



Vanadium (V) - value for the body and health, which contains

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Abstract. The article considers the main properties of vanadium (V) 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 vanadium 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 vanadium on the human body under certain medical conditions and diseases are analyzed separately.

Keywords: vanadium, V , vanadium, useful properties, contraindications, sources

This is an element with atypical biological functions. The American Dietetic Association AmDAssoc considers the mineral essential for humans, especially men and women over 41 years of age. It is involved in redox reactions, has an anti-cancer function, improves the action of insulin, and has many other health benefits. Let's look at its main properties, proven by scientific research.

Vanadium in the body

The trace element is poorly absorbed in the intestine - from 0.2 to 5%. Fortunately, this is not a problem, as it is needed in trace amounts and is toxic in excess. But it is worth remembering that a deficiency, as well as excessive concentrations, can lead to a number of pathologies, cause irreversible damage to tissues and organs.

The total content of the polyvalent metal in the body of adults is 100-200 mcg. Half of the total amount is in the bones, and the remainder is mainly deposited in the kidneys, liver, spleen. A tiny amount is found in the muscles, lungs and brain.

It is known that the micronutrient can change and suppress the action of the protein. Under certain conditions, it affects the metabolism of erythrocytes, the transmission of intracellular signals, the accumulation and transport of calcium in cells. In addition, it regulates the activity of key enzymes, takes part in carbohydrate and lipid metabolism, the formation of cells for various purposes and tissue growth. ^[12]

Vanadium in food

Vanadyl and vanadate are the most biologically significant forms of the mineral. Vanadyl sulfate is especially common and is used in food supplements. The trace element is also found in compounds with valency I, II, IV and V, among which the last two groups are most popular.

Foods with a high concentration of vanadium

Foods with a micronutrient greater than 1 ppm (part per million) are considered rich sources of a nutrient, while levels between 1 and 5 ng/g are considered low.

7 foods with the highest vanadium content

No.	Products	ng/g
one	Mushrooms	50–2000
2	dried parsley	1800
3	Black pepper	987
four	Spinach , vacuum freeze dried	533–840
5	Dill seeds	431
6	Whole grains and cereals	5–30
7	Cow's milk products	5–30

A lot of useful component can be obtained from shellfish, beer, wine, drinks with artificial sweeteners.
[3, 4]

Recommended daily allowance

There are currently no established doses for optimal intake of the mineral. The National Institute of Medicine NIH (an agency of the US Department of Health) has established an acceptable upper limit, at which there are no unwanted side effects - 1.8 mg for adults. Safe daily doses for infants, children, pregnant and lactating women are not yet known.

Studies show that 7.8–10 mg of a micronutrient per day for 2 weeks does not cause adverse symptoms. Problems provoke doses of 14–42 mg - with an excess, the work of the gastrointestinal tract is disrupted.

The intake of the substance depends on the diet and on average a European receives 15–20 mcg/day from food, and an American from 10 to 60 mcg/day. Dietary supplements contain different amounts of a micronutrient - the concentration depends on the chemical compound used. For example, about 31% of elemental vanadium is concentrated in sulfate, 42% in sodium metavanadate, and 28% in sodium orthovanadate.

6 Health Benefits of Vanadium for Children, Men and Women

1. Enhances the action of insulin, prevents the development of diabetes

High doses of vanadyl sulfate (about 100 mg/day) improve the body's use of insulin. This hormone is responsible for the absorption of glucose and regulates its level in the blood, so adding the mineral to the diet reduces blood sugar even in people with diabetes. True, researchers have concerns about high doses, as they can cause unwanted effects with long-term use. ^[5, 6]

2. Shows antioxidant properties and protects the kidneys

Experiments on rats have shown that after treatment with vanadium in rodents increased glucose metabolism, its utilization, insulin sensitivity in obesity and improved liver condition. In addition to glucose, vanadyl sulfate reduced the concentration of urea and creatinine in the blood, reduced oxidative stress and maintained normal kidney function. ^[7, 8, 9, 10, 11]

3. Fights bacteria, viruses, fungi and parasites

The mechanism of the antibacterial activity of the metal is not fully understood, but it is known that it penetrates the walls of bacteria, causes their morphological changes and prevents division. Also, the mineral blocks the replication of the human immunodeficiency virus HIV-1 / HIV-2, preventing its reproduction and protecting against the development of infection. It is able to destroy intracellular pathogens and help the immune system. ^[12, 13]

4. Fights tumors

The anticarcinogenic activity of the component still needs to be studied, but its compounds and complexes have already shown themselves to be effective agents for fighting cancer. Of great importance are the antioxidant properties of the mineral and its ability to protect cellular metabolism. New research shows that it can be considered as a readily available, promising chemopreventive agent against cancer. ^[14, 15, 16, 17]

