Journal of Animal Research: v.8 n.1, p. 107-110. February 2018

DOI: 10.30954/2277-940X.2018.00150.17

Histoarchitectural Studies on Bursa of Fabricius of Kadaknath Birds

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Received: 18 Sept., 2017 **Revised:** 11 Dec., 2017 **Accepted:** 12 Dec., 2017

ABSTRACT

The study was conducted on thirty specimen of bursa of Fabricius from day old to twenty six weeks old Kadaknath birds. Formalin fixed samples were processed by routine paraffin embedding technique and subjected to histological study. The histoarchitectural observation on bursa of Fabricius revealed that, it was composed of four tunics. The bursal mucosa was lined by pseudostratified columnar epithelium except at crypts it became simple columnar. Bursal epithelium had four types of cells as type-I, type-II, type-III and type-IV. Presence of melanocytes in bursa of Fabricius was unique characteristic feature of present study which was fusiform cell with elongated nuclei in the cytoplasm was generally occurred in all component of bursa of Fabricius. There was complete regression of bursa of Fabricius after 25th week of age.

Keywords: Kadaknath, Bursa of Fabricius, Bursal epithelium, Histology.

Kadaknath is locally known as 'Kalamasi' meaning the fowl having black flesh, native breed of Jhabua region of Madhya Pradesh, India. These are mostly reared by tribals and rural poor farmers as an earning source and fulfillment of daily requirement of protein and minerals. The lymphoid tissues play an important role in the defense against all pathogen. The chicken has central (Thymus and bursa of Fabricius) and peripheral (spleen and all mucosa associated lymphoid tissue) lymphoid tissues. The lymphoid system of chicken consists of unique organs and divided into two morphologically and functionally distinct components. The bursa of Fabricius develops as a dorsal diverticulum of the proctodeal region of the cloaca (Khan *et al*., 2014). The bursa-dependent component is represented by the larger lymphocytes which transformed into plasma cell in the tissue and plays an important role in humoral immunity (Akter *et al*., 2006).

MATERIALS AND METHODS

The study was done on bursa of Fabricius of thirty healthy from day old to twenty six old male and female birds of Kadaknath breed of poultry. These birds were sacrificed ethically and glands were fixed immediately in 10% neutral buffer formalin for 24 hours. Fixed glands were processed by routine paraffin embedding technique and paraffin sections of 5 to 7 µ were subjected for histological and histochemical study. For general histological study the tissue sections were stained by hematoxylin and eosin for normal histological structure, Verhoeff`s method for elastic fibers, Van-Gieson for collagen fibers (Singh and Sulochana, 1997) and Gomori's for reticular fibers (Drury and Wallington, 1980).

RESULTS AND DISCUSSION

The bursa of Fabricius was composed of four tunics as tunica mucosa, tunica submucosa, tunica muscularis and tunica serosa. These finding are in agreement with (Jain *et al*., 2010) in CARI shyama and Vanraja, (Gulmez and Aslan, 1999) in native geese and (Kumar *et al*., 2014) in Khaki Combell duck. However, these results differ from (Chandrashekhar *et al.,* 2012) in domestic fowl who reported that bursa of Fabricius was composed of three

tunics, the tunica mucosa, tunica muscularis and tunica serosa.

The outer most layer was tunica serosa which was made up of mesothelium and sub-serosal loose connective tissue containing blood vessels and nerve endings and cells. The tunica muscularis layer was formed by circular and longitudinally arranged smooth muscle fibers, major blood vessels and nerves were embedded within this layer similar finding by (Jain *et al*., 2010) in CARI Shyama and Vanraja and (Kumar *et al*., 2014) in Khaki Combell duck. The serosal layer and tunica muscularis layers covered the organ in the form of capsule (Fig. 1) which was made up of mainly collagen fibers, few elastic and reticular fibers (Fig. 2).

