



Postnatal development of the caput epididymis in Assam goat (*Capra hircus*)*

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ABSTRACT

The present work has been aimed to elucidate the age-wise post natal development of the testis, epididymis and thyroid gland of Assam goats from 0 day to 10 months of age. Assam (18) goats were divided into six age groups (N, 3; in each group) viz. group 1 (0–day), group 2 (2 months), group 3 (4 months), group 4 (6 months), group 5 (8 months) and group 6 (10 months). The gross and biometrical parameters of the caput epididymis were recorded. The tissues fixed from this organ were utilized for micrometrical studies. The values of majority of the biometrical parameters of caput, viz. length, width, thickness and weight showed a highly significant variation between different age groups. Bilateral variations of these parameters were also noticed between right and left counterparts of this organ. The diameter of the epididymal tubules, height of tubular epithelium and height of the stereo cilia in caput epididymides showed a significant increase with advancing age of the male Assam goats.

Key words: Assam goat, Biometry, Caput epididymis, Micrometry, Postnatal development

Post-natal anatomical studies on the male genital system at various ages, particularly the tubular system are important to know the anatomical growth and development. The reports on the postnatal development of the epididymis are meager. Little works has been conducted on goats (Harshan *et al.* 1978 and Islam *et al.* 2002), buffalo (Goyal and Dhingra 1975) and indigenous and crossbred pigs (Veerabrahmaiah *et al.* 1998). We present the first report on age related post natal development of the caput epididymis in Assam goat.

MATERIALS AND METHODS

Male Assam goats (18) varying in age from 0 day to 10 months were divided into 6 age groups (N, 3; each group), viz. group 1 (0–day), group 2 (2 months), group 3 (4 months), group 4 (6 months), group 5 (8 months) and group 6 (10 months).

Each animal was weighed using spring balance to record

the body weight. The animals were sedated and subsequently anaesthetized by administering intravenous injection of intravel sodium @ 15 mg/kg body weight as described previously (Hall *et al.* 2000). After induction of proper level of anesthesia, the animals were sacrificed.

Each epididymis was separated from the testis and divided into caput, corpus and cauda based on the external morphology. The length, width and thickness of caput epididymides were measured in cms using Vernier callipers. The weight of each segment of epididymis was recorded using a electronic balance with sensitivity from 0.02 mg to 310 g. Tissue pieces from caput epididymis were fixed in 10% neutral buffered formalin solution (Luna 1968). All the tissues were processed for paraffin sections (Luna 1968) by alcohol- xylene method using cedar wood oil to obtain 5 µ thick paraffin sections using a microtome. Paraffin sections stained with haematoxylin and eosin were used for following micrometric studies. The various measurements were recorded by image analyzer using software. All the data were put to statistical analysis and the means along with their standard errors were calculated. Variations of different parameters among different age groups were estimated by ANOVA and the probable variations between individual age groups were calculated by critical difference test. The correlation between certain parameters was determined by calculating the correlation coefficients. All the above calculations were carried out by using SPSS software version 11.5.

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RESULTS AND DISCUSSION

Gross morphology and biometry: The caput epididymis appeared rounded and elongated in shape in day-old kids (group 1) and flattened in older animals (Fig. 1). It was covered externally by the thick tunica vaginalis. The caput was attached to the dorsal extremity of the testis in all the animals under study as reported earlier in small ruminants (Getty 1975) and pig (Nickel *et al.* 1981). The tunica albuginea was closely attached to the epididymal tissue.

The observations on biometrical parameters pertaining to caput epididymis were presented in Table 1. The mean length of the caput was recorded as 0.88 ± 0.02 cm at birth (group 1) which increased to 3.63 ± 0.11 cm at 10 months of age (group 6). The length of the caput epididymides showed significant ($P < 0.01$) bilateral variations between their right and left counterparts in various age groups. Again, the variation in length of the caput epididymis was also recorded as highly significant ($P < 0.01$) between various age groups.

The mean width of the caput increased from 0.77 ± 0.01 cm in day-old kids (group 1) to 2.74 ± 0.02 cm in 10 months old goats (group 6). The variation in values of the width of the caput epididymis between right and left sides of the body was not significant, but the mean width differed significantly ($P < 0.05$) between 6 (group 4) and 8 months old bucks (group 5).

