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DETOXIFICATION METHODS IN CASE OF CADMIUM SULPHATE INTOXICATIONS

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Abstract. Virtually all metals can produce toxicity when ingested in sufficient quantities, but there are several which are especially important because either they are so pervasive, or produce toxicity at such low concentrations. When speaking of heavy metals we generally mean, lead, mercury, iron, copper, manganese, cadmium, arsenic, nickel, aluminium, silver, and beryllium. The analysis performed on animal model have been chosen to offer information regarding to the accumulation levels of cadmium in different organs and tissue of the laboratory mice and to test some new methods to detoxify the organisms. In order to obtain the information there have been performed two programs: programme of cadmium poisoning and programme of detoxification**.**

INTRODUCTION

The heightened concern for reduction of environmental pollution that has been occurring over the past 20 – 25 years has stimulated active continuing research on the toxicology of heavy metals. While the toxic effects of these substances are a widespread concern in the modern industrial context, Man has succeeded in poisoning himself with them repeatedly. Starting from the point that heavy metals are natural components of the Earth's crust, that cannot be degraded or destroyed and industrialization is unbalancing the environment, lead and cadmium became two heavy metals of big importance due to their negative effects on human health.

It is very important to investigate the effects of long-term, low-level lead and cadmium exposure in the human organism to validate existing risk assessment procedures. The bioavailability and intestinal absorption of lead and cadmium is predominantly determined by the available cadmium-binding forms in food.

The *actual stage of knowledge* in the studied research field concerning the toxic effects of cadmium, is driving us to a few important conclusions:

- Cd^{2+} is haveing predilection for sulphur and nitrogen containing groups;
- Cd^{2+} has fixed oxidation state and by replacing an essential metal ion with redox function, they are able to produce functional inhibition with severe toxic consequences, as for example, the cadmium antagonistic effect on the cupper and iron metabolism;
- Deficit vitamin D is decreasing the absorption of cadmium, and deficit calcium nutrition is increasing it;
- Behind it’s extremely toxic property, cadmium is contributing to the function of thyroid;
- Cadmium is decreasing the selenium level and glutation peroxidase quantity causing an implication of thyroid hormones;

- Some toxic effects of cadmium can be reduced by selenium, zinc, cobalt, calcium and by substances that contain tiolic groups;
- The amino acids (discovered until now) involved in the mechanisms of intoxication and detoxification are: methionine, cysteine and glycine, but it seems that glutamate, glutamine, lysine and triptophan have also some involvement;
- To detoxify the organism in cases of cadmium intoxications, it is important to administer a detoxifying substance, that beyond its chelating capacity for lead and cadmium ions, its also rich in Zn, Se, Ca, Fe, Co, Mg, Mn, cystein, methionin, metallotionine, vitamins B,C, E, EGCG, flavine, essential oils eith S, papaina, sterols, catalase, peroxidase and that means a medicine obtained by mixing garlic, green tea, coriander, alfalfa, turmeric, horseradish, chlorella, spirulina and capsicum etc.

MATERIAL AND METHOD

As animal model were used laboratory mice. The experiments were conducted on 40 adult mice (NMRI) same age and weight , housed in stainless steel cages, respecting the laws: nr 205/2004 regarding animal protection and OMAPM 400/2002 regarding the shelter, environment and nutrition of experimental animals. The animals were acclimatized and than randomly allocated to 4 different groups injected with cadmium sulphate solution (0.0mM; 0.01mM; 0.01 mM [+ D1]; 0.01 mM [+D2]) in 1 ml/100g body weight for for 5 weeks, every week 1 injection and starting the detoxification methods ([D1] and [D2]) after three days, after the second injection.The control batch specimens were intraperitonealy injected with physiologic serum to provide a placebo effect of similar stress condition as for the other 3 batches. The disintoxicating programme is based on two detoxifying procedures:

- D1 based on Vitamin C, E, beta carotene, horse radish leaves and hot capsicum as supplemental nutrition;
- D2 based on, fresh lemon juice, beta carotene, Vitamin E in drinking water, green tea infusion, tomatoes and coriander seeds as supplemental nutrition;

The content of cadmium in organs was analyzed with Spectrophotometer AAS JENA.