5. Normalizes cholesterol levels and heart function

Organic and inorganic compounds act as cardioprotective agents. They improve heart function, protect against ischemia, prevent hypertension and myocardial hypertrophy. Additional cardioprotective mechanisms are increased glucose catabolism, stimulation of its transport and normalization of levels in myocardial cells. ^[18, 19, 20, 21, 22]

6. Regulates Appetite and Helps Fight Obesity

Studies on rodents have shown that the introduction of the mineral into the diet leads to a decrease in appetite, less food intake. As a result, the concentration of leptin in the blood (a hormone that regulates appetite) and body weight decrease. ^[23]

Interaction of vanadium with other trace elements

- chromium, chloride, ferrous ions and aluminum hydroxide reduce its absorption;
- magnesium, vitamins C and [E](#), polyphenols, phytosterols fight the toxicity of the mineral in its excess - reduce oxidative stress.

Application in medicine

Antiviral, antibacterial, antiparasitic, antifungal, anticancer, antidiabetic and antihypercholesterolemic activity, as well as cardioprotective and neuroprotective effects, are of interest to many research

centers. Humans need microgram amounts of the element to improve glucose metabolism and insulin sensitivity, which means it can be therapeutically active at low concentrations.

Metal complexes and compounds are already used in tissue engineering to obtain biomaterials. They are used to regenerate damaged tissues, organs and restore their lost functions. Also, vanadium is a part of metal biomaterials in bone surgery (prostheses).

Studies have shown that some complexes of the element fight viruses, including HIV, influenza, SARS, dengue fever. They can also be effective in combating candidiasis, mycosis and bacteria that provoke poisoning, respiratory infections, typhoid fever, strep throat, tuberculosis and skin diseases.
[24]

In scientific research

- The mineral can act not as an antioxidant, but on the contrary, it can be a pro-oxidant and increase oxidative stress. This leads to many negative consequences, including DNA degradation, protein denaturation. In this case, it weakens the antioxidant barrier and damages cells, as free radicals do. It can also release some transition metals, accumulate in the liver and kidneys, causing hepato- and nephrotoxic effects.^[25, 26]
- Implants made of titanium alloys with vanadium are exposed to body fluids - the mineral can be released into the surrounding tissues and have an adverse effect. Therefore, the surface layer of the prosthesis is often modified to cause a specific tissue reaction that is safe for health. This applies to both orthopedic and dentures.^[27]
- Strength training enthusiasts use vanadyl sulfate to improve athletic performance. Previously, this caused concern in the scientific community - scientists suggested that supplements could lead to anemia, changes in the white blood cell system. Studies conducted on athletes have refuted the assumptions - such supplements do not affect the number of red blood cells, white blood cells, platelets, blood viscosity and biochemistry.^[28]

Dangerous properties of vanadium

The usual amount of trace element in the diet (less than 30 mcg/day) has low toxicity. However, its ability to accumulate and strong toxicological potential limit its use in pharmacology. And the ability to lower blood sugar levels forces people with hypoglycemia to carefully monitor the intake of the component, avoiding it in supplements and medications.^[29]

Vanadium deficiency in the body and symptoms

Signs of a lack of an element in humans have not yet been established. Researchers only speculate that a deficiency can raise cholesterol and blood sugar levels, lead to spinal degeneration and diabetes. In a study done on goats, its deficiency for three years caused irreversible bone deformity in the animals and some of them died.

Excess vanadium and symptoms

The toxicity of a mineral depends on many factors, including food composition, type of compound (organic/inorganic), addition to complexes, valency. Equally important is the duration of exposure and individual sensitivity. It is believed that the element is dangerous in a dosage of more than 1.8 mg / day. However, large doses are used in the treatment of various diseases, which can cause unwanted side effects:

- abdominal discomfort, bloating;

- diarrhea
- nausea;
- green-black tongue;
- loss of appetite and energy;
- weight loss;
- problems with the nervous system.

The element is dangerous when used in large quantities for a long time. In this case, the risk of damage to the kidneys and other organs increases.

Interaction with drugs

Taking the mineral along with diabetes medications can lead to too low blood sugar levels. The micronutrient can also slow blood clotting, and taking it with drugs that slow blood clotting increases the chance of bruising and bleeding.

Expert comment

Tatyana Eliseeva, nutritionist

Vanadium is of interest to scientists and doctors due to its biological activity and wide spectrum of action. It improves glucose tolerance, inhibits cholesterol synthesis. The amount of research on its use in medicine is constantly growing, and it can be assumed that new drugs based on the mineral will soon be available for the treatment of many life-threatening diseases. In the meantime, you can get the substance from commonly available and inexpensive foods that are not superfoods.

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