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Studies on age related changes in serum biochemical and enzymic profile in male Surti goats*

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ABSTRACT

The age related changes in biochemical profile of serum, viz. total protein, cholesterol, alkaline phosphatase and inorganic phosphorous were studied at fortnightly interval in 21 growing male Surti goats and were correlated with their growth rate. The experimental animals were divided equally into three groups with 6-9, 9-12 and 12-18 months of age. The study revealed that the total cholesterol and total protein levels increased with advancement of age, whereas the serum alkaline phosphatase (AKP) activity was found to be decreased. The mean levels of total protein were 7.30 ± 0.06, 7.47 ± 0.09 and 8.03 ± 0.07 g/dl, total cholesterol 64.47 ± 1.53, 67.61 ± 2.24 and 70.50 ± 1.60 mg/dl, AKP 266.16 ± 7.89, 232.51 ± 8.51 and 144.31 ± 8.76 IU/l, and inorganic phosphorus 13.41± 0.38, 12.08 ± 0.42 and 13.01 ± 0.47 mg/dl, in age group I, II and III respectively. The effect of age and period was significant for all the traits, but their interaction was not significant. The serum inorganic phosphorous levels tended to remain static up to one year of age and then it declined. The serum cholesterol and total protein levels had similar trend as found with testosterone levels in different groups of Surti bucks, but similar trend was not observed either for serum AKP or inorganic phosphorous levels.

Key words: Age, Surti male goat, Serum profile, Protein, Cholesterol, AKP, Phosphorus.

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Biochemical profiles in the circulating blood reflect the physiological functioning of gonads directly or indirectly through hormonal system. Many workers have reported the importance of alkaline phosphatase (AKP) in growing animals and have noted a general decrease in its levels up to maturity. The enzyme AKP has been implicated in a number of important cellular processes such as transport of solute across the cell membrane and synthesis of phospholipids, RNA and in carbohydrate metabolism (Tewari and Bourne, 1962). The phosphorous is the most essential constituent for bone formation, ATP synthesis, Phosphorylation of enzyme, DNA synthesis and in carbohydrate and lipid metabolism. It also influences gonadal function in male and female animals. Cholesterol synthesized from acetate is the most important and essential precursor for steroid hormone synthesis from testis, ovary and adrenal cortex. It is probably a constituent of all animal cells, and is essential for life with its varied functions (Kleiner and Orten, 1962). It is also a constituent of plasma lipoproteins, which are involved in the lipid transport system of the body (Tayler *et al.*, 1966). Serum proteins are complex which are known to play important roles in the body metabolism (Roubicek and Ray, 1974). They provide resistance to blood flow in vascular system, which is essential for the efficient heart action, provide nutrition for the body tissue, and contribute to the solubility and transport of lipids, fat soluble vitamins, bile salts, hormones and various drugs in the blood through the formation of complexes. The present study was planned to evaluate the age related changes in serum profile of total protein, cholesterol, AKP and inorganic phosphorus in growing male Surti goats.

A total 21 growing male goats of Surti breed were randomly divided in to three equal groups, consisting 7 male goats according to their age and body weight. The group I, II and III consisted of male goats of 6-9 months, 9-12 months and 12-18 months of age and weighting 8 to 12, 12 to 22 and above 23 kg, respectively. All these male goats were maintained identically under stall fed conditions at Reproductive Biology Research Unit of the College at Anand. These male goats were given "Amuldan" as concentrate, apart from greens and other roughages. The work was carried out from November-2006 to April-2007. All the male goats

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selected were healthy and vaccinated routinely against common infectious diseases. Blood collections and body weights were taken at every fortnight interval from each group of male goats over 105 days period. The serum samples were stored in deep freeze at -20°C till its analysis

The levels of biochemical constituents, viz. serum total protein (Biuret method) and total cholesterol (CHOD/PAP method) as well as alkaline phosphatase (pNPP Kinetic method) and inorganic phosphorus (Molybdate UV method) were estimated by using standard kits procured from Merck Specialties Pvt. Ltd. and Anamol Laboratories Pvt. Ltd., respectively, with the help of clinical chemistry analyzer - autoanalyzer - "SELECTRA JUNIOR" (Vital Scientific CO, France). The data was analysed statistically using factorial CRD and critical difference tests (Snedecor and Cochran, 1989).

The findings on age related changes in biochemical and enzymatic constituents studied in growing male goats are as follows.

