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Effects of Carazolol on Plasma Malondialdehyde, Superoxide Dismutase and Catalase in Sheeps

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Abstract: In this study, the effects of beta receptor blocker (carazolol) on the main detoxifying enzymes, Superoxide Dismutase (SOD) and Catalase (CAT) in sheeps were investigated. Two group (n = 6) were design. 1 mL ewe^{-1} of serum physiologic were administered i.m. to the control group (Group 1) and 0.5 mg ewe^{-1} of carazolol were injected i.m. to the treatment group (group 2). After treatment the blood samples were collected at 24, 48 and 72 h. No differences were observed in antioxidant enzyme values in sheep plasma. Also, no effect was seen on oxidative stress marker. Here, we show that carazolol may be alternatively used as a β-blocker agent in sheeps.

Key words: Carazolol, antioxidant status, sheep, superoxide, dissmutase, catalase, plasma

INTRODUCTION

Adrenergic blockers block the effects of catecholamines on adrenergic receptors in various effectors cells. They are classified as a and β adrenoreceptor blockers on the basis of receptor sub-groups upon, which they have a particular effect. Carazolol, a β-adrenoreceptor blocker, is structurally analogous to catecholamines and binds to β receptors reversibly (Costin *et al*., 1983). Exhibiting a fairly high capacity to bind to both β1 and β2 receptors, Carazolol is capable of acting as a blocker for about 12 h. As it prevents, endogenous catecholamines secreted under stress conditions from binding to β-adrenoreceptors, Carazolol is commonly used in veterinary medicine to treat stress-induced disorders and to reduce the cardiovascular responses elicited by catecholamines in various species of animals and particularly in pigs (Bartsch *et al*., 1977). Furthermore, it also has other uses in the fields of veterinary gynecology and artificial insemination in preventing newborn deaths caused by weak uterine contractions, reducing the incidence of neonatal loss by shortening the period of parturition in multiple births, helping the dams to lactate, obtaining semen from male animals, performing artificial insemination in female animals, treating endometritis in combination with other medicaments in the cow and treating and preventing retentio secundinarium caused by the stress of difficult births (Bademkiran and Kaya, 2006).

Today, the generation of free radicals can take place exogenously as a result of drug and toxin reactions and plays an important role in casting light on the toxic mechanism.

The formation free radicals cause structural degeneration in the DNA, proteins, carbohydrates and lipids (Mates, 2000). This study is designed to evaluate the effect of Carazolol on oxydoreductase enzymes (superoxide dismutase and catalase).

MATERIALS AND METHODS

Animals and management: Twelve kivircik breed ewes aged 1.5-2 were used. The animals were randomly divided into 2 groups as a control (Group 1) and an experimental group (Group 2), each group consisting of 6 animals. The experiment was carried out during the breeding season. The ewes were kept at the Faculty of Veterinary Medicine, University of Istanbul, Turkey (28°S, 41°W).

Experimental design: Each procedure was evaluated with and without carazolol. The 1 mL ewe^{-1} of serum physiologic were administered i.m. to the control group (group 1). 0.5 mg ewe^{-1} of carazolol were injected i.m. to the treatment group (group 2). The blood samples were taken at 24, 48 and 72 h.

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Estimation of biochemical analysis

Lipid peroxidation: The TBARS level in plasma was measured by the absorbance of pink product at 532 nm according to the method described by Yoshioka *et al.* (1979) and was expressed in terms of Malondialdehyde (MDA).

Superoxide Dismutase (SOD) activity: The SOD activity in plasma was measured by the method of Sun *et al.* (1988). The optical density of blue product was read at 560 nm.

Catalase (CAT) activity: CAT activity was estimated by the method of Yasmineh *et al.* (1995) by measuring the rate of decomposition of hydrogen peroxide (H_2O_2) at 240 nm.

Statistical analysis: All results are expressed as mean±SEM. Data were analyzed by the independent t-test. Statistical significance was considered at $p<0.05$.

RESULTS AND DISCUSSION

As shown in Table 1, concentrations of TBARS, which is a lipid peroxidation index were found to be fairly close to the control group in the plasma from the blood samples collected on 24 and 72 h and higher than the control group but still statistically insignificant for samples collected on 48 h. In samples from the plasma of sheep, both SOD and catalase acting as enzymic antioxidants failed to exhibit any changes on 24, 48 and 72 h, when compared to the control group.

The damage caused by free radicals playing an important role in the pathogenesis of many illnesses in recent years and containing a high percentage of oxygen is directly related to the oxidative stress in the organism (Baker *et al.*, 2004; Mullan *et al.*, 2004). One of the principal, enzymes taking part in the detoxification of free radicals is superoxide dismutase transforming the superoxide radicals to the less reactive hydrogen peroxide form. Decomposing hydrogen peroxide into water to prevent the formation of hydroxyl radicals, catalase is yet another highly efficient detoxification enzyme capable of preventing oxygen consumption in the cell caused by drugs.

The main product of lipid peroxidation is MDA. Various studies served to demonstrate that lipid peroxides are found in systemic circulation following damage to the body and reach peak concentrations in 24 h (Mates, 2000). For this reason, it was resolved to obtain the first data of this study by collecting serum samples 24 h after carazolol administration. At the end of the said period, the MDA level observed in the carazolol group was found to be close to the results obtained for the control group. When compared to the control group, the MDA levels on 24 and 72 h were found to be statistically insignificant. On the other hand, it was also observed that the MDA level slightly increased between 24-72 h following carazolol administration whereas, SOD and CAT caused no statistically significant changes and yielded similar results to the control group during the same periods.

Table 1: Activities of antioxidant status in plasma of sheeps (mean±SEM) (n = 6)

	Activities of antioxidant status					
	MDA groups		SOD groups		CAT groups	
Time (h)	1	2	1	2	1	2
24	31.1± 8.8	28.6±9.50	24.8±4.6	30.8±6.6	51.7±6.1	55.8±12.3
48	11.1±2.90	47.6±21.7	21.8±6.4	19.7±6.6	45.8±5.7	50.5±11.9
72	36.3±10.0	52.3±11.8	14.7±4.5	19.5±4.5	42.7±13.2	58.1±6.70

Values are means±SEM (n = 6); MDA activity is expressed as nmol mL^{-1}; SOD activity is expressed as U g^{-1}-Hb and CAT activity as k g^{-1}-Hb; The values observed were significant $p<0.05$ when compared to control animals; Data were analyzed by the independent t-test

CONCLUSION

Nowadays, toxicological studies tend to focus on lipid peroxidation caused by drugs. No information was available on the effects of carazolol on oxidative stress in living organisms. Although, statistically insignificant, the constant increase observed in the MDA level during this study gives rise to the thought that a mild oxidative stress may have been generated. On the other hand, the fact that no statistically significant changes were observed in the levels of antioxidant enzymes (SOD, CAT) during the analysis suggests that carazolol may be reasonably used to this end as it does not cause oxidant stress in the sheep.

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