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GROSS AND HISTOMORPHOLOGY OF THE OVARY OF BLACK BENGAL GOAT *(Capra hircus)*

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ABSTRACT. Ovary plays a vital role in the reproductive biology and biotechnology of female animals. In this study, both the right and left ovaries of the Black Bengal goat were collected from the slaughter houses of different Thanas in the Mymensingh district. For each of the specimens, gross parameters such as weight, length and width were recorded. Then they were processed and stained with H&E for histomorphometry. This study revealed that the right ovary (0.53 ± 0.02 g) was heavier than the left (0.52 ± 0.02 g). The length of the right ovary (1.26 ± 0.04 cm) was lower than the left (1.28 ± 0.02 cm) but the width of the right (0.94 ± 0.02 cm) was greater than the left (0.90 ± 0.03 cm). The diameter of ovarian follicles in the cortex was measured as primordial 39.6 ± 6.61 µm, primary single layer 54.0 ± 4.06 µm, primary multi-layer 147.6 ± 11.04 µm, secondary with C-shaped antrum 449.5 ± 75.71 µm and graafian 1.3 ± 0.20 mm. In the graffian follicle, the thickness of the granulosa cell layer was 79.2 ± 11.04 µm, theca interna 75.76 ± 6.82 µm, theca externa 130.07 ± 12.53 µm and the oocyte diameter was 109.8 ± 5.75 µm. These results will be helpful to manipulate ovarian functions in small ruminants.

Keywords: Morphometry, ovarian follicles, cortex, medulla, oocyte.

INTRODUCTION

Black Bengal goat is the national pride of Bangladesh. The most promising prospect of Black Bengal goat in Bangladesh is that this dwarf breed is a prolific breed, requiring only a small area to breed and with the advantage of their selective feeding habit with a broader feed range. It is very popular to consumers for its delicious and tender meat. Its skin is also highly valued in the world market due to some unique features of yielding fine leather that is light in weight and fine in texture. Considering the paramount importance and bright prospects of Black Bengal goat in Bangladesh, goat production level should be maintained properly by increasing fertility and conception rate.

The ovary is the key female reproductive organ of all the vertebrates. The reproductive physiology of goat is least understood compared to cattle, sheep and pig. A search of the literature for specific and detailed information on the ovary of goat is not rewarding. Description of goat is usually made as if it is identical with sheep (Smith, 1986). Some work on the morphology, physiology and pathology of reproductive organs of the goat (Epelu-Opio *et al.*, 1988; Moreira, *et al.*, 1991; Sattar and Khan, 1988; Torres and Badiongan, 1989) have been reported in many countries. But no comprehensive study has yet been undertaken on the ovary of Black Bengal goat in Bangladesh. Therefore, the study was designed to clarify the morphology and morphometry of the ovary of Black Bengal goat. The knowledge of the present study will contribute significantly in the reproductive biology and biotechnology of small ruminants.

MATERIALS AND METHODS

The study was conducted in the laboratory of the Department of Anatomy and Histology, Faculty of Veterinary Science, Bangladesh Agricultural University, Mymensingh, Bangladesh.

Collection and transportation of ovaries

Both the right and left ovaries of the female non-gravid adult Black Bengal goats (1-2 years of age) were collected from the slaughter houses of different Thanas in Mymensingh district. The ovaries were then kept in a collection vial containing 0.9% physiological saline in a Thermos flask at 25 °C to 30 °C and transported to the laboratory within 4 to 5 hours of slaughter. The ovaries were then transferred to sterilized Petri dishes and rinsed thoroughly by physiological saline at 25 °C before further processing.

Measurement of weight, length and width

After trimming individually, the right and left ovaries were weighed with the help of an electric balance. The length and width were measured with the help of measuring scale.

Histomicrometry

The ovarian tissues were fixed by Bouin's fixative for 4 hours and then processed by routine paraffin embedding technique. The paraffin sections were cut by microtome (5-6 μ) and stained with routine Hematoxylin and Eosin (H&E) for histomorphometrical analysis. The diameter of ovarian follicles and thickness of follicular layers along with oocyte diameter were measured by micrometry methods.

Data analysis

All the data were recorded in a tabular form and analyzed by Student's *t*-test.

RESULTS AND DISCUSSION

Gross study of the ovary

The ovaries were found almond-shaped, pale colored structures situated in the edge of the mesovarium near the lateral margin of the pelvic inlet. This report corresponds to the report of Getty, 1975; May, 1970. Each ovary had an irregular surface by follicles of various sizes projecting from the surface. It also supports their observations. The weight, length and width of the left ovary were 0.52 ± 0.02 g, 1.28 ± 0.02 cm and 0.90 ± 0.03 cm and of the right were 0.53 ± 0.02 g, 1.26 ± 0.04 cm and 0.94 ± 0.02 cm, respectively. The length of the left and right ovaries were 1.71 ± 0.27 cm and 1.73 ± 0.27 cm, respectively in Nigerian goats (Adigwe and Fayemi, 2005); 1.5 cm reported for small ruminants (Sisson and Grossman, 1975); 2.2 cm reported in goats (Smith, 1986). The uterine extremity of the ovaries was connected with the extremity of the horn of uterus by a proper ligament of the ovary. There was no demarcation between the horn of the uterus and the very flexuous uterine tubes (Figure 1).

