

Mucopolysaccharide Distribution in Adrenal Gland of Gohilwadi Goat during Postnatal Development

Vishnudeo Kumar^{1*} and Anil Sharma²

Department of Veterinary Anatomy, College of Veterinary Science and Animal Husbandry
Kamdhenu University, Junagadh-362 001 (Gujarat)

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ABSTRACT

The present study included the left and right adrenal glands of 20 Gohilwadi goat, age ranging from day old to adult. The samples were divided into three groups viz. group- I (day old to 1 month), group- II (>1 month to 6 months) and group- III (>6 months). The neutral mucopolysaccharide (NMPS) content was high in the inner aspect of capsule and moderate in the wall of large blood vessels. Zona glomerulosa exhibit weak PAS positive reaction in group-I and moderate in other two groups. Zona fasciculata showed moderate PAS positive reaction in group- I and II and weak in adult. The outer medullary zone showed weak and inner medullary zone showed moderate PAS positive reaction. The acid mucopolysaccharide (AMPS) content was weak in capsule and moderate in the cells of zona glomerulosa and zona fasciculata. A high AMPS content was observed in the cells of zona reticularis in adult. Moderate reaction for AMPS was observed in both the outer and inner zones of medulla.

Key words: Adrenal, Gohilwadi Goat, Mucopolysaccharide, Postnatal

The goat is a multi-purpose animal producing meat, milk, hide, fibre and manure. Goat has been described as a poor man's cow (or mini-cow) because of its immense contribution to the poor man's economy. They not only supply nutritious and easily digestible milk to their children but also regular source of additional income for poor and landless or marginal farmers. Being small-sized animals, goats can easily be managed by women and children. Capital investment and feeding costs are also quite low. Goats can be successfully reared in areas where fodder resources are limited and in rural areas, goat farming plays a vital role in providing employment.

Mucopolysaccharides are glycosamino-glycans, i.e., heteropolysaccharides composed of hexosamines and non-nitrogenous sugars linked by glycosidic bonds; some also contain various substituent groups. They occur in different proportions in different tissues, and the pattern of distribution in the same tissue changes with maturation and aging. The importance of disturbances in the natural distribution of mucopolysaccharides is indicated by the clinical abnormalities (Karl, 1969). The mucopolysaccharides distribution in the adrenal gland had been reported in various domestic animals (Prasad and Sinha, 1981), in pig foetuses (Bielanska-Osuchowska, 1989a, b), in goat foetuses (Hakeem *et al.*, 1993), and in buffalo (Kumar *et al.*, 2011) but very scanty information is available on postnatal mucopolysaccharides distribution

in the Gohilwadi goat. Therefore, present study was conducted to observe the distribution of neutral and acid mucopolysaccharides in adrenal gland.

