and storage

When choosing sorrel, you should focus on the same signs as when choosing other greens: buy leaves with a uniform color, rejecting yellow, darkened, drying out and with spots. Sluggish leaves are also rejected - fresh stems will crunch when pressed. But in general, it is difficult to keep sorrel fresh for a long time, so sellers often cut it off immediately before selling it, and buyers take a bunch in a volume that can be eaten at a time.

If it became necessary to "hold" the sorrel for 2-3 days, then it is better to wrap it in plastic wrap, cut the ends of the stems, dip them in water and put them in the refrigerator.

To preserve sorrel for a longer period, the herb is dried, frozen, salted or preserved in its own acid.

- **Drying.** The washed sorrel is first dried as a whole on a towel in the sun, and then cut and dried in a ventilated room on a windowsill between two paper towels, which should absorb excess moisture. In inclement weather, sorrel is harvested using dryers at a temperature of 50-60°C.
- **Freeze.** The washed greens are cut across the leaf and dipped for 0.5-1 minute in boiling water until its color changes to olive. After that, the sorrel is well dried for several hours and packed in plastic containers, which are then sent to the freezer.

- **Salting.** The washed leaves are stacked in a glass jar in layers, and the space between them is abundantly covered with salt. Such a container is tightly closed with a lid and sent to a refrigerator or basement with a low temperature.
- **Canning "in its own juice".** Washed leaves in a chopped state are laid out in a frying pan without oil and heated until they darken and let the juice flow. Immediately after this, the sorrel with juice is transferred to pre-sterilized jars, after which the cycle is repeated until the entire jar is filled with leaves. Banks are closed, and the grass in them "reaches" under the covers for several more hours.

The latter method allows you to store sorrel for about 3 months. In other cases, this period is extended to 1-2 years.

Sorrel has not received wider use in the economy. But, on the other hand, judging by the active and productive study of plant extracts by scientists, all the medicinal possibilities of the herb have not yet been revealed. And the beneficial properties already known today allow people to maintain their health using traditional medicine. It should only be remembered that the use of sorrel as a medicine in home therapy is associated with certain risks, therefore, plant preparations should be used with extreme caution for a long time.

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Abstract. The article discusses the main properties of sorrel and its effect on the human body. A systematic review of modern specialized literature and relevant scientific data was carried out. The chemical composition and nutritional value of the product are indicated, the use of sorrel in various types of medicine and the effectiveness of its use in various diseases are considered. The potentially adverse effects of sorrel on the human body under certain medical conditions and diseases are analyzed separately. Considered scientific basics diets With his application .



Spinach (lat. *Spinacia oleracea*)

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Abstract. The article discusses the main properties of spinach and its effect on the human body. A systematic review of modern specialized literature and relevant scientific data was carried out. The chemical composition and nutritional value of the product are indicated, the use of spinach in various types of medicine and the effectiveness of its use in various diseases are considered. The potentially adverse effects of spinach on the human body under certain medical conditions and diseases are analyzed separately. The scientific foundations of diets with its use are considered.

Keywords: spinach , benefits, harm, beneficial properties, contraindications

Beneficial features

Table 1. Chemical composition of spinach (according to [Food+](#)).

Main substances (g / 100 g):	Fresh spinach ^[1]
Water	91.4
Carbohydrates	3.63
Alimentary fiber	2.2
Squirrels	2.86
Fats	0.39
Calories (kcal)	23
Minerals (mg/100 g):	
Potassium	558
Calcium	99
Sodium	79
Magnesium	79
Phosphorus	49
Iron	2.71
Manganese	0.897
Zinc	0.53
Copper	0.13
Vitamins (mg/100 g):	
Vitamin C	28.1
Vitamin E	2.03
Vitamin PP	0.724
Vitamin B6	0.195
Vitamin B2	0.189
Vitamin B1	0.078
Vitamin A	0.469
Vitamin K	0.483
Vitamin B9	0.194

The table shows data for raw spinach. Their analysis shows that the plant:

- one of the best sources of vitamin K (0.483 mg per 100 g at a daily rate of 0.12 mg for an adult male);
- quite rich in vitamin C (28.1 mg at a rate of 75-90 mg per day);
- in the "top ten" of plant foods in terms of vitamin A content (469 mcg per 100 g at a daily rate of 700 mcg for women and 900 mcg for men);
- very rich in vitamin B9 - folates (194 mcg at a daily rate of 200 mcg for an adult and 400 mcg for pregnant women).

It was from spinach that **natural folate was first obtained in 1941** (as vitamin B9, contained in food, is called). However, the bioavailability of spinach-derived folates is markedly lower than the bioavailability of synthetic vitamin B9 (folic acid) and is highly dependent on the cooking method. The amount of 0.6 micrograms of synthetic folic acid corresponds to about 1 microgram of vegetable folate, which should be taken into account when planning a healthy diet.

Also, some adjustment should be made when assessing the content of iron, calcium, zinc and other minerals in spinach. These elements coexist in the leaves of the plant with phytic acid and oxalic acid salts, which should potentially prevent their absorption. However, the actual bioavailability of minerals tested in experiments depends on a number of concomitant factors leading to different results in some experiments.

Thus, one study ^[2] evaluated the effect of concomitant components on the bioavailability of ferrous iron in anemic rats. The relative biological value for iron was first determined at 53%. But adding 2.1% oxalic acid to the diet program increased this figure to 164%. The inclusion of lignin and pectin in various combinations in the diet also led to an increase in digestibility. In general, in their study, scientists came to the conclusion that under the conditions of the experiment, the bioavailability of iron in plant foods depended on the form and neighborhood in which this substance entered the body. They also noted that cellulose, phytate (phytic acid) and oxalate, added to a clarified diet containing ferrous iron, even increased the bioavailability of this element.

Spinach is included in the group of plants-record holders (along with sorrel, rhubarb, oxalis) in terms of the content of oxalic acid, salts and esters of which (oxalates), crystallizing, can clog the renal and urinary ducts, provoke the development of gout and arthritis. According to some reports, the leaves of the plant (depending on the variety, place and methods of cultivation) contain oxalates from 100 mg / 100 g ^[3] to 800 mg / 100 g, which already significantly exceeds the permissible daily intake, subject to complete assimilation. But the absorption of oxalates is greatly influenced by their form, bacterial environment in the gastrointestinal tract and the combination of products, and the formation of stones is influenced by the characteristics of calcium metabolism. Thus, both dangerous and beneficial properties of plant components can only be assessed with an integrated approach.

Finally, spinach is distinguished by a very high content of carotenoids, in terms of the amount of lutein (11.607 mg), significantly ahead of other garden and horticultural crops ^[4]. There is a lot in it, compared to other vegetables, and zeaxanthin - 331 mcg. It should also be noted high concentrations (in relation to the daily norm) of manganese, boron and silicon in the plant.

Medicinal properties

Phytochemicals and bioactive substances derived from spinach are capable of:

- absorb reactive oxygen species and prevent macromolecular oxidative damage;
- modulate the expression and activity of genes involved in metabolism, proliferation, inflammation and antioxidant protection;
- synthesize proteins that provide a normal level of blood clotting;

- help reduce food intake by secreting satiety hormones;
- exhibit immunostimulatory effects on macrophages and macrophage-like cells. ^[5]

Some medicinal properties of spinach are predicted based on the content of certain components of the plant. Thus, the record concentration of vitamin K in spinach ensures a normal level of blood clotting, promotes metabolism in muscles and connective tissue. In the heart and lung tissues, there are also protein structures synthesized exclusively with the participation of vitamin K.

The abundance of zeaxanthin and especially lutein in the composition makes spinach an effective herbal remedy in improving visual function. Entering the body with food and accumulating in the retina, lutein begins to play the role of a light filter - natural "sunglasses" that can prevent the destruction of the retina and clouding of the lens.

A number of medicinal properties of spinach have been confirmed in laboratories during experiments with cellular material or with the participation of experimental animals. It has been found that different forms of spinach can:

- promote tissue regeneration and healing of ulcers in diabetes mellitus ^[6];
- alleviate postmenopausal osteoporosis and increase the rate of bone fusion in fractures ^[7];
- have a cytotoxic effect on pancreatic tumor cells, colon adenocarcinoma, increase the sensitivity of tumor cells to laser irradiation ^[8], and also serve as an instrumental basis for the delivery of anticancer drugs (due to glycolipid isolated from spinach) ^[9];
- exhibit a depressant effect on the central nervous system during convulsions ^[10] and prevent neurodegenerative diseases (in particular, Alzheimer's disease); ^[eleven]
- protect against inflammatory processes in the intestines (from colitis and enterocolitis) and reduce the symptoms of diseases ^[12];
- inhibit myocardial necrosis by mitigating inflammation ^[13].

In addition, in an experiment involving several dozen healthy men and women, the ability of nitrate-containing spinach to reduce blood pressure, normalize the function of the endothelium of blood vessels, and generally improve the state of the cardiovascular system, was established. ^[fourteen]

In medicine

At the beginning of the last century, a substance called "spinach-secretin" was obtained from fresh spinach leaves by hydrolysis. It was used to stimulate the pancreatic gland and the glands of the gastric mucosa. The action of the substance was compared with the manifestations of the alkaloid pilocarpine, which also enhances the secretion of the digestive and bronchial glands, but, in addition, increases the tone of smooth muscles, uterus, intestines, gall and bladder, and also creates a number of therapeutic ophthalmological effects.

Today, vegetable raw materials of spinach are used for deficiency of vitamins and microelements, for anemia, constipation. Spinach is also included in the composition of some choleretic drugs.

- "Holagogum". Spinach leaf extract is part of the dietary supplement, which is declared as a drug for the treatment of chronic cholecystitis, cholangitis, cholelithiasis. However, turmeric and mint, which are present in the composition of Chologogum, are responsible for these effects. Spinach is introduced into the recipe as an element with multivitamin activity and a means of stimulating the digestive glands and intestinal motility.
- Holaflox. A multicomponent herbal preparation with a choleretic effect also includes spinach leaves. "Holaflox" is produced in the form of dry raw materials for brewing a "tea" drink, which must be drunk three times a day to get the effect.

Some therapists do not recommend combining spinach with blood pressure drugs due to the potassium content of the plant.

In folk medicine

Spinach in folk medicine is mainly treated for diseases of the gastrointestinal tract, chest organs, lumbar pain (lumbago) and inflammation of the larynx. However, some ancient folk recipes and therapeutic practices look outdated today.

So, in the past, for the treatment of insanity and / or melancholic conditions, it was recommended to eat spinach boiled with meat. Moreover, if you use the legs of animals for such a dish, then this should have helped with dizziness and lung diseases (for example, with pulmonary tuberculosis).

It was also believed that spinach juice was able to dissolve and remove stones from the kidneys and bladder, which conflicts with modern ideas about the role of oxalic acid salts in the formation of the most common calcium oxalate stones.

Modern traditional medicine has abandoned some optional "clarifications" in recipes, but still uses spinach for lung diseases, inflammation of the upper respiratory tract (laryngitis, laryngopharyngitis, bronchitis), flatulence as a carminative and laxative, as well as in the treatment of lumbago. In diseases of the throat, gargling with the juice of spinach leaves is practiced. For pain in the lumbar region, first boil the leaves of the plant in water until thickened, and then drink the decoction with the addition of cinnamon powder. To relieve constipation, spinach is most often mixed and drunk with sugar.

A little less often, spinach is used in the treatment of cardiovascular diseases, inflammation of the colon mucosa, and in the healing of ulcers and burns. Sometimes there are recommendations to take spinach boiled with mung beans (mung or Asian beans) for the treatment of gonorrhea.

Decoctions and infusions

In decoctions and infusions, spinach leaves are prepared for both external and internal use:

- **Infusion for the treatment of burns and eczema.** To prepare it, spinach leaves are crushed and poured with boiling olive (sometimes soy) oil. The mixture is infused until cool, after which it is used as a poultice applied to burns and eczema. The compress is fixed with a loose bandage and changed 3 times a day. The treatment lasts until the wound heals.
- **Infusion to increase the volume of urination.** To create a diuretic effect, an infusion is prepared from crushed leaves, filled with a glass of boiling water in a 1: 1 ratio. Under the lid, the infusion is aged for 15 minutes, and then, after straining, it is drunk during the day.
- **Decoction to strengthen hair.** Fresh, heavily chopped spinach (120 g) is poured with water (0.5 l) and boiled for a quarter of an hour. After cooling, the gruel is rubbed onto the scalp and aged on the hair for about an hour, after which it is washed off.

in oriental medicine

Spinach occupies the extreme Yin position on the "grocery" Yin-Yang scale. This means that if the plant is eaten daily, it will cause a strong imbalance and become a threat to health.

In the system of traditional Chinese medicine, all foods are divided into two groups according to the content of the two fundamental principles of Yin and Yang: food from one group enhances Yang, food from the other strengthens Yin. The degree of manifestation of one or another beginning is reflected on a scale from -3 (the highest degree of Yin content) to +3 (the highest degree of Yang-beginning).

The most neutral and useful in the daily diet are foods with a low degree of onset (-1 or +1), and foods with indicators of -3 and +3 are not recommended. They are used cautiously, temporarily, with a strong initial imbalance of energies and exclusively for medicinal purposes. The same restrictions apply to spinach.

So with spinach, basically:

- compensate for the lack of blood and elements, the deficiency of which arose due to blood loss;
- eliminate constipation in debilitated and elderly people;
- reduce blood pressure in arterial hypertension;
- normalize the functioning of the liver (especially in diseases characterized by hyperactivity of the Yang-liver).

Spinach is also prescribed for headaches, disorders of the nervous system, and externally for eczema and dermatitis.

Tibetan medicine uses the softening and moisturizing properties of spinach, the leaves of which are used to treat coughs and the seeds to treat chest pain. It is believed that spinach is well absorbed by the body without the formation of gases, and its harmful qualities can be easily eliminated by adding cinnamon.

In scientific research

Spinach research is conducted mainly on laboratory animals, and only in some cases, experiments are carried out with the participation of people. Scientists are interested in the ability of various forms of spinach to suppress the growth of cancer cells, affect the state of the cardiovascular system, relieve intestinal inflammation, regenerate tissues, and fight the effects of oxidative stress. The following are examples of such studies.

Spinach consumption reduced serum total and glucose levels and liver cholesterol levels in rats fed a high-fat diet. ^[fifteen]

The researchers evaluated the effects of dietary carotenoids from spinach on inflammatory and oxidative stress biomarkers, liver lipid profiles, and liver transcriptome and metabolic profiles in rats with fatty liver (steatosis) induced by a high-fat diet.

Two concentrations of spinach powder (2.5% and 5%) were used in the experiment in the standard diet and in the high fat diet. Although fatty-fed rats showed hepatocyte fat accumulation, comparison of the results showed no difference in adiponectin hormone, tumor necrosis factor alpha (TNF- α) and free radical activity compared with standard diet animals.

