

HISTOMORPHOLOGICAL STUDIES ON THE OVIDUCT OF NELLORE SHEEP

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ABSTRACT

The present study was conducted on the oviduct of fifteen apparently healthy, adult, non-pregnant Nellore sheep. After conducting gross studies, histological and micrometrical observations were made from sections obtained from different parts of the oviduct. The oviduct was lined by pseudo-stratified columnar epithelium. The height of the primary and secondary folds of mucosa decreases from infundibulum to isthmus. The lamina muscularis of mucosa was absent. The propria-submucosa comprised of loose connective tissue with blood vessels, abundant amount of collagen fibres and few reticular fibres. The propria submucosa housed oviduct glands that were simple tubulo-alveolar type. The tunica muscularis was mainly made up of circularly arranged smooth muscle fibres and its thickness increased towards uterine end during follicular phase. Tunica serosa consists of collagen and elastic fibres.

Keywords: Histomorphological studies, Nellore, Oviduct, Sheep.

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The oviduct is the site of fertilization in a large number of animals. The epithelium of the oviduct secretes fluid which has positive effect on sperm viability and provides the nutrients necessary for oocyte survival and enzymes with anti-oxidant effect. The structure and microenvironment of oviduct plays a pivotal role in the final maturation of female and male gametes, fertilization and early embryo development. Hence, the present study was conducted to explore anatomical and histological architecture of the oviduct in Nellore sheep.

MATERIALS AND METHODS

Reproductive tracts of fifteen apparently healthy, adult, non-pregnant Nellore sheep were collected from the local slaughter house. The tissue sections were collected from infundibulum, ampulla and isthmus after taking the gross measurements with non-expandable thread, scale and vernier calliper. The tissues collected from different regions of oviduct were preserved in 10% neutral buffered formalin solution and they were further processed for routine paraffin technique (Bancroft, 2008). The sections of 5-6 μ were cut using microtome (Leica RM2125RTS) and histological procedures were carried out (Luna, 1968). The histological sections were subjected to standard Haematoxylin-Eosin, Masson's trichrome, Verhoeff's, Vangieson's and Gomori's staining techniques (Bancroft, 2008). The thickness of various layers in the wall of infundibulum, ampulla and isthmus were measured by inbuilt software with micaps proseries 1080 HDMI camera.

RESULTS AND DISCUSSION

The oviducts were long flexuous tubes and they consisted of expanded cranial end, the infundibulum, the

middle segment, the ampulla, the caudal narrow segment towards the uterine end, the isthmus (Fig. 1). The free edge of the infundibulum shows processes called fimbria. The total length of the left oviduct (11.81 \pm 0.21cm) was longer than the right (11.45 \pm 0.32 cm) one in Nellore sheep as reported earlier by Sahu *et al.* (2017) in Kendrapada sheep.

