ERYTHROCYTE d - AMINOLEVULINIC ACID DEHYDRATASE (ALA-D) ACTIVITY AND BLOOD LEAD LEVEL (Pb-B) OF TORTOISE (Testudo hemanni, Gmel.) OF VICINITY OF LEAD AND ZINC SMELTER "TREPCA" IN KOSOVA

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ABSTRACT

In comparison with control animals, a significant negative correlation (r = - 0.77), between lead level and the activity of d-aminolevulinic acid dehydratase activity in the blood of land turtle (Testudo hermanni, Gmel.) caught in five different localities from heavy polluted environment of lead and zinc smelter "Trepca" was found. The concentration ratio of lead level in blood between control animals and those from the vicinity of smelter was 10:160 % and ratio of ALA-D activity was 10:18,3 U/LE.

INTRODUCTION

It is well known that the erythrocyte d-aminolevulinic acid dehydratase activity (ALA-D) is a specific indicator of different kinds of lead intoxications (Binsignore et al.,1965, de Bruin, A.,1971). Numerous papers concerning that problem mostly deal with cases of several kinds of lead intoxications including that of plumbisme (Hayashi, M.,1983, Schegel and Kufner, 1979) but to our knowledge the number of papers focusing on the ecotoxicological aspect of this problem are rare.

Having in mind this fact, we decided to analyze this relation in natural population of Tortoise (Testudo hermanni, Gmel.) caught in an extremely polluted environment in the vicinity of lead and zinc smelter "Trepca". This study is a continuation of our previous work on Tortoises of the same area, when a higher glutamate octal-acetate transaminase activity and reticulocytosis of blood (Rozhaja et al.,1983) and lower catalase activity of blood (Elezaj et al.,1983) was found in this area.

STUDY AREA, MATERIAL AND METHODS

This research was undertaken in male Tortoise (Testudo hermanni,Gmel.) caught in five localities at increasing distances (0.5, 3.0, 11, 15 and 50 km) from lead and zinc smelter of "Trepca" close to the town of Mitrovica, western Kosova. The area surrounding the above mentioned smelter is extremely polluted with heavy metals, so Mitrovica is one of the most polluted towns not only in Kosova but even on a world scale. In order to illustrate the level of mentioned pollution, it is necessary to point out some relevant data of some authors (Popovac et al.,1981) according to whom the amount of lead dust which was emitted from this smelter in 1979 was 5.7 tons per day. According to another author (Shllaku, L ., 1996) atmospheric lead concentrations of Mitrovica exeed the daily MAC value (0,7 mg/m3) 61-87 of the time, depending on the month of year. In January 1989, the MAC value was exceeded by a factor 37, on average. At the station close to the faculty in Mitrovica, the daily MAC for lead was once exceeded by factor of 132 (gausso-logarithmic form).

Blood samples of each animal were collected with heparynized plastic syringes after decapitation. In order to avoid the interference of superficially sedimented metal dust on our results the necks of animals before their decapitation were successively washed with tape and distillated water, then with diluted (1%) nitric acid and finally with bidistillated water.

Erythrocyte ALA-D activity was measured by Commission of European Committee's standardized method (Brelin Schaller, 1974) and results are expressed as U/LE lead level in wet mineralizated (with nitric acid) blood was measured by flame atomic apsorbtion spectrophotometry (Perkin Elemer 370 A) by Milic (Milc, S.,1985).

RESULTS AND DISCUSSION

Results summarized in Table 1. show that the activity of erythrocyte ALA-D of Tortoises caught in the heavy polluted area close to the lead and zinc smelter is remarkably inhibited, blood lead level were significantly higher in all examinated groups in comparison to the control group of animals.

Note. Values are expressed as means + SD ; no number of animals; ND- non detected; * significantly different from controls ($P < 0.001$). r - Correlation coefficient.

From grouped data of four examined groups of Tortoises an inverse power relationship between erythrocyte ALA-D activity and blood lead level was obtained ($r = -0.70$; $y = 12.5 + 0.085 X$). It can be concluded from the above table that the concentration of PBS-B is progressively increased and erythrocyte ALA-D activity decreased along the pollution gradient toward the smelter.

The statistically significant inhibition of erythrocyte ALA-D activity of Tortoises from polluted area confirms the sensitivity of this enzyme to lead in this animal model also. The reduced activity of erythrocyte ALA-D

Table 1. Erythrocyte ALA-D activity and blood lead level of Tortoise (Testudo hermanni, Gmel.) caught at different distances from lead and zinc smelter "Trepca"

Distance (km)	no	ALA-D (U/LE)	Pb.Conc (mg %)	Corr.Coef. r
0,5	20	1.3+0.8*	166.0±56	
3,0	18	1.2+0.6*	662±13.7	
11.0	20	7.0+0.7*	30.6±6.6	R = - 0,70
15.0	18	18.0+5.3*	10.5±1.6	
50.0	15	18.0+4.3*	ND	

observed in our animals can be connected to our earlier findings (Elezaj et al., 1988) when we found inhibition of erythrocyte ALA-D activity and elevated lead concentration in the blood of laying hens exposed to the same polluted area for 6 weeks.

These results also can be connected to Popovac's results (Popovac et al., 1982) who found elevated erythroporphyrine and lead level in the blood of people living in this polluted area.

It is important to stress that we (Elezaj et al.,1989) have found extremely higher concentration of lead in the femur bone of these animals (1655,7 mg/g dry weight) which was 70 times higher in comparison to the control group of animals (24 mg/g dry weight). Finally, from these results it could be concluded that the Tortoise (Testudo hermanni, Gmel.) can also be used as an indicator organism for monitoring of lead pollution conditions, through analysis of erythrocyte ALA-D activity.

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