SHORT COMMUNICATION

Scanning Electron Microscopic Study on Oviduct of Goat during Follicular Phase of Estrous Cycle

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Abstract

Present study was carried out to investigate the scanning electron microscopic characteristics of oviduct of goats during follicular phase of the estrous cycle. Study revealed the presence of mucosal folds lined with ciliated and non-ciliated or secretory cells in all segments of the oviduct. The infundibulum and ampulla exhibited a dense population of ciliated cells during the follicular phase. Non-ciliated cells were few in number and interspersed between the ciliated cells. The occurrence of ciliated cells declined dramatically in the isthmus than infundibulum and ampulla.

Key Words: Follicular phase, Goat, Oviduct, SEM.

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Introduction

Goats are the most ecologically diverse species among the farm animals. The fertility of animals has a direct impact on the profitability of livestock industry. Gamete and embryo transport, sperm storage and final capacitation, fertilization and early cleavage-stage (embryonic development) occur in the oviductal environment (Suarez, 2008). For better understanding the structure and function of goat oviduct, more information is needed on different segments associated with the stages of estrous cycle. Therefore, the present study was conducted to investigate the scanning electron microscopy of oviduct of goats during the follicular phase of estrous cycle.

Materials and Methods

The study was conducted on oviduct of 10 adult goats during follicular phase of estrous cycle. The oviducts were collected fresh from local abattoir, after examining the status of ovaries. Tissue samples were collected from the infundibulum, ampulla and isthmus regions. The tissue samples were washed in chilled 0.1 M phosphate buffer (pH 7.2) and were subjected to fixation in 2.5% gluteraldehyde in 0.1 M phosphate buffer solution at pH 7.2 for 4-6 h. Fixed samples were washed in 0.1 M phosphate buffer at 4°C. Thereafter, the samples were dehydrated in ascending grade of acetone solutions at 4°C. The specimens were mounted on aluminium stubs, coated with gold in an Emitech SC7620 sputter coater. The processed tissue samples were viewed under Zeiss EVO-18 (Germany) scanning electron microscope and photographs were taken.

Results and Discussion

Scanning electron microscopic (SEM) observations showed that the mucosa of the infundibulum displayed numerous longitudinal folds interconnected by transverse folds (Fig. 1). These folds were lined with two types of cells: ciliated and non-ciliated or secretory cells. The ciliated cells were characterized by the presence of kinocilia, which covered the surface and often overlapped the secretory cells as reported earlier by Shankhapal *et al.* (2014) in goat, Pathak *et al.* (2012) in sheep and Sanjeev *et al.* (2008) and Kumar and Vyas (2018) in buffaloes.

The epithelial lining of the infundibulum exhibited a dense population of ciliated cells. These ciliated cells possessed a cluster of cilia on their apical surface. The secretory cells, on the other hand, displayed an expanded apical surface. The cilia in the infundibulum were uniformly distributed in terms of length and distribution. In between the ciliated cells, a few non-ciliated cells were interspersed. The non-ciliated cells were characterized

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by numerous stubby microvilli that protruded from their apical surface. These microvilli varied in length and diameter and were sometimes interconnected, possibly due to the continuity of their plasma membranes or the presence of secretory substances. The apical surfaces of the non-ciliated secretory cells were rounded or elliptical, and some of these cells exhibited secretory blebs (Fig. 2). These findings were in agreement with the findings of Abe *et al.* (1993) in goat, Hafez and Kanagawa (1973) in cow, Kumar *et al.* (2008) and Kumar and Vyas (2018) in buffaloes, and Hafez (1972) in female rabbits. Contrary to above, Stalheim *et al.* (1975) observed that the clusters of ciliated and non-ciliated cells were present on the luminal surface of the oviducts of the cow, mare, sow, and doe in approximately equal amount in the infundibulum and ampullary regions.

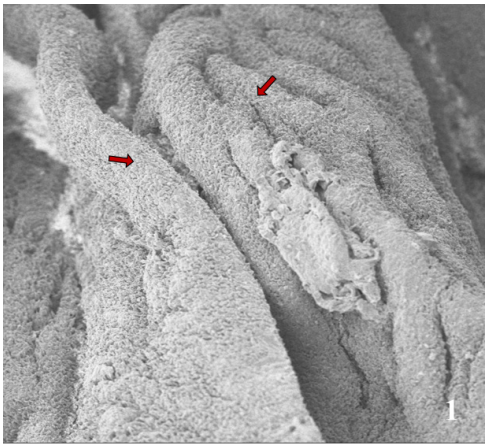

Fig. 1: Scanning electron micrograph showing mucosal folds in oviduct (arrow). X 482.