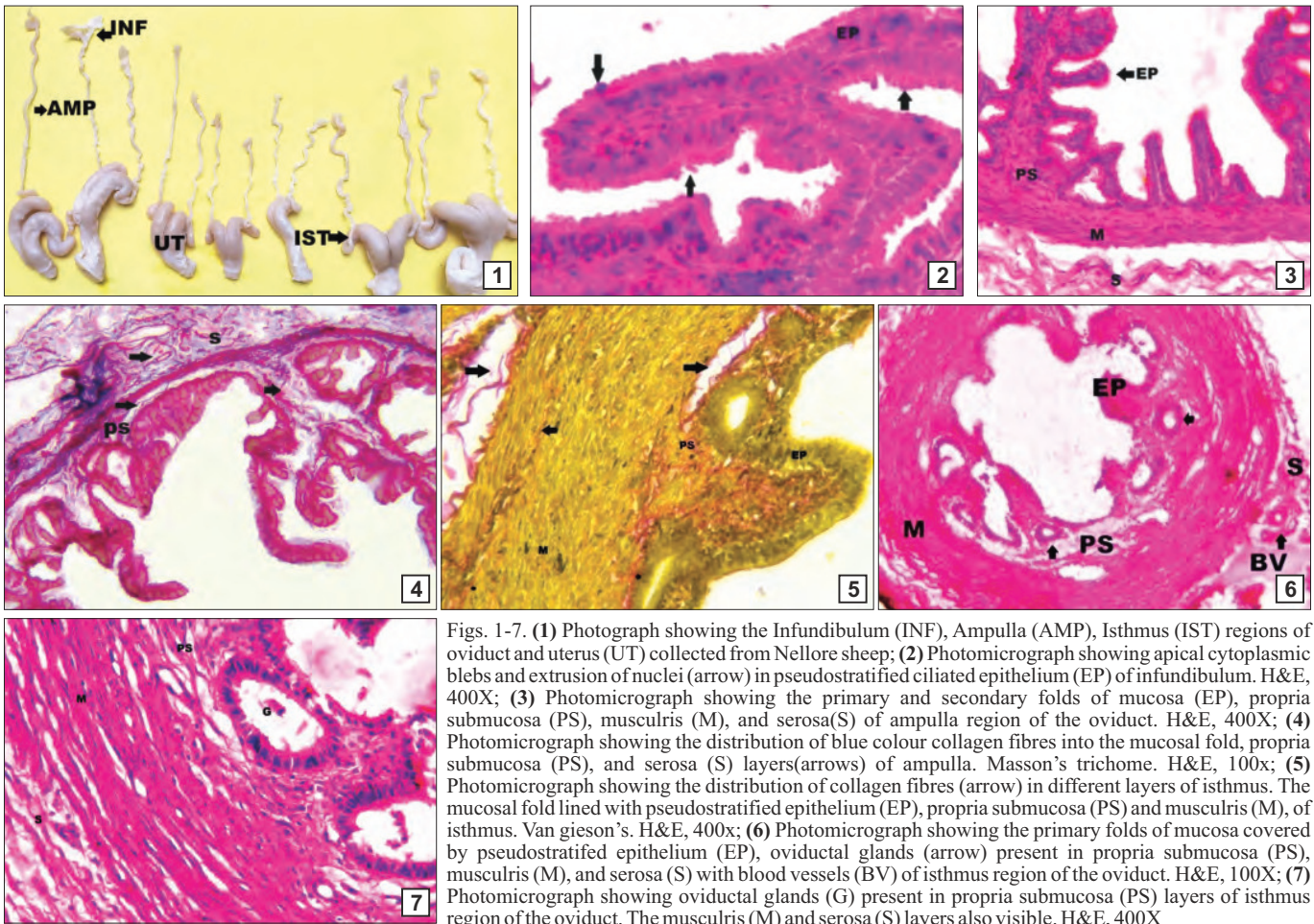
The wall of the oviduct comprised of four layers i.e., tunica mucosa, tunica submucosa, tunica muscularis and tunica serosa (Figs. 3 and 6). The tunica mucosa consisted of lamina epithelialis and lamina propria. The lamina muscularis mucosa was not observed along the length of the oviduct hence, propria-submucosa was formed (Figs. 3, 4, 5, 6 and 7) as described earlier in goat (Singh and Prakash, 1990) and Kendrapada sheep (Sahu *et al.*, 2017).

The lining epithelium of oviduct in Nellore sheep was pseudostratified ciliated columnar epithelium in all the three segments (Figs. 2, 3 and 7) as was reported by Bacha and Bacha (2000). However, the study of Saleem *et al.* (2016) revealed that the oviduct was lined with pseudostratified columnar ciliated epithelium in infundibulum and ampulla regions and pseudostratified columnar non-ciliated epithelium in isthmus in goat. The simple tubulo-

Table 1. Table showing various parameters of left and right oviducts of Nellore sheep

Parameter	Left (Avg \pm S.E)	Right (Avg \pm S.E)
Length of Infundibulum (cm)	4.79 \pm 0.26	4.78 \pm 0.26
Length of Ampulla (cm)	7.13 \pm 0.23	7.02 \pm 0.23
Length of Isthmus (cm)	3.21 \pm 0.15	2.79 \pm 0.15
Width of Infundibulum (cm)	0.821 \pm 0.03	0.723 \pm 0.06
Width of Ampulla (cm)	0.573 \pm 0.24	0.527 \pm 0.31
Width of Isthmus (cm)	0.441 \pm 0.07	0.414 \pm 0.17

