

Effect of heavy metals on living organisms

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ABSTRACT

The rapid development of technology and the changes that are occurring in the world today largely affect on the environment. One of the primary sources of pollution of the biosphere are industrial plants, which emit both gaseous substances (eg. Carbon monoxide, sulfur and nitrogen) and dust, containing all sorts of toxic substances. For the serious consequences of the development of civilization and industry should be spread include heavy metals. Included in the atmosphere, dust and heavy metals fall to the ground parts of plants and enters the soil. Shall be collected by the roots of plants or animals grazing on the roads and thus incorporated into the food chain. These elements are not biodegradable. They are indestructible and indelible. Once released into the environment continuously circulate therein, changing, at most its shape. Heavy metals are ubiquitous and can be detected in every organic material and in every living organism. They are a particular threat to humans.

Keywords: heavy metals; soil; iron; zinc; copper; manganese; cobalt; mercury; lead; cadmium

1. CHARACTERISTICS OF HEAVY METALS

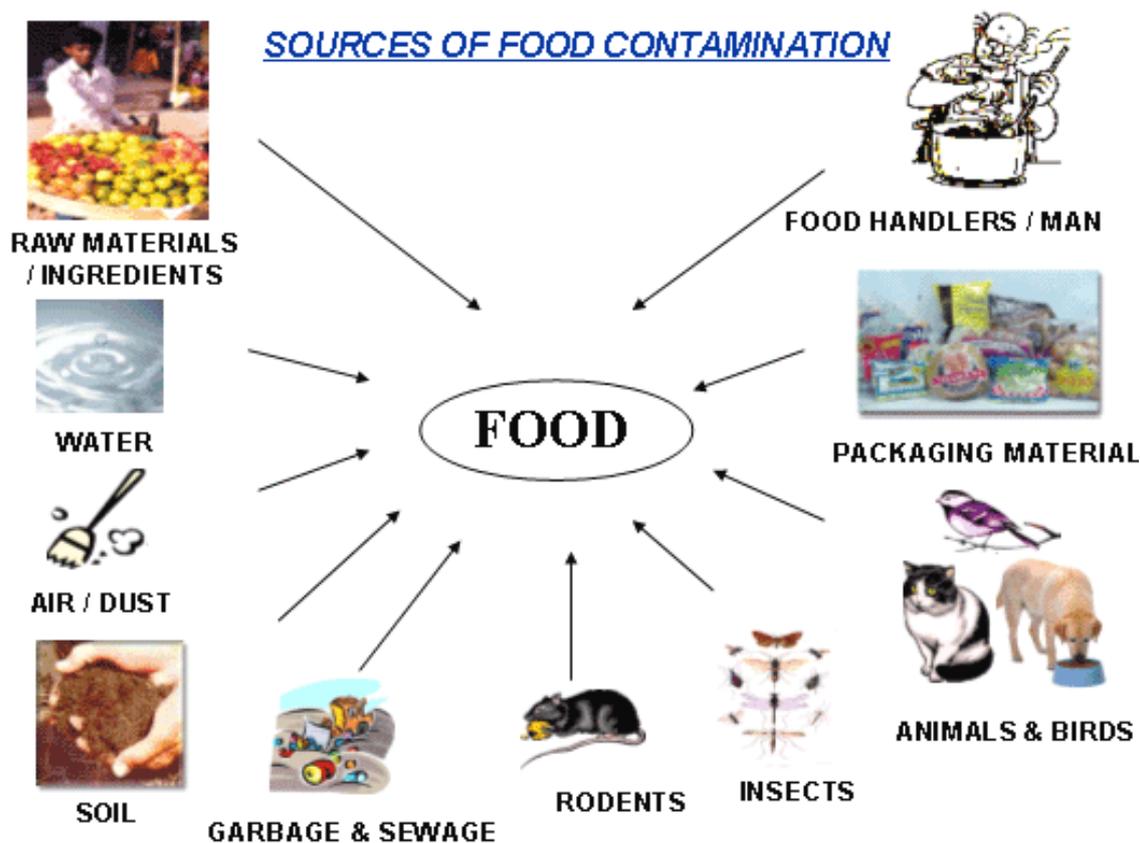
Heavy metals are metals are recognized at the present stage of development of the so-called. inorganic biochemistry unnecessary or even toxic. Once introduced in small doses for a long time in the body can cause acute or chronic poisoning. A number of heavy metals is a constant and necessary component of a living body (iron, zinc, copper, manganese, cobalt). Others such as mercury, lead, cadmium, thallium, bar are harmful to the body [11].