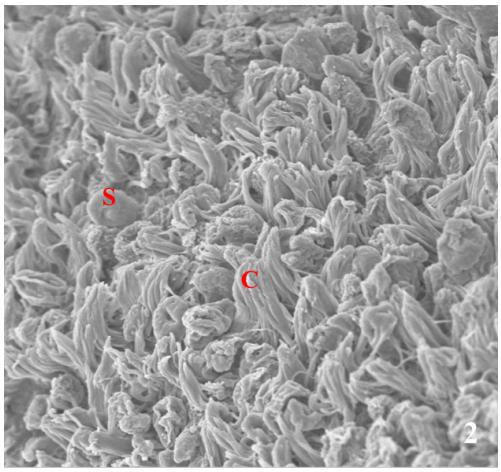

Fig. 2: Scanning electron micrograph of infundibulum showing C. ciliated cells and S. secretory cells during follicular phase. X 4.95 K.

The mucosa of the ampulla was similar to the infundibulum, exhibited longitudinal folds that were lined with both ciliated and non-ciliated or secretory cells. Similar observations were recorded by Shankhapal *et al.* (2014) in goat oviduct. During the follicular phase, the ampulla had a higher number of ciliated cells compared to secretory cells. The ciliated cells were evenly distributed throughout the lining. The cilia were of consistent length, and clusters of cilia often extended above the apical surface of secretory or non-ciliated cells. Secretory cells had a rounded appearance on their apical surfaces. Most of non-ciliated cells possessed well-developed microvilli (Fig. 3). Similar observations were recorded earlier in oviduct of caprine (Shankhapal *et al.,* 2014; Sharma *et al.,* 2015), sheep (Pathak *et al.,* 2012), and buffalo (Kumar *et al.,* 2008; Kumar and Vyas, 2018).

The mucosa of the isthmus was thrown into larger number of folds. During the follicular phase, epithelium of isthmus exhibited less ciliation than the other parts of the oviduct. The epithelium of isthmus displayed groups of ciliated cells that were unevenly distributed and mixed within non-ciliated cells. The length and orientations of the cilia on ciliated cells were variable. The number of non-ciliated cells was substantially higher in some areas. Non-ciliated cells featured microvillous processes on their surface, and these processes had a bulbous apical end. Over the microvillous processes of non-ciliated cells, a few tiny secretory masses were visible (Fig. 4). Similar observations were reported by Shankhapal *et al.* (2014) in caprine, Abe and Oikawa (1993) in cow, Tienthai *et al.* (2009) in Thai swamp buffalo, Kumar and Vyas (2018) in Jaffarabadi buffalo and Kamaci *et al.* (1999) in human.

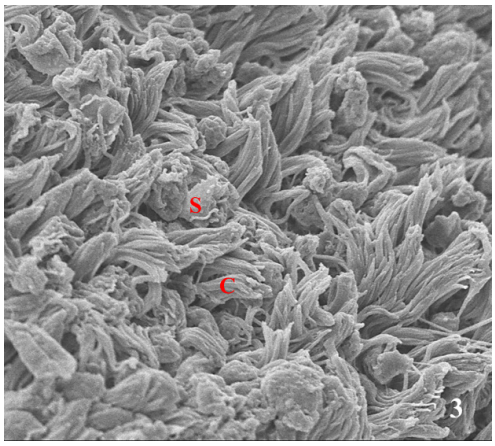

Fig. 3: Scanning electron micrograph of ampulla showing C. ciliated cells and S. secretory cells during follicular phase. X 6.53 K.

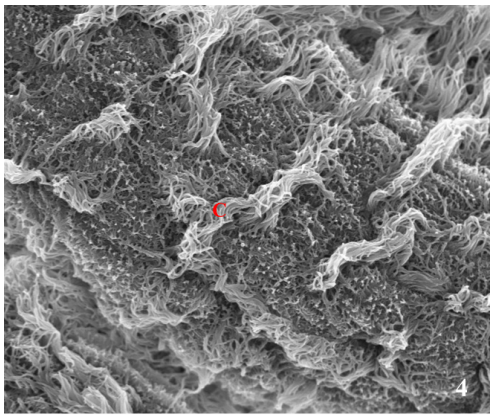

Fig. 4: Scanning electron micrograph of isthmus showing C. ciliated cells during follicular phase. X 4.50 K.

In brief, the scanning electron microscopic study of oviduct during the follicular phases of cycle revealed several mucosal folds in all three segments with ciliated and non-ciliated or secretory cells. The infundibulum exhibited mainly a dense population of ciliated cells. The ampulla had large number of ciliated cells as compared to secretory cells. The cilia extended above the apical surface of secretory cells and were of consistent length. Non-ciliated secretory cells had a rounded secretory bleb on their apical surfaces. The isthmus showed large number of non-ciliated cells. The occurrence of ciliated cells declined dramatically in the isthmus than infundibulum and ampulla.

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