

Effects of Supplemental Lipoic Acid on Selected Antioxidant and Mineral in Transportation-Stressed Goats

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ABSTRACT

The objective of this study was to assess the effects of supplemental lipoic acid (LA) on body weight, rectal temperature, vitamin C and E, and plasma copper and zinc status in different breeds of Saudi goats subjected to road transportation. Twenty-four apparently healthy goats (12 from each breed, Aardi and Hejazi) were used in experiment. The experiment was conducted, when the ambient temperature was about 16–24°C. The conditions of transport for all goats were identical. Half on goats will be treated intravenously with LA (25 mg per ml) prior transportation, and the rest with placebo. Goats were transported for 12 hours, and blood samples were collected on prior transportation, at unloading, 12 and 24 hrs post transportation,. Transportation stress caused a significant reduction in vitamin C, E, and plasma copper and zinc in both breeds, with higher reduction of all measured variables in Hejazi compared to Aardi goats. Supplemental LA reduces the negative impact of transportation. Such finding seems important in animal production and welfare, especially under harsh conditions. In conclusion, further studies are required to extend the work on LA during hot conditions in Saudi Arabia.

Keywords: Goats, Breed; Lipoic acid, Vitamin C, E, Zinc, Copper

I. INTRODUCTION

Transportation is an inevitable husbandry practice which animals unexpectedly encounter in the livestock industry. It has widespread effects on physiological systems in animals, including changes in the cardiovascular, endocrine, immune, central nervous and reproductive systems (Padalino, in press). Many scientific trials focus on the use of antioxidant prior transportation to reduce its impact on welfare and productivity of farm animals. Vitamin E and C are parts of the non-enzymatic body's antioxidant system, consumed during transportation stress (Minka et al., 2009). Studies are accumulating in search of antioxidant minimizing the negative impact of transportation. For instance, LA is considered as a powerful antioxidant (ultimate antioxidant) owing to its ability to cross biological membranes, scavenging oxygen free radicals, and promoting the regeneration of endogenous antioxidants vitamins such as vitamin E and C (Packer *et al.*, 1997). Therefore, the objective of this study was to assess the effects of supplemental LA on selected vitamins and mineral in different breeds of Saudi goats subjected to transportation.

II. METHODS AND MATERIAL

Twenty-four apparently healthy goats (12 from each breed, Aardi and Hejazi) were used in experiment. 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. Half on goats will be treated with lipoic acid (LA) acid prior transportation, and the rest were treated with 10 ml normal saline. Twenty five mgs per ml of Lipoic acid was dissolved as the tromethamol salt and injected intravenously for three consecutive days prior transportation. Goats were transported for 12 hours and blood samples were collected on prior transportation; 0 hr of arrival, 12 hrs post transportation, and 24 hrs post transportation. Vitamin C (Ascorbic acid) was analyzed in plasma on an automated High Performance Liquid Chromatography (HPLC) system (Lykkesfeldt et al., 1995). Vitamin E (alpha tocopherol) was determined in the plasma using HPLC as adapted by Cooper et al. (1997). Plasma copper and zinc concentrations were analyzed via atomic absorption (Model 5100, HGA-600 Graphite Furnace; Perkin-Elmer, USA). The experimental

protocol consisted of a two-way repeated measure analysis of variance (ANOVA) to determine the effects of sampling time, the difference between treatments, and the interaction between time and treatment.

III. RESULT AND DISCUSSION

The main hypothesis to be tested here is that lipoic acid improves the status of stress biomarkers (vitamin C; E, and copper and zinc) in transportation-stressed goats. During stress conditions such as in this study (transportation), there is an increase demand in antioxidant, and prior supplementation proved effect in counteracting the stress effects.

Transportation causes oxidative stress in buffalo calves (El-Deeb and El-Bahr, 2014). Transported-goats showed higher plasma levels of cortisol, glucose and free fatty acids increased significantly within 15 min of the start of transportation, and these higher levels were maintained throughout transportation (Aoyama et al., 2008). In another study, transported calves showed a decrease growth hormone pulse frequency under abnormal cortisol states (Kadokawa et al., 2013).

Table 1 shows the effects of supplementation with lipoic acid on vitamin C trend post transportation. Significant effects of treatment and breed were observed here. Similar trend was observed in Table 2 for vitamin E. Transportation resulted in the increase in utilization of both vitamins (C and E) in both breeds, and LA restores such decrease by recycling the vitamins.

Zinc is an essential mineral for ruminant including goat. In the current study, both plasma copper (Table 3) and zinc (Table 4) reduced in both breeds post transportation, with LA supplementation reduce this degree of reduction. Copper reduction may relate to its role in the production of SOD, which is consumed during stress conditions. Both plasma copper and zinc decreased post transportation in Aardi goats (Al-Badawi et al., 2013).

In line with previous reports, transportation did affect the antioxidant status in different breeds of goats. Similarly, transported lambs on unpaved roads had a significant influence on physiological stress parameters (Miranda-de et al., 2011). There is increasing interest in using Lipoic acid in stress conditions, and this

partly due to its antioxidant function; and ability to regenerate and recycling both water- and lipid-soluble antioxidants from their oxidized forms (Packer et al., 1997). Practical uses of LA improved antioxidant status in rats (Akpınar et al., 2008); and prior exercise in horse (Kinnunen et al., 2009).

IV. CONCLUSION

The present study suggests breed-related variations due to stress of transportation, indicating differences in response to stress among different breeds of Saudi goats. Lipoic acid negate the decline in antioxidant (vitamin C and E), and this may be due to its regenerating effects of vitamins under stress conditions, when their utilization is high. Supplementation of lipoic acid may prove effective in counteracting stress of transportation and could be used in more trials in the future with emphasis also with heat stress, prevalent during summer in Saudi Arabia. Due to the increase in goat industry in Saudi Arabia, for their meat, more studies on their welfare should be addressed.

V. REFERENCES

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