



Nickel (Ni) - value for the body and health, where it contains

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Abstract. The article discusses the main properties of nickel (Ni) and its impact on the human body. A systematic review of modern specialized literature and relevant scientific data was carried out. The best natural sources of nickel 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 nickel on the human body under certain medical conditions and diseases are analyzed separately.

Key words: nickel , Ni , nickel, useful properties, contraindications, sources

Nickel is not the most important mineral in the body, but without its participation, some bodily functions are impossible. It shares cellular receptors with cobalt, affects blood pressure levels, promotes iron absorption, and helps maintain bone health. Another micronutrient serves as a cofactor for specific enzymes. All the positive properties that we talk about below are confirmed by scientists.

Nickel content in the body

The micronutrient accumulates in the brain, stomach, liver, kidneys, lungs and heart. It is transported throughout the body by blood, mainly bound to albumin, and almost does not accumulate in organs and tissues. Most of the component is found in the adrenal glands and the thyroid gland. The body has enough trace amounts of the compound to perform all the necessary functions. ^[1, 2, 3, 4, 5]

Nickel in food - major animal and plant sources

The mineral occupies the 24th place in the world in terms of abundance and forms various compounds with other elements. Most of them are safe for humans, but some are toxic and even life-threatening.

The absorption of dietary nickel is very low. Food greatly impairs its absorption - absorption does not exceed 10%. Especially negatively this process is affected by tea, coffee, milk, orange juice and [vitamin C](#).

Nickel food

Men, women and children get the trace element from nuts, legumes, cereals, canned foods. In food groups, high concentrations are also found in sweeteners and chocolate. However, the main contribution to the consumption of the mineral is made by soups, multi-component dishes, and cereals. The concentration in food cooked in nickel cookware is slightly higher. ^[6, 7, 8, 9]

Nickel Consumption Rates – Striking a Balance

The human requirement for nickel is small and depends in part on the total energy requirement. According to the USDA, the US Department of Agriculture, the body may need as little as 25-35 micrograms of nickel per day.

Safe doses of nickel per day

Life period	Age	Men and women (mcg)
Children	1–3 years	0.2
Children	4–8 years	0.3
Children	9–13 years old	0.6
Teenagers and adults	14+ years	0.8–1

People unknowingly consume about 170 micrograms of nickel daily, which is slightly less than the mass of one grain of sand. For most adults, the safe dose is up to 1 mg/day. Higher concentrations increase the chance of side effects and may be toxic. ^[ten]

Top 3 Benefits of Nickel: Health Benefits and Role

1. Promotes the absorption of certain nutrients

Animal studies show that nickel helps the body use folic acid and vitamin B12. The compounds are very important for maintaining optimal levels of homocysteine, a toxic amino acid that has been linked to an increased risk of heart disease and stroke. ^[eleven]

2. Stimulates the secretion of hormones

Nickel concentration affects the synthesis of certain hormones. Among them are adrenaline, norepinephrine, aldosterone, and prolactin, which stimulates the production of breast milk. Aldosterone is important because it helps maintain blood pressure, regulates the water-salt balance. ^[12]

3. Improves Iron Absorption

Scientists have found that nickel deficiency worsens the status of iron in the body. It serves as a cofactor that facilitates the absorption, absorption, and metabolism of iron. ^[13]

Interaction of nickel with trace elements:

- helps the body use folic acid, vitamin B12;
- regulates iron absorption, calcium metabolism;

- is an antagonist of vitamin E - causes symptoms of its deficiency if accumulated in large quantities (possibly due to metabolic failure);
- prevents the absorption and accumulation of copper in tissues.

The use of nickel in medicine

Nickel-titanium alloys are widely used in dentistry, especially in endodontic root canal instruments. Nickel-containing materials are safe, hygienic and easy to clean.

Nickel research: scientific discoveries and scientists' conclusions

- In 2008, nickel received the title of "allergen of the year" - it became the most common cause of contact allergy in the world. The frequency of an allergic reaction to a mineral continues to rise. It cannot be explained by fashionable piercings or contact with nickel objects, which are widely used in medicine. The sources of allergy have changed as a result of industrialization and today systemic exposure is associated with food, water, surgical implants. ^[fourteen]
- Tests have shown that when boiled, substances are washed out of kettles into water, especially if it is acidified with lemon. The amount of metals washed out depends on the type of kettle, contact time. Long-term exposure to elevated concentrations of pollutants leads to chronic diseases, increases the risk of poisoning. ^[fifteen]
- *Helicobacter pylori* (*H. pylori*) infection is associated with gastritis, peptic ulcer disease, and adenocarcinoma. To resist the acidity of the gastric juice and continue to multiply in it, the bacterium uses an enzyme with minerals - the colonization of the body by the gastric pathogen *H. pylori* depends on the supply of nickel. ^[16, 17, 18]
- The mineral can damage the organs of the endocrine system - the hypothalamus, pituitary gland - and lead to their dysfunction. It also affects hormone secretion and can cause oxidative stress, free radical release and DNA damage. However, there are few studies of the endocrine system and some data need additional confirmation. ^[19]

Complications and adverse reactions associated with the use of nickel

People with kidney disease may have trouble absorbing the micronutrient. Its high concentrations also negatively affect bone tissue even in healthy people - they block bone mineralization.

Another negative effect of nickel is allergy. People with hypersensitivity to the component develop a rash after contact with nickel-containing jewelry, coins, stainless steel objects, surgical implants or dental appliances. Allergic reactions also develop when taken orally. ^[20, 21, 22, 23, 24]

Nickel Deficiency: Risks and Symptoms

Scientists have not identified diseases that may be associated with a lack of a mineral - little is known about its deficiency in people, since we get a sufficient amount of the component from food and water. The researchers suggest that the deficiency may be associated with some negative effects:

- anemia due to iron deficiency;
- growth retardation;
- weak, brittle bones - osteoporosis;
- an increase in glucose levels.

Deficiency of the compound can contribute to the development of depression, liver disease.

More Isn't Always Better: Symptoms of Nickel Excess

There is no need to take the mineral in addition - it is enough in healthy food, and in large doses it is toxic. In several reports, scientists have documented the acute effects of high doses. In case of accidental ingestion of up to 2.5 g of nickel with water, people developed abdominal pain, diarrhea, nausea, vomiting, shortness of breath, and worsened blood counts. Excessive consumption contributes to the development of angina pectoris, asthma.

In hypersensitivity to the compound, oral exposure causes symptoms similar to contact dermatitis. An allergy to a mineral can occur after eating foods containing salts of nickel, cobalt or chromium. Overdose sometimes leads to a rare type of eczema - pompholyx. In this condition, itchy blisters form on the palms, fingers, soles. Therefore, it is advisable for allergy sufferers to avoid canned food and dishes cooked in nickel-plated dishes. [25, 26, 27]

Nickel drug interactions

Disulfiram, which is taken to treat alcoholism, reduces the absorption of nickel. No other drug effects were found.

Expert comment

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There are many important minerals, in addition to the two obvious ones iron and calcium, that help the body work more efficiently. Nickel is one of them. We need it in microdoses and some processes in the body depend on it. The good news is that if you eat a variety of fresh vegetables every day, then you are getting enough nickel from your diet and you don't need nickel supplements.

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