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Website: www.mutagens.co.in
E-mail: submit@mutagens.co.in
researchsubmission@hotmail.com

Research Paper

THE EFFECTS OF ANTIOXIDANT LIPOIC ACID ON BIOCHEMICAL PROFILE OF GOATS

Elzahrani, Magbola, S.H.

Department of Biology,
College of Science; University of Al Baha, Saudi Arabia.

Abstract

The influence of road transportation on selected biochemical biomarkers was assessed in different breeds of (Aardi and Hejazi) of Saudi goats. Twenty four goats, twelve from each breed were used in this study. Goats were transported for 12 h by road, and they were divided into two groups, treated lipoic acid (LA), and the control administered with sterile water. Blood samples were collected via jugular vein-puncture before and after the road transportation as well as after 0.5, 12, 24 hrs post-transport. The results show that transportation is stressful to Saudi goats and that LA supplementation prior the commencement of transportation may help goats by maintaining biochemical markers. In conclusion, the transport has negatively affecting the biochemical variables, with the exception of creatinine in different breeds of Saudi Goats, with Hejazi goats being less tolerant to transportation stress.
Key words: Breed; Goats; Lipoic acid; Biochemistry.

INTRODUCTION

Goats are one of the world's oldest domesticated animals more than 10000 years ago. Saudi Arabia is the habitat for approximately 2.2 millions. The three local breeds of goats distributed in different regions of the Kingdom of Saudi Arabia with varying numbers namely the Aardi, Hipsi and Zumri, are raised mainly for meat production. The physiological indices in these breeds and in different farming systems are not known. Blood profiles may used as indicator of stress in farm animals; for instance transportation (acute stressor), alter numerous physiological variables with a negative impact on production and health (Buckham *et al*., 2008). It is essential to implement a scoring system, especially in harsh environment such as in Gulf countries (Al-Sabbagh (2012). There is an increase interest in the application of antioxidant, during stress conditions of exercise and transportation (Adenkola et al., 2011; Bodas et al., 2011). We thought here to introduce, for the first time, lipoic acid, as potential antioxidants that replace normalize the negative effects of transportation on antioxidant biomarkers in different breeds of Saudi goat.

MATERIALS AND METHODS

Twenty-four apparently healthy goats (12 from each breed, Aardi and Hejazi) were used in experiment. Half on goats will be treated with lipoic acid prior transportation, and the rest will not treat with lipoic acid. a-Lipoic acid was dissolved as the tromethamol salt in sterile water equivalent to 25 mg alpha lipoic acid per ml) and was injected intravenously the 3 consecutive days prior transportation. Lipoic acid (LA, Sigma, St. Louis, MO, USA; 100 mg/kg/day) was

injected intraperitonally to the L and LS groups for 21 days. Physiologic saline was injected intraperitonally to the C and S group for 21 days. Goats were divided into two groups; group I three goats were treated with normal saline at intravenous route of 0.05 ml/30 kg prior the start of the transportation protocol. Group II was given lipoid acid. Goats were transported for 960 km., and blood samples were collected on prior transportation; 0 hr of arrival, 12 hrs post transportation, and 24 hrs post transportation. The experiment was conducted during the months of November and December, when the ambient temperature was about 16–24°C. The conditions of transport for all goats were identical. Plasma total protein, cholesterol, plasma urea nitrogen were analyzed using n automated analyzer. Creatinine plasma concentrations were analyzed using a colorimetric quantitative reaction (Boehringer, PAP method). The experimental protocol consisted of a two-way repeated analysis of variance (ANOVA) to determine the effects of sampling time, the difference between treatments, and the interaction between time and treatment.

Table 1: The effects of transportation stress on total protein plasma concentration (g/l) in different breeds of Saudi goats pretreated with lipoic acid (LA)

Time of sampling	Aardi		Hejazi		RSD		Significant
	Saline	LA	Saline	LA	RSD	Treatment	Breed
Prior transportation	82.2	80.12	79.1	79.3	2.02	NS	NS
0.5 hr post arrival	78.3	77.0	70.2	75.7	2.11	NS	NS
12 hrs post arrival	65.00	65.3	68.5	63.4	2.25	NS	NS
24hrs post arrival	66.8	67.9	63.2		2.24	**	**

NS; not significant; Residual Standard Deviation; * P < 0.05; * P < 0.01

Table 2: The effects of transportation stress on urea nitrogen plasma (mmol/l) concentration in different breeds of Saudi goats pretreated with lipoic acid (LA)