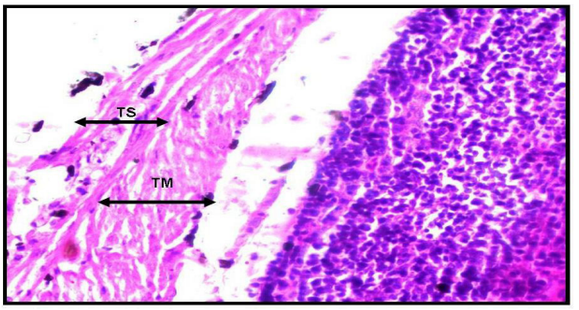

Fig. 1: Photomicrograph of bursa of Fabricius (13 days old) showing tunica serosa (TS) and tunica muscularis (TM) (H&E, 407x)

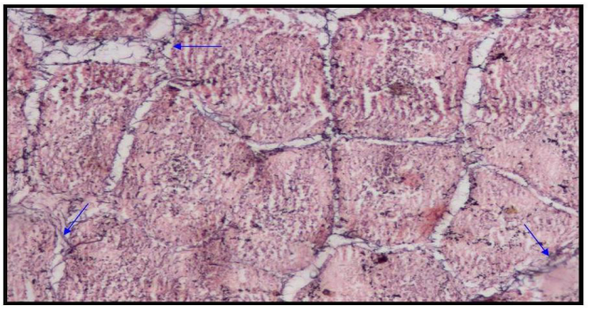

Fig. 2: Photomicrograph of bursa of Fabricius (3rd week) showing reticular fibers in between follicle (arrow) (Gomori's, 804x)

The collagen fiber was found in trabeculae, interfollicular septae and loose connective tissue of tunica submucosa. Few reticular and elastic fibers were seen in trabeculae, interfollicular septae and loose connective tissue of tunica submucosa. Reticular fibers also present in cortex and medulla of follicles in the form of network which provided support to lymphocytes. These finding are in agreement with (Jain *et al*., 2010) in CARI Shyama and Vanraja. The presence of collagen fibers predominant in bursa of Fabricius indicated the structural and functional unit was also noted by (Davison *et al*., 2008) in birds.

The tunica mucosa was lined by pseudostratified columnar epithelium (Fig. 3) except crypt which was lined by simple columnar epithelium (Fig. 4). This observation was in accordance with (Chandrashekhar *et al.,* 2012) in domestic fowl while differ from (Khan *et al*., 2014) in broiler chicken who reported that mucosa was lined by pseudostratified columnar epithelium except apex which was lined by simple columnar epithelium.

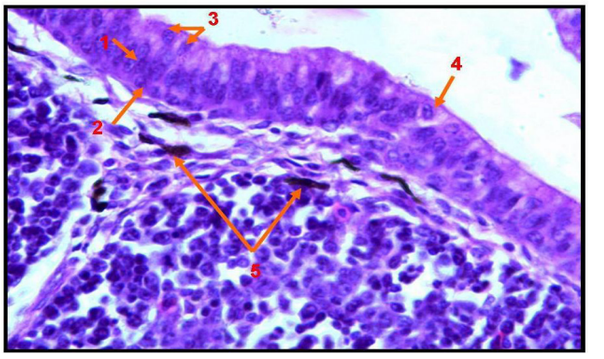

Fig. 3: Photomicrograph of bursa of Fabricius (8th week) showing four types of cells, 1 Columnar cell, 2 Basal cell, 3 Apical cell, 4 Mucous secretary cell and 5 Melanocytes

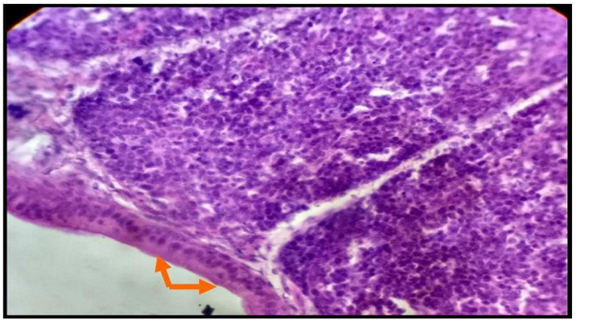

Fig. 4: Photomicrograph of bursa of Fabricius (8th week) showing columnar cells in crypt (arrow) (H&E, 407x)

