

## HEAVY METALS IN FOOD

<sup>1</sup>Haydarov Bekzod, <sup>2</sup>Khalilov Muzaffar, <sup>3</sup>Maratova Matluba, <sup>4</sup>Haydarova Sabrina

<sup>1</sup>Assistant teacher of the Yangiyer branch of Tashkent Institute of Chemical Technology

<sup>2</sup>Senior teacher of the Yangiyer branch of Tashkent Institute of Chemical Technology

<sup>3,4</sup>Students of the Yangiyer branch of Tashkent, Institute of Chemical Technology

<https://doi.org/10.5281/zenodo.7860096>

**Abstract.** *This article talks about heavy metals in food, metals necessary for the body, and information about their harmful and negative effects on human health.*

**Keywords:** *our diet, minerals, rationalization, association, ultraviolet, sterol, phospholipid, lipoprotein, cholesterol, phytosterol.*

Metals are elements necessary for the full life and normal functioning of the body in an acceptable amount in food. But at the same time, the excess amount of heavy metals harms the human body and causes a number of diseases. They can get into food in different ways: through air, soil, water or as a result of violating the rules of technological processing of food and raw materials. Heavy metals are copper, chromium, zinc, molybdenum, manganese, lead, cadmium, nickel, arsenic, mercury; active substances, necessary for the normal life of plants and people; they are present in the air we breathe, in the water we drink and wash, in the soil, they are absorbed by plants and participate in food chains and, accordingly, in food, cosmetics, etc. Many heavy metals, such as iron, copper, zinc, molybdenum, are involved in biological processes and are trace elements necessary for the activity of plants, animals and humans in certain quantities. On the other hand, heavy metals and their compounds can have a harmful effect on the human body, they can accumulate in tissues and cause a number of diseases. Metals that do not play a beneficial role in biological processes, such as lead and mercury, are defined as toxic metals. Certain elements, such as vanadium or cadmium, which are normally toxic to living organisms, may be beneficial to some species. Of plant products, mercury is most abundant in nuts, cocoa beans and chocolate (up to 0.1 mg/kg). Most other products do not contain more than 0.01-0.03 mg/kg of mercury. Mercury can stimulate changes in normal brain development in children and cause neurological changes in adults at high doses. In case of chronic poisoning, micromercurialism develops, this disease is manifested by rapid fatigue, increased excitability, then memory loss, self-doubt, nervousness, headache, tremors of limbs. Lead is a very toxic poison. Its natural amount in many plant and animal products does not exceed 0.5-1.0 mg/kg. Most lead is found in predatory fish (up to 2.0 mg/kg in tuna), molluscs and crustaceans (up to 10 mg/kg). Mainly, the increase in lead content is observed in cans placed in a so-called jointed tin, soldered on the side and lid with solder containing a certain amount of lead. Unfortunately, the soldering is sometimes of poor quality (solder spatter is formed), and although the boxes are additionally coated with a special varnish, this does not always help. In very rare cases (up to 2%), there are cases when canned food in this container, especially during long-term storage, accumulates up to 3 mg / kg of lead (up to 2%), which is definitely a health hazard is dangerous. Lead slows down the cognitive and intellectual development of children and increases blood pressure. and causes cardiovascular diseases in adults. Changes in the nervous system are manifested by headaches, dizziness, increased fatigue, irritability, sleep disorders, memory disorders, muscle hypotension, sweating. Lead can replace calcium in bones and become a source of permanent poisoning. becomes Organic lead compounds