MATERIALS AND METHODS

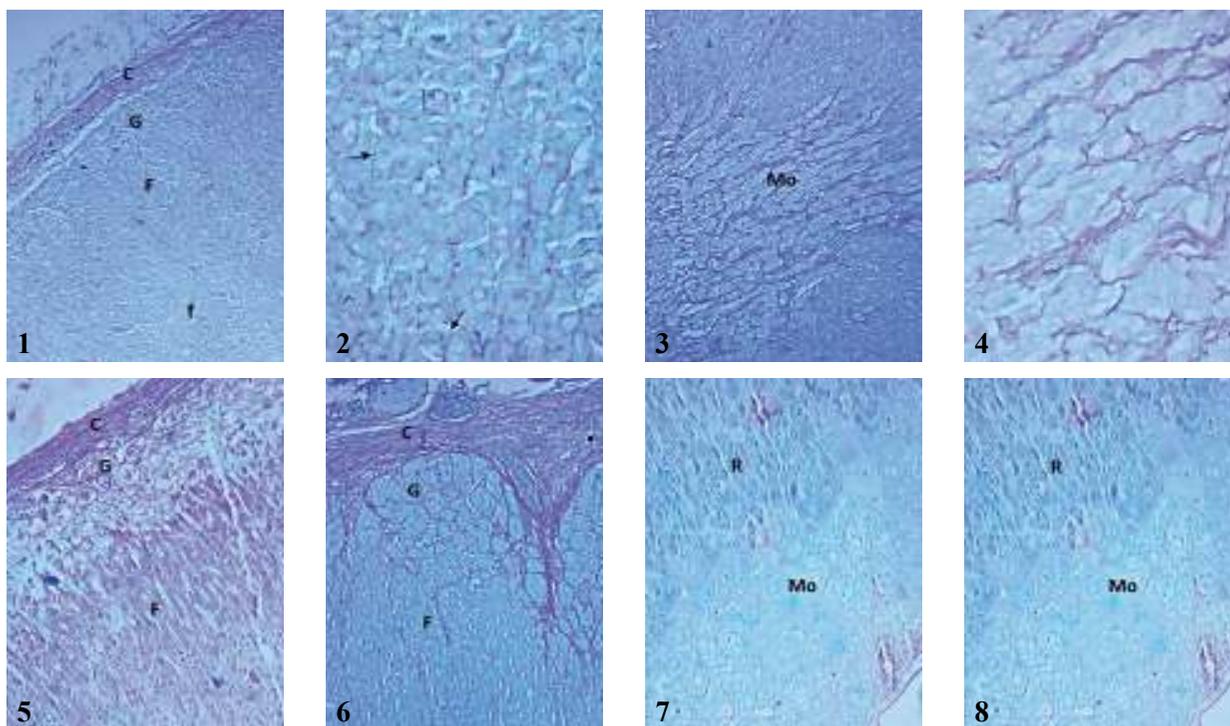
The study was conducted on adrenal glands of 20 Gohilwadi goats of different age groups. On the basis of age the animals were divided into three groups viz. group- I (day old to 1 month), group- II (>1 month to 6 months) and group- III (>6 months). The glands were collected from local abattoir, college farm and clinical complex and fixed in 10% neutral buffered formalin (NBF). The tissue samples were processed by standard protocol (Prophet *et al.*, 1992) and paraffin blocks were prepared. Tissue sections of 5-6 μ m thickness were obtained on glass slide with the help of rotatory microtome. The sections were stained with periodic acid Schiff's (PAS) for neutral mucosubstances and PAS - alcian blue (AB) at pH 1.0 and 2.5 for acid mucosubstances (Prophet *et al.*, 1992)

RESULTS AND DISCUSSION

Neutral mucopolysaccharide (NMPS): In Group-I the adrenal gland showed a moderate Periodic Acid Schiff (PAS) positive reaction especially in the inner zone of the capsule and strong reaction in the wall of large blood vessels of capsule (Fig. 1). The moderate PAS positive reaction in the inner aspect of capsule might be due to the presence of reticular fibers. The PAS positive reaction in the adrenal capsule was also reported by Hakeem *et al.* (1993) in goat foetuses and Kumar *et al.* (2011) in young

1 Assoc. Prof.; 2 Asstt. Prof.

*Corresponding author: drvishnudeo@gmail.com



Figs. 1-8. Photomicrograph of Adrenal gland of one week old Gohilwadi kid. **1.** Capsule (C), zona glomerulosa (G), zona fasciculata (F) arranged in radiating cords and foetal cortex (f). PAS-AB x 40; **2.** Foetal cortex with distinct PAS positive rim (arrow). PAS-AB x 400; **3.** Outer (Mo) zone of medulla. PAS-AB x 100; **4.** Inner zone of medulla. PAS-AB x 400; **5.** Capsule (C), zona glomerulosa (G) and zona fasciculata (F) in four month old Gohilwadi goat. PAS-AB x 100; **6.** Capsule (C), zona glomerulosa (G) and zona fasciculata (F) in adult Gohilwadi goat. PAS-AB x 100; **7.** Zona reticularis (R) and outer (Mo) zone of medulla in five month old Gohilwadi goat. PAS-AB x 400; **8.** Outer (Mo) and inner (Mi) zone of medulla in adult Gohilwadi goat. PAS-AB x 400.

