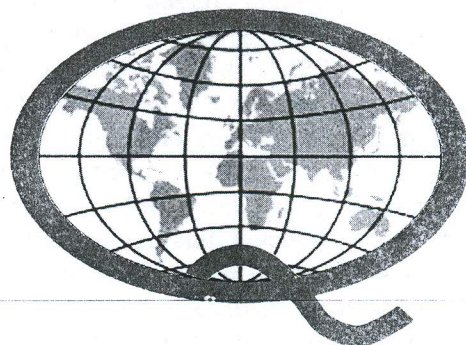


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PROGRAMME and ABSTRACTS

THE INFLUENCE OF COENZYME Q₁₀ SUPPLEMENTATION ON ANTIOXIDANT DEFENSE SYSTEM IN THE LIVER OF CADMIUM TREATED RATS

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Coenzyme Q₁₀ in its reduced form (CoQ₁₀H₂) is a powerful antioxidant. As an antioxidant it is exploited either directly upon superoxide or indirectly on lipid radicals (1). CoQ₁₀H₂ can also act together with Vitamin E by regenerating the active form from the tocopheroxyl radical (2). CoQ₁₀ may prevent both the initiation and propagation of lipid peroxidation, protects DNA from oxidation causing by lipid peroxidation and protects organism from oxidative stress induced by various toxic agents (3). Cadmium (Cd) is a commonly occurring environmental contaminant which after being absorbed into the organism accumulates mostly in the liver and kidneys (4). In the liver Cd induces derangement in protein metabolism and increased activities of gluconeogenic enzyme (5). Recent studies on mammals have shown that Cd stimulates formation of superoxide anion radicals, hydrogen peroxide and hydroxyl radicals (6). As a consequence, enhanced lipid peroxidation, DNA damage, altered calcium and sulfhydryl homeostasis, as well as marked disturbances of antioxidant defense system occur (7). The activities of total superoxide dismutase (Total SOD), manganese containing superoxide dismutase (Mn SOD), copper zinc containing superoxide dismutase (CuZn SOD), catalase (CAT), glutathione peroxidase (GSH-Px), glutathione-S-transferase (GST), glutathione reductase (GR), as well as ascorbic acid (AsA), vitamin E (Vit E), coenzyme Q (CoQ) and Cd concentrations were analyzed in the liver of male *Wistar albino* rats (two months old) treated with cadmium (Cd, 200 mg CdCl₂ x H₂O, in drinking water during 30 days), coenzyme Q₁₀ (CoQ₁₀, 20 mg/kg CoQ₁₀ dissolved in olive oil, i.m., every fifth day), concomitantly treated with cadmium and coenzyme Q₁₀ (Cd+CoQ₁₀, 200 mg CdCl₂ x H₂O, in drinking water during 30 days + 20 mg/kg CoQ₁₀ dissolved in olive oil, i.m., every fifth day) and in control animals (C). The average intake of Cd was 17 mg/day/kg

body mass, and CoQ₁₀ was 16 mg/kg/dose. After treatment the rats were sacrificed by decapitation and liver tissue was isolated and prepared for analysis. Each experimental group consisted of seven animals. The results obtained in our experiments are presented in Table 1. The significance of all experimental groups was compared with control animals (C). The activity of total SOD was significantly increased in Cd+CoQ₁₀-cotreated rats (p<0.05), while the activity of Mn SOD was significantly decreased in Cd-treated animals (p<0.02). At the same time, the CAT activity was significantly decreased (p<0.005) in all experimental groups of animals (e.g. Cd, CoQ₁₀ and Cd+CoQ₁₀ treated rats). The activity of GSH-Px was significantly decreased in rats exposed to Cd (p<0.05) and rats exposed to Cd+CoQ₁₀ simultaneously (p<0.005). GST activity was significantly decreased in animals treated with Cd, CoQ₁₀ and Cd+CoQ₁₀ (p<0.005). The activity of GR was significantly decreased only in animals treated with Cd+CoQ₁₀ simultaneously (p<0.01). The concentration of AsA was significantly higher in rats exposed to Cd (p<0.01), CoQ₁₀ (p<0.005) and Cd+CoQ₁₀ (p<0.01), while Vit E concentration was significantly higher in rats treated with CoQ₁₀ and Cd+CoQ₁₀ (p<0.05). At the same time, the concentration of CoQ in the liver was significantly increased in rats exposed to CoQ₁₀ and concomitantly exposed to Cd+CoQ₁₀ (p<0.005). A significantly increased accumulation of Cd in liver tissue was observed in animals treated with Cd and animals treated with Cd+CoQ₁₀ simultaneously (p<0.005). The presented data shows that Cd influences antioxidant defense system in the liver of rats and that CoQ₁₀ supplementation exhibit some protective effects, especially on non-enzymatic components such as AsA, Vit E and CoQ.

Table 1. The activities of Total SOD, Mn SOD, CuZn SOD, CAT (U/g w.m.), GSH-Px (nmol NADPH/min/g w.m.), GST (nmol GSH/min/g w.m.), GR (nmol NADPH/min/g w.m.), as well as AsA (mg/100 g tissue), Vit E (µg/g tissue), CoQ (nmol/mg proteins) and Cd (µg/g tissue) concentrations in the liver of control rats (C), treated with cadmium (Cd), treated with coenzyme Q₁₀ (CoQ₁₀) and concomitantly treated with cadmium and coenzyme Q₁₀ (Cd+CoQ₁₀).

	C	Cd	CoQ ₁₀	Cd+CoQ ₁₀
Total SOD	6359.2 ± 279.4	6413.3 ± 152.7	6175.5 ± 248.0	6963.5 ± 248.0 ^A
Mn SOD	1118.6 ± 54.5	864.3 ± 35.6 ^B	1011.8 ± 48.9	1181.3 ± 42.7
CuZn SOD	5240.6 ± 213.2	5549.1 ± 127.0	5163.7 ± 233.8	5782.1 ± 191.6
CAT	93654.9 ± 4325.2	60573.1 ± 2572.6 ^D	63670.2 ± 2715.5 ^D	60307.2 ± 1930.6 ^D
GSH-Px	74316.3 ± 295.2	70331.3 ± 1260.0 ^A	75655.2 ± 943.1	70475.1 ± 508.0 ^D
GST	176021.7 ± 4102.4	131710.9 ± 506.8 ^D	107401.3 ± 3622.4 ^D	117984.8 ± 4794.7 ^D
GR	7811.4 ± 296.8	7643.7 ± 324.4	7374.6 ± 396.0	6182.7 ± 263.8 ^C
AsA	13.9 ± 1.2	20.3 ± 0.6 ^C	37.2 ± 1.3 ^D	20.4 ± 0.4 ^C
Vit E	17.2 ± 0.4	17.7 ± 0.4	20.2 ± 0.4 ^A	20.1 ± 0.5 ^A
CoQ	524.4 ± 21.6	572.1 ± 14.8	966.2 ± 36.7 ^D	958.2 ± 37.1 ^D
Cd	0.3 ± 0.03	43.3 ± 1.7 ^D	0.3 ± 0.1	38.2 ± 1.2 ^D

The values are means ± SE from 7 animals. Significantly different from controls (C): ^Ap<0.05; ^Bp<0.02; ^Cp<0.01; ^Dp<0.005.

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