

DOI <https://doi.org/10.30525/978-9934-588-81-5-2.42>

**BIOTIC AND ABIOTIC METAL COEFFICIENTS
OF CORRELATION IN CHILDREN'S ORGANISM
OF ECOLOGICALLY STRESSED TERRITORY**

Antonova O. V.

*Candidate of Medical Sciences,
Associate Professor at the Hygiene,
Ecology and Occupation Safety Department
State Institution «Dnipropetrovsk Medical Academy
of the Ministry of Health of Ukraine»*

Onul N. M.

*MD, PhD, Dsc,
Professor at the Hygiene, Ecology and Occupation Safety Department,
State Institution «Dnipropetrovsk Medical Academy
of the Ministry of Health of Ukraine»*

Zemlyakova T. D.

*Candidate of Medical Sciences,
Associate Professor at the Hygiene, Ecology
and Occupation Safety Department,
State Institution «Dnipropetrovsk Medical Academy
of the Ministry of Health of Ukraine»
Dnipro, Ukraine*

Introduction. In the conditions of environmental denaturation and significant decadence of health of the population, the problem of influence of lead on the human body has the particular importance. [1, 2]. This metal is one of the most toxic, including for the child's body, causing a polytropic action, even at relatively low concentrations [3]. The purpose of the research – to estimate the content of lead, as an abiotic metal, and cuprum and zinc as biotic metals in biological substrates of children in industrial areas and calculate the coefficients of their correlation (CC) by the data of their content in the blood, urine and hair of children.

Methods. In children's body, the content of lead, cuprum and zinc in indicator biomedical environments – blood, urine and hair – was determined by the method of atomic-absorption spectrophotometry on AAS-1N

in a propane-butane-air mixture. The calculations of ratios were done on a PC using standard statistical packages *Statgraphics and STATISTICA 5. 5* [4, 256–273].

Results. Conducted biomonitoring revealed, that lead was determined in all biological substrates of examined children. In our study, the average concentrations of lead in the blood of children in the industrial areas are 1.6-5 times higher than the normative one and 9.5-30 times higher than the control concentration. 70-100% of them has the concentration of the lead at the level of the intellectual development impairment.

The concentrations of the lead in the urine of the surveyed children in both of the industrial and control areas are above the norm by 6.4-11.2-12.8 times and can be regarded as a metal bearing or the initial stages of the intoxication, which finds a place in 33-66% of the preschoolers from the industrial regions, as well as in 12% of children from the control area.

The hair of the preschoolers from the industrial regions contains lead in the concentrations corresponding to the permissible level in the first one, but exceeds it by 1.3 times in the second one. It should be emphasized that in 73-78% of children from the industrial areas, the lead content is higher than the quoted norm and 2-3.5 times higher than in the children from the control area.

Multiple correlation analysis indicates that the lead content in the blood and hair is most closely related to the concentration of the lead in the food. Regression analysis allowed to calculate the «thresholds» of the content of toxicant in the environmental objects, at which its concentrations in the body can go beyond the limits of the norm. For air, they are set at 0.023 mcg/m³, for TDI – 0.06 mg/day, for the ration – 0.04 mg/day. It is important that these values are 1.3-2 times lower than the corresponding standards in the air and diet. It was found that with the lead content in the blood at the concentrations above the 4.16 µg/dl, in hair – 2.75 µg/g, its enhanced renal excretion is already taking a place.

In blood CC Zn / Pb averaged 11 conventional units (cu), CC Cu / Pb – 8 cu.; in the urine Zn / Pb CC – 1.5 cu, Cu / Pb CC – 0.1 cu; in the hair Zn / Pb CC – 30 cu, the Cu / Pb CC – 1.6 cu. Since cuprum and zinc are natural antagonists of lead, the CC of them should be considered as a prognostic risk factor violations of trace element metabolism in the body [5, 6, 7].

Conclusions:

1. In the organism of children living in industrial districts lead is determined in elevated concentrations, which can be explained by its constant

and prolonged influence on the organism of children, the impact of which begins with the intrauterine period of development.

2. Estimated CC of abiotic and biotic metals shall have practical value in the diagnosis of the microelementosis and in predicting the risk of pathological changes in the health of the child under the influence of denatured environment.

References:

1. Трахтенберг І.М. Свинець в умовах промислових міст: зовнішня експозиція, біомоніторинг, маркери дії та ефекту, профілактика / І.М. Трахтенберг, Е.М. Білецька, В.Ф. Демченко. *Довкілля та здоров'я*. 2002. № 3. С. 10–12.

2. Toxicity, mechanism and health effects of some heavy metals / M. Jaishankar et al. *Interdisciplinary Toxicology*. 2014. Vol. 7. Issue 2. P. 60–72.

3. Prenosological changes in the organism of the children under influence of lead of industrial origin / O.V.Antonova, V.I. Glavatskaya, T.D. Zemlyakova. *Eurasian scientific congress. Abstracts of the 1st International scientific and practical conference*. Barca Academy Publishing. Barselona, Spain. 2020. P. 70–74.

4. Антомонов М.Ю. Математическая обработка и анализ медико-биологических данных / М.Ю. Антомонов. Киев : 2017. 578 с.

5. Antonova O. V., Zemlyakova T. D. Biomonitoring of lead in children organism as marker of its technogenic intake. *Актуальні проблеми транспортної медицини*. 2016. № 2. С. 63–66.

6. Differential association of lead on length by zinc status in two-year old Mexican children /Alejandra Cantoral, Martha M. Téllez-Rojo, Teresa Shamah Levy et al. *Environ Health*. 2015. 14. 95.

7. Біохімічні зміни в організмі дітей як предиктори мікросатурнізму/ Е.М. Білецька, Н.М. Онул, О.В. Антонова та ін. *Запорожський медичинський журнал*. 2020. 22. 2 (119). С. 200–205.