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LEAD CONTAMINATION OF MEŽA VALLEY

Lead mobilization with Ca-Na_2-EDTA from the body of inhabitants.

Dušan Djurić, Ljubica Graovac-Leposavić, Svetislav Milić and Ljuba Sconičar

Institute of Occupational and Radiological Health, Belgrade, and Medical Center, Ravne, Yugoslavia

The paper is dedicated to Prof.Dr.J.Teisinger, Director of the Institute of Occupational Health in Prague, Czechoslovakia, for his 70-th birthday.

In the Meža valley, Slovenia, Yugoslavia, a considerable lead contamination exists, due to pollution by lead aerosols from smelting plant in Žerjav. Taking in consideration that the smelting plant is reconstructed in 1896, we can assume that the population is increasingly exposed to lead until today.

From 1967 a broad ecologic study on lead content of air, water, soil, plants, food and lead exposure of population in

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* This paper is based on work performed under contract BSS-(1)-[illegible] between Institute of Occupational and Radiological Health, Belgrade and US Public Health Service.

the valley has been developed.

To find out the lead body burden we performed mobilization of lead using Ca-Na_2-EDTA in 108 inhabitants, mostly woman and children, non-professionally exposed to lead.

Methods and material

A portion of the urine was collected from 108 persons, living in contaminated area, who are not professionally exposed to lead. The plastic bottles were specially decontaminated on lead. Then 5 ccm of $CaNa_2EDTA$ solution ("Calcium-Lek") containing 1 gr. of this agent, was injected intravenously to the adults. Half of the dosis is injected to the children. After that 24-hour urine sample was collected.

Determination of lead in the urine, after destruction of lead chelate, was performed by polarographic method and expressed in micrograms per liter.

Results and discussion.

Recently many authors performed lead mobilization in professionally non-exposed persons, using various chelating agents, to establish the body burden.

The lead body burden depends on many factors as nutrition, geographic position, social level etc. Therefore, here for comparasion we can use data about lead mobilization performed on Yugoslavs or on a population with a similar way of life, for example czechoslovaks.

In Yugoslavia Stanković (1) studied lead excretion

after oral application of $CaNa_2EDTA$ in printers without clinical symptoms of lead poisoning. He established that spontaneous lead excretion, before chelating agent application was until 0,120 mg per h. sample of urine. After application of 3 gr. of Mosatil per os excretion was 0,236 ± 0,101 mg.Pb/24 h. Stanković accepted 0,340 mg Pb/24 as upper limit of mobilization yield in non-exposed persons.

Teisinger et al. (2,3,4) studied 50 healthy, professionally non-exposed persons and established an average spontaneous lead excretion as 0,032 mg. and 0,100 mg/24 h. as upper normal limit. After one injection of CaEDTA lead excretion varied from 0,062 to 0,390 mg/24 h. Therefore Teisinger recommended 0,350 mg/24 h. of lead as upper limit for mobilization yield. In the other group of non-exposed persons he observed values until 0,500 mg/l. in a fraction of the urine as upper limit.

We divided the studied group in the various subgroups following lead excretion after $CaNa_2EDTA$ injection mobilization yield as presented in Table 1. Average lead excretion before (spontaneous) and after CaEDTA injection is presented on Table 2.

All persons showed spontaneous lead excretion under 0,100 mg/l (average 0,411 mg/l).

We accepted Teisinger's criteria for mobilization yield of non-exposed persons. In that case only 5,5 % of the persons excreted until 0,350 mg/l of Pb after mobilization, and 18,5 % excreted the upper normal limit until 0,500 mg/l. The other

81,5 % excreted 0,5-4,2 mg/l of lead. That means, in spite of quite "normal" spontaneous excretion of lead, after mobilizatic 81,5 % persons showed increased mobilization yield, due to abnormal lead body burden.

It is of interest to consider the relation of spontaneously excreted lead to mobilized lead. Přerovska (5) studied this relation in professionally non-exposed and exposed persons In non-exposed persons spontaneous lead excretion represent 13,3 ± 1,9 % of the quantity excreted in the first 24 hours after 1 CaEDTA injection. In the exposed persons this relation was: 6,4 ± 1,4 %. Teisinger and Srbova (2) performed similar investigation and established this relation as 21-28 % in non--exposed group and 10-13% in exposed workers.

We calculated the relation of spontaneously excreted lead to mobilized lead for mentioned subgroups. These relation are presented on Table 3. In the first two groups with "normal lead mobilization yield" these relations are about 7,5 ± 3,02%. In persons showing abnormal lead mobilization yield this relation is between 4-1,5%. Mentioned results are suggesting that this case represent a special situation where persons are chronically exposed to higher environmental lead level from birthday until death and for many generations. That means, their body burden is similar to that of exposed workers, but biologically active lead (8) portion is much smaller.

Teisinger and al. (6,7) established on rabbits that after one CaEDTA injection about 21-27 % of the lead body burden (deposit) is excreted in the urine during first 24 h. in

acute poisoning. In the case of chronic exposure of animals this relation i much smaller and only 7,9 % of deposited lead is excreted.

If we assume that these animal data could be extrapolated and applied on human beings, then we can expect that in chronically exposed persons about 8 % of the total lead body burden will be excreted after one CaEDTA injection. This hypothesis is allowing us to suppose inhabitants of Meža valley contain lead body burden from normal (4-5 mg) to about 10 times higher -52,5 mg.

We performed a broad study on this group of population including medical examination, many biochemical, toxicological and hematological analysis, subjective complaints. All these results are in course of the evaluation to find out if any pathologic effects appear due to increased exposure to lead through the life time and for many generations in the Meža valley.

Such studies could give some very intersting answers connected with the problem of the city population exposed to lead contamination due the vehicle exhaustive gases.

TABLE 1.

Distribution of results of Pb excretion in the urine after $CaNa_2$ EDTA injection

	Pb in micrograms per liter of urine					
	until 349	350-499	500-999	1000-1999	2000-4200	total
Number of persons	6	14	30	39	19	108
Percentage of the total	5,5%	13%	27,5%	36%	18%	100%

TABLE 2.

Average lead excretion before and after mobilization

	Pb in microgram per liter of urine					
	until 349	350-499	500-999	1000-1999	2000-4200	total average
Spontaneous normal excretion	20,3 ± 7,4	48,7 ± 29,1	30,5 ± 18,6	45,7 ± 34	55,6 ± 28,3	41,1
After $CaNa_2$ EDTA injection	281 ±59,8	494,2 ± 79	767 ± 42,7	1358 ±257,9	3003 ± 337	1326,5

TABLE 3.

Relation of spontaneously /normally/ excreted lead to the quantity excreted in 24 $\overset{h}{=}$ after Ca Na_2 EDTA injection

Groups by mobilization	until 349	350-499	500-999	1000-1999	2000-4200	Total
Relation in percentage	7,5 ± 3,02%	9,5 ± 5,7%	4,0 ± 2,3%	3,1 ± 2,4%	1,55 ± 0,85%	4,1%

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