are more toxic. A highly effective binder for ingested lead turned out to be pectin from orange peel. Currently, the following maximum levels of lead in food products are: milk; products for newborns 0.02 mg/kg; fruit vegetables; beef, mutton and pork, poultry; animal and poultry fats, vegetable oils; milk fat 0.1 mg/kg; small fruits, apples and grapes; cereals, beans, wine 0.2 mg / kg; feed by-products of cattle, pigs and poultry 0.5 mg/kg. Cadmium is a highly toxic element and is present in food about 5-10 times less than lead. High concentrations are observed in cocoa powder (up to 0.5 mg/kg), animal kidneys (up to 1.0 mg/kg) and fish (up to 0.2 mg/kg). Canned products made from fused tin cans have increased cadmium content because cadmium, like lead, migrates from poor-quality solder into the product, which also contains some cadmium. High levels of cadmium can occur as a result of its introduction from the environment, for example, cadmium-contaminated areas are used for growing crops or animals. In this case, the risk group is vegetables, fruits, meat, milk. Wheat contains three times more cadmium than rye. Cadmium accumulates primarily in fungi, many plants (especially grains, vegetables and legumes, as well as nuts) and animals (primarily in water). Heavy metals enter plants from the soil. Some soils naturally contain cadmium, while others are contaminated with industrial waste or treated with cadmium fertilizers. Natural cadmium in food is about 5-10 times less than lead. High concentrations are observed in cocoa powder (up to 0.5 mg/kg), animal kidneys (up to 1.0 mg/kg) and fish (up to 0.2 mg/kg). Cadmium's chemical properties are related to zinc, and it can replace zinc in a number of biochemical processes in the body, disrupting them (for example, acting as a pseudo-activator of proteins). mg dose can be fatal for humans. Especially -3 138 Cadmium has a long shelf life: about 0.1% of the dose taken is removed from the body within 1 day. Symptoms of cadmium poisoning: protein in the urine, damage to the central nervous system, acute bone pain, dysfunction of the genital organs. Cadmium affects blood pressure, can lead to the formation of kidney stones (accumulation in the kidneys is especially strong). Emphysema is added for smokers or those who work in production using cadmium. Arsenic is a chemical element that exists in everything in the environment, and humans have no control over it. The source of arsenic contamination of food and water: household waste, industrial waste, chemical pollution, farming, pesticides in the fields, which then enter groundwater and rivers with rain, not to mention the high level of arsenic in the soil itself . Because of its widespread use, arsenic has long been present in our food chain. Research shows that arsenic levels today have been dangerously elevated by human activity. Arsenic is found in the following foods: white and brown rice, apple juice, chicken, protein shakes and protein powder. Long-term exposure to large concentrations of arsenic causes cancer of the liver, kidneys, bladder, lungs or prostate. Symptoms of arsenic poisoning: diarrhea, sharp pains in the abdomen, vomiting, if the dose is too high, the body cannot remove it, then tingling in the legs, arms, muscle cramps and death. If arsenic is regularly present in drinking water and food, you will inevitably get cancer or skin pathology. The following consequences are also possible: the development of the heart, vascular diseases, diabetes. Regular arsenic poisoning in small doses, changes in pigmentation, hyperkeratosis, excessive thickening of the cornea (on the palms, soles of the feet), skin cancer is inevitable after five years of poisoning, hyperkeratosis is a harbinger of skin cancer, this is the official statement of WHO. In addition to skin cancer, long-term exposure to arsenic can also cause bladder and lung cancer, and damage. blood vessels, warts on the skin and disorders of the nervous system. The International Agency for Research on Cancer (IARC) has listed arsenic and arsenic compounds in our food and water as carcinogens. Regular exposure to low levels of arsenic in the body of a pregnant woman causes defects in the developing

