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Age related changes on hematobiochemical parameters in Assam hill goat

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Abstract

The present study was conducted in eighteen numbers of healthy goat of different age groups viz day old, 3 months and 6 months comprising six animals in each group (irrespective of sex) in the Department of Veterinary Anatomy and Histology, College of Veterinary Science, Assam Agricultural University, Khanapara. The animals were procured from in and around Guwahati city. For hematological, biochemical and hormonal estimation 10 ml of blood were collected from each animals before sedation. 2 ml of blood were transferred to sterilized test tube containing EDTA for hematological study viz. Hemoglobin (Hb), Total leucocyte count (TLC), Total erythrocyte count (TEC) and Packed cell volume (PCV) estimation. Serum hormonal parameters were estimated with the standard procedure of Radioimmunoassay (RIA), using RIA kits (I^{125} labeled) supplied by Immunotech, France. The different data hematological and biochemical parameters were analyzed by standard methods. TEC level was found to be increased from day old to 6 months age group. The average TLC level in day old, 3 months and 6 months were found to be 13.19 ± 1.41 , 22.49 ± 1.34 and 16.59 ± 0.93 Th./cmm respectively. The average serum triiodothyronine level in day old, 3 months and 6 months were found to be 3.86 ± 0.37 , 2.22 ± 0.11 and 2.90 ± 0.24 n mol/L respectively. There was no significance difference found between age group II and III in serum thyroxine level. Enzyme??? Significant or not mention.

Keywords: Goat, biochemical, hematological, age

Introduction

In the present study, Assam hill goat has been taken as an animal of choice considering its economic importance and large population in this state. Goats are very resistance to common infective diseases and can thrive in extreme environmental condition. Goats plays a major role in the socio-economic development of rural people of India particularly for small and marginal farmers and landless labours due to its short generation interval, higher rate of prolificacy and low initial investment. Although scientific study of various aspects of Assam hill goat has been conducted, but literature pertaining to haematological and biochemical parameters is very scanty. Therefore, the present investigation was conducted to elucidate this aspect of research i.e. to investigate certain hematological and biochemical and hormonal parameters of Assam hill goat at different stages of development.

Materials & Methods

The present study was conducted in eighteen numbers of healthy goat of different age groups viz day old, 3 months and 6 months comprising six animals in each group (irrespective of sex) in the Department of Veterinary Anatomy and Histology, College of Veterinary Science, Assam Agricultural University, Khanapara. The animals were procured from in and around Guwahati city. For hematological, biochemical and hormonal estimation 10 ml of blood was collected from each animal before sedation. 2 ml of blood were transferred to sterilized test tube containing EDTA for hematological study viz. Hemoglobin (Hb), Total leucocyte count (TLC), Total erythrocyte count (TEC) and Packed cell volume (PCV) estimation. The remaining amount of blood were transferred to a 10 ml test tube and kept in slanting position for 3- 4 hour at room temperature for collection of serum. The biochemical parameters viz. serum alkaline phosphatase (ALP) and acid phosphatase (ACP) was done on the same day of collection with the help of commercially available kits using spectrophotometer. The rest of the serum was kept at -20°C for hormonal study viz. triiodothyronine (T_3) and thyroxin (T_4). Serum hormonal parameters were estimated with the standard procedure of

Radioimmunoassay (RIA), using RIA kits (I^{125} labeled) supplied by Immunotech, France. The estimation was done in Automatic gamma counter, Startec, West Germany. The data were analyzed by standard statistical methods advocated by Snedecor and Cochran (Year???)

RESULTS

Hematological Parameters

Hemoglobin (Hb)

The average hemoglobin (Hb) level in Assam hill goat for all the age groups are shown in the table 1. The hemoglobin level was found to be decreased from day old to 6 months age groups. The average hemoglobin level in day old, 3 months and 6 months age group were 9.45 ± 0.30 , 8.37 ± 0.14 , and 8.13 ± 0.32 gm% respectively. There was highly significant difference ($P < 0.01$) between age groups I and II and also between I and III but there was no significance difference found between age group II and III in Hb level.