At the same time, the scientists found that the consumption of spinach and the accumulation of α -, β -carotenes and lutein in the liver were inversely correlated with total cholesterol and glucose in the blood serum and cholesterol in the liver. With an increase in the concentration of spinach powder to 5%, the content of monounsaturated fatty acids and polyunsaturated fatty acids increased, but the level of cholesterol in the liver of rats decreased.

In addition, there were changes in the expression of genes associated with the condition of fatty liver, and increased expression of genes involved in the metabolism of fatty acids and cholesterol.

Spinach extract slows the progression of osteoarthritis and subchondral bone changes in rats. ^[16]

In this laboratory experiment, scientists first artificially induced osteoarthritis in rats by injecting sodium iodoacetate into the knee joint of the animals, and then evaluated the anti-osteoarthritic potential of two doses of spinach extract for various inflammatory markers for 28 days. In parallel with this, and for the same purpose, experiments were carried out "in a test tube".

Histological analysis, X-rays, micro-CT analysis of the subchondral bone showed that spinach extract acts as a strong antioxidant and anti-inflammatory agent. It has the ability to alleviate the manifestations of osteoarthritis by increasing bone volume to tissue volume (BV / TV), which leads to a decrease in trabecular structure factor (Tb.Pf) by more than 200%. In addition, the extract stimulated the expression of chondrogenic marker genes with a decrease in pro-inflammatory markers. Together, this led to a significant improvement in motor function in laboratory animals.

Daily oral consumption of spinach has an attenuating effect on markers of oxidative stress and muscle damage in trained healthy young adults after a half marathon. ^[17]

The effect of spinach supplementation on exercise-induced oxidative stress was tested in an experiment on 20 volunteers from trained healthy athletes who ran a 21-kilometer distance. The participants in the experiments were divided into two groups, one of which received a placebo, and the other received a spinach supplement at the rate of 1 g per 1 kg of body weight for 14 days before the start.

Before and after the half marathon, the researchers measured:

- as a marker of muscle damage - the level of creatine kinase;
- as a marker of oxidative stress - malondialdehyde, protein carbonyl and uric acid;
- as plasma antioxidant capacity - TAC (total antioxidant capacity).

According to the results of the measurements, it was found that the total antioxidant capacity in the "spinach" group increased significantly, and the indicators of stress markers remained at lower levels than in the "placebo" group. This led scientists to believe that daily spinach consumption reduced muscle damage in healthy athletes during significant aerobic exercise.

Weight regulation

Spinach has only 23 calories per 100 grams of raw greens, making it a popular choice in weight loss programs. However, not only low-calorie spinach is able to ensure the effectiveness of the weight loss process.

Indian researchers have found that consumption of the plant extract (especially when combined with aerobic exercise) controls obesity in rats fed a high-fat diet through an inhibitory effect on animal pancreatic lipase. ^[eighteen]

In the experiment, scientists added 200 and 400 mg/kg of garden spinach extract to animals in a fat-rich diet for 3 weeks, then comparing the results with the indicators of rats from the control group, as well as with the results from the group of animals that combined extract nutrition with aerobic exercises.

On its own, spinach extract was highly effective in maintaining a normal lipid profile and controlling obesity, but when combined with exercise, the result was even better. The antihyperlipidemic effect of the extract was due to an inhibitory effect on pancreatic lipase comparable to that of orlistat (a weight loss drug with a similar mechanism of action).

Another study showed that spinach may help reduce food intake by secreting satiety hormones.^[19] The constituents of spinach help release short-term satiety signals that regulate the balance between food intake and energy expenditure to maintain body weight.

To test the appetite-suppressing effect, laboratory rats were given a flavonoid-rich plant leaf extract (200 and 400 mg/kg, orally) and the stimulant antidepressant fluoxetine (6 mg/kg, intravenously) for 2 weeks before meals. In rats treated with this therapy, against the background of a significant reduction in food intake, there was a decrease in weight gain compared with animals from the control group. Rats that received spinach extract (400 mg/kg) with fluoxetine in the experiment ate about twice as fast.

In cooking

Some culinary specialists believe that spinach should be added to dishes, if only because it stimulates the appetite by activating the salivary and pancreas glands. For this property in France, cooks call it "gastric broom." But spinach also has an independent culinary value, which allowed it to gain a foothold in the traditional recipes of different peoples of the world.

So, in Sweden cutlets are prepared from this vegetable crop, in Britain - omelettes and casseroles, in Italy - salads, in Spain - mashed potatoes, in Greece - pies, in the USA - soufflés and puddings. Bulgarian banitsa, Polish ravioli, Greek moussaka, Caucasian chikhirtma, Slavic cabbage rolls with plant leaves, etc. are made with a large amount of spinach.

In most cases, spinach in dishes is combined with other products (potatoes, rice, pasta, eggs). But this stewed vegetable can also act as an independent side dish for fish and meat. Spinach coexists especially harmoniously with bacon, cheese, cream, nutmeg and pine nuts, chickpeas.

In addition to taste properties, chefs value spinach for its stable emerald color, which does not disappear during heat treatment. It is characteristic that water is not even added to the pot to cook the vegetable - the plant is simply thoroughly washed and cut, and the pan is covered with a lid for several minutes. Spinach, which is 90% water, begins to actively release moisture itself - during cooking, you just need to mix it several times and then, taking it out, squeeze it using a sieve.

In cosmetology

Cosmetic companies use the ability of spinach:

- fight early signs of skin aging;
- whiten and reduce the visible manifestations of pigmentation;
- moisturize, eliminate dryness and peeling of the epidermis.

Recently, spinach has been especially loved by Korean skincare manufacturers, who include its extracts in creams, serums, lotions, foams, and gels. Although, as a rule, in this case, spinach becomes only one of the many plant components of the combined remedy.

In homemade face masks, spinach is also rarely used on its own. Usually it is combined with egg, honey, sour cream, potato starch, butter.

Dangerous properties of spinach and contraindications

The dangerous properties of spinach are associated primarily with the high content of oxalic acid salts (oxalates) in the leaves of the plant. An increased concentration of calcium oxalate in the urine leads to

the formation of kidney stones from this salt. In addition, an increase in the level of oxalate in food leads to a decrease in the degree of absorption of calcium in the intestine.

The presence of certain diseases and pathological conditions requires a strict restriction of oxalates. These conditions include absorptive hypercalciuria type 2, intestinal hyperoxaluria, and primary hyperoxaluria. Limiting dietary oxalates to 50 mg per day is recommended for kidney disease, rheumatoid arthritis, gout, stomach ulcers, and cystitis. Moreover, when choosing a diet, it should be taken into account that the heat treatment of spinach can reduce the content of oxalic acid salts by only 5-15%.

Spinach easily accumulates pesticides and toxins. He, along with celery, peppers, cucumbers, cherry tomatoes and potatoes, is included in the group of vegetable crops, to the pulp of which American experts who monitor the safety of products on the shelves recommend applying test strips to determine the level of harmful chemicals in general and pesticides in particular before buying. . There is information that spinach greens can accumulate the toxic heavy metal thallium.

[20] appeared on the website of the EWG (a non-profit organization for the protection of the environment) , which details the results of pesticide contamination of spinach over the past few years. It turned out that since the penultimate inspection in 2008-09, the pesticide content in the tested spinach samples has increased dramatically (which was not typical for any other product). In particular, in the composition of one sample, the researchers found traces of, on average, 7 types of chemicals, and in the most contaminated samples, the content of 19 pesticides.

Most often and more than other poisonous substances, the vegetable contained traces of three fungicides (mandipropam, fluopicolide and amethoctradine), as well as permethrin, a neurotoxic insecticide that in high doses affects the nervous system and causes tremors and convulsions (since 2000, the drug has been banned in the European Union for use). on food crops). Moreover, in spinach, unlike other crops, even DDT residues were found. Although this pesticide was banned back in the 1970s, its degradation products are still pulled out of the soil by susceptible crops such as spinach.

Washing the leaves of the plant before consumption reduces the risks, although it does not completely eliminate the danger of pesticide poisoning. However, thoroughly washing spinach helps fight another food hazard - bacterial contamination. When 3 people died in the US in 2006 due to the O157:H7 strain of Escherichia coli bacteria, poorly washed California spinach was the cause. And the very next year, 2007, due to the risk of salmonella infection, several thousand packages of spinach were withdrawn from retail chains. To prevent new episodes of infection, the FDA has allowed greens to be pre-treated with antimicrobial ionizing radiation.

Finally, spinach can provoke an allergic reaction. Its main allergenic protein is profilin. It is not uncommon for people with hypersensitivity to spinach protein to also be allergic to molds and latex due to similar epitopes.

Selection and storage

The freshness of spinach can be judged by the elasticity of the leaves and the crunch that occurs with gentle pressure. Too thick a stem may indicate that the plant is overripe and will be bitter when cooked (although even "adult" leaves, after steaming, stewing or frying, can be a good side dish).

The bright color of the leaves can also indicate the quality of the product. The color should be even without dark or light spots. But shades of green can vary depending on the variety of spinach. For example, in the retail chains of our country, you can most often find 3 varieties, of which:

- "**Victoria**" is characterized by rounded thick leaves of a dark green tone;
- "**Giant**" is distinguished by elongated oval leaves of light colors;
- '**Godry**' is described as a cultivar with an ovoid leaf blade, slightly wrinkled surface, green or light green with yellow coloration.

In supermarkets, spinach is usually already washed and packaged. But, despite this, it is still better to wash the leaves of the vegetable before use and eat them within 1-2 days. However, if this cannot be done immediately, then the spinach should be stored in the refrigerator without washing it, so as not to provoke the onset of rotting.

Spinach does not tolerate storage well, and loses some of its beneficial properties even at low temperatures. For example, in one study, scientists found that a third of the ascorbic acid was lost when spinach was stored at 4°C for 2 weeks. ^[21]

Moreover, you should not store ready-made spinach dishes, since this leads to the release of a large amount of nitrogenous substances, and when they enter the blood, they provoke the formation of methemoglobin, which cannot carry oxygen to the tissues.

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Spinach - useful properties, composition and contraindications

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Apricot (lat . *Prunus armeniaca* Lin.)

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Abstract. The article discusses the main properties of apricot and its effect on the human body. A systematic review of modern specialized literature and relevant scientific data was carried out. The chemical composition and nutritional value of the product are indicated, the use of apricot in various types of medicine and the effectiveness of its use in various diseases are considered. The potentially adverse effects of apricot on the human body under certain medical conditions and diseases are analyzed separately. The scientific foundations of diets with its use are considered.

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Beneficial features

Table 1. Chemical composition of apricot (according to [Food+](#)).

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Alimentary fiber	2
Squirrels	1.4
Fats	0.39
Calories (kcal)	48
Minerals (mg/100 g):	
Potassium	259
Phosphorus	23
Calcium	13
Magnesium	ten
Sodium	one
Iron	0.39
Zinc	0.2

Copper	0.078
Manganese	0.077
Vitamins (mg/100 g):	
Vitamin C	ten
Vitamin E	0.89
Vitamin PP	0.6
Vitamin B6	0.054
Vitamin B2	0.04
Vitamin B1	0.03

Apricot contains citric, malic, tartaric acids, phenolic and tannins, flavonoids, pectin, a large amount of carotene (up to 16 mg/100 g). The pulp of apricot fruits contains a lot of sucrose, glucose, sorbitol and fructose (up to 28% in total). Moreover, in hybrids and varieties of late harvest, higher levels of sugar and lower levels of magnesium are noted, which is already quite small in fresh fruits.

Relatively little in apricot and most other minerals: iron in 100 g - about 5% of the daily requirement, calcium and phosphorus - 3%, magnesium - 2%. The exception is potassium, according to the content of which apricot occupies one of the leading places among products of plant origin. One hundred grams of fresh fruits provide about 10-12% of the daily human need for this mineral. And one hundred grams of dried fruits prepared from apricots (dried apricots, apricots, etc.) provide about 70% of the body's daily need for potassium.

It should be noted that with such a comparison of dried fruits and fresh fruits, the erroneous impression often arises that the content of nutrients in all dried fruits increases dramatically for some reason. In fact, if you compare one fruit before and after drying, the difference will not be so significant. And the error arises due to the fact that usually the amount of useful substances in the tables is taken based on 100 grams of the product, but these hundred grams "fit" a different number of fresh and dried fruits.

Therefore, in 100 grams of dried fruits that have lost moisture, iron, phosphorus, magnesium, and potassium are indeed several times more than in 100 grams of fresh apricots. But 100 g of dried apricots contains only 30-31% of water, and in fresh fruit - 85-90% in 100 g.

Medicinal properties

Apricot preparations (oil, extracts of pulp and fruit seeds) in studies and experiments demonstrate various medicinal properties:

- **Antitumor.** In the experiments of Japanese scientists in vitro ("in vitro") and in vivo ("inside a living organism"), the antitumor effect of Japanese apricot extract was found in relation to human cancer cells. In particular, the inhibitory effect of the extract on skin transit metastases in a patient with malignant melanoma was confirmed. High sensitivity to MIAPaCa-2 pancreatic cancer cell extract was also found. At the same time, the fatal effect on cancer cells did not affect normal cells and did not create side effects. ^[2] Other studies have found the ability of the same extract to inhibit the growth of breast cancer cells. ^[3]
- **Bactericidal.** Another group of Japanese scientists revealed the ability of the Japanese apricot to suppress the development of *Helicobacter pylori*, due to which the manifestations of chronic atrophic gastritis were less pronounced. ^[four] In other studies, the ability of apricot juice to inhibit the development of putrefactive bacteria was also established.
- **Antioxidant.** The fruit pulp and various extracts of sweet and bitter apricot kernels also show an antioxidant effect. ^[5] At the same time, in the works of scientists, a more pronounced

relationship was established between the total antioxidant capacity of apricots and the content of phenol, rather than carotenoids. ^[6]

- **Painkiller.** Amygdalin, a plant glucoside isolated from apricot kernels, showed an analgesic effect in animal experiments when administered as an intramuscular injection. It is assumed that it can be used as an analgesic with anti-inflammatory action. ^[7]

The results of studying the extracts of different parts of the apricot show that in the future, with their help, it may be possible to treat diseases of the heart, liver, kidneys, intestines, respiratory tract, the consequences of pathologies of the nervous system and brain dysfunction.

- Researchers have found that eating apricots can reduce the risk of steatosis (fatty liver disease) and damage caused by free radicals. ^[8] Also, a therapeutic and prophylactic effect against liver fibrosis was achieved through the use of preparations based on apricot kernels. ^[9]
- The apricot diet prevented damage to the kidney tissue of mice and apoptosis of kidney cells, which was artificially provoked by exposure to methotrexate. ^[ten] With the help of the fruit, scientists were able to significantly reduce the toxic effects of methotrexate and suggest that by eating apricots, it will be possible to reduce damage to the kidneys by toxic drugs.
- An aqueous extract of apricot seeds showed anti-asthma activity in an experiment on mice. Oral administration of the extract relieved the asthma symptoms and airway inflammation that resulted from an allergen reaction. ^[eleven]
- Apricot oil had a protective effect on the development of ischemia in laboratory rats. Experimental studies have shown that apricot oil can be considered as a nutrient for the treatment and prevention of myocardial infarctions, since it has a strong cardioprotective effect. ^[12]
- Apricot kernel extracts and oil, orally and intra-abdominally, have been tested as a treatment for ulcerative colitis in rats. The scientists found that, although the oil fractions did not enhance the properties of the extracts, the anti-inflammatory effect in the intestines was pronounced, especially with the injection method of drug delivery. ^[13]
- Apricot carotenoids showed anti-amyloidogenic activity in vitro, which gave researchers hope for their use in the prevention of Alzheimer's disease. ^[fourteen]

In medicine

Apricot fruits, seed oil, decoctions and infusions of dried apricots are used in various therapeutic programs.