According to location and cellular structure, four types of cells were observed as type- I or principle cells were columnar type which has basal nucleus and prominent nucleolus, type-II cells were basal cells resting on basement membrane, type-III cells were found on apical portion of epithelium, these cells were round in shapes with large nucleus (Fig. 3) and scanty cytoplasm and type-IV cells were also columnar types which were found on interfollicular epithelium. These cells contained mucin in their cytoplasm (Fig. 3).

According to (Kumar *et al.,* 2014) in Khaki Combell duck, three types of cells were observed in epithelium. The type- I cell was found to be oval in shape with a clear round to oval shaped nucleus, type-II cells were numerous, rounded with an oval nucleus possessing single nucleolus and type-III cell was goblet cells. In the present study, type-III i.e. apical cells may be contributed to the bidirectional transport while type-IV i.e. mucin secreting epithelial cells were released mucin into the bursal lumen lubricating the surface of fold. The plicae were found to be composed of number of follicles. The numbers of plicae as well as number of follicles were high at 8 week of age (Fig. 5). These results differ from (Kumar *et al*., 2014) in Khaki Combell duck, who revealed that number of follicles increased upto 4th week of age. Each plica was completely filled with follicles separated by connective tissue trabeculae. The forms and sizes of follicles were varied from one to another similar observation by (Hassan *et al*., 2011) in quail birds.

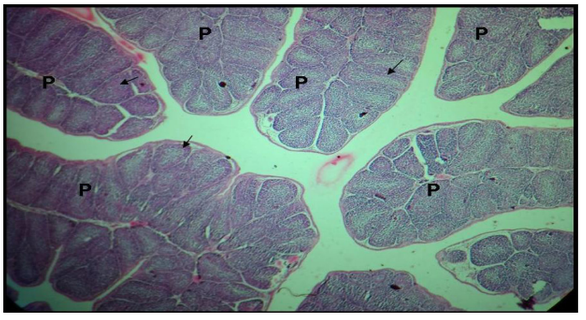

Fig. 5: Photomicrograph of bursa of Fabricius (8th week) number of plicae (P) and demarcation between cortex and medulla (arrow) (H&E, 161x)

The undifferentiated epithelial reticular cells were found at corticomedullary junction which was separated the medulla from cortex. The clear cut demarcation between cortex and medulla was observed at eight week of age (Fig. 5).

These finding was differ from (Chandrashekhar *et al*., 2012) in domestic fowl who reported that cortex and medulla were clearly differentiated by four week of age. This observation suggested that the ERC in corticomedullary junction is resistant to infectious bursal disease similar fact noted by (Davison *et al*., 2008) in birds. The mesenchymal reticular cells (MRC) formed the supporting cells of the cortex which expressed vimentin and desmin intermediate follicles similar fact noted by (Davison *et al*., 2008).

Presence of melanocytes in bursa of Fabricius was unique characteristic feature of present study; fusiform cell with elongated nuclei in the cytoplasm was generally occurred in tunica serosa, tunica muscularis, lamina propria and septae. The melanocytes were higher in group-IV (Fig. 3). Due to melanocytes deposition in organ the external extremities as well as internal organs is black in color.

The histomorphological study of bursa of Fabricius showed that the mucosa was lined by pseudostratified columnar epithelium except at crypts it became simple columnar epithelium. Epithelium had four types of cells as type-I, type-II, type-III and type-IV. The numbers of follicles and plicae were high in 8th week of age. The melanocytes were found all component of bursa of Fabricius except follicles. The bursa of Fabricius was complete regressed after twenty fifth week of age.

ACKNOWLEDGMENTS

The authors are thankful to, College of Veterinary science and A.H., Mhow, for providing necessary facilities for MVSc. work.

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