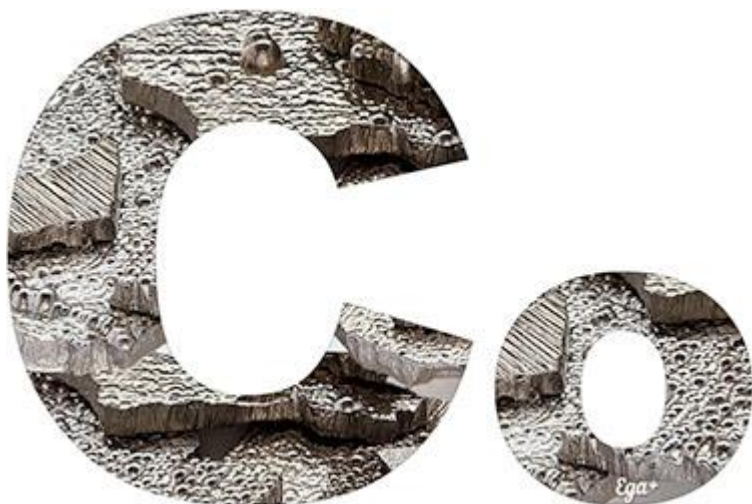




Cobalt (Co) - importance for the body and health, where it contains

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

Key words: cobalt , Co , cobalt, beneficial properties, contraindications, sources

Cobalt is an essential trace mineral and a component of vitamin B12. It is necessary for the formation of red blood cells, enzymatic reactions and the formation of nerve sheaths. The mineral strengthens the immune system, stimulates the activity of white blood cells to prevent infections. What foods are rich in trace elements and what are its benefits? Research and findings of scientists will surprise you.

Cobalt in the body: role and function

The component is needed in microdoses and no more than 2 mg is stored in the body of an adult. The main reserves are concentrated in the liver, but were also found in other organs of the gastrointestinal tract, kidneys. It is also part of the lymph nodes, hair. ^[one]

The mineral is part of vitamin B12. The latter performs several important tasks, including the creation of red blood cells. It performs the same functions as zinc and manganese and can replace them in some biochemical reactions. Cobalt is also part of the biotin-dependent Krebs cycle, the process the body uses to break down sugar and turn it into energy. ^[2, 3]

cobalt in food

The trace element is widely distributed in the environment. Its good food sources of cobalt are:

- fish;
- nuts;
- cereals;

- green leafy vegetables - broccoli, spinach, etc.

Cobalt is added to some beers as a stabilizer. Fans of such a drink have an increased risk of developing cobalt intoxication, which can lead to cardiomyopathy, heart failure.

Ground vegetables contain the mineral in small amounts. As the soil becomes more scarce, its levels decrease. This does not apply to soil near mining and smelting facilities, where concentrations of the compound are very high, with negative health effects.

Cobalt in Foods - Plant and Animal Sources

The trace element is mainly found in animal proteins. The concentration in vegetables depends on the amount in the soil in which they were grown.

15 products of animal and vegetable origin, the content of cobalt

No.	Product	Cobalt content ^[4] , mg/kg
one	Cheese	0.18
2	Chocolate	0.05
3	Crustaceans and molluscs	0.046
four	Dried fruits and nuts	0.041
5	by-products	0.033
6	Butter	0.018
7	Rice	0.01
eight	Fruit	0.009
9	Meat	0.008
ten	Fish	0.007
eleven	Bread	0.006
12	Vegetables (except potatoes)	0.006
13	Eggs	0.005
fourteen	Bird and game	0.002
fifteen	Milk	0.001

Products with a natural mineral help the body accumulate vitamins A, B3, C. ^[5]

Daily requirement for cobalt

The recommended daily allowance for a micronutrient has not yet been established and is currently determined by vitamin B12 requirements. For example, for most adults, it is desirable to consume 2.4 mcg of vitamin B12 daily, which corresponds to 0.1 mcg of the mineral.

To determine your micronutrient needs, it's worth talking to your doctor, dietitian, or nutritionist about it. It is especially important to carefully monitor its blood levels for athletes, people with anorexia or bulimia.

Nutritionists believe that the daily requirement does not exceed 0.1-2.4 micrograms per day. However, many adults consume much more of it - an average of 4 to 8 mcg per day. While maintaining vitamin B 12 in the body at the proper level, there is no need to take the mineral additionally. If your supplement contains 1.4 mg or less, it is unlikely to cause any harm. A dose of more than 30 mg is considered lethal. ^[6, 7]

5 health benefits of cobalt

1. Essential for Vitamin B12

The micronutrient plays the most important role for cobalamin. Vitamin B12 is not synthesized in the body, but only comes from outside. Many vegans and vegetarians do not get enough of it, so they may need cobalt supplements. ^[eight]

2. Protects Against Anemia and Maintains Healthy Blood

Cobalt can play a vital role in the absorption of iron - making it available for the formation of hemoglobin. Supplements with the component also help in the treatment of anemia when other methods are useless. ^[9]