- Apricot seed oil (*Oleum persicorum*) is used in medicine as a solvent for drugs - fat-soluble drugs intended for intramuscular and subcutaneous injections. In composition, this fatty oil is close to peach and almond. It includes various acids - linoleic (20%), stearic (14%), myristic (5%) - and can not dry out for a long time, but deteriorates from exposure to oxygen and light.
- In the complex therapy of cardiovascular and renal diseases, thick decoctions and / or infusions of some types of dried apricots can be included. They are used as a diuretic product in case of edema.
- As part of the magnesium diet for hypertension, dried and fresh fruits are introduced into the diet.

In addition, apricot extracts and extracts from apricot kernels are widely represented on the pharmacological market. The latter are better known under the commercial name "Laetrile", or vitamin B17. Laetrile is positioned as a means of preventing and treating cancer. However, in addition to the unproven effectiveness, there are additional risks associated with this cyanide-containing drug, which you can read more about in the "Hazardous Properties" section of this article.

In folk medicine

The basis of modern "home" therapeutic practice with the use of apricot fruits was laid by the ancient medical recipes of the peoples of Central Asia. The inhabitants of this region got to know the apricot earlier than anywhere else on the planet, and, accordingly, they also learned about the healing properties of the fruit before others.

Already ancient healers noticed that apricots can remove bad breath, and dried fruits from it can control sweet and sour belching, relieve the heat of the stomach, and stimulate the excretion of bile. In continuation of this tradition, and today in folk medicine, with the help of infusions of dried fruits, they normalize digestive processes and provoke choleretic function. Fresh apricots are now widely used as a laxative.

But along with the medicinal manifestations of the fruit, its side effects were also found. For example, it was believed that overeating apricots could lead to the formation of patches of skin with pigmentation disorders, and eating raw apricots could harm people with a weak stomach. Only the elderly should avoid apricots in their daily diet. But all people (including healthy people) were advised never to drink apricots with cold water, not to eat fruit on an empty stomach and not to finish heavy meals with apricots.

Today, for medicinal purposes in folk therapy, it is customary to use not only the pulp, but also other parts of the plant:

- **Bones.** In the form of water infusions, the bones are used to restore the work of the heart, and to remove intestinal parasites. They also get rid of helminths with the help of bitter seed oil. In addition, they also treat hemorrhoids (externally) and urolithiasis (when ingested). Ear pain is relieved by instillation of apricot oil into the auricle.
- **Leaf decoction.** The brewed leaves of the plant also serve as an anthelmintic. If necessary, the same decoction is used as a diuretic.
- **Fruit juice.** In folk medicine, it is used for dysbacteriosis and stomach problems caused by low acidity. They also drink it to lower blood pressure.

Recipes for drugs and infusions

Medicinal folk remedies are prepared both from one apricot ingredient and from several components:

- An infusion of dried apricots is taken to relieve swelling of the legs. Dried fruits (50 g) are poured with boiling water (250 ml) and kept for 3-4 hours. After straining, the infusion is taken ½ cup twice a day.
- A mixture of dried apricots, walnut kernels and honey is prepared to improve the functionality of the cardiovascular system and improve metabolic processes. To do this, all components are taken in equal proportions. At the same time, dried apricots with nuts are ground in a blender. The remedy is recommended to be taken daily for 1 tbsp. l.
- Another complex remedy from apricot kernels (20 pcs.), Honey (500 g) and lemon (500 g) is used in folk therapy for palpitations and heart rhythm disturbances. Before mixing with honey, the kernels are crushed in a mortar, and the lemon in a meat grinder. The composition is stored in the refrigerator and taken 1 tbsp. l twice a day (after waking up and before going to bed).
- A similar composition with the addition of juice of 30 red geranium leaves is used for hypertension. To reduce pressure, the drug should be drunk 2 hours after meals three times a day, 1 tbsp. l.

- Ashes from the shell of apricot seeds are taken to purify the blood. During the cooking process, the bones are broken to separate the core, and the shell is burned in a pan or baking sheet until ash forms. The tool is taken in 1 tsp. at least a week.

in oriental medicine

The ancient oriental traditions of using apricots in healing were laid down both by the school of Arab-Persian-Tajik medicine (the works of whose representatives were translated into Chinese back in the Middle Ages), and by their own earlier heritage of Chinese healers.

During the existence of the Eastern Han Dynasty in China (20-225), the healer, whose name was Dong Feng, became famous for centuries. With herbal medicine and acupuncture, he treated mainly commoners and was so successful in this that his fame spread throughout the country. As a reward for healing, Dong Feng offered the healed to plant an apricot pit in his garden. And after a few years, the healer's dwelling was buried in apricot trees, the fruits of which the doctor used for medical practice. Therefore, until now in China, a "speaking" definition is sometimes used for apricot fruits - "Dr. Dong's fruits", and all Chinese traditional medicine is called "apricot garden".

In general therapy, apricot is widely used in China to cleanse the body of poisons and toxins, to rejuvenate and improve brain function. It is no coincidence that this fruit used to be included in the menu of emperors, and today it is in the diet of astronauts.

However, for the treatment of specific diseases and pathological conditions in traditional therapy, apricot pits are still used more often. With their help, they get rid of cough, hiccups, and when other herbal medicines are added, they treat respiratory diseases (tracheitis, bronchitis, whooping cough, laryngitis), gastrointestinal tract and inflammation of the kidneys. For example :

- with Chinese ephedra (Ma Huang) infusions of stones are used for difficult breathing;
- with hemp seed (Ho Ma Ren), the nucleoli are used as a laxative for constipation caused by "dry intestines";
- with black nettle leaves (Zi Su Ye), apricot seeds are prescribed to get rid of dry cough and "cold wind".

For the treatment of bronchial asthma, bitter apricot seeds are also used in Korean folk medicine. The Japanese also have their own national apricot "fruit of health", extremely rich in ascorbic and citric acids. *Prunus mume* apricot fruits are traditionally salted and fermented on the islands, with the help of which the inhabitants of Japan relieve fatigue, restore heart function, treat throat diseases, and stimulate the activity of the digestive system.

In scientific research

Most of the scientific work devoted to the study of the chemical properties of the fruit relates to the topic of the influence of various extracts of apricot kernels in experiments in vitro and in vivo. In recent years alone, dozens of studies have been carried out on the potential of apricot kernels in the fight against allergic reactions, diseases of the liver, kidneys, intestines, and oncology. As an example, here are just a few studies that were published during 2018-19.

Apricot kernel extract prevents inflammation of the cornea and conjunctiva, which was caused by particulate matter contained in urban smog. ^[fifteen]

In the experiment, eye drops containing 0.5 mg/ml or 1 mg/ml apricot kernel extract were injected into the eyes of female laboratory rats with characteristic eye lesions. In parallel, the expression of inflammatory factors was studied in the epithelial cells of the conjunctiva "in vitro".

As a result, it turned out that both concentrations of the extract inhibited damage to the epithelial layer of the cornea, protected from the destruction of the protective layer on the surface of the eye, and local administration of drops of 1 mg/ml weakened the decrease in the secretion of tears. Scientists suggest that the pharmacological activity of apricot kernel extracts may be partly due to the presence of amygdalin in the composition.

Apricot kernel oil protects the gastric mucosa of rats from damage due to its anti-inflammatory, antioxidant, and anti-apoptotic effects, and may be useful in reducing the severity of gastric ulcers. ^[16]

Stomach ulcers, artificially provoked by ethanol in male albino rats, scientists tried to treat with apricot oil. After staining the gastric tissue for apoptosis, measuring the expression of gastric IL-10 and IL-6, analyzing some enzymes (catalase, superoxide dismutase, etc.), the scientists found that in the "apricot oil + ethanol" group of animals, the area and degree of gastric damage was significantly less than in the "ethanol without apricot oil" group.

Apricot kernel extracts have the potential to be used in the future in dietary anti-cancer therapy in the treatment of human colon cancer. ^[17]

Studies were conducted on HT-29 colon cancer cells. The interactive role of three different nuclear extractions in modulating cell proliferation, apoptosis, and cell cycle progression was monitored for 24, 48, and 72 h periods. As a result, scientists have received a complex picture of the effect of apricot extracts, which in a possible therapy will require detailed dosages and clarification of procedures.

For example, after 24 hours, all apricot kernel extracts had a biphasic proliferative effect on HT-29 cells. But on a 24-hour time period, 500 µg / ml extract inhibited the growth (proliferation) of cells, and after 72 hours the same concentration already stimulated this process. At the same time, in the case of further study of the mechanisms of influence, scientists see prospects for the use of extracts containing amygdalin in dietary anticancer therapy.

Weight regulation

Taking into account the high content of various sugars, apricots, with their calorie content of 45-50 kcal / 100 g, are used in diets aimed at losing weight in a limited amount - no more than 100-150 g per day. With their help, you can provide the body with some of the necessary vitamins and minerals, but this sweet fruit cannot be called an ideal assistant in the fight against extra pounds.

Existing mono-diets, designed for 3 days, allow eating 1 kg of fruit per day, divided into 5-6 meals. With such a diet, the body receives only about 500 kcal per day, which, while maintaining physical activity, easily creates a negative balance when more energy is expended than supplied. But to maintain full activity, eating only apricot, is quite difficult. And not everyone can withstand fasting for three days. Therefore, individual "apricot" fasting days are more often practiced, and even then - in the absence of contraindications.

In cooking

Fresh apricots in themselves are a dessert delicacy, but different types and varieties of these fruits have their own "culinary specifics", due, for example, to different amounts of pectins, high or low acidity,

etc. So, in the confectionery industry for the manufacture of jelly, marmalade, jam, marshmallow, fruits with a high pectin content are more suitable. And the fruits of the Japanese apricot, due to their high acidity, are more often in demand in the production of marinades, pickles, seasonings.

In particular, in Japan there is a tradition of fermenting apricot fruits using a technology similar to the one we use to make sauerkraut: unripe fruits are removed from the tree, mixed with salt and left in their own juice under oppression in a cool place for a month. This seasoning is called umeboshi and is usually served with rice. Whole fruits extracted from sourdough are considered an excellent snack. Properly cooked apricot retains a dense texture and light fruity flavor. But sometimes, as a basis, you can find sun-dried, dried fruits, which, after brine, are usually blanched in boiling water to soften.

Dried apricots are widely used in cooking. In this form, dried fruit is known by various names:

- Dried apricots are an apricot fruit divided into two slices, from which the stone was removed before drying. It is used as a filling for poultry dishes, pies, casseroles, yoghurts, sweets.
- Apricot is a whole fruit with a stone. This is how small-fruited varieties are usually dried, so that later they can be added to compotes and jelly.
- Kaisa is a dried whole apricot, in which the stone is removed without breaking the fruit through the place where the stalk is attached.
- Ashtak-pashtak is also a whole-dried apricot fruit, but, unlike kaisa, after removing the stone, it is split to get the core, which is then returned to the apricot again.

In one version of the recipe for a traditional Armenian sweet called alani, not the usual peaches are used, but slightly underripe or dried apricots of predominantly white varieties. In dried fruits, the stone is replaced with crushed walnut kernels mixed with sugar and spices. There are recipes in which dried apricots are steamed with boiling water to get a soft aromatic mass, and then this apricot raw material is baked like dough.

Quite a lot of alcoholic drinks are made on the basis of apricot. In the traditional apricot, the fruit juice is first fermented and then distilled (distilled).

The fruits of the Japanese apricot also serve as the basis for the 10-15% sweet and sour umeshu liquor popular in various Asian countries, which the Japanese began to cook at home since the 17th century.

In cosmetology

In cosmetology, apricot components have been used for more than 2 thousand years. The pulp of the fruit is mainly used in the manufacture of home cosmetics. It is used to make "quick" nourishing and moisturizing face masks, anti-aging products.

So, for a simple homemade nourishing mask, you only need ripe fruits and mineral water. Apricots (3 pieces) are kneaded into porridge with a wooden spoon and applied in a thick layer to the previously cleansed skin. After a quarter of an hour, the "porridge" is washed off with ordinary water, and the skin is rubbed with a mixture of freshly squeezed apricot juice and mineral water without gas in a 50/50 ratio.

Apricot pits are used more widely. From finely ground kernels, pastes are made to even out the tone of the face, moisturizing and nourishing serums, anti-inflammatory ointments, and coarsely ground shell powder is added to scrubs. Seed-based oil is included in many skincare products from various manufacturers. Such oils and extracts are labeled as *Prunus Armeniaca* Extract, *Prunus Armeniaca* Kernel Oil or *Armeniaca* Seed Powder (INCI classification). Burnt apricot kernels are used in carcass production.

Also, apricot components can be easily found in the composition of hair care products. Although it is not difficult to prepare a mask from the pulp and apricot kernel oil to strengthen hair at home. According to the recipe, oil (3 tablespoons) is heated in a water bath to a comfortable warm state, mixed with the yolk of one egg and the pulp of one fruit. The mask is applied to the scalp at the base of the hair and "rubbed" with a comb with rare teeth. To eliminate dandruff, lemon or tea tree oil is added to the composition.

Dangerous properties of apricot and contraindications

A large amount of various types of sugars (about 9-9.5 g / 100 g) in the pulp of apricot fruits imposes certain restrictions on the use of these fruits by diabetics. But the glycemic index of fresh fruits is low (up to 34), it is even lower for dried apricots (about 30), therefore, both in the form of dried fruits and fresh, diabetics can afford to eat several fruits (while controlling blood sugar levels).

More significant risks are associated with self-medication with apricot kernel extracts, which contain hydrocyanic acid, a deadly cyanide. More precisely, apricot seeds contain amygdalin glycoside, which, decomposing upon hydrolysis, forms a hydrocyanic acid molecule.

Small portions of cyanide the human body is able to neutralize on their own. Glucose in the blood binds cyanides, so people with diabetes, for example, are more resistant to this kind of poisoning. But even 1 gram of amygdalin can already be fatal, and this amount corresponds to about 100 grams of apricot kernels. Children, on the other hand, can get poisoned with a smaller amount, having eaten the kernels of only 10-12 seeds.

