



Potassium (K , potassium) - description, effect on the body, best sources

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Abstract. The article discusses the main properties of potassium (K) 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 potassium 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 potassium on the human body under certain medical conditions and diseases are analyzed separately.

Key words: potassium, potassium, K , benefit, harm, useful properties, contraindications

Potassium (K) is an important dietary mineral and electrolyte. It is essential for the functioning of all living cells and therefore is present in all plant and animal tissues. Normal body function depends on the proper regulation of potassium concentrations both inside and outside the cells. This trace element plays an important role in the regulation of body electrical signals (maintenance of cell polarity, neuronal signaling, transmission of cardiac impulses and muscle contraction), in the transport of nutrients and metabolites, and in the activation of enzymes ^[1,2].

Discovery history

As a mineral, potassium was first discovered in 1807 by the famous British chemist Humphrey Davy while creating a new type of battery. It was only in 1957 that an important step was taken in understanding the role of potassium in animal cells. The Danish chemist Jens Skou, who received the Nobel Prize in Chemistry in 1997, made a discovery in the process of exchange of potassium, sodium and magnesium ions in crab cells, which gave impetus to subsequent studies of the mineral in other living organisms ^[3].

Foods rich in potassium

Both plant and animal products are excellent sources of potassium. Potassium-rich plant foods include avocados, raw spinach, bananas, oats, and rye flour. Relatively rich in potassium foods of animal origin - halibut, tuna, mackerel and salmon. Slightly less of the mineral is present in meats such as pork, beef, and chicken. White flour, eggs, cheese and rice contain very small amounts of potassium. Milk and orange juice are good sources of potassium, as we often consume large amounts of them ^[1].

Table 1. List of foods rich in potassium (according to [Food+](#)).

Product	Potassium content (mg/100 grams)
White beans	1795
Dried apricots	1162
pistachios	1025
Raisin	825
Flaxseeds	813
Pumpkin seeds	809
Almond	733
Prunes	732
chickpeas	718
Dark chocolate (85% cocoa)	715
Hazelnut	680
Oat bran	566
Spinach	558
Avocado	485
edamame beans	482
Potato	425
Bulgur	410
Sardines, cooked	397
Chard	379
Parsnip	375
Salmon	366
Banana	358
Butternut squash	352
curly cabbage	348
Sweet potato	337
Beet	325
Carrot	320
Buckwheat	320
Champignons	318
Mackerel	314
Melon	267
Tuna	252
polka dots	244
Pomegranate	236
Pork	185
Cucumber	147
Whole milk	132
Watermelon	112
Lean beef	96
shellfish	46

daily requirement

Since there is insufficient data to determine an estimated average requirement and therefore to calculate a recommended dietary allowance for potassium, an adequate intake has been developed instead. NAP for potassium is based on a diet that should support lower blood pressure, reduce the adverse effects of sodium chloride intake on blood pressure, reduce the risk of recurrent kidney stones, and possibly reduce bone loss. In healthy people, excess potassium above the NAP is excreted in the urine.

The Adequate Intake of Potassium (depending on age and gender):

Life period	Age	Men: (mg/day)	Women: (mg/day)
babies	0–6 months	400	400
babies	7–12 months	700	700
Children	1–3 years	3,000	3,000
Children	4–8 years	3,800	3,800
Children	9–13 years old	4,500	4,500
Teenagers	14–18 years old	4,700	4,700
adults	19 years and older	4,700	4,700
Pregnancy	14-50 years old	-	4,700
Breast-feeding	14-50 years old	-	5,100

Daily requirement increases:

- *in African Americans:* Because African Americans have a lower dietary potassium intake and are more likely to suffer from high blood pressure and salt sensitivity, this subpopulation especially needs to increase their potassium intake;
- *in patients with type 1 diabetes* or those taking non-steroidal anti-inflammatory drugs;
- *when playing sports:* potassium is intensively excreted from the body with sweat;
- *when taking diuretics* ;
- *with a low-carbohydrate and high-protein diet* : often with such a diet, fruits are not consumed, which contain alkalis necessary for potassium metabolism.