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Figs. 1-7. (1) Photograph showing the Infundibulum (INF), Ampulla (AMP), Isthmus (IST) regions of oviduct and uterus (UT) collected from Nellore sheep; (2) Photomicrograph showing apical cytoplasmic blebs and extrusion of nuclei (arrow) in pseudostratified ciliated epithelium (EP) of infundibulum. H&E, 400X; (3) Photomicrograph showing the primary and secondary folds of mucosa (EP), propria submucosa (PS), muscularis (M), and serosa (S) of ampulla region of the oviduct. H&E, 400X; (4) Photomicrograph showing the distribution of blue colour collagen fibres into the mucosal fold, propria submucosa (PS), and serosa (S) layers (arrows) of ampulla. Masson's trichrome. H&E, 100x; (5) Photomicrograph showing the distribution of collagen fibres (arrow) in different layers of isthmus. The mucosal fold lined with pseudostratified epithelium (EP), propria submucosa (PS) and muscularis (M), of isthmus. Van gieson's. H&E, 400x; (6) Photomicrograph showing the primary folds of mucosa covered by pseudostratified epithelium (EP), oviductal glands (arrow) present in propria submucosa (PS), muscularis (M), and serosa (S) with blood vessels (BV) of isthmus region of the oviduct. H&E, 100X; (7) Photomicrograph showing oviductal glands (G) present in propria submucosa (PS) layers of isthmus region of the oviduct. The muscularis (M) and serosa (S) layers also visible. H&E, 400X

alveolar oviductal glands were found in tubular part of infundibulum, ampulla and isthmus. These glands were formed by the invagination of lining epithelium into propria submucosa. The lining epithelium of glands was pseudostratified columnar and simple columnar at some places of isthmus (Fig.7). The number of oviduct glands increased from infundibulum to isthmus part. The lamina propria extended into longitudinal folds and it consisted of pigment cells in Black face and crosses breeds of sheep, pigment cells (Aughey and Frye, 2001). The muscularis was mainly made up of a layer of inner circular smooth muscles and its thickness increases towards the uterine end and a thin layer of longitudinal smooth muscles in Nellore sheep. The serosa was loose vascular connective tissue with prominent blood vessels.

Infundibulum: The tunica mucosa of the infundibulum showed primary, secondary and tertiary folds. Similar findings were reported by Natarajan *et al.* (2003) in buffalo and Saleem *et al.* (2016) in Bakerwali goat. The epithelium showed ciliated, secretory and basal cells. The luminal surface of the epithelium showed cytoplasmic protrusions. The secretory material accumulated in the supranuclear zone and also formed apical blebs along the microvillus

border of the epithelium indicating apocrine mode of secretions (Fig. 2), as reported earlier by Sharma and Sharma (2004) in Gaddi goat during luteal phase. The nuclear migration towards the apical border of epithelium was also reported by Abdulla (1968) in sheep. The core of the primary and secondary folds consisted of mainly collagen and few reticular fibres. Tunica muscularis of infundibulum ($39.20 \pm 2.77 \mu\text{m}$) was made of only circularly arranged smooth muscle fibres. In the tunica muscularis few collagen fibres were observed. Tunica serosa ($77 \pm 2.97 \mu\text{m}$) comprised of mainly collagen and reticular fibres along with blood vessels were observed. Similar observations were reported in Gaddi sheep (Rajput *et al.*, 1997).

Ampulla: The tunica mucosa of ampulla showed primary and secondary folds. The pseudostratified ciliated columnar epithelium ($4.201 \pm 0.23 \mu\text{m}$) with distinct basement membrane was observed (Fig. 3). Similar results were observed in Kendrapada sheep (Sahu *et al.*, 2017). The lamina submucosa consisted of loose connective tissue rich in collagen (Fig. 4) and reticular fibres. The tunica muscularis ($115.30 \pm 4.75 \mu\text{m}$) consisted of inner circular and outer longitudinal layers. Fine reticular and collagen fibers also observed interspersed in the tunica muscularis.