The mean values of thickness of the caput was recorded

as 0.27 ± 0.01 cm at birth (group 1) which increased to 1.04 ± 0.02 cm in 10 months-old bucks (group 6). The thickness of the caput epididymides showed insignificant bilateral variations in different age groups. However, there was significant differences ($P < 0.01$) between day-old (group 1) and 4 months-old kids (group 3). As observed in the present study, the length, width and thickness of the three segments of the epididymides revealed a significant increase in dimensions with the advancement of age in the male Assam goats from 0– day to 10 months of age. Similar trend of growth was reported in indigenous and crossbred pigs (Veerabrahmaiah *et al.* 1998). Further, the mean values for these parameters exhibited marked bilateral variations between the epididymides of right and left counterparts in this study as also reported in lambs (Colyer 1971) and pigs (Veerabrahmaiah *et al.* 1998).

The mean weight of the caput increased from 0.03 ± 0.00 g in day-old kids (group 1) to 3.39 ± 0.14 g in 10 months old kids (group 6). Analysis of variance revealed that, the values of the width of the caput epididymis had highly significant ($P < 0.01$) variation between right and left sides of the body, Again, the variation was also recorded as highly significant between different age groups. A significant difference in weights between right and left epididymides was also reported in lambs (Colyer 1971). Harshan *et al.* (1978) reported that the left epididymis was found to be

Table 1. Biometrical values (mean $\pm$ SE) of caput epididymis of male Assam goats in different age groups

Age group	Length (cm)			Width (cm)		
	Body side			Body side		
	Right	Left	Overall	Right	Left	overall
(0-Day)	0.91 ± 0.02	0.85 ± 0.03	$0.88^a \pm 0.02$	0.78 ± 0.01	0.75 ± 0.02	$0.77^a \pm 0.01$
(2- months)	1.92 ± 0.04	1.87 ± 0.04	$1.89^b \pm 0.03$	1.22 ± 0.04	1.12 ± 0.02	$1.17^{ab} \pm 0.03$
(4- months)	2.71 ± 0.02	2.79 ± 0.01	$2.75^{bc} \pm 0.02$	1.42 ± 0.02	1.28 ± 0.04	$1.35^{abc} \pm 0.04$
(6- months)	2.93 ± 0.04	2.92 ± 0.02	$2.92^{cd} \pm 0.02$	1.75 ± 0.05	1.61 ± 0.06	$1.68^{bd} \pm 0.05$
(8- months)	3.29 ± 0.07	3.14 ± 0.04	$3.21^{bd} \pm 0.05$	2.31 ± 0.02	2.58 ± 0.06	$2.45^e \pm 0.06$
(10- months)	3.86 ± 0.09	3.40 ± 0.06	$3.63^{bde} \pm 0.11$	2.70 ± 0.03	2.77 ± 0.03	$2.74^{ef} \pm 0.02$
Total	2.60 ± 0.23	2.49 ± 0.21	2.55 ± 0.16	1.69 ± 0.16	1.69 ± 0.18	1.69 ± 0.12

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Age group	Thickness (cm)			Width (cm)		
	Body side			Body side		
	Right	Left	Overall	Right	Left	overall
(0-Day)	0.29 ± 0.02	0.24 ± 0.02	$0.27^a \pm 0.01$	0.03 ± 0.00	0.03 ± 0.00	$0.03^a \pm 0.00$
(2- months)	0.46 ± 0.02	0.49 ± 0.02	$0.47^{ab} \pm 0.01$	0.38 ± 0.05	0.40 ± 0.05	$0.39^{ab} \pm 0.03$
(4- months)	0.71 ± 0.02	0.79 ± 0.02	$0.75^{bc} \pm 0.02$	1.80 ± 0.02	1.60 ± 0.01	$1.70^c \pm 0.05$
(6- months)	0.94 ± 0.02	0.92 ± 0.00	$0.93^{cd} \pm 0.01$	2.05 ± 0.03	2.27 ± 0.01	$2.16^{cd} \pm 0.05$
(8- months)	1.06 ± 0.03	1.03 ± 0.02	$1.04^{bcd} \pm 0.02$	2.54 ± 0.06	2.57 ± 0.03	$2.56^{de} \pm 0.03$
(10- months)	0.98 ± 0.01	1.04 ± 0.02	$1.00^{bcde} \pm 0.02$	3.10 ± 0.06	3.68 ± 0.09	$3.39^{ef} \pm 0.14$
Total	0.74 ± 0.07	0.75 ± 0.07	0.74 ± 0.05	1.65 ± 0.27	1.76 ± 0.31	1.71 ± 0.20