The daily requirement is reduced:

- in patients with chronic renal failure, end-stage kidney disease, heart failure;
- in pregnant women with preeclampsia, due to the risk of developing hyperkalemia with excessive intake of potassium in the body ^[4].

Useful properties of potassium and its effect on the body

Health Benefits of Potassium:

- Supports Brain Health

Potassium is very important for the health of the nervous system, which consists of the brain and spinal cord, as well as nerves. Potassium also plays a role in the osmotic balance between cells and interstitial fluid. This means that with a lack of potassium, the exchange of fluids in the body is disturbed. An

upset of the nervous system, combined with an increase in blood pressure and cerebral fluid due to low potassium content, can lead to severe headaches.

- Reducing the risk of stroke

Because of potassium's role in regulating the nervous system, heart function, and even fluid balance, a diet high in potassium can help reduce the risk of stroke. What's more, this benefit has been shown to be stronger when potassium comes from natural food sources rather than supplements.

- Improving Heart Health

Potassium is needed for the smooth functioning of muscles. The contraction and relaxation cycles of muscles, including the heart, depend on potassium metabolism. A mineral deficiency may play a role in the development of an arrhythmia or an irregular heartbeat.

- Lowering blood pressure

In the human body, there is a mechanism known as sodium-potassium metabolism. It is essential for cell metabolism, fluid balance and proper heart function. The modern diet is most often almost devoid of potassium and has a high amount of sodium. This imbalance leads to an increase in blood pressure.

- Bone Health Support

Studies have shown that potassium, found in abundance in fruits and vegetables, plays an important role in improving bone health. Potassium has been found to reduce bone resorption, the process by which bone breaks down. Therefore, a sufficient amount of potassium leads to an increase in bone strength.

- Prevention of muscle cramps

As noted, potassium is essential for muscle function and fluid regulation in the body. Without enough potassium, the muscles can spasm. In addition, regular consumption of foods rich in potassium can help with menstrual cramps.

Not only does eating delicious potassium-rich fruits, vegetables, and legumes help prevent muscle cramps, it also reduces muscle weakness and fatigue. This provides more energy to move throughout the day and make the most of your time. For athletes with more demanding exercise schedules, getting the maximum amount of potassium from food will help overall performance. This means that potassium-rich foods should be included in every meal and snack, as well as in concentrated and recovery shakes.

- Help in the fight against cellulite

We often associate cellulite with high fat intake and low physical activity. However, one of the main factors, in addition to genetics, is also the accumulation of fluid in the body. This occurs with increased salt intake and insufficient potassium intake. Try introducing more potassium rich foods into your diet on a regular basis and you will see cellulite reduction and overall health improvement.

- Healthy weight support

One of the most important benefits of adequate potassium intake, among others, is its impact on healthy body weight levels. This effect is observed because potassium helps to recover weakened and tired muscles, improves heart health, helps the nervous system and maintains the balance of fluids in the body. In addition, foods rich in potassium, as a rule, are nutritious and low-calorie - there will simply be no place left for “harmful” food in the stomach.

Potassium metabolism

Potassium is the main intracellular cation in the body. Although the mineral is found in both intracellular and extracellular fluid, it is more concentrated within cells. Even small changes in the concentration of extracellular potassium can greatly affect the ratio of extracellular to intracellular potassium. This, in turn, affects nerve transmission, muscle contraction, and vascular tone.

In unprocessed foods, potassium occurs mainly in association with precursors such as citrate and, to a lesser extent, phosphate. When potassium is added to food during processing or to vitamins, it is in the form of potassium chloride.

A healthy body absorbs about 85 percent of the dietary potassium it consumes. High intracellular potassium concentration is maintained by sodium-potassium-ATPase metabolism. Since it is stimulated by insulin, changes in plasma insulin concentration can affect the extracellular potassium concentration and hence the plasma potassium concentration.

About 77-90 percent of potassium is excreted in the urine. This is because, at steady state, the correlation between dietary potassium intake and urinary potassium is quite high. The rest is excreted mainly through the intestines, and a much smaller amount is excreted in sweat. ^[4].

