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# Heavy metals in circulation biogeochemical

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**ABSTRACT**

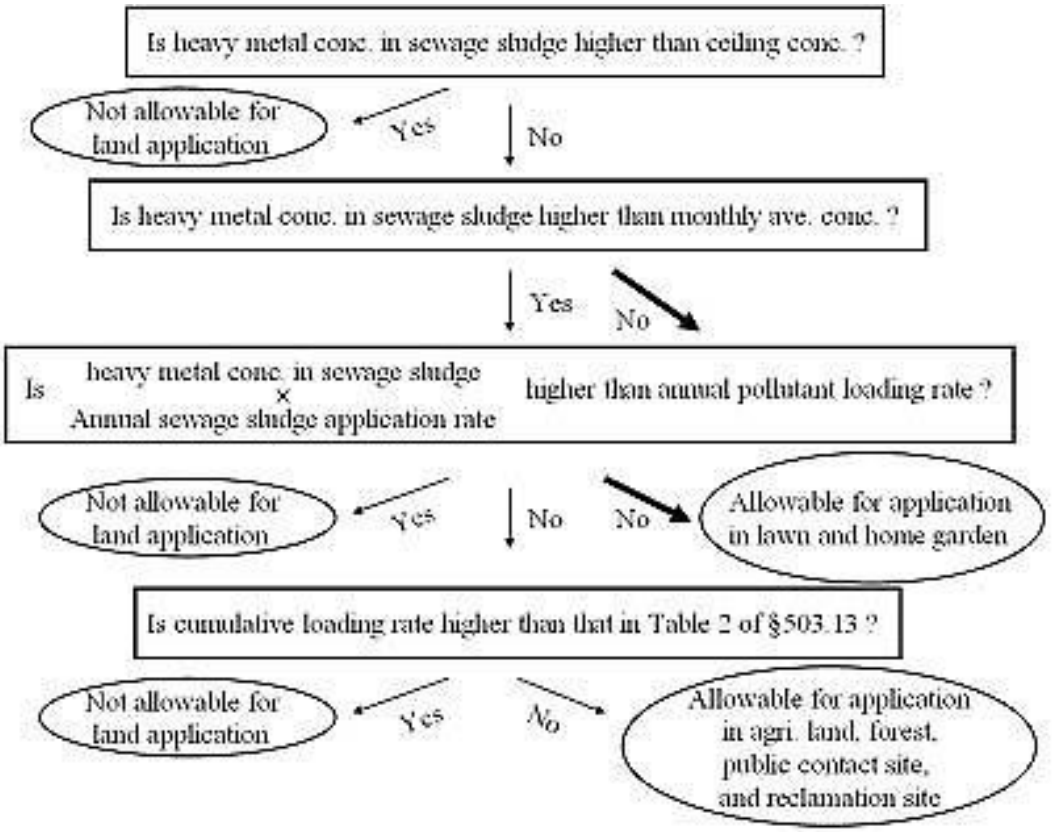
Heavy metals can come from two types of sources: natural and anthropogenic. Natural origin of heavy metals associated with: volcanic eruptions, weathering of rocks, processes soil - creative, forest fires or evaporation of the oceans. Anthropogenic sources of pollution these elements is primarily the burning of fuels, both in power and heating plants and power plants as well as regional and local municipal boiler houses, as well as in the home. In addition to the natural environment gets heavy metals as a result of non-ferrous metals and iron, waste incineration and transport. 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 [6]. 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.

***Keywords*:** heavy metals; biogeochemical; circulation

## 1. INTRODUCTION

Heavy metals are involved in the biogeochemical cycle. A part of the biological cycle, that is, the flow of the trophic chain elements in which the first link is a plant, another animal, and the last one metal Moving to the next cell associated with an increased concentration resulting in the partial accumulation of these elements in the cell [15]. Heavy metals can come from two types of sources: natural and anthropogenic. Natural origin of heavy metals associated with: volcanic eruptions, weathering of rocks, processes soil – creative forest fires or evaporation of the oceans. Anthropogenic sources of pollution these elements is primarily the burning of fuels, both in power and heating plants and power plants as well as regional

and local municipal boiler houses, as well as in the home. In addition to the natural environment gets heavy metals as a result of non-ferrous metals and iron, waste incineration and transport [6]. They are dangerous poisons for living organisms (eg. Lead, cadmium, mercury, arsenic), but among them are elements which are necessary for normal growth and function (eg. Copper, zinc, iron). However, beyond a certain limit of normal content of all the toxic effect [12].



