MICROMORPHOLOGY AND HISTOCHEMISTRY OF UTERUS OF GADDI GOATS DURING REPRODUCTION AND SENILITY

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ABSTRACT
Detailed histological and histochemical observations were recorded on corpus and cornuae of uteri obtained from 15 healthy Gaddi goat (Prepubertal (4), pubertal follicular group (4), pubertal luteal group (4), senile group (3)). The endometrial thickness and epithelial height was maximum in luteal group. Unlike other animals chromatophores and elastic elements were not observed in Gaddi goat uteri. But mast cells were frequently recorded in pubertal follicular and luteal phases. However, absent in prepubertal and senile groups. Myometrium and perimetrium showed varied frequency intensity for these constituents. The endo-myo and perimetrial thickness in senile group was due to fibrosis. Uterine epithelium was strongly positive for carbohydrates and bound lipids.

INTRODUCTION
Histological and histochemical studies are important indices in elucidating the reproductive status of an animal. Such studies in different breeds have been reported (Joshi, 1974; Agarwal and Bhattacharya, 1980 and Bhattacharya and Saigal, 1984). However, such information in Gaddi goats is completely lacking. Therefore the present study was undertaken.

MATERIAL AND METHODS
The small slices from corpus and both cornua were collected from 15 non-pregnant healthy Gaddi goats and classified in prepubertal (4), pubertal follicular (4), pubertal luteal (4) and senile (3) groups. The collected slices were fixed in 10% neutral formalin, Baker's calform and Lavdowskey fixatives for 24-48 hrs. The paraffin sections of 5/1m thickness were stained with Harris haematoxylin and eosin, Verhoeff's elastica stain, Vongieson, Gridley's reticulum for connective tissue fibres. PAS with and without diastase for carbohydrates, Alcian blue for acidic mucopolysaccharides, Aldehyde fuchsin for carboxylic mucopolysaccharides, Sudan black B, Nile blue sulphahte, Oil Red O for bound lipids and triglycerides (Luna, 1968). The microscopic structures were measured by calibrated ocular micrometer. The presence of bio-organic constituents were accessed by microscopic examination of staining intensity of particular part.

RESULTS AND DISCUSSION
The uterine wall of Goddi goat comprised of three tunics; the mucosa or endometrium, myometrium and perimetrium (Joshi, 1974, Agarwal and Bhattacharya, 1980 and Bhattacharya and Saigal, 1984). However, such information in Gaddi goats is completely lacking. Therefore the present study was undertaken.

The endometrium was well defined into nonglandular/caruncular areas and glandular/inter caruncular areas (where glands opened directly into lumen). The endometrium was thickest in pubertal luteal group owing to proliferation of glands, thinnest in prepubertal group (Table 1). This was in contrast with the findings of Rajput and Sharma, (1999). Endometrium was observed as fibrosed in senile group.

The uterine lining epithelium showed regional as well as cyclic variations in different phases of growth and reproduction. It varied from low to tall simple columnar, ciliated to non ciliated pseudostratified columnar epithelium (Fig. 1). Three types of cells; ciliated columnar, nonciliated columnar/secretory cells and basal cells were identified as earlier recorded by Agarwal and Bhattacharya (1980) in goats.
Table 1. Micrometry of three layers of uterus

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Prepubertal</th>
<th>Pubertal</th>
<th>Luteal group</th>
<th>Senile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endometrial thickness (μm)</td>
<td>635.74±5.50</td>
<td>800.00±16.00</td>
<td>1538.30±45.00</td>
<td>1431.08±8.63</td>
</tr>
<tr>
<td>Myometrial thickness (μm)</td>
<td>893.76±2.78</td>
<td>851.20±4.56</td>
<td>1596.00±7.97</td>
<td>1066.66±5.32</td>
</tr>
<tr>
<td>Perimetrial thickness (μm)</td>
<td>47.88±1.01</td>
<td>367.08±1.85</td>
<td>266.00±3.95</td>
<td>126.35±1.11</td>
</tr>
</tbody>
</table>