Interaction with other trace elements:

- **Sodium chloride:** potassium softens the pressor effect of sodium chloride. Dietary potassium increases the excretion of sodium chloride in the urine.
- **Sodium:** Potassium and sodium are closely related, and if the ratio of the two elements is incorrect, the risk of kidney stones and hypertension can be increased ^[4].
- **Calcium:** Potassium improves calcium reabsorption and also has a positive effect on bone mineral density.
- **Magnesium:** Magnesium is essential for optimal potassium metabolism in cells, and the correct ratio of mania, calcium and potassium can reduce the risk of stroke ^[5].

Healthy Potassium Food Combinations

Yogurt + Banana: Combining potassium-rich foods with protein helps build muscle tissue and replenish amino acids that are lost during physical activity. Such a dish can be consumed both for breakfast and as a snack after a workout ^[8].

Carrots + Tahini: Carrots are considered to be incredibly healthy - they contain healthy carbohydrates, fiber, vitamins A, B, K and potassium. Tahini (sesame paste) also includes a large amount of vitamins and minerals, as well as proteins. The fiber found in tahini helps reduce calorie intake and is also anti-inflammatory and supports gut health.

Olives + Tomatoes: Olives are an excellent source of fiber, which supports the functioning of the gastrointestinal tract and stimulates the intestines. Tomatoes, in turn, contain a unique antioxidant lycopene, as well as vitamin A, iron and potassium ^[7].

Rules for cooking foods with potassium

During the food processing of foods containing potassium, a sufficiently large amount of it is lost. This is due to the high solubility of potassium salts in water. For example, boiled spinach, from which excess liquid was removed with a colander, contains 17% less potassium than its raw version. And the difference in the amount of potassium between raw and boiled kale is almost 50% ^[1].

Application in official medicine

Medical studies show that a high intake of potassium has a protective effect against a number of pathologies affecting the cardiovascular system, kidneys and skeleton.

In addition, there is growing evidence that increasing the amount of potassium in the diet has a positive effect on muscle function, general condition and the frequency of falls. ^[10].

- Osteoporosis

Positive dynamics in the growth of bone mineral density was noted in pre-, post- and menopausal women, as well as older men, who consumed from 3000 to 3400 mg of potassium per day.

Foods rich in potassium (fruits and vegetables) usually also contain many bicarbonate precursors. These buffer acids are found in the body to stabilize acid levels. Western diets today tend to be more acidic (fish, meats and cheeses) and less alkaline (fruits and vegetables). In order to stabilize the body's pH, alkaline calcium salts are released in the bones to neutralize ingested acids. Eating more fruits and vegetables with potassium lowers the total acid content of the diet and may help maintain healthy bone calcium levels.

- Stroke

Doctors attribute the reduction in stroke rates to higher potassium intake, as indicated by several large-scale epidemiological studies.

Overall, the evidence suggests that a modest increase in potassium-rich foods can significantly reduce the risk of stroke. This is especially true for people with high blood pressure and/or relatively low potassium intake.

- salt substitutes

Many salt substitutes contain potassium chloride as a replacement for some or all of the sodium chloride in the salt. The potassium content of these foods varies widely - from 440 to 2800 mg of potassium per teaspoon. People suffering from kidney disease or using certain medications should consult their healthcare provider before taking salt substitutes due to the risk of hyperkalemia caused by the high levels of potassium in these foods ^[9].

- Stones in the kidneys

There is an increased risk of kidney stones among people with high levels of calcium in the urine. It can also be associated with a lack of potassium. Urinary calcium excretion can be reduced by increasing calcium intake or by adding potassium bicarbonate ^[2].

In dietary supplements, potassium is often present as potassium chloride, but many other forms are also used, including potassium citrate, phosphate, aspartate, bicarbonate, and gluconate. The nutritional supplement label usually lists the amount of elemental potassium in the product, not the weight of the total potassium-containing compound. Some dietary supplements contain microgram amounts of potassium iodide, but this ingredient serves as a form of the mineral iodine, not potassium.