Total Leucocyte count (TLC)

The average total leucocyte count of Assam hill goat for all the three age groups are shown in the table.2. The TLC level was found to be increased from day old to 3 months old age group and thereafter it showed a decrease value at 6 months old age group. The average TLC level in day old, 3 months and 6 months were found to be 13.19 ± 1.41 , 22.49 ± 1.34 and 16.59 ± 0.93 Th./cmm respectively. There was highly significant difference ($P < 0.01$) between age group I and II and also between II and III while there was no significance difference between age group I and III in TLC level.

Total Erythrocyte Count (TEC)

The average total erythrocyte count of Assam hill goat for all the age groups were showed in the table.3. The TEC level was found to be increased from day old to 6 months age group. The average TEC level in day old, 3 months and 6 months age groups were 9.71 ± 0.31 , 14.48 ± 0.76 and 14.81 ± 0.51 million/cmm. Respectively. There was highly significant difference ($P < 0.01$) between age group I and II and also between I and III, however there was no significance difference between age group II and III in blood TEC level

Packed Cell Volume (PCV)

The average packed cell volume of Assam hill goat for all the three age groups were showed in the table. 4. The PCV was found to be decreased from day old to 3 months age groups and thereafter it showed a increased value at 6 months old age group. The average values of PCV in day old, 3 months and 6 months age groups were 33.65 ± 0.93 %, 23.28 ± 1.58 % and 24.55 ± 1.37 % respectively. There was highly significant difference ($P < 0.01$) between group I and II and also between group I and III, however there was no significant difference found between group II and III.

Biochemical Parameters

Alkaline phosphatases

The average serum alkaline phosphatases level in Assam hill goat for different age groups are shown in table 5. It showed decreasing trend with age from day-old kids to 6 month old goats. The average serum alkaline phosphatase level in day old, 3 months and 6 months were 24.82 ± 1.68 , 11.83 ± 1.00 , and 9.09 ± 0.56 KAU respectively. There was highly significant difference ($P < 0.01$) between age group I and II and also between I and III, but there was no significant

difference between age group II and III in serum alkaline phosphatase level.

Acid phosphatase (ACP)

The average serum acid phosphatase level in Assam hill goat for different age groups are shown in table 6. The average serum acid phosphatase level in day old, 3 months and 6 months were found to be 1.55 ± 0.13 , 1.62 ± 0.05 and 1.49 ± 0.04 KAU respectively. There was no significant difference among the various age groups in serum acid phosphatase level.

Thyroid Hormone Profile

Triiodothyronine (T₃)

The average serum triiodothyronine (T₃) level in Assam hill goat for all the age groups are shown in table 7. The serum triiodothyronine hormone level found to be decreased in 3 months old age group in compared to day old kids and after that it showed an increased value in 6 months old age group. There was highly significant difference ($P < 0.01$) between the age group I and II and also between I and III. However there was no significance difference found between age group II and III in serum triiodothyronine level.

Thyroxine (T₄)

The average serum thyroxine (T₄) level in Assam hill goat for all the age groups are shown in table 8. The serum thyroxine level found to be decreased in 3 months old age group in compared to day old kids after that it showed an increase value at 6 months old age group. The average serum thyroxine level in day old, 3 months and 6 months were found to be 150.90 ± 14.68 , 36.11 ± 2.43 and 50.96 ± 3.68 nmol/L respectively. There was highly significant difference ($P < 0.01$) between the age groups I and II and also between I and III. However there was no significance difference found between age group II and III in serum thyroxine level.

Discussion

Hematological Parameters

Hemoglobin (Hb)

The hemoglobin level was found to be decreased from day old kids to 6 month age groups. The average hemoglobin level in day old, 3 month and 6 month age groups were 9.45 ± 0.30 , 8.37 ± 0.14 , and 8.13 ± 0.32 gm% respectively. There was highly significant difference ($P < 0.01$) between age group I and II and also between I and III but there was no significance difference found between age group II and III in Hb level.

Ningia *et al.* (1968) [11] reported that the mean Hb level as 8.0, 7.0, 7.4, 7.0, 6.5 and 7.0 g/dl at 0-6, 6-12 months, 1 to 2, 2-3, 3-4 and 4-5 years of age in Beetal goat. Bhargava (1980) [11] carried out a study on hematology in Marwari breeds of goat and observed the Hb level as 10.09 gm/dl. Pyne *et al.* (1982) [15] carried out a study on hematology of healthy Black Bengal goat and reported mean value of Hb as 9.98 ± 0.56 g /dl. Rastogi and Singh (1990) [16] reported the Hb content of mountain Gaddi goats to range from 10-12 g /dl with an average of 11.1 ± 0.72 g/dl. The slight variation of Hb level in the present investigation might be due to age and breed variation which affect the process of erythropoiesis.