Tunica serosa ($129.37 \pm 4.27 \mu\text{m}$) showed similar characters to those of infundibulum.

Isthmus: The tunica mucosa of the isthmus showed only primary folds (Fig. 6). The epithelium observed in the isthmus of Nellore sheep was pseudostratified ciliated columnar epithelium (Fig. 7). Dogan *et al.* (2019) stated that in the isthmus of wild goat, the epithelium decreased in height and gradually changed to a non-secretory simple columnar type. The invagination of the epithelium was very deep to form oviductal glands. The pseudostratified layer showed very few ciliated cells. The propria submucosa comprised of areolar connective tissue with collagen (Fig. 5) and reticular fibres. The thickness of the tunica muscularis ($235.70 \pm 8.67 \mu\text{m}$) was increased in the isthmus at the uterotubal junction which was believed to help in the transport of ova towards uterine horn by rhythmic contraction. The collagen fibers were present in between muscle bundles (Fig. 5). The tunica serosa ($197.96 \pm 4.57 \mu\text{m}$) consisted of collagen, elastic fibres and blood vessels (Fig. 6).

CONCLUSION

It was concluded that the mucosal folds were maximum in the tubular part of the infundibulum, less in ampulla and least in isthmus of Nellore sheep. The propria submucosa had oviductal glands and was comprised of loose connective tissue with blood vessels, abundant amount of collagen fibers and few reticular fibers. The number of smooth muscle layers increased in the tunica muscularis towards the uterine end of the oviduct.

REFERENCES

- Aughey, E. and Frye, F.L. (2001). Comparative veterinary histology with clinical correlates. Iowa State University Press. p. 188.
- Bacha, W.J. and Bacha, L.M. (2000). Colour Atlas of Veterinary Histology, (2nd Edn.), Lippincott Williams and Wilkins, United States.
- Bancroft, D.J., Suvarna, S.K. and Christopher, L. (2008). Bancroft's theory and practice of histological techniques, (6th Edn.), Churchill livingstone, Elsevier. pp. 121-161.
- Dogan, G.K., Kuru, M., Bakir, B. and Sari, E.K. (2019). Anatomical and histological analysis of the salpinx and ovary in Anatolian wild goat (*Capra aegagrus aegagrus*). *Folia. Morphol.* **78(4)**: 827-832.
- Luna, L.G. (1968). Manual of Histologic Staining Methods of the Armed Forces Institute of Pathology, (3rd Edn.), McGrawHill Book Co., New York.
- Natarajan, T., Prasad, R.V., Karade, K. and Jamuna, K.V. (2003). Histological and histochemical studies on the oviduct of the buffalo (*Bubalus bubalis*) at different reproductive stages. *Indian J. Anim. Sci.* **73**: 484-487.
- Rajput, R. and Sharma, D.N. (1997). Regional cyclic and genetical studies on histology and histochemistry of oviduct of Gaddi sheep. *Indian Vet. J.* **74**: 580-583.
- Sahu, S.K., Das, R.K., Sathapathy, S., Mishra, U.K. and Dash S.K. (2017). Gross, histological and histochemical studies on the ovary and oviduct of Kendrapada sheep (*Ovis aries*) at different age groups. *J. Entomo. Zool. Stud.* **5(6)**: 2319-2324.
- Saleem, R., Suri, S., Sarma, K. and Sasan J.S. (2016). Histology and histochemistry of oviduct of adult Bakerwali goat in different phases of estrous cycle. *J. Anim. Res.* **6(5)**: 897-903.
- Sharma, S. and Sharma, D.N. (2004). Biometrical study on internal genital system of Gaddi goats. *Indian J. Anim. Reprod.* **4(2)**: 243-246.
- Singh, G.K. and Prakash, P. (1990). Effect of age on the morphological changes in the uterus of goat. *Indian J. Anim. Sci.* **55**: 426-428.

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