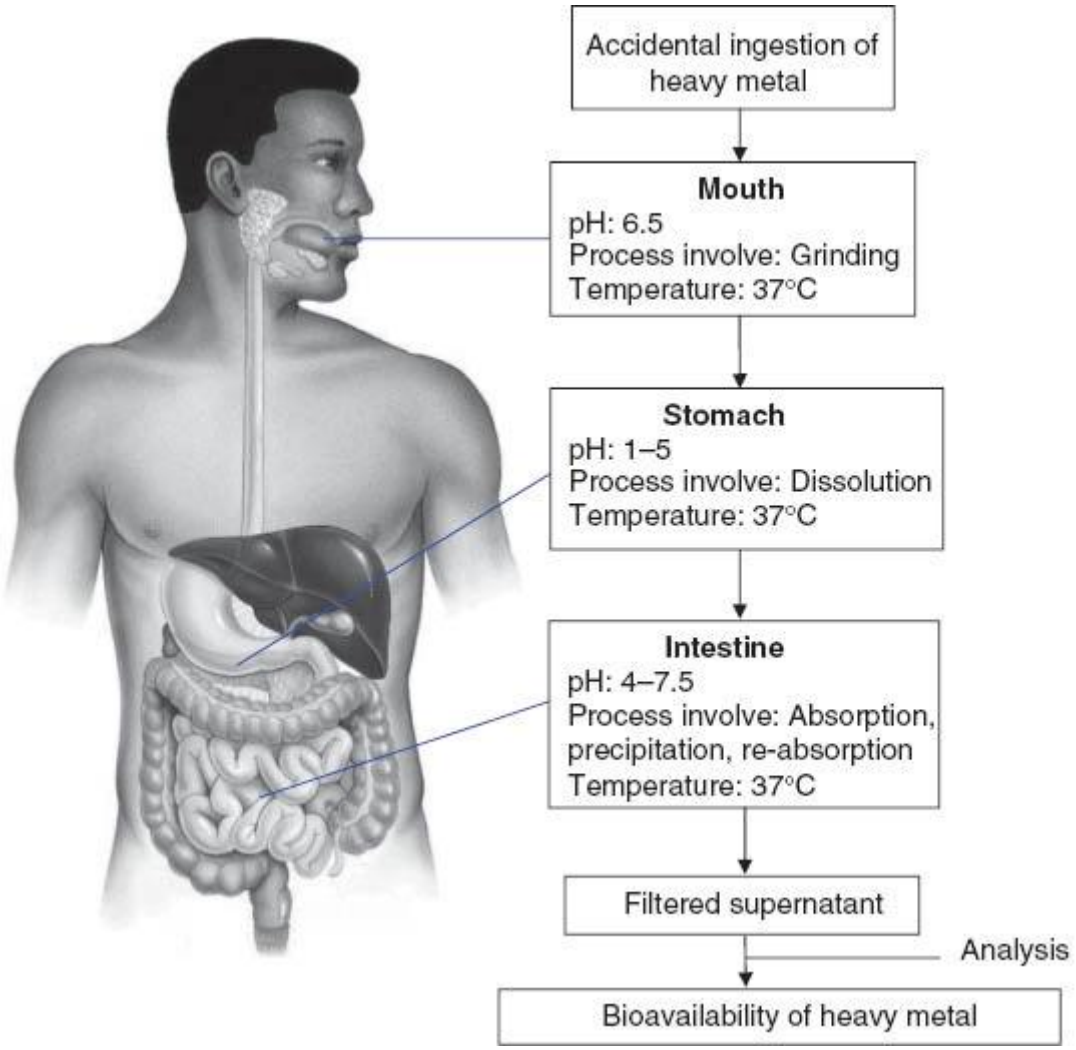

The danger posed by heavy metals is due to their properties, including: vulnerability to bioaccumulation of the environment or the soil, easy absorption from the gastrointestinal tract, penetrating through the placenta to the embryo, a biological barrier permeability through the blood - brain and creating connections with sulfhydryl groups proteins. Their positive role is mainly connected with the enzymes, especially those that are involved in the processes of reduction and oxidation. Another function of these elements is that they are included in the process of protein metabolism, transport elements and substances, at the level of cells and organs but [6,10].

