LOCALIZATION OF CERTAIN DEHYDROGENASES IN THE CAUDA EPIDIDYMIS OF ASSAM GOATS FROM BIRTH TO TEN MONTHS OF AGE#

Kamal Sarma[1], S.N. Kalita [2] and and J. Devi [3]
Department of Veterinary Anatomy, College of Veterinary Sciences, Assam Agricultural University, Khanapara, Guwahati-22, Assam, India

Received: 07.09.2016
Accepted: 09.11.2016

ABSTRACT

A total of 18 male Assam goats varying in age from 0-day to 10 months were used in the present study. The animals were divided into six age groups viz. group-I (0-day), group-II (2 months), group-III (4 months), group-IV (6 months), group-V (8 months) and group-VI (10 months) consisting of three animals in each group. The cryostat sections obtained from the cauda epididymides were incubated for the histoenzymic demonstration of various enzymes viz. Glucose-6-Phosphate dehydrogenase (G-6-PDH), lactate dehydrogenase (LDH), malate dehydrogenase (MDH), Δ^5-3 β- hydroxysteroid dehydrogenase (Δ^5-3 β-HSD) and 17-β-hydroxysteroid dehydrogenase (17-β-HSD). The activity of LDH remained weak to moderate in the epididymal tubular epithelium of the kids below 4 month of age (group-III). However, the enzymic activity for LDH increased to strong with the advancing age of the male goats. The tubular epithelium of the epididymis showed an enhanced activity for MDH enzyme in the male kids with advancing age. Moderate activity of G-6-PDH was observed in the tubular epithelium of the epididymis in male Assam goats at 8 to 10 months of age.

***Key words*:** Tubular epithelium, cauda epididymis, histoenzymology, Assam goat

Introduction

Goat rearing has tremendous potential in the North-eastern states particularly among the small and marginal farmers and landless labourers because of very low initial investment and adequate financial returns. The epididymis is the continuation of the testicular duct system connecting it with the vas deferens which provides a plateform for maturation of the spermatozoa (Hafez, 1987). The enzymes located in the cauda epididymis plays a major role in this process (Deganand Lee, 1982).

Detection of various enzymes in the tissues of the epididymis had been carried out in various domestic animals like camel (Tingariand Moniem, 1979), horse (Singh *et al.*, 1989), donkeys (Uppal *et al.*, 2002). The aim of this present work is to study the localization of various dehydrogenase enzymes in the cauda epididymis of Assam goats at various post natal ages, which is the first report of its kind in this indigenous breed of Assam.

Materials and Methods

Eighteen male Assam goats aged from 0-day to 10 months were used in the present study. The animals were divided into six age groups *viz.* group-I (0-day), group-II (2 months), group-III (4 months), group-IV (6 months), group-V (8 months) and group-VI (10 months) consisting of three animals in each group. The animals were sedated by giving intramuscular injection of Siquil (triflupromazine hydrochloride) @ 1 mg/kg body weight and subsequently anaesthetized by administering intravenous injection of intravel sodium (pentobarbital sodium) @ 15 mg/kg body weight (Hall *et al.*, 2000). After induction of proper level of anesthesia, the testicles were incised out by performing open method of castration as per standard protocol. Subsequently, the animals were given proper post operative treatment and care.

After separating from the testes, tissue samples from cauda epididymis were collected and sectioned at 10 µ thicknesses using a cryostat (Leica, U.K.). The cryostat sections were incubated for the histoenzymic demonstration of various enzymes stated as detailed hereunder.

Results and Discussion

The activity of LDH remained weak to moderate in the epididymal tubular epithelium of the kids below 4 month of age (group-III). However, the enzymic activity for LDH increased to strong with the advancing age of the male goats (Fig.1). In 6 to 10 months old bucks, comparatively more activities of LDH was observed (Fig.2) in the epididymal tubular epithelial cells of the cauda. (Allen and Salter, 1961) reported that the LDH localized in the epididymis was suggestive to be more of a secretory type that provided lactate which could be used as a source of energy by the spermatozoa efficiently in partially anaerobic conditions. In the epididymis of Assam goats, thus the lactate secretion although appeared to occur in all the three segments of the epididymis, it was maximum in the cauda. This might be to provide adequate energy requirements for the stored spermatozoa in goats from 6 month of age (group-IV) onwards. On the contrary, Hall *et al.* (2000) reported maximum localization LDH enzyme in the corpus epididymis of horse, which might be a species specific characteristics. The tubular contents and the stereo cilia exhibited strong to intense reactions to LDH in 8-10 months old bucks (groups-V and VI). These findings were in corroboration with that reported in donkeys (Uppal *et al*., 2002).