RESULTS AND DISCUSSION

The tabel 1 and figure 1 present the quantity of cadmium accumulated in organs.

Table 1 Quantity of cadmium accumulated in organs [mg/kg F.M.]

Crt. No.	**Organs**	**Cd [ppm]**			
		Control batch	**Intoxicated control batch 5 inj, 0,01 mM 1ml/100g b.w.**	**Detoxified batch D1 5 inj, 0,01 mM 1ml/100g b.w.**	**Detoxified batch D2 5 inj, 0,01 mM 1ml/100g b.w.**
1	Liver	10,59	29,47	8,29	6,49
2	Kidney	6,83	62,50	68,32	23,61
3	Lungs	17,05	62,50	11,36	13,64
4	Pancreas	58,86	106,25	56,82	26,28
5	Spleen	6,94	25,00	20,83	0,00
6	Brain	8,127	23,85	0,00	12,46

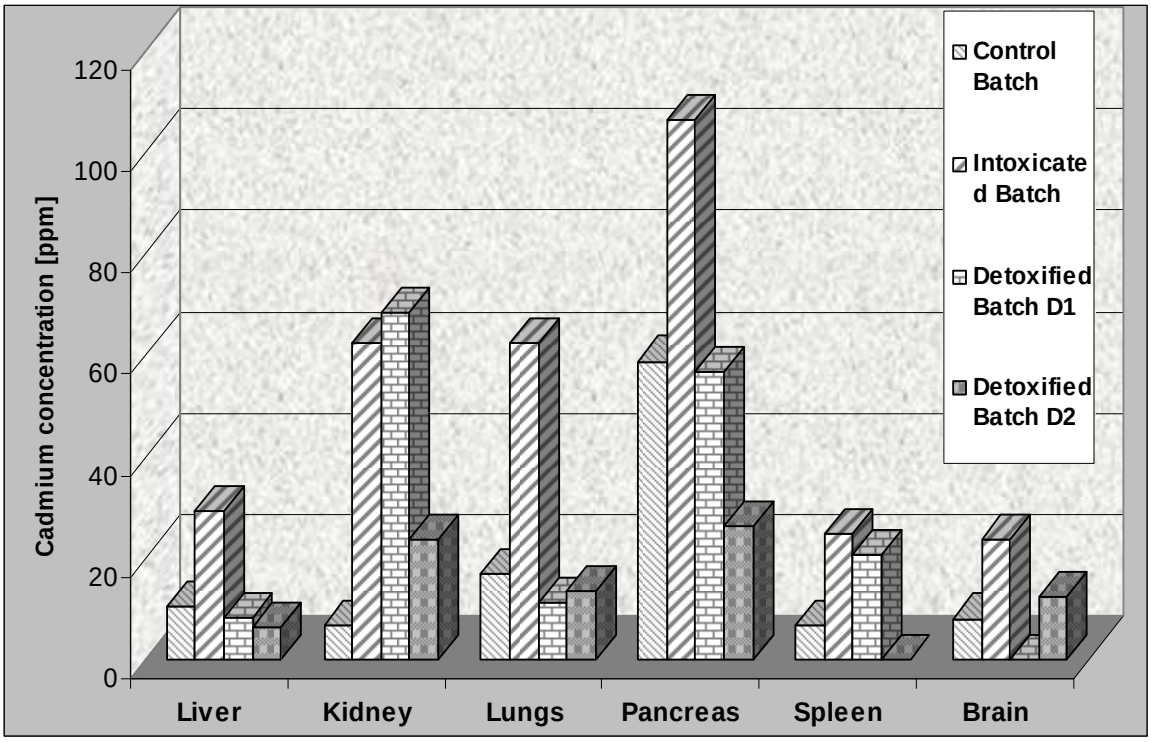

Figure 1. Comparative presentation of detoxifying programs

In table 1 and figure 1 we can observe that procedure D1is bringing the level of cadmium in liver, lungs and pancreas back to normal values (those of control batch) but for detoxification of kidney the procedure D2 is more relevant