1.1. Iron (Fe) is a constant and necessary component of the animal and human. Used for the synthesis of hemoglobin and myoglobin muscle. The daily requirement of iron is covered in food. When the deficiency disorders are formed (anemia), which is treated with the administration of iron salts as a medicament [7]. Iron is found in all organs and tissues,

and the largest quantities are stored in the liver and spleen. Iron salts taken orally do not poison, but can produce side effects such as constipation and vomiting [10].

1.2. Zinc (Zn) in the body plays an important role in a variety of enzymes and hormones. Accumulates in the liver, pancreas and on the surface of red blood cells. In medicine, zinc oxide is used as a drug astringent and germicide. Symptoms of zinc poisoning are: damage to the lining of the nasal cavity - throat and lower respiratory tract and necrotic changes in the walls of the stomach, duodenum and intestines [7]. Characteristic acute form of zinc poisoning is a "fever foundry" - an occupational disease which occurs in workers employed when working with zinc heated to a temperature close to boiling.

1.3. Copper (Cu) - essential element for the living body, because plays an important role in the synthesis of hemoglobin. Due to the volatility of the valence of copper ions they have a catalytic effect on various processes Oxo-reduction enzymes. A small amount of copper is in the liver, spleen, kidney, lung and blood. Fatal poisoning are extremely rare, and the rapid occurrence of violent vomiting removes most of the poison entered. Transitional poisoning can occur after ingestion of improperly fruit sprayed with insecticide copper or preserved foods containing added excessive amounts of copper sulphate [8].



1.4. Manganese (Mn) - is one of the elements necessary for a live organism. Acts as a carrier of oxygen in the tissue redox processes. In medicine, potassium permanganate is used as a disinfectant for cleaning wounds [1]. The weak solution is sometimes used to wash the stomach poisoning easily oxidizable substances. Manganese poisoning occur only at

higher concentrations of vapor or smoke. Characteristic symptoms include fatigue, weakness, drowsiness, parkinsono symptoms similar to tremors, maskowaty face and difficulty walking. Still following hair loss and loosening of the teeth [14].

1.5. Cobalt (Co) - is an essential element for life system as a factor against the anemic forming part of a molecule of vitamin B12 "cobalamin". It irritates causing bone marrow hyperplasia, and consequently a significant increase in the number of red blood cells. In the tissues and organs of cobalt collects in small amounts. Causes allergic reactions and acute poisoning with paralysis of the nervous system and seizures. Chronic poisoning observed growth retardation and weight and enlarged thyroid deficiency associated with this gland [2].

1.6. Mercury (Hg) - shiny silvery white metal, liquid at room temperature. Density 13.53 g / cm³, melting point - 38,8 °C. In the compounds present at 1 and 2 oxidation. With many metals produces alloys - amalgams. In nature is rare and a small number. It is used in thermometers, barometers, manometers, diffusion pumps, for the manufacture of quartz lamps. Salts of mercury and its organic compounds have antibacterial and are used in medicine for the decontamination of surgical instruments and intact skin. Internally, it is appropriate in certain kidney diseases. But due to its high toxicity of spaces strict dosage. Mercury in the liquid state thi harmful. Minamata disease which causes first appeared in Japan in the Gulf of Minamata [11]. Is approx. 200 people died of poisoning with mercury compounds contained in fish. Mercury was there because of the factory, which was seeing directly into the water. Mercury vapor can cause severe poisoning and even death. Mercury vapor lamps are used in mercury for, inter alia, to radiation treatment. Due to the high content of ultraviolet radiation emitted light are used as germicidal lamps in rooms that require total sterility (laboratories, laminar flow in which eye drops are prepared, laboratories for the preparation of infusion). Historically, in the form of mercury chloride was used in veterinary medicine as a laxative. However, as a potent poison it is no longer used. In the living organism causes severe agitation, tremor, blurred vision, hearing and speech, kidney damage, and in severe poisoning coma and consequently death [2,6].