In 2017, a report was published ^[18] about a 67-year-old Briton who, by daily use of two teaspoons of a home-made apricot seed extract and three Novodal dietary supplement tablets (based on the same seeds), brought himself to chronic intoxication in 5 years, which nearly cost him his life. At the time of the examination, the level of cyanide exceeded the norm by 25 times. The reason for the apricot drug craze was the belief that amygdalin provided cancer prevention, although such properties of amygdalin are now openly denied by the medical community.

Supporters of alternative medicine, this glycoside is better known under the brand name "Laetrile". It was registered as a drug for the treatment of disorders of intestinal fermentation ^[19], but later they "remembered" that at the end of the 19th century they tried to treat cancer with amygdalin, after which a large-scale and profitable campaign was launched to popularize the anti-cancer properties of the drug. Traces of this company are easy to find in Runet, where amygdalin is often written about as the so-called vitamin B17. In the United States, the distribution of the drug "Laetrile" is now prosecuted by law.

Dried apricots also pose a certain danger. In the process of its industrial preparation, to improve consumer qualities, sulfur dioxide is used, which is indicated on the packaging as a preservative E220. This additive has been assigned the 3rd hazard class and is approved for use in all countries of the world. However, even low concentrations of sulfur dioxide can cause allergic reactions in some people. The risk group includes asthmatics, who are better off not eating "store-bought" dried apricots, people with chronic allergic diseases, as well as patients with gastrointestinal diseases who are more sensitive to sulfur dioxide due to changes in the acidity of gastric juice.

At the same time, you need to know that sulfur dioxide does not accumulate in the human body and is quite easily excreted in the urine. Therefore, in case of an overdose, you should simply drink more water.

Due to poor chewing of dried apricot fruits or swallowing them whole, intestinal obstruction may occur in children ^[20] and those adults who, due to the state of their teeth, are not able to sufficiently chew dried apricots before swallowing. ^[21] Cases are described when even single small fruits, after swelling, blocked the lumen of the small intestine, although, in general, episodes of intestinal blockage by phytobezoars are quite rare.

Selection and storage

To buy ripe apricot fruits, you should choose fragrant fruits with already soft and pliable, but still firm flesh and rich orange skin without spots, dents or damage.

Fully ripened fruits are not stored for a long time - they must be eaten or processed immediately. Slightly unripe fruits lie well in the refrigerator. Before use, it is enough to take them out of there, put them in a paper bag and wait 2-3 days until they become ripe. At the same time, if a completely green fruit got into the refrigerator, then it will not be possible to bring it to ripeness.

Recently, apricots have been often frozen. To do this, they are simply pre-washed, dried and placed in the freezer. However, the most common way to prepare an apricot for long-term storage is drying the fruit.

To get a kilogram of dried apricots, you need to dry 3-4 kg of fresh fruit. To do this, selected dense apricots are washed, divided into slices (the stone is removed), and in turn they are dipped in portions for 10-15 minutes in water acidified with lemon juice. For 3 kg of fresh fruits, you need about 1 liter of water mixed with 250 ml of lemon juice. After that, apricot slices are either dried in the sun for a week, trying to prevent moisture from entering, or sent to the oven for 9-12 hours, while the baking sheet is pre-covered with baking paper, and the slices themselves are regularly turned over every hour.

Dried apricots are stored in hermetically sealed glassware, preventing moisture from entering, due to which dried fruits quickly become moldy and deteriorate. At the same time, blanks should not be kept under direct sunlight either, because ultraviolet light will have time to destroy ascorbic acid and affect the taste of the product. Therefore, usually a closed jar of dried apricots is sent for storage in the cellar or in the refrigerator.

All this, however, does not mean that the apricot cannot be called a healthy fruit. A variety of studies prove its potential value, including in matters of maintaining and improving health. But you can't build a therapeutic nutrition program on just one apricot, no matter what the myths about this delicious fruit say.

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Apricot - useful properties, composition and contraindications

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Abstract. The article discusses the main properties of apricot and its effect on the human body. A systematic review of modern specialized literature and relevant scientific data was carried out. The chemical composition and nutritional value of the product are indicated, the use of apricot in various types of medicine and the effectiveness of its use in various diseases are considered. The potentially adverse effects of apricot on the human body under certain medical conditions and diseases are analyzed separately. Considered scientific basics diets With his application .



Blackcurrant (lat. Ribes nigrum)

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Key words: blackcurrant, benefits, harm, beneficial properties, contraindications

Beneficial features

Table 1. Chemical composition of black currant (according to [Food+](#)).

Main substances (g / 100 g):	Fresh blackcurrant ^[1]
Water	81.96
Carbohydrates	15.38
Squirrels	1.4
Fats	0.41
Calories (kcal)	63
Minerals (mg/100 g):	
Potassium	322
Phosphorus	59
Calcium	55
Magnesium	24
Sodium	2
Iron	1.54
Zinc	0.27
Manganese	0.256
Copper	0.086
Vitamins (mg/100 g):	
Vitamin C	181
Vitamin E	one
Vitamin PP	0.3
Vitamin B6	0.066
Vitamin B2	0.05
Vitamin B1	0.05

In the composition of blackcurrant berries, vitamin C is usually called the “main” useful component. By its amount, blackcurrant falls into the Top 10 list of plant vitamin sources. Only 20 grams of berries are enough to provide the daily requirement of an adult for ascorbic acid, and in unripe fruits it is even more than in ripe ones. The concentration of this vitamin is even higher in buds (up to 450 mg/100 g) and leaves of the plant (up to 470 mg/100 g after flowering) ^[2]. There is also a lot of it in flowers and buds, so in folk medicine there are recipes with all the listed parts of the plant. The amount of ascorbic acid depends on weather conditions (in a dry hot period it decreases by about 25-30%), on the region (in the northern cold regions there is more vitamin C in berries) and on other factors.

Among the minerals, there are quite a lot of potassium in the berries (about 13-15% of the daily requirement) and iron (about 9-10% of the d.p.). Fruits accumulate zinc, copper, selenium. But black currant shows its healing effects not only due to the presence of some individual components.

Often, researchers talk about a synergistic effect, which is manifested due to a complex of substances that systemically enhance each other's actions. Therefore, scientists pay special attention to the content of carotene, phenylalanine, citric, malic and other organic acids, glycosides, anthocyanins (cyanidin, delphinidin), tannins and pectin substances, essential oils and various sugars (glucose, fructose, etc.) in berries.

Medicinal properties

Blackcurrant phytochemicals exhibit varying degrees of antimicrobial, neuroprotective, hypotensive, immunomodulatory, diaphoretic effects, as well as potent anti-radiation, antioxidant, and anti-inflammatory properties that may be beneficial in cancer prevention and treatment. Currant substances show the potential to improve overall human health, especially in diseases associated with

inflammation and regulation of blood glucose levels. In addition, blackcurrant extracts have the ability to inhibit low-density lipoprotein and reduce the risk of cardiovascular disease.

The medicinal properties of blackcurrant are demonstrated so far, mainly in experiments "in vitro" on cellular material (in vitro) and on laboratory animals. But even these experiments lead researchers to promising conclusions and assumptions:

- An anthocyanin-rich blackcurrant extract could possibly inhibit the growth of human hepatocellular carcinoma cells. Moreover, an aqueous extract of berry peel showed an even more pronounced cytotoxic effect on HepG2 human liver cancer cells than berry pulp anthocyanin aglycones. ^[3]
- Blackcurrant consumption attenuates liver inflammation and lipopolysaccharide-stimulated inflammatory responses of splenocytes (spleen tissue monocyte cells) in obese mice ^[4]. Extract supplementation reduces obesity-induced inflammation in adipose tissue and splenocytes, at least in part, by modulating energy metabolism in skeletal muscle. ^[5]
- Blackcurrant extracts may improve postprandial ("after eating") glycemic control in type 2 diabetics through the antilglucosidase activity of the plant's polyphenols. ^[6]
- Wild blackcurrant leaf extract inhibits influenza A virus in vitro and in mice. The extract interferes with the attachment and penetration of the virus into the cell, and the secondary metabolites of the plant are able to inhibit the replication of the influenza virus through interference with the synthesis of hemagglutinin, reduce the expression level of an inflammatory cytokine, prevent interaction with the cell membrane, etc. This gives hope for the development of a drug or a therapeutic strategy for prevention of infection and spread of the virus at an early stage. ^[7] Even earlier, the fruit extract was found to have antiviral activity against influenza A and B viruses and herpes simplex virus. ^[eight]
- The use of drugs based on black currant polysaccharides may be used in the treatment of atopic dermatitis (inflammation that causes dry skin and impaired skin barrier function). It is still far from the creation of a drug, but in experiments on laboratory mice, the currant drug had a diverse effect on the immune system (suppressed the migration of mast cells into the skin of the epidermis and hyperproduction of immunoglobulin E) and generally alleviated the symptoms of atopic dermatitis. ^[9]
- Berry extract in combination with cyanidin-3-O-glucoside may be promising candidates for the development of new treatments for smoking-induced periodontal disease. This is due to the fact that currant extract neutralizes the cytotoxic effect of nicotine on epithelial cells and fibroblasts ^[10]
- Blackcurrant juice can cause a significant and dose-dependent decrease in blood pressure and heart rate. So far, this has been found with intravenous juice and in animal experiments, but the results allow a better understanding of the mechanism of hypotension. ^[eleven]

The effect of black currant on the functionality of the organs of the gastrointestinal tract is being actively studied:

- Plant anthocyanins are able to regulate the gut microbiome, as confirmed by experiments on mice. True, only long-term use of berry supplements has a significant effect, and only in young mice. But even such results open up prospects for the creation of programs for the treatment of the gastrointestinal tract with the help of diets ^[12]. There are already projects investigating the positive effects of blackcurrant extract powder on the human colon microbiome to reduce the risk of cancer.
- Blackcurrant juice has an antispasmodic effect on the smooth muscles of the gastrointestinal tract (in vitro), so that common gastrointestinal disorders may be treated with a currant supplement without resorting to medication. ^[13]

- Arabinogalactan protein isolated from plant seeds moderately prevents *Helicobacter pylori* from sticking to the walls of the stomach (in the experiment on sections of the mucous membrane), which can potentially be used in the treatment of gastritis and peptic ulcer. ^[fourteen]

Studies are also underway on the extent to which blackcurrant antioxidants are able to stop pathological tissue growth, exhibiting antiproliferative activity on the material of tumor cell lines of mouse melanoma, ovarian cancer, and cervical cancer. The diuretic and salt-removing (saluretic) properties of different volumes of blackcurrant ethanol extracts are being studied, since data on the effect of preparations of this berry on the excretory function of the kidneys are still contradictory, and the nature of the effect probably depends on the dosage. ^[fifteen]

Some studies have shown the medicinal effects of blackcurrant in human experimental programs. For example, it was found that:

- currant juice reduces the effect of oxidative and inflammatory biomarkers in cultured macrophages in patients with a tendency to atherosclerosis. ^[16]
- Blackcurrant anthocyanins as a dietary supplement to the main treatment inhibit the progression of glaucoma ^[17], and reduce intraocular pressure in both patients with glaucoma and healthy people ^[18],
- the use of blackcurrant before smoking significantly reduces the negative impact of tobacco smoke on the immunological status of saliva, and, accordingly, the risks of oral diseases.

In voicing the results of the work, the researchers very clearly describe the conditions of the experiment and the characteristics of the group of patients in which the therapeutic effect of black currant was noticed, because when the given conditions change, the effects may weaken or even disappear. But in general, the results of the research show how much healing potential is contained in both the berries and the leaves of the plant.

Use in medicine

Blackcurrant fruits are produced as a medicinal product, which, according to indications, is intended for the treatment of gastrointestinal diseases, atherosclerosis, colds, asthenia (a pathological condition of rapidly occurring fatigue), cardiovascular diseases and periodontal disease.

Blackcurrant berries, along with rose hips in a 50/50 ratio, are included in Vitamin Collection No. 1. It is prescribed for beriberi (lack of vitamins A, C, P, K). Brewed infusion is recommended to drink 100 ml 3-4 times a day.

Currant fruits are also part of the complex herbal preparations Travohol (where currant berries are one of the main components of the product), Nevrosin, Gerboton and many others:

- The pharmacological action of the Travohol elixir involves its use mainly as a choleretic agent (stimulating the formation and secretion of bile) in therapy for violations of the outflow of bile according to the hypokinetic type and in the treatment of chronic non-calculous cholecystitis. Among the concomitants are antioxidant, anti-inflammatory, membrane-stabilizing and antispasmodic effects. There is also a bacteriostatic effect of the drug against the bacteria *Escherichia coli*, *Streptococcus faecalis*, *Staphylococcus aureus*.
- Tablets "Nevrosina", according to the instructions, are used for physical and mental fatigue, neuroses, depression, diseases of the cardiovascular system, autonomic disorders, spasms of smooth muscles, menopausal syndrome.
- Gerboton tincture is positioned as a general tonic to increase physical and mental activity during recovery periods.

The leaves of the plant are used in complex plant bioadditives "Phytoline No. 24 Adaptofit map", "Fitolann No. 11 Urofit map", "Anti-alcohol-biol extract", "Cirrofit", etc. Foreign manufacturers produce a number of dietary supplements based on blackcurrant berries and seeds (one of the most common forms are capsules). Among these effects are the prevention of problems of the cardiovascular system and disorders of visual function, reducing the intensity of menstrual pain, improving the condition of the joints, etc.

In folk medicine

In folk medicine of those countries where blackcurrant is traditionally considered a medicinal raw material, it is almost universally used to treat colds, respiratory diseases, urinary system organs and joints. But there is also a regional specificity of the use of medicinal berries.

- In Central Asia, blackcurrant berries and leaf decoctions are used to treat gastritis, anemia, and diabetes. Berry and leafy decoctions are taken to normalize the digestive tract and stop vomiting. Leafy "teas" (which are brewed similarly to tea leaves) are drunk as a laxative, diuretic, and diaphoretic. Decoctions of the leaves when taking a bath relieve pain in the joints and muscles, help in the treatment of furunculosis. In mountainous areas, blackcurrant is used to treat skin tuberculosis.
- Bulgarian folk healers recommend drinking an infusion of currant leaves for rheumatic pains. In combination with white wine, such an infusion is prescribed for weakness of the stomach.
- In the folk medicine of Belarus, blackcurrant berries are a popular product for the treatment of liver and heart diseases, as well as for restoring the functions of the nervous system. For gastritis characterized by low acidity, currant juice is used (50-70 ml 2-3 times a day). With diathesis and skin tuberculosis, baths are taken with the addition of a decoction of the branches of the plant.
- Russian folk therapy uses currant juice as a remedy for beriberi and colds, and tea from the leaves to relieve symptoms of rheumatism and relieve inflammation of the bladder and kidneys.

All East Slavic peoples have a common practice of using blackcurrant to lower blood pressure, as well as get rid of headaches of vascular and neurogenic origin. Moreover, for therapeutic purposes, berries simply ground with sugar are often used. Such a "dessert" for 1-2 tbsp. l. daily consumed with tea, instead of jam, a long course (from 1 month and, as a rule, until the end of currant stocks). According to supporters of traditional medicine, in addition to a gradual decrease in the intensity of headaches with such therapy, meteorological dependence disappears (health does not deteriorate even with a sharp change in weather), insomnia ceases to torment, memory improves, energy and strength appear.