fetus. Copper is an essential trace element required by the body for a number of functions, from the formation of bone and connective tissue to the production of specific enzymes. According to the WHO recommendation, the daily need for copper for adults is 1.5 mg. Copper is present in all tissues of the body, but its main reserves are in the liver, less in the brain, heart, kidneys and muscles. Although copper is the third most abundant micronutrient in the human body after iron and zinc, it is only found in about one mg in the body. About 90% of copper in the blood is part of compounds that transport iron to tissues, and also works as enzymes that accelerate its oxidation, i.e., its processing and absorption. Therefore, often symptoms of iron deficiency (for example, low hemoglobin) actually mean copper deficiency. In addition, copper is a component of the enzyme lysyl oxidase, which is involved in the synthesis of collagen and elastin, two important structural proteins found in bones and bones. connective tissue. Copper is also present in tyrosinase, an important enzyme that converts tyrosine into melanin, the pigment that gives color to skin and hair. Copper is also found in substances that make up the melanin covering that protects nerves. Excessive consumption of copper can cause abdominal pain and colic, nausea, diarrhea, vomiting, and liver damage. In addition, some experts believe that elevated copper levels, especially in zinc deficiency, may be a contributing factor to schizophrenia, hypertension, depression, insomnia, premature aging, and premenstrual syndrome. postpartum depression may also be associated with high copper levels. This is due to the fact that during pregnancy, copper accumulates in the body in a double dose, and it takes three doses. 4139 months to bring it back to normal. Because excess copper is excreted through the bile, copper poisoning can occur in people with liver problems or other diseases associated with reduced bile secretion. The toxic effects of increased levels of copper in tissues have been observed in patients with Wilson's disease, which is a genetic disorder of the ability to accumulate copper in various organs, which leads to a violation of protein synthesis for copper transport in the blood. The amount of zinc in the body of an adult is small, 1.5-2 g. The daily requirement of zinc is mg. The upper limit of zinc intake is 25 mg per day. It affects our body at the cellular level, is directly involved in metabolism: this important trace element is part of all vitamins, enzymes and hormones, in fact it occupies 98% of all our cells. Zinc is indispensable for the normal functioning of the human body and, of course, the soul, because "a healthy mind in a healthy body". The presence of this trace element in the body ensures the normal life and good health of a person. On the contrary, its lack can cause a number of serious problems: impaired reproductive function; malfunction of the immune system; allergic reactions; dermatitis; poor blood circulation; anemia; slow down the healing process; inhibition of normal growth, puberty; loss of taste and smell; hair loss; decrease in the results obtained in athletes; teenagers have a tendency to alcoholism; in pregnant women, termination of pregnancy; premature birth; birth of weak children with low birth weight. Thus, most zinc is found in grains and legumes and nuts. However, oysters are the champions in the content of this useful substance per 100 grams. Boiled eel and wheat bran, meat products, dry or pressed yeast are also rich in zinc. Zinc is also found in poultry, cheeses, onions, potatoes, garlic, green vegetables, buckwheat, lentils, soybeans, barley flour, sour cream, celery, asparagus, radishes, bread, citrus fruits, apples, figs, dates, cabbage. layers, raspberries, black currants. Toxic elements can enter food products from raw materials and during technological processing in dangerous concentrations for humans only in case of violation of relevant technological instructions. Therefore, in the raw materials of plants, they may appear in violation of the rules for the use of pesticides containing toxic elements such as mercury, lead, arsenic, etc.

We all know that there are many metals that we consume through our diet and nutrition that are essential for our body's basic functions, and some of the macro requirements are essential for our health. We meet minerals. Mineral substances obtained from food products are required in small amounts as part of the micronutrient requirement, but the heavy metals contained in them can also harm human health. At the same time, due to various causes of unhealthy lifestyle and diet, poverty and low prices, imbalances with deficiency or excess of these important mineral nutrients are common, which in turn is detrimental to our health. It has an effect. It is even worse to consume food substances without knowing whether they are harmful or useful. Let's study such cases. Calcium intake and cancer risk: Several previous studies have shown that high intakes of the mineral calcium from food (low-fat dairy sources) or supplements may increase the risk of colon cancer. associated with a reduced risk of cancer. These were worked on by M. Slattery, J Epidemiology. Kampmann et al., 2000 noted that it induces cancer control. Biasco G and Paganelli M, Ann NY Acad Sci, 1999 concluded that calcium carbonate supplementation leads to a reduction in calcium polyp prevention studies. Grau MV and J Natl Cancer Inst et al., 2007, proved the precursor of colon cancer in the development of pre-cancerous, non-malignant adenoma tumors in the colon.