Table 2 GOT, GPT, ALP and urea blood test

Analysis	Control batch	Intoxicated Control batch 5 inj, 0,01 mM 1ml/100g b.w.	Detoxified batch D1 5 inj, 0,01 mM 1ml/100g b.w.	Detoxified batch D2 5 inj, 0,01 mM 1ml/100g b.w.	Standard values (Swiss)
Medium GOT	178.2	251.6	301.4	254.2	85.7
Medium GPT	35.0	54.0	72.6	45.6	33.3
Medium ALP	128.4	202.4	195.8	186.4	90.2
Medium Urea	16.2	37.4	43.6	21.2	23.0

The performed blood tests (GOIT, GPT, ALP and urea) presented in table 2 and figure 2 distinguishes D2 procedure as a more efficient one for detoxifying the blood.

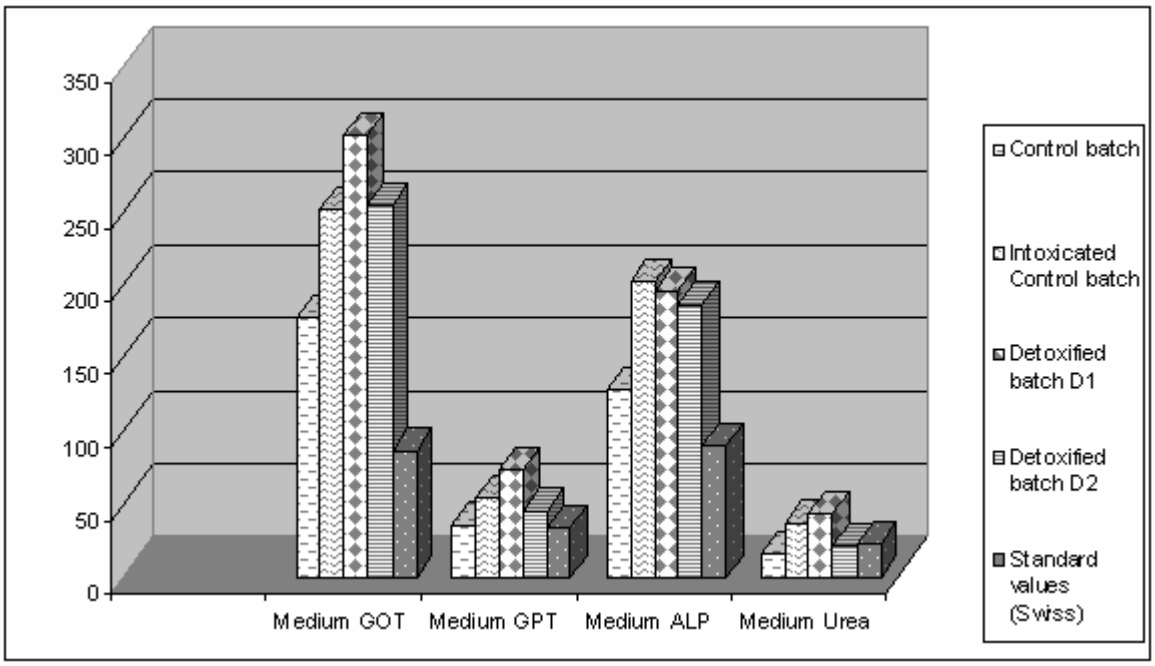

Figure 2. Histogram of GOT, GPT, ALP and urea blood tests levels

Statistical analysis as cluster (figure 3) and PCA (figure 4) reveal D2 procedure, also as the most confident one for detoxifying the blood

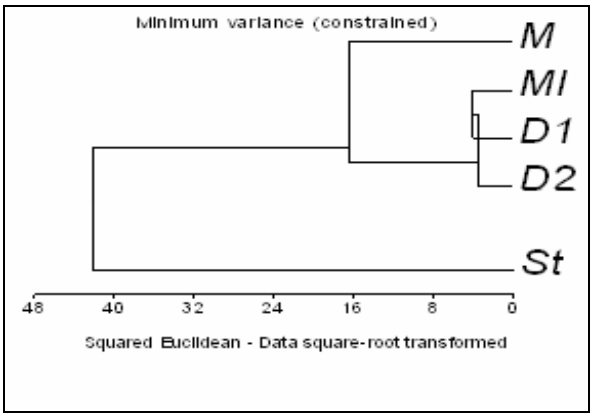

Figure 3. Cluster analysis graphical representation of the minimum variance

The principal component analysis PCA using the biplot graphic representation of the GOT, GPT, ALP and urea values is demonstrating ones more that the D2 procedure is better than D1 procedure for detoxifying the organism. The obtained levels come back to the normal and also are very near to the standard Swiss recommended levels.