Time of sampling	Aardi		Hejazi			Significant	
	Saline	LA	Saline	LA	RSD	Treatment	Breed
Prior transportation	3.6	3.7	3.4	3.6	0.70	NS	NS
0.5 hr post arrival	3.7	3.7	3.5	3.5	0.66	*	NS
12 hrs post arrival	4.1	3.8	4.0	3.6	0.69	*	NS
24hrs post arrival	4.0	3.9	3.9	3.7	0.68	*	NS

NS; not significant, LA; Lipoic acid; RSD, Residual Standard Deviation; * P < 0.05; ** P < 0.01

Table 3: The effects of transportation stress on cholesterol plasma concentration in concentration in different breeds of Saudi goats pretreated with lipoic acid (LA)

Time of sampling	Aardi		Hejazi				Significant
	Saline	LA	Saline	LA	RSD	Treatment	Breed
Prior transportation	1.96	2.00	1.03	2.01	0.163	NS	*
0.5 hr post arrival	1.98	1.90	1.06	1.05	0.154	NS	*
12 hrs post arrival	1.97	1.94	1.00	0.99	0.149	NS	*
24hrs post arrival	1.89	1.88	0.91	0.89	0.160	NS	*

NS; not significant; LA; Lipoic acid; Residual Standard deviation; * $P < 0.05$

Table 4: The effects of transportation stress on creatinine plasma concentration in concentration in different breeds of Saudi goats pretreated with lipoic acid (LA)

Time of sampling	Aardi		Hejazi				Significant
	Saline	LA	Saline	LA	RSD	Treatment	Breed
Prior transportation	98.60	99.20	106.12	105.50	4.45	NS	NS
0.5 hr post arrival	102.10	101.30	103.10	103.40	3.99	NS	NS
12 hrs post arrival	103.24	100.70	100.20	101.00	4.01	NS	NS
24hrs post arrival	99.00	99.80	101.20	103.20	4.35	NS	NS

NS; not significant; LA; Lipoic acid; Residual Standard deviation

RESULTS AND DISCUSSION

The main objective of this study was to assess the possible beneficial effects in ameliorating stress of transportation in different breeds of Saudi goats. An accumulating evidences of the use of antioxidant during stress condition, including the stressor, transportation. Here we are seeking the inclusion of LA, a proofed-effective antioxidant in horse (Williams *et al*., 2002), and rats during exercise and training.

Irrespective of treatment, plasma total protein decreased post transportation in both breeds of goats (Table 1). This may be attributed to mobilization of reserve protein for the provision of energy, and LA showed no effects. Similar trend was reported in calves by Knowles *et al*. (1995).

Table 2 shows change in plasma urea concentration in relation to LA supplementation and breed of Saudi goats. In the control group, significant increase in urea was observed. The observed increase in urea in the control group may relate to the increase in protein breakdown. A similar trend of effects was observed in goats by Minka and Ayo (2010), and in calves (Knowles, 1995). The insignificant effects of LA-supplemented groups indicate that it may delay the tissue catabolism under the stress conditions. Transported weanling heifer from Ireland to Spain resulted in an increase in plasma urea (Earley *et al*., 2012; 2013).

Post transportation resulted in an increase in plasma cholesterol in Saudi goats (Table 3). It should be expected that transportation resulted in mobilization of body fat to provide energy during stress conditions, with breed related effects. However, supplemental LA shows no profound effects in both breeds. Similar results were obtained by Knowles *et al*. (1995).

Table 4 shows plasma creatinine concentrations of Aardi and Hejazi breeds supplemented with or without LA post transportation. No significant differences were observed compared with pre transportation stress, with no breed differences. The absolute muscle mass and level of physical activity may influence of creatinine serum concentration. In ruminants creatinine is a more reliable indicator of alterations in renal function than urea. However, in other studies, creatinine increased post transportation in Chamois (goats) (Lopez-Olvera *et al*., 2006), and also in African cattle post transportation, and there were no breed differences (Ndlovu *et al*., 2008). The results obtained here are done on paved roads we should expect more profound effects on unpaved roads in Saudi Arabia.

Transported rabbits under hot conditions produced an increase in total plasma protein (Nakyinsige *et al*., 2013).

Our study provides useful information about breeds of goats, for the first time in relation to the stress of transportation and also as to supplemental lipoic acid, a promising antioxidant in animal production industry. In conclusion, transportation caused a significant change in the biochemical profile examined, with the exception of creatinine. The supplementation of LA may help in minimizing the side effects of transportation, and further studies using different doses and in relation to season may be recommended, in particular under harsh conditions, as prevalent in Saudi Arabia.

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