But more often, in folk therapy, they use fresh juice or blackcurrant berries without added sugar. In this form, currant products are more useful for various diseases of the digestive system: gastritis with low acidity, inflammation of the gastric mucosa, diarrhea, colic, diabetes, excess uric acid in the body. It is advisable to rinse the oropharynx with sore throat and stomatitis with juice with water without adding sugar.

Some sources devoted to the treatment of folk methods mention blackcurrant as a means of enhancing male sexual function. Sometimes blackcurrant is used as an aid in the fight against cancer.

Decoctions and infusions

For medicinal purposes in folk therapy, decoctions and infusions of fruits, leaves, flowers, branches and roots of the plant are used. From the coarse parts of the currant (branches and roots), decoctions are most often prepared for bathing procedures for diathesis, rickets, rheumatism, skin tuberculosis at

the rate of 1 part of the decoction per 1000 parts of water. From the tender parts, preparations are prepared for internal use:

- **Current tea from buds and flowers.** It is used in folk therapy for joint pain of various nature (arthritis, rheumatism, osteochondrosis), prostatitis and urolithiasis. Medicinal "tea" is prepared from buds and flowers collected in early spring. Dry raw materials (2 tsp) are poured with boiling water (250-300 ml) and infused in a teapot under the lid for 20-30 minutes. One such teapot should be enough for a day. In total, the course of treatment lasts from one and a half to three months, but every three weeks a 5-7-day break is made.
- **A decoction of dried fruits.** Recommended for colds, high blood pressure, swelling. Dry berries (3 tablespoons) are poured with water (500 ml) and first kept on low heat for about 5 minutes, and then infused for an additional hour. After straining, the decoction is drunk half a glass during the day 4-5 times. A whole glass of broth is drunk immediately if necessary to bring down the heat.
- **Infusion of fresh young leaves.** Vitamin fortifying "energy" drink is prepared from the spring leaves of the plant, which are poured with equal parts of boiled water and sour fruit juice (in the approximate proportion of 50 g of leaves per 1 liter of liquid). "Cocktail" is infused for a day, filtered and taken half a glass a day. To improve the taste, it can be slightly sweetened.
- **Infusion of dry leaves.** A diuretic drink for pyelonephritis, cystitis, urolithiasis is prepared from crushed blackcurrant leaves (5-6 tablespoons), which are steeped in boiling water (1 l) for 1 hour in a hermetically sealed container. The infusion should be taken 5 times a day, 200-250 ml. with a spoonful of honey or sugar.

In scientific research

Listing the medicinal properties, we have already referred to various studies of derivatives of blackcurrant fruits and leaves. Most of these projects, in which the anti-radiation, antimicrobial, immunomodulatory, hypotensive, neuroprotective, antioxidant, anti-inflammatory and other properties of the plant were studied, were carried out in laboratories "in test tubes" or on experimental animals. But the more valuable and illustrative are the relatively rare studies involving people. Examples of such work are given below.

Blackcurrant berries and its nectars optimize the metabolic reactions of the postprandial system to sucrose. As a result, there was a delay in the digestion of sucrose and a slower absorption of glucose. ^[19]

This randomized controlled cross-over study involved 20 healthy women who consumed whole berries or their nectar (300 ml) supplemented with 35 g sucrose. The glucose, insulin, and free fatty acid responses of the berry diet group were compared with those of the group that ate the same amount of sucrose without the berry supplement.

Despite the higher content of available carbohydrate in the berry and nectar food due to natural currant sugar, the concentration of glucose and insulin in the participants of the "berry group" decreased during the first 30 minutes. In addition, the levels of these indicators grew more slowly during the second hour. Overall, women on the berry diet had a significant improvement in their glycemic profile. And this suggested that blackcurrant can slow down digestion and reduce the absorption of sucrose and thereby suppress postprandial glycemia.

The consumption of blackcurrant before smoking improves the immunological status of saliva and the rate of salivation in healthy smokers, partially leveling the negative effects of tobacco smoke. ^[twenty]

In the study, the researchers first measured the rate of salivation and the level of secretion of immunoglobulin A in the saliva of healthy smokers 5 minutes, half an hour and an hour after smoking. And then they measured the same indicators after eating 100 g of berries and smoking.

In the "smoking without currant" group, an hour-delayed effect of reducing the rate of salivation was observed, while in the "currant + smoking" group, it was not observed. At the same time, in the second group, a significant decrease in the concentration of the level of secretion of immunoglobulin A was observed after a 5-minute interval, with a further increase in indicators after 60 minutes.

The researchers believe that the use of blackcurrant before smoking significantly reduces the effect of tobacco smoke on salivation, the physicochemical properties of saliva, the biological activity of its components, including salivary immunoglobulin A. But they emphasize that the best strategy in the prevention of chronic diseases would be complete smoking cessation.

Blackcurrant extract powder positively affects the gut microbiome and risk markers for colon cancer in humans. ^[21]

The study involved 30 healthy adult male and female volunteers who took two preparations based on blackcurrant extract powder (in the second case with lactoferrin and lutein). At the same time, scientists conducted fluorescent hybridization and analysis of populations of their fecal microbiota before and after taking the drugs.

The results showed that the use of currant extracts led to a significant increase in the population of lactobacilli and bifidobacteria, while the population of *Clostridium* spp. and *Bacteroides* spp was significantly reduced. Also, after the drugs, the pH of feces and the activity of β -glucuronidase (a bacterial enzyme that can increase the risk of developing colorectal cancer) decreased.

Based on this, the scientists concluded that blackcurrant extracts can act as prebiotic agents, increasing the number of beneficial bacteria (lactobacilli and bifidobacteria) in the intestine, and deactivating toxic bacterial enzymes involved in colon carcinogenesis.

In addition to those described, there is also a whole cluster of works on the material of the New Zealand berry, in which scientists, under different initial conditions, studied the ability of black currant to increase endurance and influence some other physiological characteristics in athletes. The conclusions of scientists cannot be called unambiguous, because the indicators depended on the type of load, age ^[22], the degree of fitness of the subjects ^[23] and even on their ethnicity ^[24]. But all the results indicate that there is a certain "sporting" effect from taking blackcurrant, and in order to unlock the maximum potential, you only need to find and observe the optimal parameters and dosages when using a currant remedy.

Weight regulation

The relatively low amount of calories (63 kcal / 100 g of berries) makes blackcurrant a popular product among supporters of berry diets. Delicious fruits help a person diversify the menu and provide a supply of important vitamins and minerals. But there is another mechanism that probably allows the berry to be used in the fight against extra pounds: under certain conditions, blackcurrant anthocyanins can help control weight gain, although their effect is not universal.

Thus, in the study described below ^[25], the gastrointestinal distribution of blackcurrant anthocyanins and phenolic acid metabolites in overweight mice was studied. Animals with a microbiome artificially disturbed by antibiotics and healthy mice were compared. They found that daily consumption of a mixed low-fat, high-fat diet supplemented with 1% powdered blackcurrant extract for 8 weeks did

reduce body weight gain and improve glucose metabolism, but only in mice with an intact gut microbiome. If the state of the microflora was disturbed, this effect was no longer observed.

But it turned out that with the help of some currant products, dysfunctions associated with obesity and its complications can be eliminated. So, using blackcurrant pomace extract, scientists in another experiment were able to improve the serum lipid profile and positively affect markers of insulin resistance and antioxidant status in laboratory rabbits fed a high-fat diet. ^[26]

In cooking

The taste of blackcurrant berries can vary from sweet to sour with a lot of intermediate flavors. The fruits of the plant are more often eaten fresh (or defrosted), but sauces, jams, jelly, cookies, marmalade, marshmallow and jelly are often prepared from them, as well as alcoholic tinctures, wines and liqueurs. Plant buds are also used for syrups and liqueurs. In Russia, mash was traditionally prepared from blackcurrant.

In the cuisines of northern peoples, blackcurrant, like other berries, can be included in the recipe of national dishes. So in Estonia, Latvia, Sweden, Finland, a summer airy dish of semolina, blackcurrant and sugar is known. This semolina mousse has its own name in each country (in Estonia - mannavah, in Latvia - uzputenis, in Sweden - klappgröt), but it is prepared in approximately the same way.

Blackcurrant (at the rate of 300 g for 6 servings) is pressed to a dry cake, and the resulting juice is mixed with water (400 ml) and boiled for 10 minutes over medium heat. Sugar (250 g) is added to the strained broth, after which it is brought to a boil again. Semolina (100g) is poured into this hot liquid in a thin stream, which, with constant stirring, cook for about 10 minutes. After cooling, the currant-semolina mass is whipped with a mixer until it acquires an airy fluffy consistency and is sent to the refrigerator for 2-3 hours. This dish is usually served in bowls with whipped cream, milk, mint leaves.

However, in cooking, not only the taste is widely used, but also the strong aroma of the fruits and leaves of the plant, which is clearly felt due to the abundance of essential oils. For smell, leaves are added to preservation.

In cosmetology

The strong currant smell made it possible to use the plant bud extract as an additive in the perfume industry. But especially often blackcurrant can be found in cosmetics as part of products for eliminating numerous dermatological problems of various nature: eczema, rosacea, pruritus, neurodermatitis, exudative diathesis, systemic scleroderma, psoriasis, lichen planus. In folk cosmetology, the juice of currant fruits is used externally to remove warts.

Currant remedies are also used to reduce the severity of vitiligo (a pathological condition associated with the disappearance of melanin in certain areas of the skin). At home, age spots and freckles are eliminated with a mask of mashed berries that can whiten the skin.

Blackcurrant masks in the "berry season" are used to prevent baldness and strengthen hair. In addition, recommendations on preventive lubrication of the nail plate and cuticles with currant juice are distributed on thematic sites to prevent fungal infections.

Dangerous properties of blackcurrant and contraindications

When using blackcurrant, there are restrictions that apply to patients with thrombosis and increased blood clotting, patients with hepatitis, gastritis with high acidity, duodenal ulcers and / or stomach ulcers. It is not recommended to eat currant berries for people with a tendency to constipation.

Due to the very high content of phenylalanine, blackcurrant berries are contraindicated in patients with phenylketonuria (Felling's disease). This genetically determined congenital pathology leads to excessive accumulation of the amino acid (phenylalanine) and its metabolites, resulting in severe CNS damage. For the same reason, doctors can remove blackcurrants from the diet of pregnant women.

Selection and storage

Berries of the typical form of black currant change color when ripe, passing through the red phase, gradually becoming darker. Therefore, the more black such a fruit is, the better. Although, in rare cases, berries of *Ribes nigrum* breeding forms can be caught, which, even when ripe, have a yellow, whitish or green color.

When there is an alternative, buyers usually choose a large berry. In some varieties, the diameter of the fruit can reach 2.5 cm, and the weight is 6-7 grams. But more often there are berries up to 1 cm on sale. If they are harvested on time (before shedding), then even in such relatively small fruits all useful substances are preserved. And in order to surely buy a ripe, but not overripe blackcurrant, you can choose berries on green twigs. In addition, such fruits will be stored even longer.

It is important to always buy dry berries. It is also better to collect blackcurrants in dry weather. So she can lie at room temperature for 4-5 days. Otherwise, the crop will begin to deteriorate after 2 days. To extend this period to 2 weeks, currants are usually placed in a refrigerator in a glass dish with regular airing.

It is rather difficult to preserve ascorbic acid in blackcurrant fruits using "grandmother's ways". Exposure to high temperatures and oxygen during the preparation of such a popular "five-minute" jam destroys vitamin C, reducing its amount by more than 60%. Even remaining on the bush, overripe fruits begin to lose ascorbic acid. And 2 weeks after ripening, its amount in berries decreases by almost 70%.

Therefore, freezing is considered the best way to store blackcurrants. In one of the experiments of the Research Institute of Canning Technology, after checking first frozen, and after a while thawed berries, it turned out that there was a lot of ascorbic acid left there - about 110 mg / 100 g.

Before freezing, the fruits should be separated from the branches, washed, dried, frozen, and only then transferred to a glass or plastic container for long-term storage.

In our country, the fruits of black currant have always been not just a valuable culinary and food object. From generation to generation, the image of a medicinal berry has evolved, which can replace half of the "first aid kit". And it is not surprising that today we see how many of the hopes associated with the healing effects of blackcurrant are already being confirmed by scientists.

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Black currant - useful properties, composition and contraindications

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Abstract. The article discusses the main properties of blackcurrant and its effect on the human body. A systematic review of modern specialized literature and relevant scientific data was carried out. The chemical composition and nutritional value of the product are indicated, the use of blackcurrant in

various types of medicine and the effectiveness of its use in various diseases are considered. The potentially adverse effects of black currant on the human body under certain medical conditions and diseases are analyzed separately. Considered scientific basics diets With her application .



Calcium (Ca) - description, effects on the body, best sources

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

Keywords: calcium, calcium, Ca

Calcium is the 5th most abundant mineral in the body, with over 99% found in the skeleton as the complex calcium phosphate molecule. This mineral provides bone strength, the ability to move, and plays a role in a wide range of other functions. Calcium is healthy bones, blood vessels, hormonal metabolism, absorption of trace elements and transmission of nerve impulses. Its metabolism is regulated by three main transport systems: intestinal absorption, renal reabsorption, and bone metabolism. ^[one]

Table 1. **Foods rich in calcium** (according to [Food+](#)).

Product	Calcium content (mg/100 gr)
poppy seeds	1438
Parmesan cheese	1184
Sesame	975
tofu cheese	683
chia seeds	631
Canned sardines in oil	382
Almond	269

curly cabbage	254
Dried figs	162
Arugula	160
Yogurt	121
Cow's milk, whole	113
Spinach	99
White beans, boiled	90
Rhubarb	86
Cottage cheese	80
Sunflower seeds	70
Orange	70
Dates	64
edamame beans	63
Oatmeal	58
Horseradish	56
Chicken egg	56
Dried apricots	55
sea kale	54
Broccoli	47
Quinoa	47
Artichoke	44
Trout	43
scallops	39
Lentils	35
Sweet potato	thirty
Raisin	28
Radish	25
Raspberry	25
Cauliflower	22
Strawberry	16
Avocado	13
Blueberry	6

daily requirement

Age	Daily calcium requirement (mg/day)
0-6 months	210
7-12 months	270
1-3 years	500
4-8 years old	800
9-13 years old	1300
14-18 years old	1300
19-30 years old	1000
31-50 years old	1000
51-70 years old	1200
over 70 years	1200
Pregnancy	
less than 18 years old	1300
19-50 years old	1000

Lactation	
less than 18 years old	1300
19-50 years old	1000

There is no exact data on how much calcium should be consumed each day. With a few exceptions, such as extreme starvation or hyperparathyroidism, circulating calcium levels in the blood remain adequate even in chronic deficiency, as the body uses calcium from the bones to maintain health. Therefore, the daily requirement for calcium is based on calculations in relation to a healthy population without chronic diseases. In addition, this amount suggests that for some people, even smaller doses of calcium intake are sufficient.