The activity of MDH was found to be the highest in the tubular epithelium of the cauda epididymis as strong activity was noticed (Fig. 3) in the animals of all the age groups with exception of day-old kids. The activity of MDH was granular type distributed mainly in the basal border of the epithelium. The peritubular tissue showed weak activity in the animals of lower age groups (group-I and II), weak to moderate in 4 and 6 months old goats (group-III and IV)

#[1]Part of Ph.D. Thesis of the first author submitted to Assam Agricultural University, Assam, and Present address: Associate Professor, Division of Veterinary Anatomy, Faculty of Veterinary Sciences & Animal Husbandry, S.K. University of Agricultural Sciences & Technology, Jammu-181 102, Jammu & Kashmir;[3]Associate Professor, Division of Veterinary Physiology& Biochemistry, Faculty of Veterinary Sciences & Animal Husbandry, S.K. University of Agricultural Sciences & Technology, Jammu-181 102, Jammu & Kashmir, India and [2]Retired Professor, Department of Veterinary Anatomy & Histology, College of Veterinary Science, Assam Agricultural University, Guwahati-781022 (Assam), India.

Table 1: Histoenzymic techniques used for the demonstration of different enzymes

S. No.	Enzyme	Substrate used	Incubation time	Method & source
1	Lactate dehydrogenase (LDH)	Sodium-DL-lactate	30 min	(Pearse, 1980)
2	Malate dehydrogenase (MDH)	L-Malic acid	30 min	do
3	Glucose-6-phosphate dehydrogenase (G-6-PDH)	Di-Na-glucose-6-phosphate	30 min	Nitro- BT method do

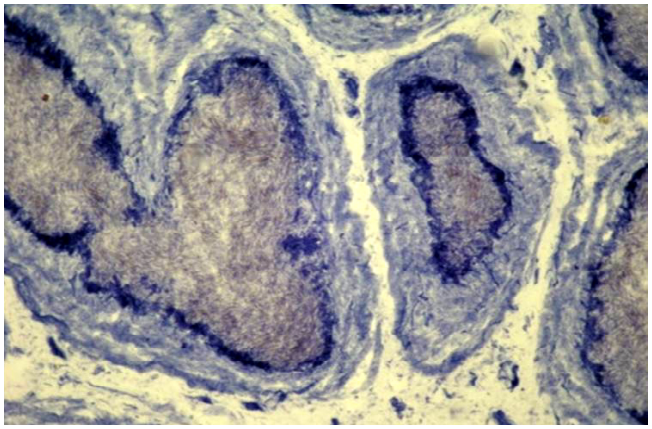

Fig.1: Photomicrograph of the cauda epididymis in an eight months old buck showing the activity of LDH enzyme (400 X).

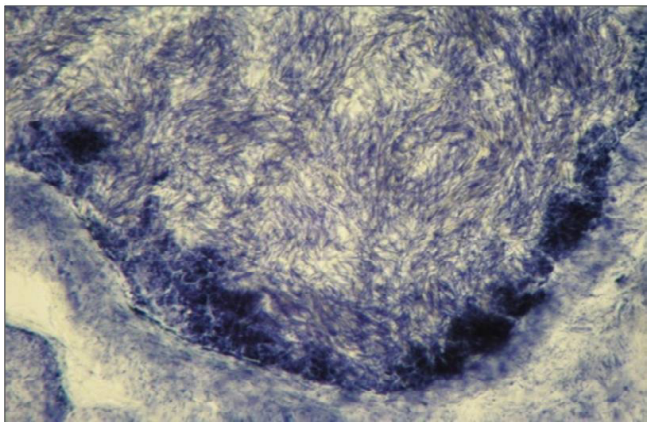

Fig. 2: Photomicrograph of the luminal content of the cauda epididymis in a ten months old buck showing the activity of LDH enzyme (400 X).

