



BIOLOGICAL PROPHYLAXIS OF OCCUPATIONAL EXPOSURE TO LEAD

P. Nikolova, B. Kavaldzhieva, P. Chankova,* T. Yankova**
Department of Hygiene, Ecology and Occupational Diseases;
**Department of Internal Medicine; ** Department of Medical Chemistry and Biochemistry, Varna*

Lead occupies a leading position among heavy metals as industrial poison and ecotoxin which determines the interest in looking for possibilities to reduce its harmful effect on man. On the basis of existing data and our own included about interrelations between lead and several biologically active nutrients as well as concerning the importance of vitamins, mineral elements and amino acids in preventive occupational nutrition, according to our own prescription a complex of vitamins, salts of mineral elements and amino acids in the form of effervescent composition appropriate for peroral application has been elaborated.

The complex is given as a drink during the dinner meal to 20 workers-volunteers from the accumulator production in which working environment prevailing mean lead concentrations exceed the utmost permissible ones by about ten times. A set of 29 parameters of blood, erythrocytes, serum, plasma and urine are estimated twofold, i.e. prior to and after an one-month period of administration, to evaluate the effect of the beverage.

Toxic agent elimination is considered most important in the evaluation of protective effect of single nutrients. Urine lead concentration of workers-volunteers being initially significantly higher than the control one ($p < 0,001$) increases by 43% after one month towards initial one ($p < 0,001$) (table 1). Both hemoglobin and reticulocyte count reach up their reference values. G-6PDH activity, being initially elevated, reduces under the influence of the complex and mean group value is close to the control one ($p < 0,05$). ATP contents decreases, too, however, probably because of its abnormal increasing, its difference to the reference value remains ($p < 0,001$). The action of the complex on intra- and extracellular concentrations of some elements is manifested by opposite towards lead effect alterations in copper, iron, zinc and magnesium levels. Erythrocytic copper and zinc concentration increases but magnesium one decreases. Plasma iron level is elevated but zinc one is relatively reduced. Serum enzymes, and especially GDH, are also influenced upon. Urinary ex-

cretion of some elements is also changed.

Table 1. Some examined parameters in erythrocytes, serum, plasma, and urine

Biologic medium	Parameter	Controls	Workers	
			1 st examination	2 nd examination
Erythrocytes	G-6PDH U/10 ¹² Er	361,85±49,80	759,28±125,48*	544,44±89,06
	ATP mM/10 ¹² Er	387,00±73,77	2424,20±377,96**	1428,35±211,07**
	Magnesium mmol/l	1,57±0,08	1,71±0,09	1,48±0,10
	Copper mkmol/l	16,75±0,99	12,21±0,48**	14,43±1,40
Serum	Zinc mkmol/l	230,78±9,15	211,85±11,37	216,00±11,10
	GDH U/l	2,48±0,41	12,32±2,18**	6,60±0,75**
	As AT U/l	10,35±1,46	32,10±7,22*	24,45±4,60*
Plasma	Al AT U/l	13,35±1,37	17,14±2,62	15,31±1,24
	Iron mkmol/l	19,59±7,07	14,91±0,91**	16,27±1,10
Urine	Zinc mkmol/l	14,61±0,34	24,70±1,78**	19,30±1,38
	Lead mkmol/l	0,09±0,005	0,256±0,01**	0,352±0,001**
	Zinc mkmol/l	10,71±0,65	12,29±1,16	8,87±0,78
	Potassium mmol/l	62,50±3,89	22,67±2,15**	28,34±4,94**
	Sodium mmol/l	170,00±7,07	130,16±11,88*	165,82±13,72

There is a trend towards an increased elimination of potassium and particularly of sodium while zinc excretion decreases significantly. Magnesium, copper and iron remain at the initial level of elimination.

These results confirm to a great extent our assumption concerning the favourable effect of the complex tested. Its specific action is demonstrated by the elevated urinary lead elimination. It can be presumed that reduction of lead contents in the organism together with intake of biologically active nutrients with proved protective effect simultaneously restoring the deficit of these substances caused by lead itself could help the improvement of disturbed metabolic processes. This is confirmed by the data about the enzymes, especially about erythrocytic G-6PDH and serum GDH activity as well as about erythrocytic ATP concentration.

It can be summarized that independently of the small number of workers examined and of the absence of positive changes of some parameters, our results demonstrate a definite effect of the complex tested and can be used to enlarge the investigations directed to a more precise evaluation of results, an improvement of complex composition and its legislation as a free-of-charge addition to workers' food from lead-dangerous plants.