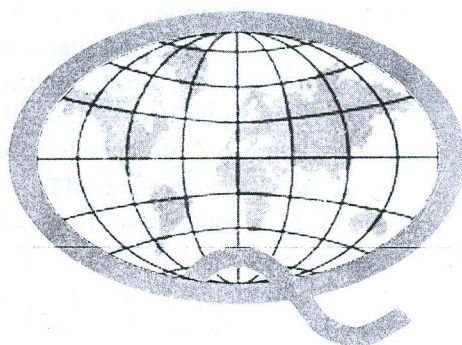


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PROGRAMME and ABSTRACTS

PROTECTIVE ROLE OF COENZYME Q₁₀ AND VITAMIN E IN CADMIUM INDUCED OXIDATIVE STRESS IN THE BLOOD OF RATS

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Cadmium (Cd) is a heavy metal commonly used in ecotoxicological studies. Cd induces oxidative damage in erythrocytes, causes loss of membrane function by enhancing lipid peroxidation and by alteration of the antioxidant defense system in erythrocytes (1). On the other hand, recent studies have shown that coenzyme Q₁₀ and vitamin E are the powerful liposoluble antioxidants, which inhibit lipid peroxidation and thus prevent free radical mediated oxidative injuries (2, 3). The aim of this study was to investigate a possible protective role of coenzyme Q₁₀ (CoQ₁₀) and vitamin E (Vit E) in cadmium induced oxidative stress in the blood of rats.

Male, Wistar albino rats 3 months old (weighing 280±30g) were used in our experiments. The animals were kept at 21±2°C and exposed to 12 h light/dark cycle. All animals were housed in individual cages and given a standard diet and water *ad libitum*. The rats injected with (A) CdCl₂ (0.4 mg Cd/kg b.m., i.p., 24^h before being sacrificed), (B) [CoQ₁₀ + Vit E] + Cd (20 mg CoQ₁₀/kg b.m., i.m., 48^h before being sacrificed + 20 IU Vit E/kg b.m., i.m., 48^h before being sacrificed + 0.4 mg Cd/kg b.m., i.p., 24^h before being sacrificed). Third group of animals was control (C). The concentration of lipid peroxides (LP) in the blood was determined as thiobarbituric acid-reactive substances. Plasma specimens were used for determination of ascorbic acid (AsA) and vitamin E (Vit E) concentrations. The activities of antioxidant enzyme: superoxide dismutase (SOD), catalase (CAT), glutathione peroxidase (GSH-Px) and glutathione reductase (GR) were determined in red blood cells, glutathione-S-transferase (GST) in the plasma, as well as the amount of glutathione (GSH) in whole blood.

In Table 1 the results obtained in our experiments are summarized. Acute intoxication of rats with Cd were followed by significantly increased of LP concentration in the blood (p<0.01). The activities of all examined antioxidant enzyme (SOD, CAT, GSH-Px, GR and GST), as well as concentrations of low molecular mass components (GSH, AsA and Vit E) were also increased in the

blood of Cd-treated rats in comparison to the control animals ($p < 0.05$, or less). Interestingly, alterations of examined parameters in rat blood after acute intoxication with Cd (presented data), followed the same pattern as alterations of these parameters after chronic intoxication with Cd (1). Recent studies on mammals have shown that Cd stimulates formation of reactive oxygen species and through binding to sulfhydryl groups of enzymes inhibits their activity, consequently causing the peroxidative destruction of cell membranes. These ubiquitous reactions of Cd result as its toxic effects on whole blood (1), liver, kidneys, heart, testes and other tissues and organs (4-6).

Table 1. Effects of Cd and [CoQ₁₀ + vit E] + Cd on LP concentration and the activities of antioxidant enzyme and concentrations of low molecular mass components. Data are given as means \pm SE from 6 animals.

	Control	Cd	[CoQ ₁₀ + Vit E] + Cd
LP (nmol/mL blood)	1.20 \pm 0.04	2.35 \pm 0.09***	1.20 \pm 0.03
SOD (U/g Hb x 10 ³)	7.73 \pm 0.22	8.91 \pm 0.33*	6.95 \pm 0.18
CAT (U/g Hb x 10 ⁴)	5.98 \pm 0.14	8.37 \pm 0.23***	6.08 \pm 0.21
GSH-Px (nmol NADPH/gHb)	22.09 \pm 1.09	30.29 \pm 1.11**	35.60 \pm 0.78***
GR (nmol NADPH/g Hb x 10 ³)	29.47 \pm 1.17	39.02 \pm 1.81**	27.90 \pm 1.63
GST (U/mL plasma)	97.45 \pm 2.37	121.61 \pm 8.92**	83.13 \pm 3.56*
GSH (nmol/mL blood x 10 ³)	0.89 \pm 0.07	1.07 \pm 0.08**	0.92 \pm 0.06
AsA (mg %)	1.06 \pm 0.02	1.36 \pm 0.08*	1.19 \pm 0.09
Vit E (μ g/mL plasma)	3.28 \pm 0.19	4.48 \pm 0.33***	5.93 \pm 0.16***

* $p < 0.05$, ** $p < 0.02$, *** $p < 0.01$ in comparison to the control animals.

The protective role of pretreatment with CoQ₁₀ and Vit E in acute intoxication of rats with Cd results as decreased LP concentration compared with animals given Cd alone, and reversed to control values. Activities of SOD, CAT and GR, as well as amount of GSH and AsA concentration were also reversed to the control values. However, pretreatment with CoQ₁₀ and Vit E induced further increase of GSH-Px activity and Vit E concentration ($p < 0.01$) in relation to control rats, and to the rats treated with Cd. On the other hand, GST activity was significantly decreased in comparison with control rats. Our results showed that combination of two liposoluble antioxidants such as CoQ₁₀ and vit E resulted as suitable and potent antioxidant action, probably as consequence of quenching of reactive oxygen species, inhibition of lipid peroxidation and prevention of free radical mediated injuries (2, 3).

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