1.7. Lead (Pb) is a typical gray-colored metal; is a soft, malleable. Density 11.34 g / cm³, melting point 327,4 °C. All lead compounds are poisonous. The chemical compounds found to lead 2 and the oxidation state +4. In the open covered with oxide film. Lead is a component bearing alloys and soldering alloys. With lead are also carried out: the battery plates, apparatus for the production of sulfuric acid, drain water pipes, electric cable, shot, missile components. Sheets of lead placed in the construction of large buildings to protect against vibration and noise. Lead compounds are used for the manufacture of anticorrosive paints and varnishes, pigments and mortar - currently in decline due to the harmful properties of these compounds. Lead oxides are a component of glassware., Polysulfide rubber (as a curing agent). Tetraethyl lead Pb(C₂H₅)₄ and tetramethyl Pb(CH₃)₄ are used as anti-knock in petrol.

Heavy Metal Ions	Related Diseases And Symptoms
Sb	Female Infertility
Hg	Minamata Disease
As	Blackfoot Disease
Pb	Cardiovascular Disease 、 Cerebral Stroke 、 Cognitive Impairment
Cr	Lead Poisoning
Cu	Liver And Kidney Disease 、 Central Nervous System Damage
Cd	Itai-Itai Disease

All lead compounds are poisonous. The most common disease is lead [6]. It is a chronic lead poisoning and its salts in employees printers, battery factories and factories of lead paint. Acute poisoning are rare. Chronic poisoning are mainly gastrointestinal and nervous systems. The main symptoms are fatigue, tiredness, muscle paralysis, gray border around the teeth, colic lead. At the same time there is proteinuria, hematuria, and brain disorders. Treatment is primarily hospital, comprising administering antidotes and high levels of vitamin B1 and B12. However, the most important is the appropriate occupational health and nutrition [14].

THE DETOXMAT™ STUDY RESULT

	Increase Over Baseline 0-24 Hrs.	Increase Over Baseline 24-48 Hrs.	Maximum Increase Over Baseline Total 48 Hrs.
Aluminum	>100%:960 ug/24 Hrs	0%	>100%:960 ug/24 Hrs
Antimony	0%	50%	50%
Arsenic	75%	1483.30%	1558.30%
Beryllium	0%	0%	0%
Bismuth	4967.70%	1833.30%	6801%
Cadmium	133.30%	100%	233.30%
Lead	2033.30%	2300%	4333.30%
Mercury	0%	312.50%	312.50%
Nickel	977.80%	1011.10%	1988.90%
Platinum	>100%: 0.8ug/24Hrs	0%	>100%: 0.8ug/24Hrs
Thallium	100%	200%	300%
Thorium	>100%: 0.05ug/24Hrs	0.00%	>100%:0.05ug/24Hrs
Tin	1380%	600%	1980%
Tungsten	50%	100%	150%
Uranium	>100%:0.09ug/24Hrs	0%	>100%:0.09ug/24 Hrs

1.8. Cadmium (Cd) is obtained as a by-product of zinc smelters, the roasted ore reduction and separation by fractional distillation. It silvery metal, like zinc and some lead, a density of 8.65 g / cm^3 and a melting point of $321 \text{ }^\circ\text{C}$. The chemical compounds found in the second oxidation state is a non-noble metal, air cover with a layer of oxide is readily with acids. Metallic cadmium is used in the manufacture of alloys, for the preparation of protective coatings (cadmium) and for the production of batteries. Cadmium sulfide CdS and CdSe cadmium selenide is used as a pigment for artistic purposes (cadmium yellow, cadmium orange). Cadmium has no medical use. However, poisoning him, his vapor or smoke are mainly found in the industry. Absorption of cadmium oxide fumes occurs by inhalation. They have no characteristic odor or irritation, and therefore can easily be absorbed quantities dangerous to humans. The main symptoms of poisoning is a dry throat, headache, shortness of breath, heart failure and elevated body temperature. From the digestive tract absorbs it very quickly and accumulates mainly in the liver and kidney [2]. Symptoms of poisoning occur after 4-5 hours and have ślinotokiem, persistent vomiting, severe diarrhea, and abdominal pain. Chronic poisoning develops slowly, and for the first year is asymptomatic. Only after 5 years appear articular muscle pain, shortness of breath, kidney damage, lung lesions and skeletal system [4].