Total Leucocyte count (TLC)

The TLC level was found to be increased from day old to 3 month age group and thereafter it showed a decreased value from at 6 months age group. The average TLC level in day old, 3 month and 6 month were found to be 13.19 ± 1.41 , 22.49 ± 1.34 and 16.59 ± 0.93 th./cmm respectively. There was

significant difference ($p < 0.01$) between age group I and II and also between group II and III but there was no significance difference found between age group I and III in TLC level.

Similar observation were also made by Nwiyi *et al.* (2000) [12] and Schalm *et al.*, (1975) and concluded that goat showed high number of WBC in the first few months of life. According to them tropical environments are known to be favorable for parasites and high WBC counts in the young ruminants may probably due to environmental disposition. However, Pyne *et al.* (1982) [15] carried out a research on hematology of healthy Black Bengal goat and reported mean value of TLC as 10.18 ± 0.28 thousands per cmm. Biswas (2001) reported that the mean Total Leucocyte Count (TLC) of Black Bengal goats under field conditions was obtained to be 10.016 ± 0.030 th/cmm. Bhargava (1980) [1] carried out a study on hematology in Marwari breeds of goat and observed the WBC value as 10.14 th/cmm. In the present investigation the higher value of TLC may be due to age and breed variation and stress related to environment.

Total Erythrocyte Count (TEC)

The TEC level was found to be increased from day old to 6 month age group. The average TEC level in day old, 3 month and 6 month age groups were 9.71 ± 0.31 , 14.48 ± 0.76 and 14.81 ± 0.51 million/cmm. Respectively. There was highly significant difference ($P < 0.01$) between age group I and II and also between I and III, however there was no significance difference found between age group II and III in blood TEC level.

Similar observation was also made by Holman and Dew (1965) [8] where they mentioned that after 3 month of age on male goat found to have a higher RBC count. Bhargava (1980) [1] carried out a study on hematology in Marwari breed of goats and observed the RBC count as 10.12 million/cmm. Pyne *et al.* (1982) [15] carried out a research on hematology of healthy Black Bengal goat and reported mean value of TEC level was found to be increased from day old to 6 month age group.

Gill and Mishra (1972) [7] studied some of the blood constituent characters of the Beetal goats and reported the TEC value as 11.40×10^6 /cmm. Dey Sarkar (1974) [6] recorded total erythrocyte count (TEC) of goat to be highest among other domestic animals. Patra (1981) estimated the TEC value as (10^6 /cmm): 11.32 ± 0.41 . Das *et al.* (1992) [5] estimated the hematological profile during the pre and post weaning age of Assam hill kids. The level of TEC values decreased significantly ($P < 0.01$) during post weaning period in comparison to pre weaning period. The slight variation of TEC in the present investigation might be due to variation in age and breed, which affect the erythropoiesis.

Packed Cell Volume (PCV)

The PCV level was found to be decreased from day old kids to 3 month age groups and thereafter it showed a increased value at 6 month old age group. The average values of PCV in day old, 3 month and 6 month age groups were 33.65 ± 0.93 %, 23.28 ± 1.58 % and 24.55 ± 1.37 % respectively. There was highly significant difference ($P < 0.01$) between group I and II and also between group I and III. However, there was no significant difference found between group II and III.

However, Ningia *et al.* (1968) [11] reported that mean PCV value as 27.9, 24.3, 22.6, 25.5, 21.9 and 24.3% at 0-6, 6-12 months, 1 to 2, 2-3, 3-4 and 4-5 years of age in Beetal breed of goat. Bhargava (1980) [1] carried out a study on hematology

in Marwari breed of goats and observed the PCV as 37.96 %. Holman and Dew (1965) [8] observed a changing pattern of PCV with age, which shows three phages. At first a fall during first month, then a rise to the 3rd month and again a fall to the mature level at 30 month. Their findings was in agreement with the present investigation. Das *et al.* (1992) [5] estimated the hematological profile during the pre and post weaning age of Assam hill kids. The level PCV values decreased significantly ($P < 0.01$) during post weaning period in comparison to pre weaning period. The slight variation of the PCV value in the present investigation might be due to age and breed variation.