## 2. MECHANISM FOR COLLECTING HEAVY METALS BY PLANTS IN THE AREA OF EMISSIONS

Source of heavy metals for plants grown in the greenhouse area is both contaminated soil and atmosphere. The amount of heavy metals from soil taken root system depends on the degree of accumulation of the individual elements and immobilization capacity of the soil

sorption complex. Sorption capacity of the soil is determined by the quantity and quality of soil colloids forming absorbent complex. As the soil content of floatable (mostly colloidal clay) and organic matter (especially decay), and the pH, the availability to plants of heavy metals is reduced, [16]. Metals are the preferred binding buffer system through the soil and become inedible plant roots). Heavy metals present in the soil and soluble forms of removable considered to be readily available to plants, easily moving in the trophic chain, thereby presenting the greatest threat to humans. The availability of these forms of metals is conditioned largely on the severity of soil processes of adsorption and desorption. The most important factors: affect That the Bioavailability of heavy metals by plants are [10]:

- The total content of "Potentially" bioavailable metals in the soil,
- The concentration of metals in the soil solution and Their relative proportions of quantitative
- Flow of metal from the solid phase to the liquid phase of soil (soil solution), and then harvesting mechanism metal roots.




Sam by plant roots is complex and is the result of several processes, such as through the cation exchange membranes, intracellular transport, processes taking place in the rhizosphere. A rich source of heavy metals for plants grown in the vicinity of the steel plants is also the

atmosphere, namely precipitation of dust emitted into the atmosphere directly on the surface of metal-ground plant organs. The amount of metal retained on the aerial parts of the plant depends to a large extent on the type of surface and the type of plant organ, where the dust settles emission derived from [5]. The level of pollution also determined by factors such as distance from the crops tested emitters of pollutants, as well as weather conditions, especially the amount of rainfall and the direction, strength and frequency of winds in the area of emissions [14].

## 3. MOVEMENT OF HEAVY METALS IN THE ENVIRONMENT

The mobility of individual heavy metals in soils determined by the following factors [8]:

- The origin of metals,
- Their physicochemical properties,
- Properties of soils themselves.

The increased mobility of the metals in the environment is very often caused by improper use of agricultural technology, whereby there is in the soil environment for transformation of different forms of heavy metals increase their solubility, run, and migration to the other elements of the environment. As a result of these changes is an increase bioavailability of metals, which entails a risk of higher toxicity to the micro flora, micro fauna, higher plants, animals and humans. Fulfill an important protective role in soil humus compounds, which are characterized by high sorption capacity.

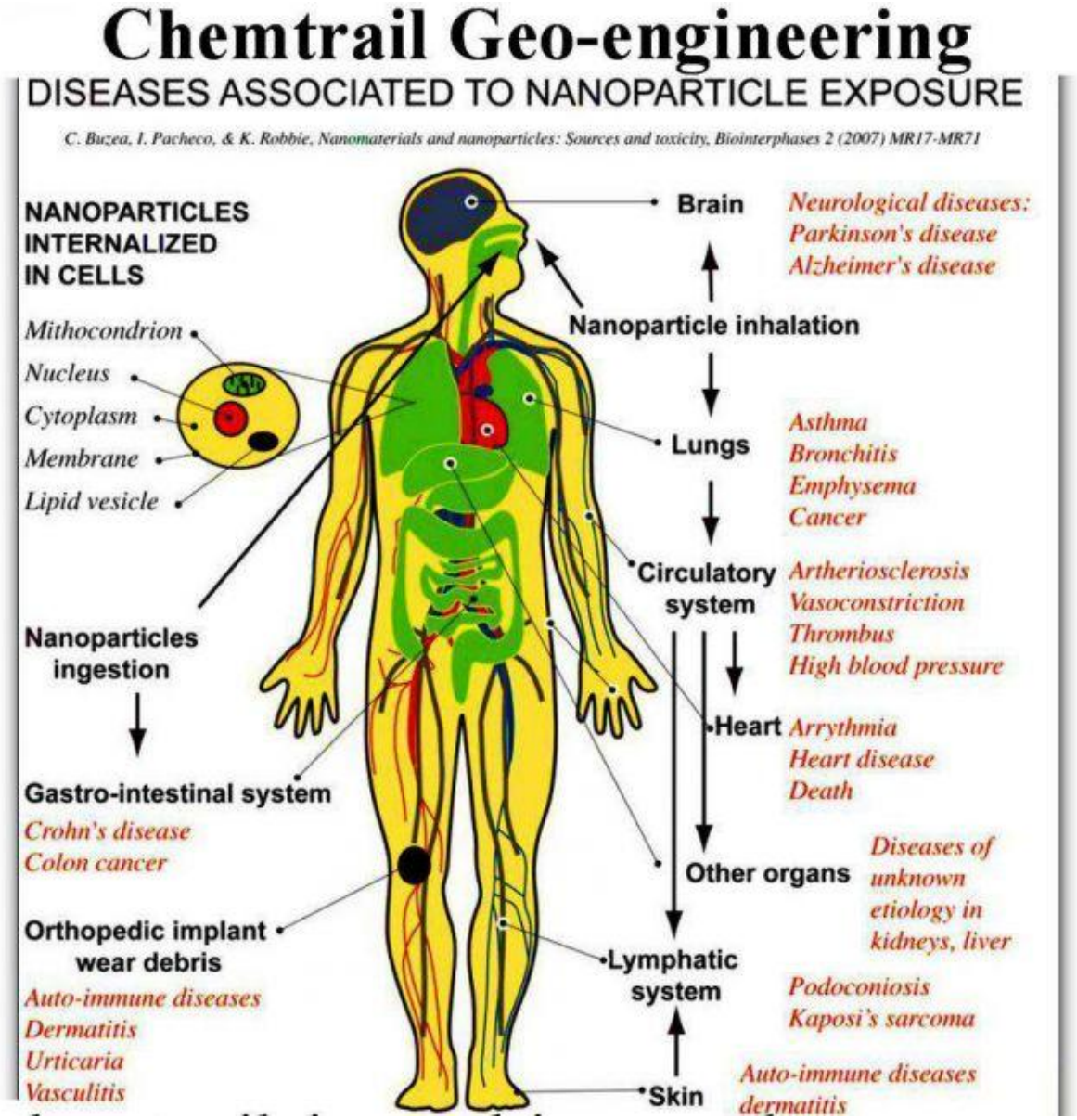
Therefore, in agricultural areas contaminated with heavy metals attaches great importance to the content of humus that can retrofit metals so effectively that it can be considered as a factor preventing the negative effects of soil contamination. The protective role of humus is due to the specific nature of humic compounds are the main component thereof. Humic compounds are characterized by a high content of functional groups such as carboxyl, hydroxyl, amino and other reactions by which metal may form salts, and chelate complex [11].