Table 2. Micrometry of uterine epithelial height

<table>
<thead>
<tr>
<th>Stage of reproduction</th>
<th>Top of caruncle (μ)</th>
<th>Side of caruncle (μ)</th>
<th>Non caruncular area (μ)</th>
<th>Mean height (μ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prepubertal phase</td>
<td>19.52±0.95</td>
<td>27.30±0.98</td>
<td>26.25±1.60</td>
<td>24.26±3.57</td>
</tr>
<tr>
<td>Follicular phase</td>
<td>23.80±0.74</td>
<td>30.10±0.48</td>
<td>32.20±0.74</td>
<td>28.70±3.56</td>
</tr>
<tr>
<td>Luteal phase</td>
<td>36.16±0.94</td>
<td>25.90±1.09</td>
<td>22.40±1.01</td>
<td>28.15±5.83</td>
</tr>
<tr>
<td>Senile phase</td>
<td>28.58±1.06</td>
<td>17.50±0.63</td>
<td>28.70±0.74</td>
<td>24.92±5.25</td>
</tr>
</tbody>
</table>

Fig. 1. Photomicrograph of uterus showing tall columnar pseudostratified non ciliated epithelium. Epithelium stains strongly for AMPS at apical border in luteal group of Gaddi goat. Alcian Blue x 200.

However, this observation was at variance with findings of Grant (1934) and Restall (1967) in sheep. The mean epithelial height was almost same at noncaruncular area in both follicular and luteal group but it was highest in luteal group at the top of caruncle. It was minimum in prepubertal group (Table 2). Rajput and Sharma (1999) recorded maximum epithelial height in follicular phase. This could be attributed to progesteronal effect during luteal phase. Migratory type mast cells were also recorded between epithelial cells and basement membrane as also reported earlier by Agarwal and Bhattacharya (1980) in goats. These cells were more in luteal group, absent in prepubertal and senile groups.

The lining epithelium was found invaginated in lamina propria to form glandular structures (gland uterine). The lamina propria-submucosa comprised of loose connective tissue enriched with fibroblasts, mast cells (Fig. 3) and neutrophils as stated by Dellmann (1971).
in domestic animals. The pigment cells (melanophores) described by various authors (Grant, 1934; Cole and Miller, 1935) in sheep were not seen in Gaddi goat’s uteri. The propria was occupied by the glands which were arranged in three distinct zones i.e. (a) subepithelial zone (b) intermediate zone and (c) compact/deeper zone. The subepithelial zone glands were larger, fewer and endowed with rich capillary plexus whereas intermediate glands were infiltrated with wide lumminated glands. The deeper zone was rich in small lumminated, compactly arranged glands mesenchymal cells and juvenile fibroblasts. The stroma was highly endematous in follicular phase similar to Gaddi sheep (Rajput and Sharma, 1999). Dense network of thin reticular fibres form basket like arrangement around each gland (Fig. 2).
The myometrium comprised of usual inner thick circular, outer thin longitudinal layer of smooth muscle and middle vascular layer. Similar pattern of myometrium had been reported in sheep and other domestic animals by Rajput and Sharma (1999), Trautmann and Fiebiger (1957) and Dellmann (1971). Myometrial thickness was more in corpus than in coraue. Further it was thickest in luteal group followed by senile group (Table 1). In senile group inner and outer muscular layer was replaced by colla-genous tissue intermixed with network of reticulin. However, elastic tissue was observed only along the course of coiled blood vessels and lymphatics in intermuscular sheets. Mast cells and fibroblasts were frequently encountered in senile group.

Perimetrium was moderately dense aerolar connective tissue sheet covered by mesothelium. It was formed mostly of collagen interwoven with reticular fibres and elastic fibres. But these findings were in contrast to the findings of Agarwal and Laloraya (1978).

This outer layer was thickest in follicular phase (Agarwal and Laloraya, 1978).

Histochemistry: Apical and basal borders of lining epithelium were strongly reactive for PAS, bound lipids and fatty acids in adult follicular and luteal group. However, it was highly reactive with Alcian blue and aldehyde fuchsin for AMPS and carboxyl carbohydrates only at supra nuclear border in all groups (Fig. 1). Mast cell granules were intensely positive for carbohydrates (PAS) and bound lipids (Nile blue sulphate) (Fig. 3) and negative for AMPS (Alcian blue) and Aldehyde fuchsin. Myometrium was positive for diastase labile PAS (glycogen) in prepubertal and luteal group, mildly for acidic mucopolysaccharides (2.5 pH) and moderately reactive for bound lipids and free fatty acids irrespective of age and stage of reproduction.

Perimetrium showed moderate reaction for diastase resistant PAS, Alcian blue but strong reaction for bound lipids.

REFERENCES