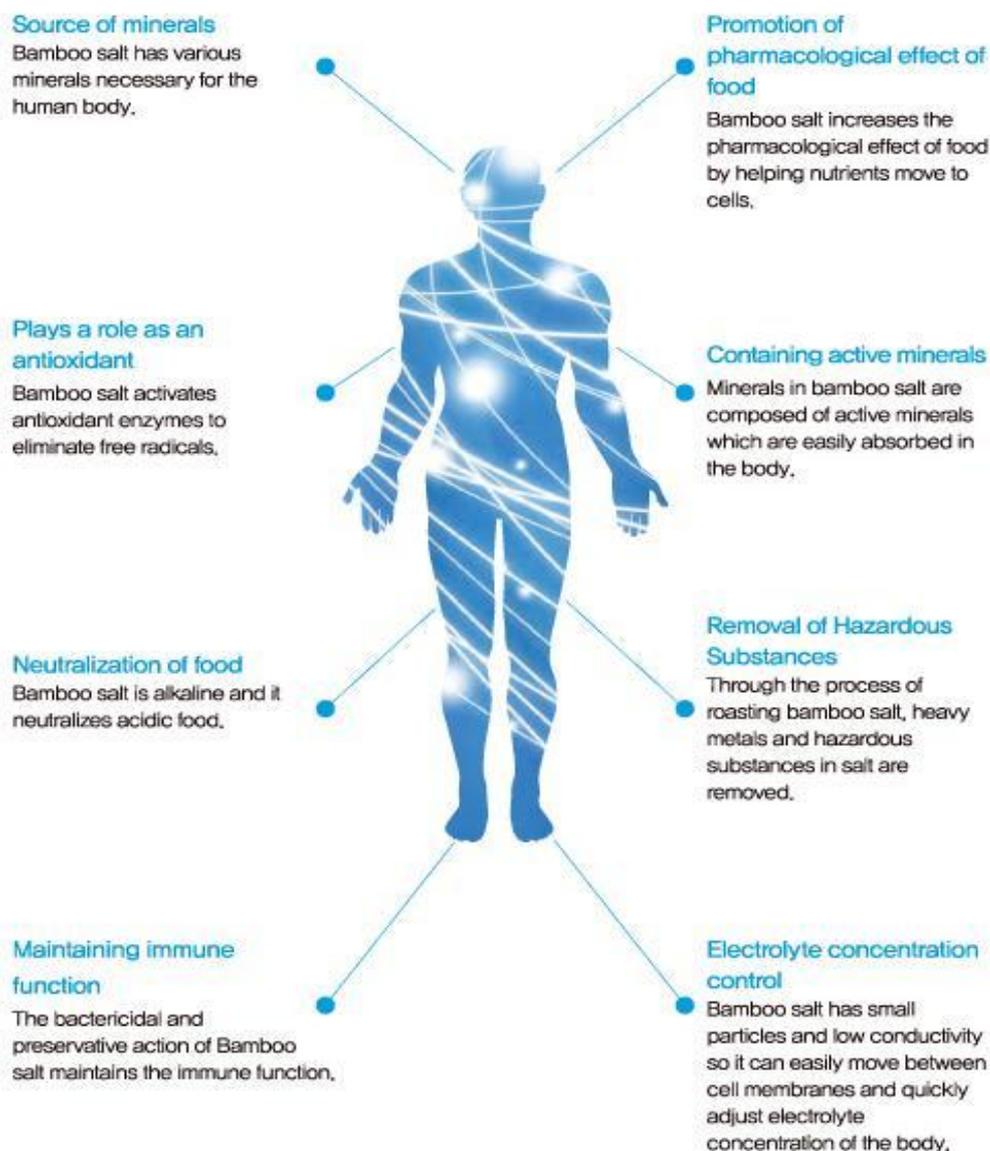
1.9. Thallium (Ta) occurs naturally in small quantities in minerals containing zinc, lead, iron, copper and chromium. Tal is obtained as a by-product in the processing of pyrites, metallic formed by electrolysis Tl_2SO_4 . Silver-gray, ductile, very soft metal, density 11.9 g / cm^3 , melting point $303,5 \text{ }^\circ\text{C}$. Creates two allotropic varieties. The chemical compounds found in the first and third oxidation. Thallium compounds are highly toxic. Tal is subjected to heated oxygen (to produce a mixture of oxides and Tl_2O_3 Tl_2O) and chlorine (TlCl_3). With fluorine, hydrogen fluoride, hydrochloric acid, nitric acid and sulfuric acid reacts even at room temperature.