Microscopic study of the ovary

The ovary consisted of two distinct zones, peripheral cortex and central medulla. This report is in agreement with Dellmann, 1971; Banks, 1986.

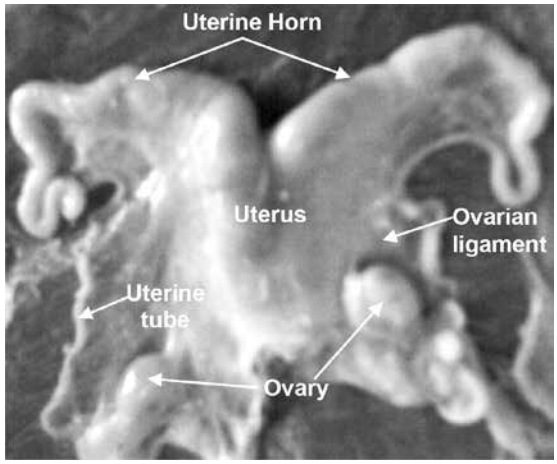

Figure 1. Photograph of the ovary and its associated structures of adult (2 years of age) Black Bengal goat

A. Ovarian cortex

Germinal epithelium: The ovary was covered by a surface epithelium of simple cuboidal cells.

Tunica albuginea: Underlying the surface epithelium was a capsule of dense irregular connective tussue.

Follicles: Follices of various stages of development were found in the cortex surrounded by the stroma. They were distinguished as:

i. Primordial follicles: They were located immediately beneath the tunica albuginea. Each was found to contain an oocyte with a large nucleus lined by simple squamous epithelium in contact with the smooth surface of the oocyte (Figure 2A). The diameter of primordial follicle was 39.6 ± 6.61 μm.