**Table 1.** Classification of naturally occurring metals according to their toxicity and availability in the hydrologic environment (from Wood, 1974)

[Metals that normally do not exist as dissolved species in natural waters or are very rare in crustal rocks are in italics]

| Nontoxic | | Low toxicity | | Moderate to high toxicity | | | |
|---|---|---|---|---|---|---|---|
| Aluminum | Magnesium | Barium | *Praseodymium* | *Actinium* | Indium | Polonium | Uranium |
| Bismuth | Manganese | *Cerium* | *Promethium* | Antimony | *Iridium* | *Radium* | Vanadium |
| Calcium | Molybdenum | *Dysprosium* | *Rhenium* | Beryllium | Lead | *Ruthenium* | Zinc |
| Cesium | Potassium | *Erbium* | *Rhodium* | Boron | Mercury | Silver | *Zirconium* |
| Iron | Strontium | *Europium* | *Samarium* | Cadmium | Nickel | *Tantalum* | |
| Lithium | Rubidium | *Gadolinium* | Scandium | Chromium | *Niobium* | Thallium | |
| | Sodium | *Gallium* | *Terbium* | Cobalt | *Osmium* | Thorium | |
| | | Germanium | Thulium | Copper | Palladium | *Titanium* | |
| | | *Gold* | *Tin* | *Hafnium* | Platinum | *Tungsten* | |
| | | *Holmium* | *Ytterbium* | | | | |
| | | *Neodymium* | Yttrium | | | | |

The establishment of such connections is limited passage of heavy metal ions to plant root system, and therefore their presence in the downstream of the trophic chain is considerably lower. Essential factor determining the solubility of heavy metals in the soil pH, which depends inter alia equilibrium sorption processes and desorption of hydrogen cations and metal cations. The solubility of heavy metals sorption processes exchangeable conditioned is generally low in the range of neutral and alkaline reactions, and increases with decreasing pH. The heavy metal solubility depending on the pH also determine the type and properties of the soil. A variety of agricultural practices designed to improve physical and chemical properties of soils to limit intake of heavy metals by plants seem to be the most rational way for their rehabilitation. The advantage of this type of method is the ability to apply them in large areas of agricultural land and that they are relatively inexpensive and technically simple to perform. Thus, these methods have found their greatest utility in agricultural practice [6,1].



## 4. CONCLUSIONS

Part of the cells in which they are stored mainly nucleus, mitochondria and cell membrane [6]. Generally, chronic exposure to heavy metals negatively affect the morphological parameters of the blood, the action of enzymes, the activity of transport proteins as well as the structure and function of cells, tissues and organs [5]. Animal organisms, in contrast to the plant have a very well-functioning mechanism of chemical homeostasis, which inactivates heavy metals. There are safety barriers anti excessive concentrations of these elements in the tissues. They consist in reducing absorption from the respiratory tract or digestive tract, rapid excretion of metals or metabolic inactivation that occurs based on specialized enzyme systems [8].

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