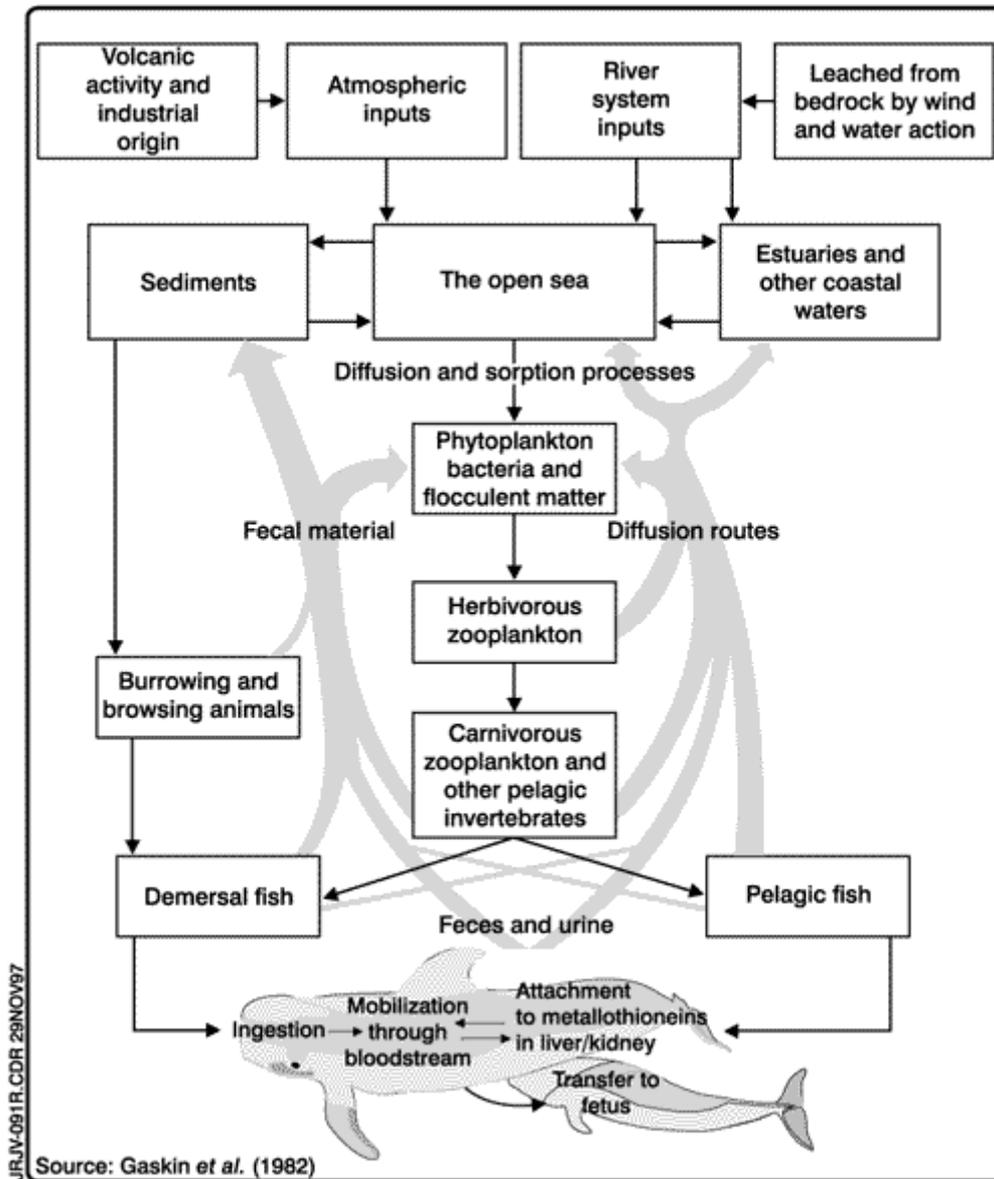
1.10. Bar (Ba) - silvery white metal, a density of 3.76 g / cm^3 , a melting point of $710 \text{ }^\circ\text{C}$. The chemical compounds bar occurs in the +2 oxidation state. It is very active chemically. Bar creates a sparingly soluble salts with oxygen (exception: nitrate (V) bar). Soluble barium compounds are poisons. Water barite (barium hydroxide solution) is a reagent in analytical chemistry. Sulfate (VI), barium is used for the production of white paint (lithopone) and a contrast material in medical diagnosis of the gastrointestinal tract. Some barium compounds are used in pyrotechnics [16]. The bar is poisonous mainly after getting into the body through the digestive tract. It is a typical poison that causes severe muscle spasms of smooth muscles of internal organs. Initially, stimulates, and devastatingly on the nervous system. Induces a strong contraction of the intestines, bloody diarrhea and vomiting. Bronchial muscle contractions cause an asthma, and death occurs due to paralysis of the respiratory center [3].