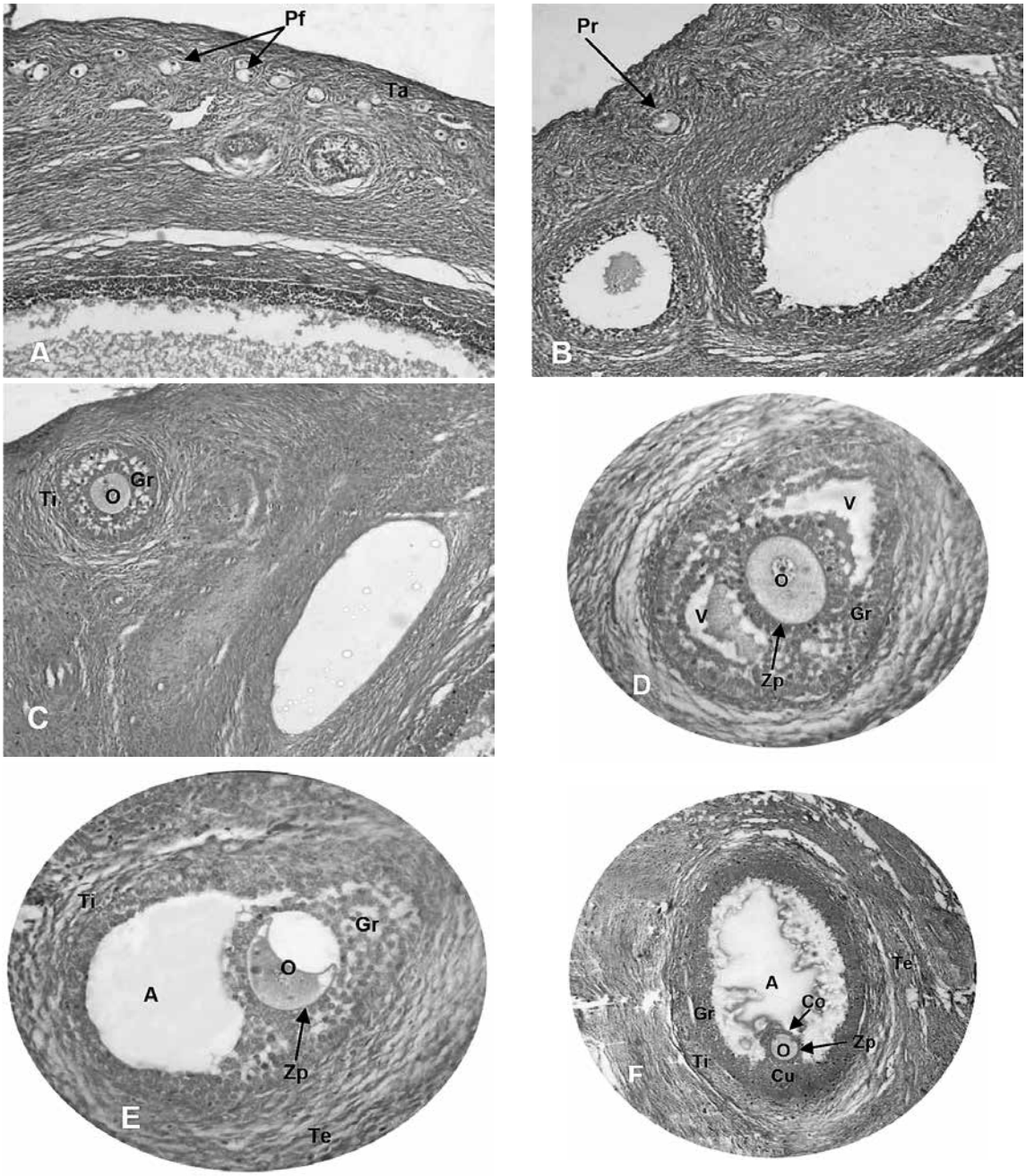

Figure 2. Photographs showing ovarian follicles in the cortex (H & E). A. Primordial follicle X10 B. Primary follicle (single layer) X10 C. Primary follicle (multilayer) X10 D. Secondary (vesicular) follicle X40 E. Secondary follicle with C-shaped antrum X40 F. Graafian follicle X40. Pf= Primordial follicle, Pr= Primary follicle, Ta= Tunica albuginea, Gr= Granulosa cells, Zp= Zona pellucida, Co= Corona radiata, Cu= Cumulus oophorus, O= Oocyte, V= Vesicle, A= Antrum, Ti= Theca interna, Te= Theca externa

ii. Growing follicles: The growing follicles were found into the deep layers of the cortex. In primary follicles, the follicular cells were found to columnar with alteration of primary oocyte. The diameter of primary follicle, single and multi-layer were 54.0 ± 4.06 µm and 147.6 ± 11.04 µm, respectively (Figures 2B and 2C). The secondary follicles were identified by an increase in follicular cell population associated with the primary oocyte and development of zona pellucida between primary oocyte and follicular cells (Figure 2D). The stromal cells differentiated into theca interna and externa. The thecal cells were separated by a basement membrane. The theca interna consisted of large, epitheloid cells and an extensive vascular network. The theca externa was fibroelastic layer of cells. The diameter of secondary follicle with C-shaped antrum was found as 449.5 ± 75.71 µm (Figure 2E).

iii. Graafian follicle: This was accompanied by the continued growth of the follicle. The primary oocyte was still surrounded by a cluster of granulosa cells that was continuous with the peripherally displaced membrane granulosa. The mound of cells was cumulus oophorus. The granulosa cells immediately adjacent to the primary oocyte found columnar that were oriented radially known as corona radiata. The cells of the cumulus oophorus constituted a visceral layer of granulosa cells separated by follicular antrum from the parietal layer of granulose cells. The parietal layer was separated from the theca interna by a basement membrane. This preovulatory follicle was the graafian or mature follicle (Figure 2F) which extended from a protrusion at the surface to the depths of the cortex. In the graffian follicle, the thickness of granulosa cell layer was 79.2 ± 11.04 µm, theca interna 75.76 ± 6.82 µm and theca externa 130.07± 12.53 µm where as the oocyte diameter was 109.8 ± 5.75 µm. The diameter of ovarian follicles and thickness of graffian follicular layers (granulosa, theca interna and theca externa) along with oocyte diameter differ from the report of Mohammadpour, 2007 in Iranian native goats.

B. Ovarian Medulla

The medulla consisted of dense irregular connective tissue with extensive network of vessels and nerves (Figure 3).

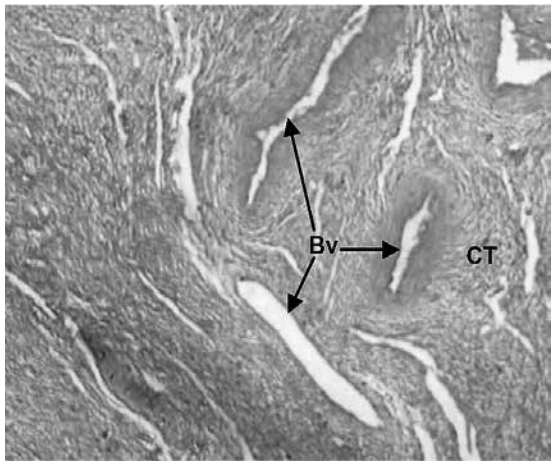

Figure 3. Photograph of medulla in the ovary of Black Bengal goat (H & E) X10. Bv= Blood vessels, CT= Connective tissue

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