Biochemical Parameters

Alkaline phosphatases (ALP)

The average serum alkaline phosphatase level showed decreasing trend with age from day-old kids to 6 month old goats. The average serum alkaline phosphatase level in day old, 3 month and 6 month old goats were 24.82 ± 1.68 , 11.83 ± 1.00 , and 9.09 ± 0.56 KAU respectively. There was highly significant difference ($P < 0.01$) between age group I and II and also between I and III while there was no significant difference found between age group II and III in serum alkaline phosphatase level. This might be due to decrease of metabolism in liver with age. This decreasing trend was also observed by Turan *et al.* (2011) [19] in humans. However, Mahawar *et al.* (2004) [9] reported that the alkaline phosphatase level in Jamunapuri and Marwari goat were 13.91 ± 0.63 KAU/dl and 9.58 ± 0.45 KAU /dl respectively. Moreover, Das (1991) [4] reported that the alkaline phosphatase level in 3 month old Assam local, $\frac{1}{2}$ Beetal – $\frac{1}{2}$ Assam local and $\frac{3}{4}$ Beetal – $\frac{1}{4}$ Assam local goats were 9 ± 1 KAU, 10.77 ± 1.02 and 12.51 ± 1.00 KAU respectively. The slight variation in the present investigation might be due to age, breed, season and different parameters of environment.

Acid phosphatase (ACP)

The average serum acid phosphatase level in day old, 3 month and 6 month old goats were found to be 1.55 ± 0.13 , 1.62 ± 0.05 and 1.49 ± 0.04 KAU respectively. There was no significant difference among the various age groups in serum acid phosphatase level.

However Mahawar *et al.* reported that the mean value of ACP in Jamunapuri and Marwari goat was 1.23 ± 0.04 KAU. Das *et al.* (2010) showed the ACP level in Assam hill goat, $\frac{1}{2}$ Beetal – $\frac{1}{2}$ Assam hill goat and $\frac{3}{4}$ Beetal – $\frac{1}{4}$ Assam hill goat were 1.486 ± 0.066 , 1.505 ± 0.003 and 1.549 ± 0.063 KAU respectively which was similar to our findings.

Thyroid Hormone Profile

Triiodothyronine (T₃)

The serum triiodothyronine hormone level found to be decreased in 3 month old age group compared to day old kids and thereafter it showed an increased value in 6 month old age group. The average serum triiodothyronine level in day old, 3 month and 6 month were found to be 3.86 ± 0.37 , 2.22 ± 0.11 and 2.90 ± 0.24 nmol/L respectively. There was highly significant difference ($P < 0.01$) between the age group I and II and also between I and III. However, there was no significant difference found between age group II and III in serum triiodothyronine level.

Similar observation was made by Bhooshan *et al.* (2010) [2] and reported that in Barbari goats, T₃ concentration did not change since birth to post-pubertal age except a decrease at 90 days age. Pandey *et al.* (2014) [13] reported that, the serum T₃

concentrations declined progressively with advancement of age in both sexes of Marwari goat. They showed the overall mean value of T₃ were 1.32±0.07, 1.13± 0.06 and 1.12± 0.07 n mol/L in age group of below 1 years, 1-2 years and 2-3 years respectively. Todini (2007) [18] reported that the T₃ concentration in goats were 0.96 ± 0.05 (2.6 nmol/L), 0.72±0.04 (1.9 n mol/L) and 0.70±0.02 ng/ml (1.9 nmol/L) in 13 week pregnancy period, dry period and in 21 weeks pregnancy period respectively. McDonald (1980) [10] stated that the serum T₃ concentration of bovine was 92.50±58.61 ng/dl (2.55 nmol/L). It was observed that the slight variation of T₃ level in the present investigation was might be due to breed and age variation.