During pregnancy, the maternal skeleton is not used as a reserve for the calcium needs of the fetus. Calcium-regulating hormones regulate the efficiency of absorption of the mineral in the mother so that calcium intake during pregnancy does not need to be significantly increased. Increasing dietary calcium intake will not prevent its loss from the maternal skeleton during lactation, but lost calcium is usually restored after weaning. Thus, the daily calcium requirement for lactating women is the same as for non-lactating women.

Increasing the amount of calcium intake may be considered in such cases:

- in amenorrhea: caused by excessive physical activity or anorexia, amenorrhea leads to a decrease in the level of stored calcium, poor absorption, and a general decrease in bone mass;
- at menopause: Decreased estrogen production at menopause is associated with accelerated bone loss over 5 years. Low estrogen levels are accompanied by low calcium absorption and increased bone turnover.
- Lactose intolerance: People who are lactose intolerant and avoid dairy products may be at risk of calcium deficiency. It is interesting to note that even with lactose intolerance, the calcium present in milk is normally absorbed;
- with a vegetarian or vegan diet: calcium bioavailability may decrease with a vegetarian diet due to increased intake of oxalic and phytic acid found in many vegetables and beans;
- Feeding multiple babies: Because of the increased production of breast milk when feeding multiple babies, doctors may consider supplementing calcium and magnesium during lactation.

[2]

Useful properties of calcium and its effect on the body

The body of an adult contains about 1200 g of calcium, which is about 1-2% of body weight. Of these, 99% is found in mineralized tissues such as bones and teeth, where it is present as calcium phosphate and a small amount of calcium carbonate, providing rigidity and structure to the skeleton. 1% is found in the blood, extracellular fluid, muscles and other tissues. It plays a role in mediating vascular contraction and relaxation, muscle contraction, nerve signal transmission, and glandular secretion. [5]

Sufficient intake of calcium has many benefits for the body. Calcium helps:

- ensure the growth and maintenance of healthy bones and teeth;
- support the work of tissues whose cells constantly require its intake - in the heart, muscles and other organs;
- the work of blood vessels and nerves in the transmission of impulses;
- absorb micronutrients such as vitamins D, K, magnesium and phosphorus;
- keep under control the processes of thrombosis;
- support the normal functioning of digestive enzymes [4].

Calcium is absorbed by active transport and passive diffusion across the intestinal mucosa. Active calcium transport requires an active form of vitamin D and provides most of the absorption of calcium at low to moderate levels of intake, as well as during periods of acute need such as growth, pregnancy or lactation. Passive diffusion becomes more important with sufficient and high calcium intake.

With a decrease in calcium intake, the efficiency of calcium absorption increases (and vice versa). However, this increased efficiency of calcium absorption is generally insufficient to compensate for the loss of absorbed calcium that occurs when dietary calcium intake is reduced. Calcium absorption decreases with age in men and women. Calcium is excreted in urine and feces ^[2].

Healthy Food Combinations with Calcium

- **Calcium + Inulin**

Inulin is a type of fiber that helps balance the "good" bacteria in your gut. In addition, it helps strengthen bones by promoting calcium absorption. Inulin is found in foods such as artichokes, onions, garlic, green onions, chicory, banana, whole grain wheat, and asparagus.

- **Calcium + Vitamin D**

These two elements are directly related to each other. The body needs adequate levels of vitamin D in order to absorb calcium. ^[6].

- **Calcium + Magnesium**

Magnesium promotes the absorption of calcium from the blood into the bones. Without magnesium, the process of calcium metabolism is practically impossible. Healthy sources of magnesium include green leafy vegetables, broccoli, cucumber, green beans, celery, and a variety of seeds. ^[7].

Calcium absorption depends on vitamin D intake and status. Absorption efficiency is related to physiological calcium requirements and is dose dependent. Dietary calcium absorption inhibitors include substances that form complexes in the gut. Protein and sodium can also alter calcium bioavailability, as high levels of calcium increase urinary excretion. Although the amount absorbed in the intestine is increased, the end result may be a decrease in the proportion of calcium directly used by the body. Lactose, on the contrary, promotes the absorption of calcium ^[8].

Calcium absorption across the intestinal membrane occurs through both the vitamin D-dependent and vitamin D-independent pathways. The duodenum is the main source of calcium absorption, although the rest of the small and large intestine also contribute. Approximately 60-70% of calcium is passively reabsorbed in the kidneys by a specific substance produced during the reabsorption of sodium and water. Another 10% is absorbed in nephron cells ^[9].

Cooking rules

Numerous studies have been conducted in order to find out how cooking affects the change in the amount of minerals and vitamins in food. Like other minerals, calcium is destroyed by 30-40 percent compared to raw foods. The losses were especially high in vegetables. Among various cooking methods, the loss of minerals was highest with squeezing after boiling and soaking in water after slicing, followed by frying, frying and stewing. Moreover, the results were the same both when cooking at home and in mass production. In order to minimize the loss of calcium during cooking, it is advised to eat boiled food with broth, add a small amount of salt when cooking, do not overcook food, and choose cooking methods that preserve the beneficial properties of food as much as possible ^[10].

Application in official medicine

Calcium is essential for the growth and maintenance of healthy bones and teeth. Studies show that, especially when combined with vitamin D, calcium may reduce the risk of osteoporosis. Osteoporosis is a disease that is influenced by many factors. It is most common among women during menopause. There are several ways to reduce the likelihood of bone damage associated with osteoporosis, including achieving maximum bone mass and limiting bone loss later in life. For this, calcium is the most important material, and a sufficient amount of vitamin D ensures optimal absorption of calcium in the body.

There are several ways to achieve higher peak bone mass, including sports such as running and strength training combined with adequate calcium (1200 mg/day) and vitamin D (600 IU/day) at a young age. Although physical activities such as walking, swimming, and cycling have a positive effect on health, their effect on bone loss is negligible.

Calcium, like other micronutrients, may have some effect on the development of colon cancer. Dietary supplementation of 1200-2000 mg of calcium per day has been shown to slightly reduce the incidence of bowel cancer in controlled clinical trials. Participants with the highest intake of calcium (1087 mg/day from food and supplements) were 22% less likely to develop cancer compared to those with the lowest intake (732 mg/day). Most studies have noted only a modest reduction in risk with calcium supplementation. This can be explained by the different response to calcium in different people. ^[4]

Some research suggests that calcium supplementation may play a role in preventing high blood pressure in pregnancy and preeclampsia. This is a serious condition, usually occurring after the 20th week of pregnancy, in which a pregnant woman develops hypertension and excess proteins in her urine. It is the leading cause of maternal and neonatal morbidity and mortality, affecting about 5-8% of pregnancies in the US and up to 14% of pregnancies worldwide. Studies show that calcium supplementation during pregnancy reduces the risk of preeclampsia, but these benefits are seen only in groups with insufficient calcium intake. For example, in a randomized clinical trial in 524 healthy women in India with a mean baseline calcium intake of just 314 mg/day, daily calcium supplementation of 2,000 mg from 12-25 weeks of gestation until delivery significantly reduced the risk of preeclampsia and preterm birth compared to placebo. In turn, a similar study in the United States (where daily calcium intake is usually normal) did not show any results. The most significant results were in women with intakes of less than 900 mg of calcium per day ^[11].

There is an opinion that women who consume calcium supplements and prefer a balanced diet have a lower risk of stroke for 14 years. However, doctors warn that this increases the risk of developing cardiovascular disease ^[4].

calcium during pregnancy

Several professional organizations recommend calcium supplementation during pregnancy for women with low calcium intake to reduce the risk of preeclampsia. For example, the American College of Obstetricians and Gynecology (ACOG) states that daily calcium supplements of 1500-2000 mg can reduce the severity of preeclampsia in pregnant women whose calcium intake is less than 600 mg/day. Similarly, the World Health Organization (WHO) recommends 1500-2000 mg of calcium for pregnant women with low dietary calcium intake, especially those at increased risk of gestational hypertension. The WHO recommends dividing the total daily dose into three doses, preferably taken with food, from the 20th week of pregnancy until childbirth. WHO also recommends splitting calcium and iron supplements for pregnant women into multiple doses to minimize the inhibitory effect of calcium on iron absorption. But some researchers argue that this interaction is of minimal clinical significance, and argue that this is why manufacturers do not advise patients to split supplements in order to simplify the regimen and improve adherence to the treatment regimen. The Canadian Working Group on Hypertensive Disorders in Pregnancy, the International Society for the Study of Hypertension in

Pregnancy, and the Obstetrics Society of Australia and New Zealand have issued similar guidelines ^[11]

Calcium in folk medicine

Traditional medicine recognizes calcium as a very important mineral for the health of bones, muscles, teeth, and the cardiovascular system. Many folk recipes are used to strengthen the skeleton - among them the use of eggshells, lactic acid products (for example, the so-called "kefir diet", in which the patient consumes 6 glasses of low-fat kefir per day to avoid hypertension, diabetes, atherosclerosis). An increase in calcium intake is also advised to patients with any form of tuberculosis. In addition, folk recipes consider the consequences of excessive calcium intake - such as, for example, kidney stones. With such a diagnosis, it is also advised, in addition to drug treatment, to change the diet. It is recommended to introduce wholemeal bread into food, avoid refined carbohydrates, sugar and milk ^[12]

Calcium in recent scientific research

- Researchers have found that excess calcium in brain cells can lead to the formation of toxic clusters that are a hallmark of Parkinson's disease. An international team led by the University of Cambridge found that calcium can mediate the interaction between small membrane structures inside nerve endings that are important for neuron signaling in the brain and alpha-synuclein, a protein associated with Parkinson's disease. Excess levels of calcium or alpha-synuclein can cause a chain reaction leading to brain cell death. Understanding the role of alpha-synuclein in physiological or pathological processes may help develop new treatments for Parkinson's disease. For example, there is a possibility that drugs designed to block calcium in heart disease may also have potential against Parkinson's disease ^[15].
- A new scientific study presented at the American College of Cardiology Science Sessions at the Intermountain Institute of Health in Salt Lake City shows that detecting the presence or absence of calcium in the coronary arteries can help determine the risk of cardiovascular disease. Moreover, this study can be carried out not only to determine future diseases, but also when the symptoms are already present. The experiment involved 5547 patients with no history of heart disease who presented to the medical center with chest pain between April 2013 and June 2016. Patients who had calcium in their coronary artery on scans were found to have a higher risk of having a heart attack within 90 days compared to patients whose CT showed no calcium. The researchers also found that calcium-detected patients also had higher rates of obstructive coronary artery disease, revascularization, and/or other serious adverse cardiac events in later years ^[14].
- Eating a calcium-rich diet or supplementing with calcium does not increase the risk of age-related macular degeneration, according to a study conducted by the US National Eye Institute. The disease is the leading cause of vision loss and blindness among people aged 65 and over in the United States. The results were published in the journal JAMA Ophthalmology. The findings contradict an earlier study indicating that high calcium levels were associated with an increased prevalence of age-related macular degeneration, and at the same time prove that calcium, on the contrary, plays a protective role in this case ^[13].

The use of calcium in cosmetology

In addition to its key role in the health of bones, teeth and body organs, calcium is also of great importance for the skin. Most of it is found in the outermost layer of the skin (epidermis), where calcium has been shown to be responsible for restoring barrier function and homeostasis (the self-healing process in which the number of cell divisions in the skin compensates for the number of lost

cells). Keratinocytes - cells of the epidermis - differently need calcium concentrations. Despite constant renewal (almost every 60 days, the epidermis is completely renewed, replacing over 80 billion keratinocytes in the adult human body), our skin eventually succumbs to aging as the turnover rate of keratinocytes slows dramatically. Aging is associated with thinning of the epidermis, elastosis, reduced barrier function, and loss of melanocytes. Since the differentiation of keratinocytes is strictly dependent on calcium, it is also involved in skin aging. The epidermal calcium gradient in the skin, which promotes the growth of keratinocytes and allows their differentiation, has been shown to be lost during skin aging. ^[16].

In addition, calcium oxide is used in cosmetology as an acidity regulator and absorbent. It is found in products such as make-up, bath salts, shaving foams, oral and hair care products ^[17].

Weight regulation

Several studies have suggested that calcium supplementation may help with weight loss. This hypothesis was based on the fact that high calcium intake can reduce the concentration of calcium in fat cells, reducing the production of parathyroid hormone and the active form of vitamin D. A decrease in intracellular calcium concentration, in turn, can increase the breakdown of fat and prevent the accumulation of fat in these cells. In addition, calcium from food or supplements can bind small amounts of dietary fat in the digestive tract and interfere with absorption of that fat. Dairy products, in particular, may contain additional components that have an even greater impact on body weight than their calcium content would suggest. For example, protein and other components of dairy products can modulate appetite-regulating hormones.

A 2014 randomized crossover study in 15 healthy young men found that diets high in milk or cheese (providing a total of 1,700 mg/day of calcium) significantly increased fecal fat excretion compared to a control diet that provided 500 mg calcium/day. However, the results of clinical trials that examined the effect of calcium on body weight were mostly negative. For example, a 1500 mg/day supplement was studied in 340 overweight or obese adults with mean baseline calcium intakes of 878 mg/day (treatment group) and 887 mg/day (placebo group). Compared with placebo, calcium supplementation for 2 years had no clinically significant effect on weight.

Contraindications and warnings

Signs of calcium deficiency

Chronic calcium deficiency can occur due to insufficient calcium intake or poor absorption in the intestines. Also, chronic kidney failure, vitamin D deficiency, and low magnesium levels in the blood can be causes. During chronic calcium deficiency, the mineral is absorbed from the skeleton to maintain normal levels of calcium circulation, thereby impairing bone health. As a result, chronic calcium deficiency leads to a decrease in bone mass and osteoporosis. The consequences of calcium deficiency are osteopenia, osteoporosis and an increased risk of bone fractures. ^[2].

Symptoms of hypocalcemia include finger numbness, muscle cramps, convulsions, lethargy, poor appetite, and an abnormal heart rhythm. If not treated promptly, calcium deficiency can be fatal. Therefore, it is very important to contact your doctor if you suspect a lack of calcium ^[4].

Signs of excess calcium

The available data on the adverse effects of excess calcium intake in humans are mainly from studies of dietary supplements. Among the many side effects of excess calcium in the body, the three most studied and biologically significant are:

- stones in the kidneys;
- hypercalcemia and renal failure;
- interaction of calcium with the absorption of other trace elements ^[2].

Other symptoms of excess calcium can be loss of appetite, nausea, vomiting, confusion, coma.

The cut-off calcium intake is 1000-1500 mg/day in infants, 2,500 mg/day in children 1 to 8 years of age, and 3000 mg/day in children 9 years of age and adolescents up to 18 years of age. In adults, this rate is 2,500 mg / day, and after 51 years - 2,000 mg / day ^[4].