Means bearing similar superscript in a column do not differ significantly.



Figs 1–2. 1. Caput epididymis (Ca) of both the sides in a four months old male Assam goat. 2. Cross section of an epididymal tubule in a eight months old male Assam goat showing cilia (C) and epithelium(E). H&E, 400 $\times$.

significantly heavier than the right one in all the age groups in Malabari goats from 1 to 180 days of age.

Micrometry: The mean diameters of the epididymal tubules of the caput increased (Fig. 3) with advancing age of the male goats and ranged from $57.09 \pm 3.30 \mu$ in day-old kids (group 1) to $342.89 \pm 12.18 \mu$ at 10 month of age (group 6). Analysis of variance revealed a highly significant ($P < 0.01$) increase of this value between various age groups under study. There were two phases of significant increase ($P < 0.05$) in diameter, viz. the first during the initial phase of development up to 4 month of age (group 3) and the second was between 6 and 8 month of age (groups 4,5) (Table 2). Similar increase in tubular diameter of the caput epididymis with the advancing age were observed in non-descript goats (Bhattacharya *et al.* 1978) and Beetal goats (Bilaspuri and Kaur 1998). The diameter was recorded as $366.36 \pm 16.92 \mu$ in 10 months old goats (group 6). In camel, the diameter of the epididymal tubules of the caput was reported to be ranged from 120 to 250 μ (Singh and Bharadwaj 1980).

The epithelial height of the epididymal tubules of the goat caput showed an increase with advancement of age (Table 2), the maximum value being recorded as $60.12 \pm 2.91 \mu$ in 10 months-old goats (group 6). Kakade (1986) reported the epithelial height of caput to be ranging from 70–93 μ in local goat of Andhra Pradesh which was slightly higher than

Table 2. Micrometrical parameters (mean $\pm$ SE in μ) of caput epididymis of male Assam goats in different age groups

Parameters	External diameter of epididymal tubules	Height of tubular epithelium	Height of stereo cilia
0-Day	$57.09^a \pm 3.30$	$17.76^a \pm 1.94$	0.00
2- months	$132.85^b \pm 4.92$	$29.70^b \pm 1.40$	$10.17^a \pm 0.70$
4- months	$245.56^c \pm 9.93$	$52.73^c \pm 1.40$	$15.49^b \pm 1.91$
6- months	$271.77^{cd} \pm 7.99$	$56.66^{cd} \pm 1.95$	$19.82^{bc} \pm 0.71$
8- months	$346.65^{ef} \pm 15.04$	$58.54^{de} \pm 1.86$	$21.19^{cd} \pm 3.29$
10- months	$342.89^e \pm 12.18$	$60.12^{def} \pm 2.91$	$23.31^{cde} \pm 2.08$
Total	232.80 ± 14.34	45.92 ± 1.85	14.99 ± 1.22

the present value in 10 months old Assam goats. The height of epididymal tubular epithelium of caput was reported to be 130 μ in camel (Tingari and Moniem 1979).

The stereo cilium was first seen in the tubular epithelium of the caput of 2 months kids (group 2) and the height of stereo-cilia increased in older goats. Further the longest stereo-cilia were observed in 10 months old goats with a mean height of $23.31 \pm 2.12 \mu$ (Table 2). The variation in height of the stereo-cilia was highly significant ($P < 0.01$) between different age groups. The heights of stereo-cilia were reported to be 23.0 μ in goat (Kakade 1986) and camel (Tingari and Moniem 1979).

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