Thyroxine (T₄)

The serum thyroxine level found to be decreased in 3 month old age group in compared to day old kids and thereafter it showed an increased value at 6 month old age group. The average serum thyroxine level in day old, 3 month and 6 month were 150.90±14.68, 36.11±2.43 and 50.96±3.68 nmol/L respectively. There was highly significant difference (P <.01) between the age groups I and II and also between I and III. However, there was no significance difference found between age group II and III in serum thyroxine level.

This was in accordance to the finding of Bhooshan *et al.* (2010) [2] where they observed that after birth, T₄ level decreased sharply and attained significant lower values at 90 days of age compared to all other stages. T₄ concentration started increasing after 3 months of age in Jamunapari goats and was significantly higher level up to 330- 360 days of age. Pandey *et al.* (2014) [13] reported that, the serum T₄ concentrations declined progressively with advancement of age in both sexes of goats belongs to arid tropical region. They showed the overall mean value of T₄ were 44.01±3.18, 39.06±1.93 and 37.97 ± 2.27 nmol/L. in age group of below 1 years, 1-2 years and 2-3 years respectively. The slight variation in the present investigation might be due to age and breed variation.

Table 1: showing hemoglobin (Hb) level in Assam hill goat at different age groups.

| Age group | Hemoglobin (gm %) |
|----------------|------------------------|
| Day old (I) | 9.45±0.30 ^a |
| 3 months (II) | 8.37±0.14 ^b |
| 6 months (III) | 8.13±0.32 ^b |

Means with different superscripts differ significantly at 1% level of significance

Table 2: showing total leucocyte count (TLC) in Assam hill goat at different age groups.

| Age group | Total leucocyte count (Th./cmm) |
|----------------|---------------------------------|
| Day old (I) | 13.19±1.41 ^a |
| 3 months (II) | 22.49±1.34 ^b |
| 6 months (III) | 16.59±0.93 ^a |

Means with different superscripts differ significantly at 1% level of significance

Table 3: showing total erythrocyte count (TEC) in Assam hill goat at different age groups.

| Age group | Total Erythrocyte count (million/cmm) |
|----------------|---------------------------------------|
| Day old (I) | 9.71±0.31 ^a |
| 3 months (II) | 14.48±0.76 ^b |
| 6 months (III) | 14.81±0.51 ^b |

Means with different superscripts differ significantly at 1% level of significance

Table 4: Showing Packed Cell Volume (PCV) In Assam Hill Goat at Different Age Groups

| Age group | Packed Cell Volume (%) |
|----------------|-------------------------|
| Day old (I) | 33.65±0.93 ^a |
| 3 months (II) | 23.28±1.58 ^b |
| 6 months (III) | 24.55±1.37 ^b |

Means with different superscripts differ significantly at 1% level of significance

Table 5: serum alkaline phosphatase level in Assam hill goat at different age groups.

| Age group | Alkaline phosphatase (KAU) |
|----------------|----------------------------|
| Day old (I) | 24.82 ±1.68 ^a |
| 3 months (II) | 11.83±1.00 ^b |
| 6 months (III) | 9.09 ±0.56 ^b |

Means with different superscripts differ significantly at 1% level of significance

Table 6: showing serum acid phosphatase level (kau) in Assam hill goat at different age groups.

| Age group | Acid phosphatase (KAU) |
|----------------|------------------------|
| Day old (I) | 1.55±0.13 ^a |
| 3 months (II) | 1.62±0.05 ^a |
| 6 months (III) | 1.49±0.04 ^a |

Means same superscripts does not differ significantly at 1 % level of significance

Table 7: showing serum triiodothyronine level in Assam hill goat at different age groups.

| Age group | Triiodothyronine (nmol/L) |
|----------------|---------------------------|
| Day old (I) | 3.86±0.37 ^a |
| 3 months (II) | 2.22±0.11 ^b |
| 6 months (III) | 2.90±0.24 ^b |

Means with different superscripts differ significantly at 1% level of significance

Table 8: Showing Serum Thyroxine (T₄) Level in Assam Hill Goat at Different Age Groups.

| Age group | Thyroxin (n mol/L) |
|----------------|---------------------------|
| Day old (I) | 150.90±14.68 ^a |
| 3 months (II) | 36.11±2.43 ^b |
| 6 months (III) | 50.96±3.68 ^b |

Means with different superscripts differ significantly at 1% level of significance

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