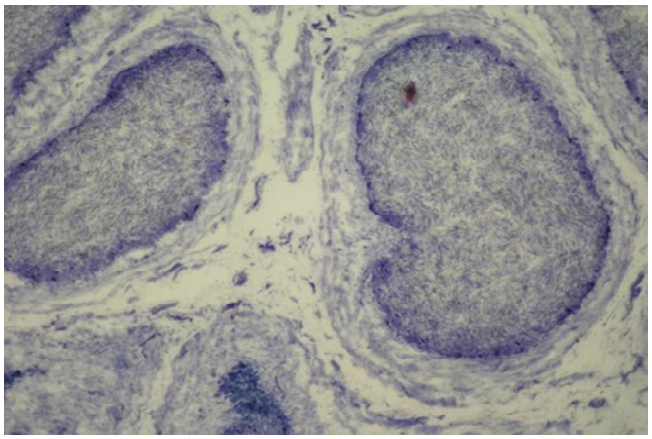

Fig. 3: Photomicrograph of the cauda epididymis in an eight months old buck showing the activity of MDH enzyme (100 X)

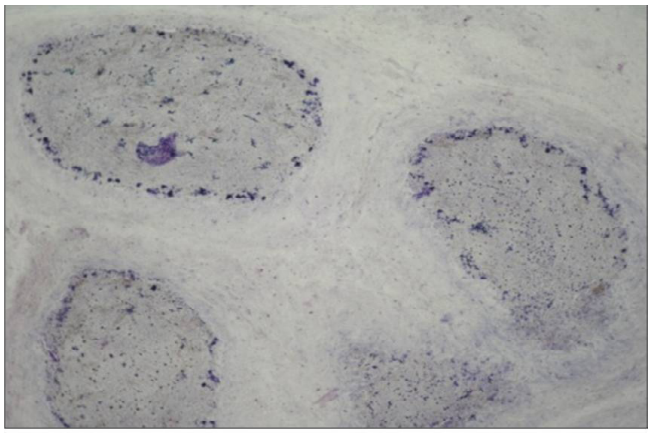

Fig.4: Photomicrograph of the cauda epididymis in a ten months old buck showing activity of G-6-PH enzyme (100 X)

and moderate activity was seen in older animals. More enzymic activity in the tubular epithelium was also reported in bull testis (Blackshawand Samisoni, 1967). Again, among all the three segments of the epididymis, the tubular epithelium of the cauda had maximum activity of MDH in Assam goats. This high localization of MDH enzyme might be to meet an increased need for energy requirement of the stored spermatozoa in the cauda epididymis.

The G-6-PDH was associated with pentose cycle or glucose phosphate shunt and played an important role in the biosysthesis of ribose, nucleic acids and nucleotides as well as in the synthesis of amino acids (Singh *et al*., 1989). No activity of G-6-PDH was seen in the epididymal tubular epithelium in the male goats of all the age groups except at 8 and 10 months of age (groups V and VI), in which a diffused moderate activity was seen (Fig. 4). The peritubular tissue showed very mild activity of G-6-PDH in the goats from birth to 6 month of age (groups-I to IV) and mild activity in older bucks. Moderate activity of G-6-PDH observed in the tubular epithelium of the epididymis in male Assam goats at 8 to 10 months of age (group-V and VI) might be suggestive for providing the epididymal tubular epithelial cells with various biomolecules during pot pubertal period. G-6-PDH activity was observed to be the maximum in the tubular epithelial cells of the corpus epididymis in stallion (Singh *et al*., 1989). However, no such trend was seen in the present study.

References

Allen, J.M. and Salter, J.J. (1961) *Histochem*. **9**: 221-233.

Blackshaw, A.W. and Samisoni, J.I. (1967) *J. Dairy Sci*. **50**: 747-752.

Degan, A.A. and Lee, D.G. (1982) *Anat. Histol. Embryol.* **11**: 267-275.

Hafez, E.S.E. (1987) *Reproduction in Farm Animals*. 5th ed., Lea & Febiger, Philadelphia.pp. 25-26.

Hall, L.W. *et al*. (2000) *Wright's Veterinary Anesthesia and Analgesia*.10th ed., ELBS and Baillierre Tindall, London.

Singh, J. *et al*. (1989) *Indian J. Vet. Anat*. **1**: 17-24.

Tingari, M.D. and Moniem, K.A. (1979) *J. Reprod. Fert*. **57**: 11-20.

Uppal, V. *et al*. (2002) *Centaur*. **19**: 18-21.