Interaction with other elements

- **Caffeine.** Caffeine can increase urinary calcium loss and reduce calcium absorption. It should be noted that the effect of caffeine remains relatively modest, this effect was primarily noted in women who consume insufficient calcium during menopause.
- **Magnesium.** Moderate or severe magnesium deficiency can lead to hypocalcemia. However, according to a 3-week study in which magnesium was artificially excluded from the diet, it was found that even a small decrease in the amount of magnesium consumed can lead to a rather serious decrease in serum calcium concentration.
- **Oxalic acid** can interfere with the absorption of calcium. Foods rich in oxalic acid are spinach, sweet potatoes, rhubarb and beans.
- **Phosphorus.** Excessive phosphorus intake can interfere with calcium absorption. However, if the amount of calcium consumed is sufficient, then the likelihood of this decreases. Phosphorus is found primarily in dairy products, cola and other soft drinks, and meat.
- **Phytic acid.** May interfere with calcium absorption. Found in unleavened bread, raw beans, nuts, grains and soy products.
- **Protein.** There is an opinion that dietary protein can lead to increased excretion of calcium in the urine. This question is still being investigated by scientists.
- **Sodium.** Moderate and high consumption of sodium chloride (salt) leads to an increase in the amount of calcium excreted from the body in the urine. Indirect evidence has been found that salt can adversely affect bones. So far, no recommended doses of calcium intake have been published in relation to salt intake.
- **Zinc.** Calcium and zinc are absorbed in the same part of the intestine, so they can mutually influence the metabolic process. Large doses of zinc consumed can interfere with the absorption of calcium. Particular attention should be paid to this in older women, in whom the level of calcium in the body is low on its own, and with the additional intake of zinc preparations, it can decrease even more.
- **Iron.** Calcium can impair the absorption of iron in the body ^[3].

Interaction with medications

Some medications can interfere with calcium metabolism, primarily by increasing the level of calcium in the urine and thereby leading to calcium deficiency. It is widely known, for example, the effect of glucocorticoids on the occurrence of osteoporosis and bone loss, regardless of age and sex. Corticosteroids increase the amount of calcium not only in the urine, but also in the feces, and as a result, negatively affect the level of calcium.

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Calcium (Ca, calcium) - description, effect on the body, best sources

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



The Ketone Diet - Scientific Rationale, Proven Health Benefits, Advantages and Disadvantages

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Abstract. The ketogenic diet is a drastic reduction in the proportion of carbohydrates in the menu and an increase in fat intake. The body then enters a state of metabolism that burns fat for fuel, called ketosis. A pleasant "bonus" can be considered the improvement of the cardiovascular system and the improvement of brain function. The ketogenic diet is also used to prevent cancer and improve the effectiveness of radiation oncotherapy.

Keywords: keto, keto diet, ketone diet, keto diet

History of occurrence

In the 1920s, the Johns Hopkins Hospital (Baltimore, Maryland) created an extremely low carbohydrate diet for children with epilepsy. Researchers have found that a complete cessation of nutrition for a short period of time reduces the frequency of seizures in patients. Such abstinence had a positive effect on cholesterol and blood sugar levels, and led to weight loss. But long-term treatment in this way is impossible. This is how the classic ketogenic diet was born. ^[1] At the same time, it turned out that complete or intermittent fasting was not necessary. Already with a sharp reduction in the diet of glucose from carbohydrate foods, the body perceived this as starvation, receiving a positive effect.

In the 1960s, this system became known as a technique for treating obesity.

The essence of the diet is that the use of all or almost all sugars and starches is limited. In the process of digestion, these complex substances are converted into simple sugars, which quickly raise blood glucose levels, causing an insulin response. High levels of glucose and insulin lead to the fact that excess calories are easily stored in the "reserves" of fat, leading to excess weight. This is due to the fact that the human body cannot store carbohydrate reserves for more than 24 hours in muscle tissue and in the liver in the form of glycogen. Glycogen for "long-term storage" is transformed into fats. With the continuation of carbohydrate nutrition, it is difficult for the body to gain access to body fat and it becomes problematic to lose weight.

If it is critical to reduce the proportion of carbohydrates in the diet, the level of glucose and insulin will be at a consistently low level, without jumps and dips. The body will use fat from "reserves" as fuel for energy processes. The end product of fat metabolism is ketones. Their content in the blood can be measured in the laboratory. At home, the presence of ketones can be easily checked in the urine using special test strips.

Therefore, even when eating enough calories and fat in food, excess fat will be burned and weight will decrease. At the same time, you do not feel hungry or do not engage in active physical exercises in the gym, trying to burn these calories.

The ketogenic diet is similar to the Atkins diet. She also calls for cutting out high-carbohydrate, sugary foods to boost your body's ability to burn fat. However, the keto diet is based on high healthy fats, low protein overall, and no processed meats. At the same time, unlike the Atkins diet, the effectiveness of the keto diet is confirmed by research. The keto diet can be called a healthy diet, which cannot be said about the Atkins diet. She simply recommends an increase in any kind of fat and a sufficiently high level of protein in the menu.

Principles of the ketone diet

- Reduce your protein load

The difference between the keto diet and its low-carb counterparts is that fat is considered more important than protein. After all, an abundance of protein in the diet can slow down the transition to ketosis, since the human body is able to transform protein into glucose in a small amount.

It is enough to consume 1-1.5 g per day. protein per 1 kg. your ideal weight. So, for a weight of 60 kg. it will be enough to use 60-120 gr. protein daily.

- Follow the proportion of BJU

BJU is proteins, fats and carbohydrates in your plate. You don't need to count calories on a keto diet, but keeping your net carbs and proteins within the right limits will be easier if you use special apps with keto calculators.

Use Keto Supplements for Greater Efficiency

Useful supplements for the keto diet are exogenous ketones and the amino acid leucine.

Exogenous ketones are also called "keto weight loss pills." They help you reach a state of ketosis earlier, and then stay in it more stable.

Leucine can be considered the most important amino acid for ketosis. If the remaining amino acids are converted to glucose, then leucine is converted to acetyl-CoA. This central metabolite of lipid metabolism is involved in the synthesis of ketone bodies. In the natural diet, it can be obtained from eggs and cottage cheese.

- Don't forget about water

Water is the most "correct" drink for a person. The ketone diet is no exception. Drink 1.8-2.5 liters of water per day. This will provide detoxification, reduce fatigue, help digestion and quell possible hunger. It's especially important to drink enough water when you're experiencing keto flu symptoms.

- Be honest with yourself

The ketone diet does not allow "free" days or "free" lunches. The strictness is due to the fact that carbohydrate foods can quickly get you out of ketosis. Everything will have to start over. In addition, the symptoms of "keto flu" may return. But if you have already reached a state of ketosis, then next time it will be easier and faster to return to it again.

Types of keto diet

The ketogenic diet is quite popular and has many versions. Whether your meal plan is safe and healthy depends on what type of Keto diet you are following.

Initially, the keto diet was designed for people with epilepsy. The content of macronutrients - in particular, carbohydrates - in the traditional version is very strictly regulated. But there are other options.

The most common are the following types:

1. **Standard ketogenic diet:** 75% of calories come from fats and fatty meats, 20% from protein foods, and only 5% are allocated to carbohydrates.
2. **Modified ketogenic diet:** calories from fat is 40%, and carbohydrates and proteins are divided by 30%.
3. **Cyclic ketogenic diet:** Suitable for athletes who want to build lean muscle mass. Not suitable for people with chronic diseases. Not designed for long-term compliance and not compatible with strength training. According to her, a few days a week - from Monday to Thursday - a strict keto diet, from Thursday evening and Saturday - a high-calorie carbohydrate diet, and Sunday is a transition day.
4. **Targeted Ketogenic Diet:** Allow carbohydrates and reduce fat on exercise days, and follow the standard keto diet on all other days.
5. **Restricted ketogenic diet:** Restrictions apply not only to carbohydrates, but also to calories. It is used for diet therapy in oncological diseases.
6. **High-Protein Ketogenic Diet:** Similar to the traditional keto diet, carbs remain at 5%, 30% of the calorie content of the diet is given to protein, and 65% remains fat. Designed for bodybuilders and the elderly, who care about maintaining muscle mass. However, it may not be suitable for people with kidney disease. For them, increasing the proportion of protein may go beyond personal restrictions on the recommendations of a doctor.
7. **Vegetarian or vegan ketogenic diet:** This is the replacement of animal products with products allowed in a particular diet. The carb limit is still enforced. The menu consists of keto fruits and low-starchy vegetables, leafy greens, nuts and seeds, healthy fats, high-fat dairy products, and oily fish where nutritional ideology allows. Combining a keto diet with vegetarianism, veganism, and/or pescatarianism has been called the keto tarian eating plan. Carbohydrates in it up to 15%.
8. **Dirty Ketogenic Diet:** With the same strict macronutrient proportions as the traditional keto diet of 70% - 20% - 5% for fats - proteins - carbohydrates, there is freedom to consume "unhealthy" keto foods. These are sausages, bacon, pork skin, carbonated water with no carbohydrates and numerous fast food products rich in fats. It is not recommended as a dietary plan, but rather as a necessary measure for nutrition while traveling.
9. **Lazy Ketogenic Diet:** Can be mistaken for the dirty keto diet. In fact, the error is not allowed in the choice of products, but in observing the proportions of proteins, fats and calories. Restrictions on carbohydrates are accepted as no more than 20 gr. net carbs per day. Less frightening for beginners, however, the results are also less pronounced.^[2]

Differences between keto and paleo diets

These two meal plans are found to be similar. Both are low carb diets. The paleo diet cuts out sugars, grains, dairy, and highly processed foods that are most often high in carbs and have a high glycemic index.

However, the ketogenic diet further restricts many carbohydrate fruits and starchy vegetables, and does not allow for natural sweeteners. Honey and maple syrup don't fit the keto plan. ^[3]

Benefits of the Keto Diet

- Weight loss fairly quickly

The diet can be used for people who are obese or overweight. The weight loss results achieved are more stable than with a conventional calorie-restricted diet with a reduction in fat below 30% of the total diet. This is confirmed by studies conducted in 2013 and recorded in the British Journal of Nutrition. ^[four]

This happens due to a hormonal effect. When insulin release is reduced on a low-carbohydrate diet, the body stops accumulating the excess in the form of fat stores. And stocks are depleted more intensively.

When eating hearty protein meals framed by healthy fats, cravings for sources of empty calories - sweets and other "food garbage" - decrease. In addition, all these products are simply excluded from the list of approved products.

Some problems of the endocrine system are solved. In studies, women with PCOS not only lost weight and significantly lowered their insulin levels, but some became infertile. ^[5] In another study, patients, in addition to weight normalization, had positive dynamics with lymphedema, which is caused by blockage of the lymphatic system. ^[6]

- Reduced risk of type 2 diabetes.

Due to the absence of sharp rises in blood glucose, insulin levels are kept at a stable level. Improves insulin resistance. As a result, type 2 diabetes symptoms are less likely to occur. If insulin production is lower for "empty" carbohydrates, the body receives less signals to store energy in the form of glycogen in the liver and muscles, and then in the form of fat.

Low-carbohydrate diets reduce postprandial glucose levels - that is, sugar levels 2 hours after a meal show fewer peaks. Diabetics taking insulin may need medical assistance to adjust their insulin therapy during and after the keto diet. This also applies to people who have problems with blood pressure. You may need to adjust your regular medication support.

- Reduced risk of cardiovascular disease

Despite the fact that the ketogenic diet encourages the use of fatty foods, cholesterol levels return to normal. The level of "bad" cholesterol decreases - triglycerides and low-density lipoproteins fall, as well as blood sugar. At the same time, high-density lipoprotein levels rise, which reduces the risk of atherosclerosis and other risk factors for cardiovascular disease. This is especially important for patients who are obese.

- Cancer protection

Research conducted within the framework of the National Institute of Neurological Disorders and Stroke at the National Institutes of Health (USA, Maryland) and at the University of Cancer at the Research University of Iowa (USA, Iowa) show the effectiveness of the ketogenic diet in the fight against cancer.^[7]

It has been proven that foods with high processing and a small amount of nutrients can stimulate the reproduction of cancer cells. Healthy cells in our body can change their metabolism and switch from eating carbohydrates to eating fats. Cancer cells don't do that. Therefore, the keto diet is an effective prevention and means of combating cancer.

- Protecting the brain from neurological disorders and cognitive impairment

Patients who have brain disorders - cognitive, such as epilepsy, Alzheimer's disease, manic depression, anxiety, or neurological disorders - can use the ketogenic diet to treat and manage symptoms. Actually, it was as a remedy for epilepsy that the keto diet saw the world in the 20s of the 20th century.

Their brain cells are often unable to receive normal nutrition due to problems in the functioning of cellular energy connections. This is a common characteristic of many disorders in the brain, although in general, these diseases are clearly different from each other.

If dietary changes cause the body to produce ketones and use them as fuel for cells, then it can significantly reduce the intensity of neurological disorders, cognitive impairment, including seizure activity, sleep disorders, headaches, multiple sclerosis, autism, brain cancer and consequences neurotrauma.

To stabilize patients suffering from epilepsy, MCT oil is widely used - medium chain triglycerides obtained from coconut and palm oils. MCT oil is more ketogenic and makes the diet more efficient or easier by allowing more indulgences in the form of carbohydrates in the diet, depending on the goals.

Studies in mice have shown a reduction in the rate of progression of Huntington's disease and Charcot's disease.

In the case of schizophrenia, pathophysiological processes are normalized, causing hallucinations, delusions, unpredictable behavior and lack of self-control. The studies done have been either animal or case studies, but the benefits of lowering carbohydrates and increasing dietary fats are promising for neurological problems.

- Increased life expectancy

A study covering more than 135 thousand people from 18 countries in the period 2003-2013. illustrates that high mortality risk is associated with high carbohydrate intake. And low overall mortality is associated with fats. At the same time, it has not been reliably proven that any particular type of fat or fat in general should be associated with myocardial infarction or mortality from cardiovascular diseases.