Not all multivitamin/mineral supplements contain potassium, but those that do have potassium typically include around 80mg. Potassium-only supplements are also available, and most contain up to 99 mg of the mineral.

Many manufacturers and distributors of nutritional supplements limit the amount of potassium in their products to only 99 mg (which is only about 3% of the recommended amount). Some oral medications that contain potassium chloride are considered unsafe because they are associated with damage to the small intestine.

potassium during pregnancy

Potassium plays an important role in maintaining the balance of fluids and electrolytes in the cells of the body. In addition, he is responsible for sending nerve impulses, helping muscle contraction. Blood volume increases by up to 50% during pregnancy, so the body needs more electrolytes (sodium, potassium and chloride in combination) to maintain the correct chemical balance in the fluids. If a pregnant woman has leg cramps, one of the reasons may be a lack of potassium. During pregnancy, hypokalemia can be observed primarily due to the fact that a woman loses a lot of fluid during morning sickness in the first months. Hyperkalemia is also very dangerous during pregnancy, as it can lead to quite serious heart problems. Fortunately, it is less common in practice and is associated mainly with kidney failure, alcohol or drug use, extreme dehydration, and type 1 diabetes ^[11,12].

Application in traditional medicine

In folk recipes, potassium plays an important role in the treatment of diseases of the heart, gastrointestinal tract, osteoporosis, nervous system and kidneys.

A well-known remedy for many diseases is a solution of potassium permanganate (the so-called "potassium permanganate"). For example, folk healers suggest taking it for dysentery - inside and in the form of an enema. It should be noted that this solution must be used with great care, since an incorrectly selected dose or poorly mixed solution can lead to serious chemical burns ^[13].

Folk recipes mention the intake of foods rich in potassium for heart problems and water metabolism disorders. One such product, for example, is sprouted grains. They contain potassium salts, as well as many other useful trace elements ^[14].

For kidney health, traditional medicine, among other things, advises eating grapes rich in glucose and potassium salts. It is also a good remedy for diseases of the heart, bronchi, liver, gout, nervous exhaustion and anemia ^[15].

Potassium in recent scientific research

- Herbs, including cilantro, have a long history of use as anticonvulsants in folk medicine. Until now, many of the basic mechanisms by which herbs work have remained unknown. In a recent study, scientists have discovered a new molecular action that allows cilantro to effectively delay certain seizures that are common in epilepsy and other diseases. "We found that cilantro, which is used as an unconventional anticonvulsant drug, activates a class of potassium channels in the brain that reduce seizure activity," said Jeff Abbott, Ph.D., professor of physiology and biophysics at the University of California, Irvine School of Medicine. "In particular, we found that one component of cilantro, called dodecanal, binds to a specific part of the potassium channels to open them, reducing cell excitability. This particular discovery is important because it could lead to more effective use of cilantro as an anticonvulsant, or modification of dodecanal to develop safer and more effective anticonvulsants." "In addition to anticonvulsant properties, cilantro also has the potential for anticancer, anti-inflammatory, antifungal, antibacterial, cardioprotective, and analgesic effects," the scientists added ^[16].
- Not so long ago, a new study was published on the causes of death from cardiovascular diseases. Scientists have come to the conclusion that insufficient consumption of vegetables and fruits leads to an incredible number of deaths every year - we are talking about millions of people. It was found that in about 1 out of 7 deaths from heart and vascular diseases could be prevented by the timely introduction of a sufficient amount of fruit into the diet, and in 1 out of 12 by eating vegetables. As you know, fresh fruits and vegetables contain a storehouse of nutrients - fiber, potassium, magnesium, antioxidants, phenols. All of these micronutrients help maintain normal blood pressure levels and lower cholesterol levels. In addition, they maintain the balance of bacteria in the digestive tract. People who eat plenty of fresh vegetables and fruits are also less likely to become obese or overweight, and potassium plays one of the most important roles in this. Scientists have found that in order to avoid the risk of cardiovascular disease, the optimal amount of fruit that should be consumed per day is 300 grams - which is about two small apples. As for vegetables, they should be 400 grams in the daily diet. Moreover, the best way to cook is to eat it raw. For example, to meet the norm, it will be enough to eat one medium-sized raw carrot and one tomato ^[17].
- The researchers were able to determine the cause of a recently discovered serious disease that causes epileptic seizures, loss of magnesium in the urine and decreased intelligence in children. Using genetic analysis, the researchers found that the disease is caused by a recent mutation in one of four forms of sodium-potassium metabolism known as sodium-potassium adenosine triphosphatase. New knowledge about the disease is likely to mean that doctors in the future will be more aware that magnesium deficiency associated with epilepsy can be caused by genetic defects in sodium-potassium metabolism ^[18].