The circulating blood serum total protein levels were 7.30 ± 0.06, 7.47 ± 0.09 and 8.03 ± 0.07 g/dl in the group I, II and III, respectively, with an overall mean of 7.60 ± 0. 05 g/dl. A definite age related change in serum protein was observed in Surti bucks studied, the differences in the levels between the groups were significant (P<0.01). The fortnightly values within the period of 105 days ranged between 10.82 ± 0.55 to 14.72 ± 0.67 g/dl. The values of total proteins increased significantly with growth. Regarding relationship between age of and levels of serum proteins it seems to be a controversy in the reports made earlier. According to Larsen and Touchbery (1959), decline levels was observed in albumin concentration and A:G ratio with advancement of age. The overall serum protein concentration reported for Surti bucks was slightly higher than that reported earlier in goats (Pyne *et al.*, 1982).

The serum total cholesterol levels were 64.47 ± 1.53, 67.61 ± 2.24 and 70.50 ± 1.60 mg/dl in the group I, II and III, respectively, with an overall mean of 68.86 ± 1.04 mg/dl. It showed an increasing trend and was non-significantly higher in adult bucks (>1 year of age) as compared to younger ones. It was evident that total cholesterol levels and testosterone levels were negatively correlated between 6 months to 1 year of age in Surti bucks (Jadav, 2008). The cholesterol has been found to act as precursor for steroid hormone synthesis. Therefore, the high cholesterol levels recorded in blood plasma between 6 months to 12 months of age is indicative of lower synthesis of sex steroids in the testis (Jadav, 2008). In the present study a similar age related changes in total cholesterol level was recorded as reported in growing bucks (Patel, 1990). The difference in the levels of cholesterol in relation to fortnightly periods was statistically significant (P<0.05).

The blood serum levels of alkaline phosphatase fluctuated in different age groups of Surti male goats. The levels were 266.16 ± 7.89, 232.51 ± 8.51 and 144.31 ± 8.76 IU/l in the group I, II and III, respectively, with an overall mean of 214.33 ± 6.42 IU/l. It was significantly (P<0.01) higher in younger bucks (6-9 months of age) and declined with advancement of age. The higher AKP activity in the blood of neonates and lower in adult bucks was a specific feature. The levels were found to be negatively correlated with age and blood testosterone levels up to 1 year of age (Jadav, 2008). The decline in plasma AKP activity with the advancement of age has been reported in bucks (Adaval *et al.*, 1969) and lambs (Bost and Bolvin, 1972). The difference in the levels of alkaline phosphatase in relation to fortnightly interval was significant (P<0.05). The values fluctuated between 178.52 ± 14.10 to 239.0 ± 20.31 IU/l within the period of 105 days. The value of alkaline phosphatase declined significantly in relation to advancing age.

The circulating blood serum inorganic phosphorous levels were 13.41± 0.38, 12.08 ± 0.42 and 13.01 ± 0.47 mg/dl in the group I, II and III, respectively, with an overall mean of 12.83 ± 0.25 mg/dl. The difference was statistically significant (P<0.05) and values were higher in younger (6-9 month) and mature (12-18 months) bucks as compared to pubertal ones (9-12 months of age). The difference in the levels of inorganic phosphorous in relation to period was also highly significant (P<0.01). The values fluctuated between 10.82 ± 0.55 to 14.72 ± 0.67 mg/dl within the period 105 days. Earlier studies (Singh *et al.*, 1972; Patel, 1990) reported a significant decline in inorganic phosphorous levels in bucks and bull-calves at 12 to 15 months of age. According to Bide and Thumbleson (1976), the levels of inorganic phosphorous declined as the animal attained sexually maturity. A significantly

lower level of serum inorganic phosphorous had been recorded at 1 year of age in rams (Long *et al.*, 1965). However, Adaval *et al.* (1969) and Nangia *et al.* (1968) could not observe a significant change in inorganic phosphorous levels in growing kids. The levels of inorganic phosphorous in blood tended to be related positively with blood testosterone levels (Jadav, 2008) and it is likely that the testosterone might help in incorporation of inorganic phosphorous in developing bones, brain tissues and gonads.

The blood biochemical profiles like total protein, cholesterol, AKP and inorganic phosphorus of growing Surti bucks followed the trends similar to other related ruminant species, and reflected age related physiological changes.

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