Also, a recent observational study of 1,169 colorectal cancer patients found no all-cause benefit for calcium intake. Wesselink E et al., Am Clin of Nutrition, 2020 There are many studies that show an ambiguous association of calcium intake with a reduced risk of colorectal cancer. Therefore, there is insufficient evidence to recommend regular use of calcium supplements to prevent colorectal cancer. However, there are a few studies that have found an association between calcium intake above 1500 mg/day and the risk of developing prostate cancer. Prevalence, 2003; Mitrou PN et al, Int J Cancer, 2007).

The natural sources of food we eat provide the mineral nutrients we need for our health and well-being. There may be changes due to the change and other environmental factors that cause changes in the mineral composition. Excessive consumption of minerals such as calcium, phosphorus and copper; Deficiencies in minerals such as magnesium, zinc (low intake of zinc-rich foods) and selenium are associated with an increased risk of cancer and other diseases. We should pay attention to food products containing zinc, magnesium and selenium and know how to get them in the right amount. Also, in order to reduce the risk of such diseases, it is necessary to limit the consumption of nutritional minerals such as calcium, phosphorus and copper in the recommended amount. Because a balanced healthy diet of natural food products is a means to maintain the recommended level of important mineral nutrients in the body in diseases.

Essential Fatty Acids (EFA) Fatty acids are essential for humans and other animals because their bodies require them for health, but they are difficult to synthesize. Only two fatty acids are known to be essential for humans: alpha-linolenic acid and linoleic acid. In addition, fats in food are more harmful than beneficial to our body.

Vitamins are organic molecules, amino acids or fatty acids necessary for the body. They usually act as enzymatic cofactors, metabolic regulators or antioxidants. Humans require thirteen vitamins in their diet, most of which are actually groups of related molecules (for example, vitamin E includes tocopherols and tocotrienols): [15] vitamins A, C, D, E, K, thiamin (B.1), riboflavin (B.2), niacin (B.3), pantothenic acid (B.5), vitamin B6 (e.g. pyridoxine), biotin (B.7), folate (B.9) and cobalamin (B.12). The requirement for vitamin D is conditional because people with sufficient

exposure to ultraviolet light from the sun or from artificial sources can synthesize vitamin D in the skin.

Mineral substances and exogenous chemical elements are indispensable for life. Although the four elements, carbon, hydrogen, oxygen, and nitrogen, are essential to life, they are so abundant in food and drink that they are not considered nutrients and have no recommended intake for them as minerals. Q. Also, the need for nitrogen is met by the requirements for protein composed of nitrogenous amino acids. Sulfur is important, but again there is no recommended intake. Instead, recommended intakes are determined for the sulfur amino acids in methionine and cysteine.

Also, in the composition of food products, for example, margarine products are of great importance in the rationalization of fatty food. Margarine is a mixture of vegetable and animal fats in their natural form with the addition of non-dairy milk, egg yolk, vitamins and various flavoring components. But the production of margarine has a harmful side. That is, when it is prepared, phosphatides are lost, and when we eat it, we are fed with certain harmful metals.

Sterols and phospholipids in fatty foods are not important nutritional factors. Sterols include cholesterol and phytosterols, which are part of membranes. Phospholipids have a lipotropic effect, stimulate the transport of neutral fats from the liver and are stabilizing components of lipoproteins. Of the various phytosterols present in vegetable oils, the physiological role of betasitosterol has been studied the most. This sterol reduces the absorption of cholesterol in the intestine and thus has a cholesterol-lowering effect. Recent data have shown that phytosterols are involved in lipid formation in humans and animals. In particular, they are found in the membranes of human erythrocytes. Phospholipids are an integral part of animal and unprocessed vegetable fat foods. They help the formation of fatty micelles in the digestive tract. This process is necessary for the breakdown and absorption of dietary triglycerides. Phospholipids have a lipotropic effect and help to remove neutral fats from the liver.