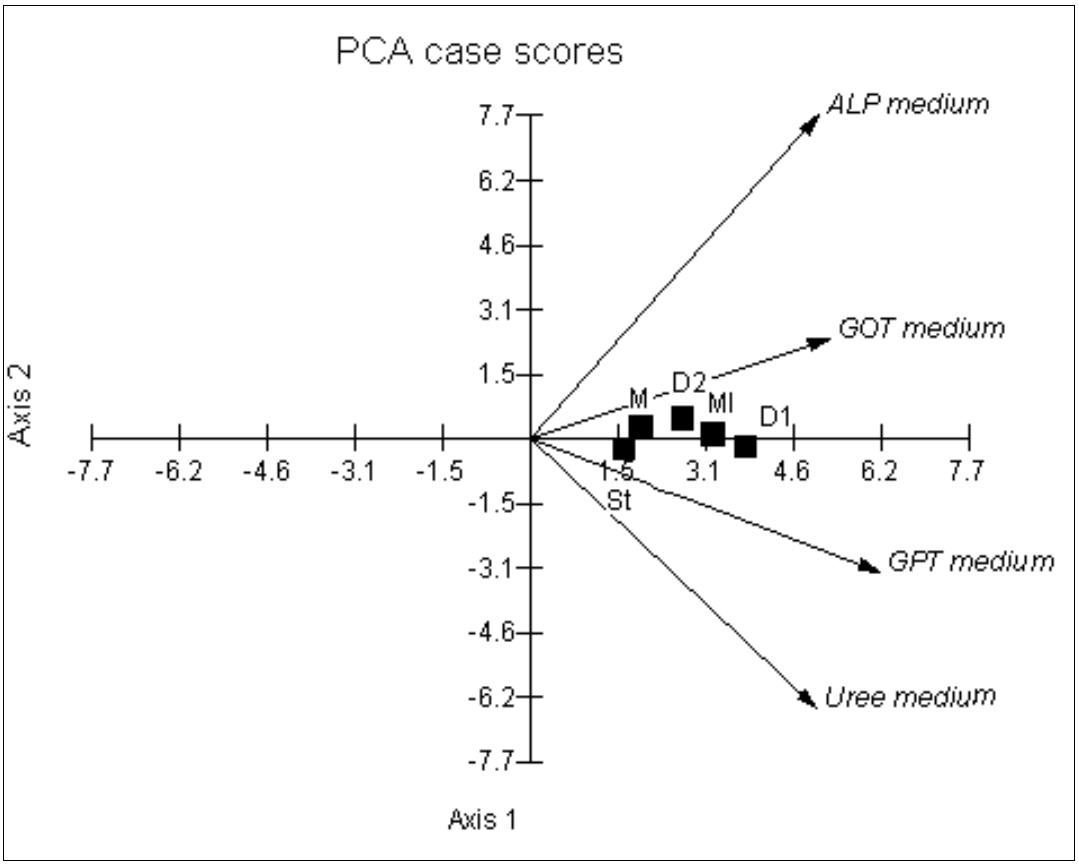

Figure 4. Biplot representation of principal components analysis of blood samples

CONCLUSIONS

The analyses of the performed tests using cadmium sulphate solution led us to the following conclusions:

The pancreas is accumulated high quantities of cadmium, an observation that is explaining the metabolic modifications as well as the enzymes activities. The pancreas as accumulation organ for cadmium represents a new scientifically discovery;

After applying the detoxification procedures we can affirm that both procedures were good chosen because both helped to remove high quantities of accumulated metal. The highest efficiency was observed while using the D2 method, because this is removing the highest amount of toxin from the body.

The detoxifying method is permitting to observe that GOT, GPT, ALP and urea are also back to the normal levels, and that is indicating the liver and kidney recovering from the induced damage.

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