The highly heated reacts with sulfur and steam. It is resistant to hydrogen, nitrogen, carbon dioxide and alkali. Tal is used as an ingredient in alloys, optical glass, semiconductor devices, catalysts, acrylic-metallic compounds (used in organic synthesis), pesticides (mainly rodenticides), thermometers. ^{204}Tl isotope is a source of β radiation, which is used inter alia in the paper industry to measure the thickness of the paper. Formerly used as a thallium acetate inhibits sweating with tuberculosis and sulfate depilatory creams thallium [2]. Tal is very widespread in nature and in small quantities is both in animals and plants. Thallium salts are readily absorbed through the respiratory tract, gastrointestinal tract and skin. Accumulates

in the body, especially the liver, brain, and hair. They are very strong poison. Thallium poisoning characteristic is the absence of obvious symptoms in the initial period. There are only a feeling of nausea and burning desire. In a later stage, develop and grow gradually symptoms such as: increased heart rate, increased blood pressure, dilated pupils, loss of sensation and reflexes in the lower limbs. The protein appears in the urine and on the gums dark seam formed from sulfide deposited tall. A characteristic symptom of toxicity is the appearance of deposits of black dye in the hair roots. Hair loss and are the nails appear white lateral stripes. Treatment usually Hospital - administration of causing vomiting, and drip with sodium thiosulfate [3].

Characteristics of Bamboo Salt as a Biological Active Substance





2. CONCLUSIONS

Heavy metals are metallic elements with an atomic number greater than 20, which exhibit metallic properties [14]. Among them, there are trace elements, or elements required for proper growth, development and functioning of living organisms (eg. Copper, zinc, chromium, iron) and those which are unnecessary for them (including cadmium, lead, mercury). However, their common feature is that beyond a certain limit are toxic and are very dangerous for plants, animals and humans [3]. Toxic heavy metals depends primarily on the degree of contamination, but also on the species and age of the organism, the route of introduction of the body, the form of the chemical, the type of interaction with other metals, or the physiological condition of the body [11]. Metals penetrate into the body by inhalation or gastrointestinal tract, and then transported by the blood to the tissues and organs, where they are concentrated and stored.

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