#### **DETERMINATION OF MACRO AND MICRO ELEMENTS IN SAMPLES BY OPTICAL EMISSION SPECTROMETRY METHOD AVIO200 (ISP – OES)**

200 mg of the sample is weighed on an analytical balance (FA220 4N) for mineralization, i.e. to turn it into a clear solution. A mineralization device (MILESTONE Ethos Easy, Italy) was used to mineralize the sample. For this, a sample (200 mg), 6 ml of nitric acid (HNO<sub>3</sub>) purified on the basis of distillation, i.e. acid distilled in an infrared acid purification device (Distillacid BSB-939-IR) and 2 ml of hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) as an oxidizer, are placed in the test tube of the device. . 20 min. during 1800C, all the mixture is mineralized.

After the mineralization process is completed, the mixture in the test tube is diluted with distilled water (BIOSAN, Latvia) to 40 ml in a separate conical volumetric flask.

The solution in the flask is put into special test tubes in the Autosampling Department and placed for analysis. The prepared sample was analyzed in an Avio200 ISP - OES Inductively Coupled Plasma Optical Emission Spectrometer (Perkin Elmer, USA). The accuracy of the device is high, and it allows to measure the elements contained in the solution to an accuracy of 10<sup>-9</sup>g.

**The data obtained as a result of the analysis are as follows:**

	<b>Sb</b>	<b>Sn</b>	<b>Cr</b>	<b>As</b>	<b>Pb</b>	<b>Cd</b>	<b>Cu</b>	<b>Ag</b>	<b>Hg</b>
<b>Sample name</b>	mg/10 0g	mg/10 0g	mg/10 0g	mg/10 0g	mg/10 0g	mg/10 0g	mg/10 0g	mg/100g	mg/10 0g

Sunflower oil was used	0	0	0,204	0	0,488	0,116	0,192		0,072
Cottonseed oil used	0	0	0,192	0	0,492	0,12	0,18	0	0,68
Sunflower oil is simple	0	0	0,176	0	0,44	0,12	0,176		0,076
Cottonseed oil simple	0	0	0,196	0	0,52	0,12	0,192	0	0,064
Margarine	0,0001	0	0,184	0	0,492	0,12	0,192	0	0,072

In conclusion, metals play an important role in the composition of food products and they have an important role. For example, in the process of fat oxidation, a part of polyunsaturated fatty metals is lost, and new substances appear in food. Tarnishing of oils due to long-term or improper storage is easily detected by well-known and organoleptic methods. According to current sanitary and hygienic legislation, the content of total oxidation products of thermally processed metals should not exceed 1%. The greatest risk for the accumulation of oxidation products is fried foods, often fried in vegetable oil, pies, donuts, fish, potatoes and other products.

### REFERENCES

1. Mahmudova N. M., Handbook of social hygiene, T., 1993; Otaboyev Sh. T., Iskanderov T. I., Communal hygiene, T., 1993.
2. Borisov I.N. "Methodology of teaching chemistry". T.: "Teacher". 1966.
3. Abdullayev Sh.B. "Text of lectures on chemistry teaching methodology". Namangan,
4. A.V. Belotsvetov, S.D. Beskov, N.G. Klyuchnikov Khimicheskaya technology. M. "Prosvesheniya". 1976.
5. Q. Gafurov, I. Shamshidinov Technology of mineral fertilizers and salts. T.: "Science and technology". 2007
6. M.E. Pozin Technology mineralnix udobreniy. L.: Chemistry 1965
7. Technology kaliynykh udobreniy / Pod ed.V.V.Pechkovsky. - Minsk: Vysheyschaya school, 1978.-304 p.
8. Titkov S.N., Mamedov A.I., Solovev E.I. Obogashchenie kaliynykh rud. - M.: Nedra, 1982.- 216 p.
9. Pozin M.E. Technology mineralnyx udobreniy: Uchebnik dlya vozov. - L.: Chemistry, 1989.- S. 263-295
10. Kashkarov O.D., Sokolov I.D. Technology kaliynykh udobreniy. - L., Chemistry, 1978. - 248p.