Blood Pb and Cd levels – Human biomonitoring study in Serbia: DecodExpo project

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Introduction

Lead (Pb) and Cd (cadmium) are toxic metals whose low-level exposure affects human health. Both metals are known to cause adverse effects on multiple organs. Cadmium is an established human and animal carcinogen and is usually associated with lung, prostate, and kidney cancers, and more recently, pancreatic cancer. Lead is a highly potent neurotoxic metal and its exposure primarily affects the central nervous system. Furthermore, some researchers postulate that there is no safe blood Pb level. Measurements of the concentration of metals in the human blood provide direct information about the exposures to these metals (A. These measurements may serve as biomarkers of the exposure to heavy metal exposure.

Therefore, in our preliminary human biomonitoring study, the aim was to measure the levels of Cd and Pb in the whole blood of the Serbian population.

Material and methods

The study population was chosen to represent the general population of Serbia and included 435 participants, 218 women and 217 men from five cohorts: prostate and testes cancer patients (104), breast cancer and benign breast dysplasia patients (96), pancreatic cancer patients (22), thyroid and metabolic disorders patients (77) and healthy volunteers (136).

Pb and Cd levels were determined by graphite furnace method using AAS GTA 120 graphite tube atomizer, 200 series AA, Agilent Technologies, Santa Clara, CA, USA. The accuracy of AAS analyses was verified using certified reference material (CRM) Seronorm Trace Elements Whole Blood L-2 (SeronormTM, Sero, Billingstad, Norway). Metal analyses were carried out following the manufacturer's specifications, with a low probability of contamination. All chemicals for metal analyses were purchased from Fisher Scientific (Germany) and were of pure analytical grade.

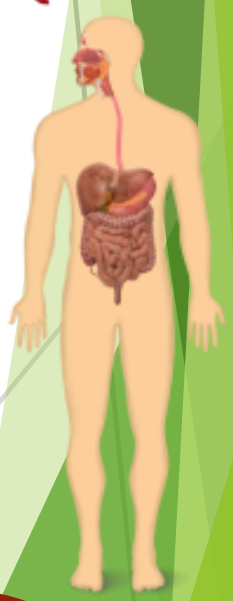
All data were analyzed using SPSS 23.0 (IBM, Armonk, NY, USA) and Graph Pad Prism8 software (GraphPad Software Inc., San Diego, USA).

Results and discussion

In the presented study, the Pb blood level was 4.303 μg/dL (5%: 0.0332, 95%: 13.182). mean Cd blood level was 1.800 μg/L (5%: 0.030, 95%: 5.801) and In females the mean Cd concentration was 1.962 μg/L (5%: 0.030, 95%: 6.448) while in males, a statistically significant lower ($P < 0.001$) Cd concentration was detected at 1.476 μg/L (5%: 0.032, 95%: 4.280). Lead levels did not significantly differ between gender groups, with females at 2.65 μg/dL (5%: 0.209, 95%: 14.01) and males at 3.11 μg/dL (5%: 0.57, 95%: 14.44).

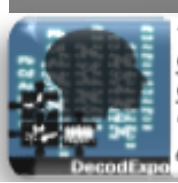
Table 1. Blood lead and cadmium levels in Serbian population

	All participants	Female	Male	P value
	N=427	N=218	N=209	
Cd AAS (μg/L)	1.800 (0.030-5.801)	1.962 (0.030-6.448)	1.476 (0.032-4.280)	<0.001
Pb AAS (μg/dL)	0.430 (0.033-13.182)	2.650 (0.209-14.01)	3.110 (0.570-14.440)	0.090



Conclusion

The presented study provides existing exposure to Cd and Pb in the Serbian population and represents the first phase of the DecodExpo project founded by Science Found of Serbia. Given that those metals are harmful at low doses, it is essential to promote the assessment of human toxic metal exposures as a basis for creating environmental control strategies to safeguard public health.



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Pb Cd