Comparative Cellular Structure of Udder and Teat of Desi and Crossbred Cows in Reference to Mammary Gland Immunity

Susanta Paul¹, Partha Das²* and Ranjit Kumar Ghosh³

Department of Veterinary Anatomy, Faculty of Veterinary and Animal Sciences
West Bengal University of Animal and Fishery Sciences, Kolkata-700 037 (West Bengal)

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ABSTRACT

The present study was conducted on teat and udder of desi (Indian zebu) and crossbred cows. The number of lobules were more in crossbred as compare to desi cows. The shape of the alveoli was round or oval in desi cow and pentagonal or hexagonal in outline in crossbred cows. The number of alveoli was 160-195 and 120-150 with an average diameter of 111.92±3.04 µ and 90.72±3.21 µ in case of crossbred and desi cows, respectively. Thickness of the inter alveolar barrier among the adjacent alveoli was about 12 µ in desi cows and 6 µ in crossbred cows. Teat canal epithelium was thicker than the teat skin epithelium. The amount of keratin, the number of rosette and thickness of epithelium was more in desi cows.

Key words: Crossbred, Desi cow, Histology, Teat, Udder

Mastitis a deadly cattle disease estimated to cause annual losses to over Rs. 6,000 crore to Indian dairy sector. The cellular factors responsible for mammary gland protection are size of alveoli, number of secretory epithelium, thickness of septa, immunogenic cell population etc. No work has been reported regarding the comparative mammary gland histology of cross bred and desi cows. Hence, the present investigation was undertaken to ascertain the cellular differences in the mammary system of cross-bred and desi cows.

MATERIALS AND METHODS

The tissues of udder and teat of healthy desi and crossbred cows were collected from local butcher shops of Punishole village, Onda block of Bankura district and Tangra slaughter house of Kolkata Corporation and West Bengal, respectively. The crossbred cows under studied were Holstein Friesian-Gir, Holstein Friesian-Sahiwal, Holstein Friesian-Hariana, Jersey-Gir, Jersey-Sahiwal and Jersey-Hariana crosses. The tissue samples were fixed in 10% neutral buffered formalin and processed for paraffin blocks. The sections were stained by routine haematoxylin and eosin method (Luna, 1968) and studied under light microscope.

RESULTS AND DISCUSSION

The lactating mammary parenchyma of both species was divided into lobes and lobules by the trabeculae extending from the capsule. These trabeculae were having more amount of connective tissue in desi cows as compared to crossbred cows. The number of lobules was more in crossbred as compared to desi cows. The shape of the alveoli of desi cows was found to be round or oval in shape and in case of crossbred cows the shape was pentagonal or hexagonal in outline (Fig. 1). The number of alveoli was 160-195 and 120-150 and the average diameter of the alveolus was 111.92±3.04 µ and 90.72±3.21 µ in case of crossbred and desi cows, respectively. The increased number and diameter of the alveoli indicated the maximum production space and milk holding capacity and similarly, the shape also varied due to intra alveolar pressure and less amount of intra alveolar connective tissue in case of cross bred cow (Alvarez-Morujo-Suarej and Alvarez-Morujo, 1982). Thickness of the inter alveolar barrier among the adjacent alveoli was about 12 µ in desi cows and 6 µ in crossbred cows.

The interalveolar space of both the breeds of cows contained a good number of myoepithelial cells and connective tissue cells such as fibroblast, plasma cells, lymphocytes, neutrophils and macrophages (Zufarov et al., 2003; Sordillo and Nickerson, 1988) (Figs. 2, 3). The population of aforesaid connective tissue cells was more in the mammary gland of desi cows when compared with that of crossbred cows. The predominance of neutrophils amongst the connective tissue cells of the interalveolar space of mammary gland was found in both the groups.
The presence of higher number of immunogenic cells in the mammary gland of desi cows might be responsible for extending higher resistance power to fight against the diseases. Each of the alveolus was lined by a single layer of cuboidal epithelial cell with a round to oval shaped nucleus in both the breeds. The cytoplasm contained secretory granules along with other structures.

The histo-architecture of the wall of the teat exhibited similar disposition in both, the desi and crossbred cows. The outer skin layer contained an epidermis and dermis, middle layer of numerous smooth musculature bundles and innermost mucosal layer. The circular muscle layer surrounding teat canal was thick and accommodated vessels, nerves and lymphatics in between the muscular bundles. Few well demarcated tubular glands lined by single layer of cuboidal epithelium were observed in this zone. The teat sinus was lined by stratified cornified squamous epithelium. Teat canal epithelium was thicker than the teat skin epithelium with a remarkable increase in keratin and stratum granulosum. The amount of keratin and thickness of epithelium was more in desi cows. The presence of more number of stria, thickness of middle layer and more deposition of keratin maintained the tight closure between the milking and hindered bacterial penetration through teat canal (Murphy and Stuart, 1953) in case of desi cows. The teat cistern was having numerous longitudinal and circular folds in the mucosa which tended to overlap and turn to the oblique folds when milk filled in teat cistern. The number of folds was more in desi cows which may help to hold less amount of milk in the teat cistern.

The submucosa of the teat contained finger like projections created by invagination of luminal epithelium (Fig. 4) just above the teat canal. The number of the projections varied from 10-14 and was more in desi cows. The teat lumen was found to be engorged with these projections, leaving the lumen into an irregular narrow space and it looked like a rosette as reported by Kumar (1990). The authors also reported that the number of the projections varied from 10-13 in cows and 10-14 in buffaloes. The intercellular ground substance was more in desi cows. The epithelial layer was thicker at the invaginated part and thinner at the projected part. Presence of narrow teat sinus, more number of longitudinal folds and tight musculature of the teat of desi cows may protected them from microbial invasions.

REFERENCES