Weight regulation

Traditionally, potassium is not perceived as an aid in weight loss. However, with the study of its mechanisms of action and functions, this opinion is gradually changing. Potassium aids in weight loss through three main mechanisms:

1. Potassium helps improve metabolism and energy: it provides our body with the components it needs to provide energy during physical activity and helps it use the metabolism-boosting nutrients iron, magnesium, and calcium.
2. Potassium Helps Gain Muscle Mass: When combined with magnesium, it aids in muscle contraction and growth. And the stronger the muscles, the more calories they burn.
3. Potassium prevents excessive retention of fluids in the body: together with sodium, potassium helps maintain the exchange of fluids in the body, the excess of which also adds the number of kilograms on the scale ^[20].

Use in cosmetology

Potassium can often be seen in a variety of cosmetic products. There are many forms in which it is used - potassium aspartate, potassium bicarbonate, potassium bromate, potassium castorate, potassium chloride, potassium hydroxide, potassium silicate, potassium stearate, etc. These compounds are most commonly used in skincare, oral hygiene and hair products. Depending on the specific compound, it can act as a conditioner, acidity regulator, antiseptic, stabilizer, emulsifier and thickener. Potassium lactate has a moisturizing effect due to its ability to bind water molecules and the breakdown products of an amino acid called serine. Many potassium compounds in high doses can cause irritation and burns, as well as being carcinogenic ^[19].

Contraindications and warnings

Signs of potassium deficiency

Low plasma potassium concentration ("hypokalemia") is most often the result of excessive loss of potassium, for example, due to prolonged vomiting, the use of certain diuretics, some forms of kidney disease, or metabolic disorders.

Conditions that increase the risk of hypokalemia include diuretic use, alcoholism, severe vomiting or diarrhea, overuse or abuse of laxatives, anorexia nervosa or bulimia nervosa, magnesium deficiency, and congestive heart failure.

Low dietary potassium intake usually does not lead to hypokalemia.

Symptoms of abnormally low plasma potassium ("hypokalemia") are associated with changes in membrane potential and cellular metabolism; they include fatigue, muscle weakness and cramps, bloating, constipation, and abdominal pain. Severe hypokalemia can lead to loss of muscle function or abnormal heart rhythm, which can be fatal ^[2].

Signs of excess potassium

In healthy people, an excess of potassium from foods, as a rule, does not occur. However, in excess, vitamins and nutritional supplements containing potassium can be toxic in excellent health. Chronic use of large amounts of dietary potassium supplements can lead to hyperkalemia, especially in people with impaired excretion of substances from the body. The most serious symptom of this disease is cardiac arrhythmia, which can result in cardiac arrest. In addition, some potassium supplements may cause gastrointestinal discomfort. Other symptoms of hyperkalemia can include numbness in the hands and feet, muscle weakness, and temporary loss of muscle function (paralysis) ^[2].

Interaction with medications

Some medications can affect the level of potassium in the body. For example, medications taken to treat hypertension and heart failure in patients with chronic kidney disease or type 2 diabetes can reduce the amount of potassium excreted in the urine and, as a result, lead to hyperkalemia. Diuretics have the same effect. Experts advise monitoring potassium levels in patients taking these drugs ^[2].

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Potassium - description, benefits and sources

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