3. Used to treat certain types of cancer

Medical cobalt-60 is used throughout the world to fight cancer and in radiation therapy to treat complex brain diseases. Radiocobalt allows doctors to deliver higher doses of radiation to tumors while limiting damage to surrounding healthy tissues and organs. For many brain cancers, this treatment remains one of the most accurate and advanced forms of radiation therapy available. ^[10, 11, 12]

4. Protects the nervous system

Cobalt is known for its ability to repair myelin sheaths, the layer that covers nerve cells and supports neurons. The trace element protects them from damage by free radicals. ^[13]

5. Heals wounds

Cobalt accelerates the healing of the skin after severe burns and injuries. It has even been shown to be beneficial in diabetic wounds where insufficient new blood vessel formation prevents healing. Nanofiber scaffolds solve this problem and help cells accumulate collagen and eliminate inflammation. ^[14, 15]

Interaction of cobalt with minerals and vitamins

- Cobalt is closely related to vitamin B12, scientifically referred to as cobalamin. The name itself suggests a connection with the mineral. The functioning of many organs and systems depends on the coordinated work of these substances.

- Cobalt goes well with ascorbic acid. With its participation, the absorption of vitamin C is significantly increased.

Application in medicine

Cobalt-60 is used in the healthcare industry to treat cancer and sterilize sutures, gloves, syringes and other medical equipment. Gamma sterilization guarantees the complete sterility of goods and saves on their production. This is especially true for implantable orthotics and heart valves, as metals and polymers are difficult to machine.

Cobalt-60 is used to sterilize insects that spread diseases such as the Zika virus and dengue fever. The method was first used on insects in the 1950s to prevent them from reproducing and taking root in the environment. Today, with the help of high-tech development, various carriers of infections in warm climates are neutralized. ^[16]

Cobalt in scientific research

- Some implants contain metal and release metal particles such as cobalt into the body. The compound may cause local or systemic toxicity including metallosis, hypersensitivity, benign tumour, cardiomyopathy, hypothyroidism and neurological disorders. Annual follow-up of implanted patients is recommended to monitor the potential toxicity of metal hip prostheses. The concentration of the mineral in the blood should not exceed 7 mcg / l. ^[17]
- Cobalt has special physical and chemical properties that can be used in drug development. Mineral complexes cause various biological effects - they suppress proteins, change the activity of drugs. ^[eighteen]
- The metal has a pronounced allergenic potential. Negative effects are associated with very large doses. Occupational health risk factors include asthma, interstitial lung disease, and alveolitis. In animal experiments, ingestion of cobalt led to reproductive changes, while injections with it led to cancer. ^[19, 20]
- Polyurethane dressing for wounds with the addition of cobalt nitrate fibers has the best physical and chemical parameters, parameters of compatibility with blood. Compatibility tests have shown longer clotting times and less toxicity. ^[21]
- The introduction of cobalt chloride to athletes is a type of doping, which consists in increasing the oxygen capacity of the blood. The trace element stimulates erythropoiesis - one of the processes of hematopoiesis, which consists in the production of red blood cells. It also helps tissues and cells adapt to low oxygen levels. The advantage of such additives is that they are not prohibited and cannot be detected by anti-doping tests, but they are potentially hazardous to health. ^[22]

Side Effects of Cobalt Use: Toxicity and Interactions

The International Agency for Research on Cancer classifies cobalt and its compounds as "possibly carcinogenic". This classification is based on the extreme intake of the substance by the animals during the study. There is no evidence of human carcinogenicity yet.

Since cobalt is a key part of vitamin B12, people with a rare eye condition such as Leber's syndrome should not take it without a doctor's approval. In these patients, some forms of vitamin B12 can cause vision loss. Pregnant and breastfeeding women should also not take supplements without a doctor's permission.

Poisoning is possible when large doses of an element that is of inorganic origin are ingested. Simply put, microdoses obtained from food are not capable of leading to an overdose. ^[23, 24]

Cobalt deficiency - deficiency symptoms, consequences

If there is a deficiency of cobalt in the body, then there is a deficiency of B12 (and vice versa). The following symptoms may indicate a deficiency:

- numbness, weakness, tingling in the limbs;
- headache;
- nausea, poor appetite;
- bleeding gums, pale lips and tongue;
- memory problems, confusion.

Vegetarians are most at risk of deficiency of the component - it is not enough in plant foods.

Symptoms of excess cobalt

The trace element is toxic at doses of 20–30 mg/day. Excess is indicated by various symptoms:

- high production of red blood cells, thick blood;
- dysfunction and enlargement of the thyroid gland;
- violation of the activity of cells in the bone marrow;
- problems with the absorption of iodine;
- diseases of the respiratory system and heart.

Excess cobalt helps to remove sesame seeds, vegetables and fruits with pectin, as well as decoctions of oatmeal, rose hips.

Interaction with medications

There are no known food or drug interactions with cobalt. But the mineral is the core of vitamin B12 and is important for the formation of red blood cells, the functioning of the nervous system and DNA synthesis. Radioactive CO-60 also has many uses, one of which is radiation therapy.

Expert comment

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Remember, the overall diet determines the risk of various diseases and protection against them. Instead of focusing on individual nutrients, it is better to eat a diet that is rich in all the essential nutrients for good health.

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