The keto diet also appears to stimulate autophagy. This is a process when the body's lysosomes literally digest intracellular debris, damaged cellular structures and aging cells that no longer carry functional benefits for the body. Autophagy is one of the biohacking techniques - cleansing the body of the signs of aging. The ketogenic diet is one way to achieve this.^[one]

Disadvantages of the Keto Diet

With the advantages described, however, the ketogenic diet also has disadvantages, such as:

- May harm the liver and kidneys due to high protein and fat content in the diet. Genetic predisposition to liver problems and the presence of kidney disease plays a significant role in this matter.
- Short-term effects for patients with type 2 diabetes - insulin resistance may increase again after returning to carbohydrate foods. How likely this effect is depends on the presence and severity of diabetes, as well as genetic factors.
- The symptoms of the "keto flu" can last from a few days to several weeks, and can also return if the diet is broken.
- Weight loss may be temporary. This is also affected by the difficulty of following a strict diet, adapting the body to a new metabolism. Weight may stop falling after six months on the diet, or even start to increase again. ^[eight]
- The risk of getting a lot of low-density lipoprotein (LDL) due to the abundance of fatty foods. An increase in "bad" cholesterol threatens with cardiovascular diseases. It is recommended that no more than 7 percent of the calorie content of the daily diet be allocated to the share of LDL.
- Lack of beneficial micronutrients derived from vegetables, fruits, grains, and legumes excluded from the ketogenic diet. This can lead to a lack of magnesium, phosphorus, selenium, vitamins C and group B.
- Constipation significantly reduces the effectiveness and health benefits expected from the diet. Constipation is caused by a lack of fiber from grains and legumes. Be sure to include fiber-rich vegetables in your diet and drink plenty of clean water.
- "Blurred" thinking, irritability, confusion may arise due to the minimization of carbohydrate sources in the diet. The brain needs glucose to function. Mood swings, reduced ability to concentrate, and other unpleasant effects can be caused by low-carbohydrate diets.

Be sure to check with your doctor and dietitian before switching to a ketogenic meal plan!

Other low-carb diets—Atkins or the paleo diet—are slightly different from the keto diet. However, the risks associated with excess fat and / or protein, and with a reduction in the proportion of carbohydrates, are inherent in all such methods. Carbohydrate-restricted diets provide excellent and fast weight loss results. Saturation with fats is more long-term than when eating carbohydrates. This leads to a decrease in appetite, which contributes to weight loss. However, this factor has not been studied in the long term. It is difficult enough to stick to restricted diets for a long time. After returning to the usual style of eating, with a high degree of probability, the weight will return. ^[9]

Are you afraid of the keto flu?

A diet that shows good results in weight loss reduces cravings for sweets. At the same time, it promises plenty of energy and a cheerful mood. You enthusiastically switched to a new nutritional system for your body ... and you feel worse than before. What happened?

Quite often, followers of this diet experience unpleasant side effects, which have come to be called “**keto flu**” symptoms. And for many, these symptoms can scare and stop the intention to try a new diet.

First of all, let's hasten to reassure - the discomfort will not be permanent. For most people, the symptoms will go away in a few weeks and sooner if the drinking regimen and a healthy diet are controlled.

What is the "keto flu"? This is a term that combines the side effects of the ketogenic diet. But why do they appear? The keto diet is generally a safe system that promotes health. But thanks to it, the body

endures global changes, one of which is the rejection of sugar and carbohydrates. On a ketogenic diet, your metabolism changes so that energy is no longer coming from burning carbs, but from burning fat.

The new state of metabolism in which ketone bodies are produced is called ketosis. It is thanks to ketone bodies that you will receive the expected benefits from the diet. But the body will get used to using fat as an energy source instead of glucose. For a while, ketones will not fully provide the body with nutrition, and the intake of glucose will already be drastically reduced. As a result, you will feel tired and possibly even "broken". But don't be afraid. After all, such a fundamental change in the principles of nutrition is probably happening for the first time in your life.

In addition to how you feel, fundamental changes will also occur in your microbiome. Numerous friendly and not-so-friendly bacteria that inhabit our bodies will also "sit down" on a diet with you. And there may be temporary digestive disturbances.

But do all people who switch to a ketogenic diet experience these symptoms? Different intensity and different duration. Everything will depend on the initial conditions - what style of nutrition you followed, what is your general state of health and many other factors, such as age, daily routine and activity, gender, age, genetic characteristics and stressful situations.

If you've been following a high-carbohydrate diet, it's likely that going on a keto diet will be quite stressful for your body.

The transition can be especially difficult for people who already have metabolic problems - diabetes mellitus or kidney failure.

In these cases, it is necessary to consult a doctor.

You can alleviate the condition if you follow a proper keto diet, eat healthy fats, sources of B vitamins, and drink regularly with the addition of electrolytes.

As symptoms of the "keto flu" you can expect:

- loss of strength, fatigue, lack of energy;
- dehydration;
- lack of appetite;
- the smell of "acetone" from the mouth;
- headache;
- dizziness;
- "cloudiness" of consciousness;
- sleep disorders;
- heartburn, nausea, sometimes vomiting;
- indigestion - constipation, diarrhea;
- low motivation for training, long-term recovery of strength after training;
- weakness, muscle pain;
- decreased libido;
- bad mood, irritability;
- Rarely, more severe symptoms such as elevated cholesterol levels, kidney stones, severe stomach and/or intestinal disorders, and growth retardation in adolescents following the keto diet are rare.

Typically, these symptoms begin to appear a few days after switching to a ketogenic diet. Glucose stores in the body are depleted within 2-3 days, and since carbohydrates in the diet are strictly limited,

the body begins to look for another source of food, moving into a state of ketosis. After adapting to ketone metabolism, the symptoms will stop bothering you and in the future you will be able to easily switch from a “carbohydrate” to a “fat” diet and back without the discomfort of the “keto flu”. ^[ten]

Safety of the Keto Diet

Whether the ketogenic diet is safe for long-term adherence remains to be seen. There were no follow-ups for more than one or two years of dieting. The safest time to follow a keto diet is two to six months. It is possible to follow a diet for up to two years, but already under the supervision of a patient by a doctor.

By observing animals on a keto diet in long-term studies, scientists have concluded that non-alcoholic fatty liver disease and insulin resistance can develop in rodents. Other studies have raised the question of the safety of the keto diet for people with a predisposition to heart problems, but there are no clear conclusions. ^[9]

Ketone diet for expectant mothers - is it necessary?

To date, the effect of the keto diet during pregnancy on the development of the child has not been studied. But the popularity of this technique in women of childbearing age requires detailed research. Due to ethics, observations on humans have not been made, so the conclusions are drawn from the study of mice.

We studied embryos of mice whose mothers adhered to the keto diet the day before and during pregnancy. On the 13th embryonic day, the subjects had a fairly large heart, but a smaller brain, cervical spinal cord, hypothalamus, and, in general, larger embryos from the control group. On the 17th day of intrauterine development, the embryos were already smaller, had a smaller heart and thymus, but at the same time an enlarged thalamus, cervical spine, midbrain, and other abnormalities compared to the average future mice. ^[eleven]

Obviously, the ketogenic diet leads to disproportions in the growth of organs in embryos, the effect on different parts of the brain and nervous system is especially noticeable. This can lead to disruption of the functions of internal organs and changes in the behavior of matured individuals.

Principles of Nutrition in the Ketogenic Diet

The ketogenic diet is based on the use of foods high in fat and low in carbohydrates. There is no strict nutrition plan in the diet, it is enough to adhere to the basic principles.

1. Healthy fats play a basic role on the keto diet - they take up to 80% of the total calorie content of the menu. These are good quality natural oils – olive oil, coconut oil, avocado oil, other vegetable oils, nuts and some seeds. Fats provide energy and relieve hunger, fatigue and weakness. Therefore, a key role in recipes belongs to fats.
2. Vegetables are also an important part of the diet. Given the restrictions on the amount of carbohydrates consumed, your choice should be stopped on non-starchy representatives of the cruciferous family - all kinds of cabbage, leafy greens, squash and zucchini, asparagus and cucumbers.
3. Much more moderately should be consumed protein foods with a minimum amount of carbohydrates in the composition. Ideally, this should be grass-fed meat, grass-fed bone broth, free-range poultry and eggs, wild-caught fish, and some high-fat, minimally processed dairy products.

4. Fruits are also included in the keto diet, despite the misconceptions about completely abandoning them. But these are not all types of fruits. It is necessary to choose with a minimum content of net carbohydrates. Portions of fruit should be small so as not to exceed the daily allowance of carbohydrates, and divided into meals so as not to interfere with the maintenance of ketosis.
5. High-carbohydrate fruits, dried fruits, high-sugar drinks (including natural fruit juices), low-fat dairy products, sweets, desserts, any baked goods, cereals and other products with a predominance of carbohydrates in the composition should be completely avoided, even if outside of the ketogenic diet, they are considered "healthy." You will have to give up all sources of "empty calories" - fast foods.

Based on these principles, we propose to compile a detailed list of foods that you can combine to your liking.

FATS

Fats should be included in the diet in large quantities and with every meal throughout the day. Contains no net carbohydrates.

- Monounsaturated and some types of polyunsaturated fats, especially omega-3 fatty acids. Every day it is desirable to use all types of the listed fats.
- Medium chain triglycerides (MCT oils, eng. *medium-chain triglycerides*), cold-pressed coconut oil and other quality "tropical" oils, extra-virgin olive oil, flaxseed and their oil, avocado and macadamia oils.
- Butter and ghee, ghee butter.
- Animal fats - lard, homemade lard, chicken or duck fat.

NON-STARCH VEGETABLES

They contain few carbohydrates, but a lot of fiber, which does not affect the level of glucose and insulin, and does not prevent the maintenance of ketosis.

- Garden and wild leafy greens and herbs - Swiss chard, rhubarb, sorrel, spinach, arugula, chicory, dandelion leaves, fennel, mustard, turnip, numerous types of salads.
- Cabbage - white cabbage, broccoli, cauliflower, Brussels sprouts and others.
- Zucchini, cucumbers, onions, leeks, green onions, celery stalks.
- Fermented foods - sauerkraut, kimchi, fermented dairy products, coconut kefir - will help the intestines.
- Low-carb vegetables and mushrooms - asparagus, bean sprouts, tomatoes, bell peppers, radishes.

PROTEINS

Animal proteins from meat and fish can be consumed to control hunger as needed. It is recommended on a ketogenic diet to give preference to fatty rather than lean pieces. Contains a small amount of carbohydrates.

- Various types of grass-fed meat (so the meat contains more omega-3 fats) and without the use of antibiotics. Beef, veal, goat, lamb, wild meats.
- Offal of the same animals, including the liver.
- Free range poultry - chicken, duck, goose, turkey, pheasant, quail, partridge, etc.
- Eggs and egg yolks.

- Fish - trout, salmon, tuna, sardines, perch, flounder, anchovies, etc.

BEVERAGES

- Clean water first.
- Unsweetened tea, coffee.
- Bone broth. ^[12]

Let's dwell on fruits in more detail, since there is a misconception that the ketogenic diet completely rejects the use of fruits.

fruits on a keto diet

Should I cut out all fruits on a keto diet? It's a common misconception that in order to achieve ketosis, you don't have to eat fruit.

Fruit can and should be incorporated into a low-carb, healthy diet.

Fruits are dominated by carbohydrates and a lot of fiber, which, passing through the human digestive system, comes out undigested. Therefore, fiber does not increase blood glucose levels, unlike carbohydrates. Insulin levels will also remain unchanged, which means that fiber does not affect ketosis and is safe to consume on a keto diet.

Instead of looking at total carbs on your menu, you should look at net carbs. Their amount is defined as the difference between the total amount of carbohydrates and fiber. For example, if the product contains 10 gr. carbohydrates, of which 3 gr. fiber, the difference gives 7 gr. net carbohydrates.

Keto fruits are those that are relatively high in fiber and relatively low in carbs. Add a few low-carb fruits to your ketogenic menu every day. This will supplement the diet with vitamins, minerals and antioxidants that are essential for a balanced diet. At the same time, the diet will not be felt as a strict rejection of all sweets and it will be much easier to endure it.

Top 10 Fruits for the Ketogenic Diet

To understand which fruits are suitable for a keto diet, you need to consider the amount of net carbohydrates in one serving (piece or cup if it is berries).

Here are the top 10 most nutritionally relevant keto fruits.

1. Avocado: 2 gr. net carbs in 1 medium fruit.
2. Lemon: 4 gr. net carbs in 1 medium fruit.
3. Lime: 5 gr. net carbs in 1 large fruit.
4. Blackberries: 6 gr. net carbs in 1 cup.
5. Raspberries: 7 gr. net carbs in 1 cup.
6. Strawberries: 8 gr. gr. net carbs in 1 cup tailless berries.
7. Watermelon: 10.5 gr. net carbs in 1 cup of peeled pulp.
8. Melon Cantaloupe: 11.5 gr. net carbs in 1 cup of peeled pulp.
9. Nectarine: 12.5 gr. net carbs in 1 medium fruit.
10. Peach: 12.5 gr. net carbs in 1 medium fruit.

Of course, you need to understand that even ketogenic-friendly fruits should be consumed in moderation.

For the keto diet to work, you need to maintain a state of ketosis. For this, it is allowed to eat no more than 30-50 grams per day. carbohydrates. But if you eat this amount of carbohydrates in one meal, it threatens to exit the state of ketosis.

Therefore, it is worth sticking to a diet with a predominance of healthy fats, non-starchy vegetables and protein foods, filled with nutrients. And very few carbohydrates to maintain a balance in the diet.

Avocado as a fruit that has more similarities with healthy fats, along with coconut, olive or ghee, is quite useful. It brings many benefits to the cardiovascular system, thanks to the content of omega-3 acids. But other fruits on the list contain more net carbs. They should be eaten less often and in small portions, to satisfy cravings for sweets - as a replacement for more harmful sweets and high-carb snacks.

To lower the glycemic index of such a snack, it is desirable to combine the carbohydrate component with fats or additional fiber.

For example, a dessert of a handful of berries is suitable, combined with good quality heavy whipped cream or unsweetened full-fat yogurt. Or a smoothie with half a cup of berries, non-starchy vegetables, coconut milk, collagen (can be substituted for bone broth), and aromatic herbs.

Fruits to Avoid on a Keto Diet

While many fruits are keto-friendly, not all are. Fruit juices and dried fruits should not be included in the diet. They are a concentrate of both natural sugars from the fruit, and are additionally enriched with glucose syrup or powdered sugar to give a presentation to the treats.

In raw form, there are also fruits that should be categorically excluded from the menu.

1. Grapes: 25.5 gr. net carbs per 1 cup.
2. Banana: 25.5 gr. net carbs per 1 medium fruit.
3. Mango: 22.5 gr. net carbs per 1 medium fruit.
4. Grapefruit: 21 gr. net carbs per 1 medium fruit.
5. Pineapple: 19.5 gr. net carbohydrates per 1 cup of refined pulp.
6. Blueberries: 17 gr. net carbs per 1 cup.
7. Orange: 16.5 gr. net carbs per 1 medium fruit.
8. Pear: 16.5 gr. net carbs per 1 large fruit.
9. Cherry berries: 16.5 gr. net carbs per 1 cup of seedless berries.
10. Plum: 16.5 gr. net carbs per 1 cup of pitted fruit [13].

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The Ketone Diet - Scientific Rationale, Proven Health Benefits, Advantages and Disadvantages

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Summary: The keto diet is the most restrictive of the low-carbohydrate diets and has been used successfully for weight loss and to relieve the symptoms of epilepsy and other neurological problems. For athletes, a cyclic keto diet provides a "drying" effect. The production of growth hormone is stimulated, the fat goes away, and the muscles become voluminous and embossed. The diet is based on changing the habitual metabolism into a state of ketosis and fat burning. However, this diet has contraindications and is not designed for long-term compliance.