and adult buffalo. In the present study the zona glomerulosa was weak PAS positive. However, Hakeem *et al.* (1993) observed moderate PAS positive reaction in the cells of the zona glomerulosa, which were due to presence of glycogen. In the present findings the PAS positive reaction was moderate in the zona fasciculata (Fig. 1). The Foetal cortical (FC) cells were also moderate PAS positive and a distinct PAS positive rim was observed in the periphery of cells (Fig. 2). Bielanska-Osuchowska (1989 *a, b*) also reported a PAS positive rim around the FC cells of the adrenal gland of pig foetus and the intracellular spaces were filled by the substances derived from plasma or steroid substances secreted by the cortical cells. The PAS positive reaction was due to the presence of these substances in the intercellular spaces. Similar PAS positive substance was also observed in the adrenal cortical cells of man, pig and cat (Motta *et al.*, 1979). The adrenal medulla of Gohilwadi goat has distinct outer and inner zones. The outer zone of medulla showed weak PAS positive reaction and inner zone showed moderate PAS positive reaction (Figs. 3, 4). Similar findings were observed earlier in the adrenal gland of neonatal buffalo calf (Kumar *et al.*, 2011). However, Bielanska-Osuchowska (1989 *a, b*) also found degenerating FC cells with slightly PAS positive cytoplasm in the adrenal medulla of pig foetuses.

In Group-II and Group-III, the capsule and its blood vessels were strongly PAS positive. The cells of zona

glomerulosa were moderate PAS positive in Group II and Group-III. However, the zona fasciculata showed moderate to strong PAS positive in Group II and weak PAS positive Group-III (Figs. 5, 6). Zona reticularis showed a weak reaction in Group II and Group-III. The cells of zona reticularis lacked PAS positive rim around them, which was observed in the FC cells in group I (Fig. 7). Hakeem *et al.* (1993) reported the PAS positive reaction in all the zones of adrenal cortex of goat. Similar observations were recorded earlier in the adrenal gland of neonatal buffalo calf (Kumar *et al.*, 2011). However, Prasad and Yadava (1974) reported a moderate reaction in the cells of zona fasciculata and a negative reaction in the zona glomerulosa. In the present study the outer and inner zone of adrenal medulla showed a weak to moderate PAS positive reaction in Group-II and Group-III (Figs. 7, 8), as reported earlier in young and adult buffalo by Prasad and Yadava (1974) and in adult Bakerwali goat by Kour *et al.* (2017) they reported that the cells of the outer medulla stained lightly with PAS. The light and dark cells were clearly differentiated by Periodic acid-Schiff (PAS) staining method.

Acid mucopolysaccharide (AMPS): In Group-I the alcinoophilic reaction was weak in the adrenal capsule of day old Gohilwadi kids. The zona glomerulosa, zona fasciculata and foetal cortical cells showed moderate

reaction in Group-I. Outer and inner zone of medulla showed moderate positive reaction for AMPS (Figs. 1, 3, 4).

In Group-II the capsule showed a weak alcinophilic reaction. There was a weak alcinophilic positive reaction in the cells of the zona glomerulosa and weak to moderate alcinophilic positive reaction in the cells of the zona fasciculata (Fig. 5). However, the reaction was moderate in the cells of zona reticularis. The outer and inner zones of medulla showed a moderate alcinophilic positive reaction (Fig. 7).

In Group-III the capsule showed a weak to negative alcinophilic reaction. There was a moderate alcinophilic positive reaction in the cells of the zona glomerulosa and zona fasciculata (Fig. 6). However, the reaction was moderate to strong in the cells of zona reticularis. The outer and inner zones of medulla showed a moderate alcinophilic positive reaction (Fig. 8).

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