SHORT COMMUNICATION

Serum Biochemical Changes During Transportation Stress in Adult Goats

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Abstract

A study was conducted to evaluate the effect of short journey transportation stress on the serum biochemical parameters in adult goats. Fifty healthy adult goats irrespective of sex, age and breed were transported for about 200 km from Ahmednagar district of Maharashtra (India) to Thane district of Maharashtra (India), by road without feed and water during transportation. Blood samples were collected from these goats before loading and after unloading at destination and thereafter for next two weeks. The biochemical parameters were estimated using standard biochemical kits. The levels of biochemical parameters viz. total proteins, albumin, globulin, total calcium, phosphorus and glucose were significantly ($p < 0.01$) increased after transportation. The levels returned to its preloading values within period of a week after unloading except glucose, which was decreased significantly on 2nd week after transportation, but was within the normal physiological range for goats.

Keywords: Biochemical Changes, Goats, Transportation stress.

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Introduction

Transportation of live animals as an inevitable husbandry practice has been recognized as one of the main causes of stress (Saeb *et al*., 2010). Handling, loading, fasting, confinement, vibrations, centrifugal forces, rapidly changing light conditions, poor air quality and mixing of unfamiliar groups are some potential stressors during transport (Saeb *et al.,* 2010; Zhong *et al.,* 2011). Transportation stress has considerable physiological effects such as increased adrenal cortical activity, decreased immunity, increased morbidity, decrease in meat quality and weight loss and sometimes mortality due to infectious diseases (Saeb *et.al.,* 2010; Maejima *et al*., 2005). As a result, transportation stress has both economic and animal welfare concerns, has attracted considerable attention in recent years.

Goats are transported from farmer's doorstep to market, slaughterhouse, for exhibition or other research and production farms where they are being used for obtaining various biological products such as antiserum etc. Goat does not endure transportation stress well during long journey. Industry report based on postmortem examination have indicated that goat become susceptible to respiratory infection, live weight shrinkage and immune competency after prolong journey under adverse weather condition (Kannan *et al*., 2000). There is paucity of literature and information available on the effect of short distance travelling stress on blood biochemical levels in goats in prevailing climatic condition. The objective of the study was to evaluate the biochemical changes occurred during short transportation of goats.

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Materials and Methods

The experiment was conducted on 50 healthy adult goats irrespective of sex, age and breed. Goats were transported by road for about 200 km from Ahmednagar district of Maharashtra (India) to Thane district of Maharashtra (India), in standing position without feed and water during transportation. Average ambient temperature and relative humidity on the day of transportation was 31°C, 51% and 35°C, 47.5% of Ahmednagar and Thane respectively.

Blood samples (5 mL) were collected from the experimental goats from jugular vein in vacutainer before and after transportation followed by weekly collection for next two weeks. Clear serum was obtained immediately after collection by centrifugation @1008 g for 10 minutes and stored at -20°C till analysis.

Serum total proteins, albumin, total calcium, phosphorus, and glucose were estimated in Biochemistry autoanalyzer using standard biochemical kits. (AGD Biomedicals, Andheri, Mumbai). Serum globulin levels were calculated by subtracting albumin from total proteins.

The experimental data was tabulated and analysed using WASP 2.0 software (Web Agri. Stat. Package), ICAR Research Complex Goa, Ela, Old Goa, India, using Completely Randomized Design (CRD).

Results and Discussion

Mean ± SE value of serum biochemical parameters during transportation in goats are presented in Table 1. The results reveal that during transportation there was a significant increase in all biochemical parameters studied. Preloading values of Total Protein, Albumin, Globulin, Calcium, Phosphorus and Glucose were found to be within normal range as reported by Ghanim *et.al*., (2016), Okoruwa (2014), Daramola *et al*. (2005), Ayo *et al.* (2009), Akinrinmade and Akinrinmade (2012) with slight variation from breed to breed.

The significant increase ($p < 0.01$) in the level of serum total proteins, immediately after transportation might be due to dehydration. Our observations are consistent with the findings of Okoruwa (2014) in goats and Mormede *et al.* (1982) in young calves. They reported increased total proteins and albumin during heat stress could be due to dehydration. After unloading the goats. The levels of total proteins in 1st and 2nd week were like the preloading and there was no significant difference found. This indicates the animals were rehydrated after unloading and thereafter. The levels of albumin and globulin followed a same trend of serum total proteins.

There was significant increase ($p < 0.01$) in the level of calcium immediately after transportation. During transportation various types of stresses might have stimulated secretions of corticosteroids and other stress hormones which are the key regulators of parathyroid hormone and in turn calcium homeostasis (Paula *et al.* (2018), which might have increased the level of blood calcium after travelling. Our finding also corroborates with the reports of Ayo *et al*. (2009). They reported that the serum total calcium concentration increased significantly post transportation from preloading 2.2 mmol/L to 4.1 mmol/L post-transportation in Red Sokoto or Maradi goats. While the values were returned to normal baseline 3 days post-transportation period. In our study the levels of total calcium at 1st and 2nd week after unloading the goats were similar to the preloading and there was no significant difference statistically.

There was significant increase ($p < 0.01$) in the level of serum phosphorus immediately after transportation. Galyean *et al.* (1981) and Parker *et al.* (2003) reported plasma phosphorus concentration to be higher in fasted and transported animals. These findings however contradictory with the reports of Ayo *et al*. (2009) in Nigerian goats. The levels of serum phosphorus came to its preloading value within one week after unloading of these animals in our study.

Various transportation stressors may have triggered secretions of corticosteroids and catecholamines and other stress hormones which might have increased the level of blood glucose after travelling. ZulkifiIndrus *et al.* (2010) reported significant increase ($p < 0.001$) in serum cortisol and glucose level after transportation under hot humid tropical conditions. Our results corroborate with the findings of Nwe *et al.* (1996), Kannan *et al.* (2000) and Rajion *et al.* (2001). These workers reported increase in serum level of glucose in goats after road transportation. In our study the levels of serum glucose came to its preloading value within one week after unloading but decreased significantly on 2nd week after transportation.

Elevation of cortisol due to transportation stress may have stimulated gluconeogenesis and contributed to increased glucose level. The release of adrenaline and noradrenaline in response to handling fear during loading at the initial stage may also have stimulated hepatic glycogenolysis leading to hyperglycaemia in our animals.

Table 1: Serum biochemical parameters during transportation in goats

S. No.	*Parameter*	*Preloading*	*Unloading*	*1st week*	*2nd week*
1.	Total Proteins g/dL	6.33 ± 0.07^{b}	7.48 ± 0.17^{a}	6.51 ± 0.08^{b}	6.63 ± 0.01^{b}
2.	Albumin g/dL	3.23 ± 0.06^{a}	3.90 ± 0.08^{b}	3.08 ± 0.08^{a}	3.13 ± 0.08^{a}
3.	Globulin g/dL	3.10 ± 0.08^{a}	3.58 ± 0.16^{b}	3.49 ± 0.16^{a}	3.50 ± 0.12^{a}
4.	Total Calcium mg/dL	8.79 ± 0.14^{b}	10.80 ± 0.20^{a}	8.56 ± 0.20^{b}	8.65 ± 0.27^{b}
5.	Phosphorus mg/dL	5.40 ± 0.12^{b}	6.13 ± 0.27^{a}	5.26 ± 0.10^{b}	5.34 ± 0.11^{b}
6.	Glucose mg/dL	56.58 ± 0.44^{b}	63.63 ± 1.64^{a}	54.21 ± 0.76^{b}	50.66 ± 0.97^{c}

Means with different superscript differ significantly

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