STUDY OF BURSA OF FABRICIUS CELLULAR ELEMENTS IN GUINEA FOWL *(NUMIDA MELEAGRIS)*[#]

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ABSTRACT

The bursa of Fabricius is primary lymphoepithelial organ, responsible for B-lymphocytes production in guinea fowl. For this study totally 42 numbers of samples were collected from different age groups of birds. The tissues of bursa of Fabricius were fixed in 10 per cent neutral buffered formalin and Bouin's fluid. Fixed tissues were processed and sections were stained with routine Haematoxylin-Eosin and other special staining techniques. Each lymphoid follicle contained an outer cortex with small and medium lymphocytes and an inner medulla with medium and large lymphocytes. These two regions were demarcated by undifferentiated epithelial cells, which demarcated the corticomedullary junction. In addition, lymphoblasts, reticular cells, macrophages, dendritic cells and erythrocytes were also noticed. The connective tissue framework mainly consisted of collagen and reticular fibres and very few elastic fibres.

Key words: Bursa of Fabricius, Guinea fowl, dendritic cells

Introduction

The term "guinea" fowl is common name for seven species of gallinaceous birds of the family *Numididae* which is indigenous to Africa (Awotwi, 1987). Guinea fowl is a promising genetic resource for evolving a low input-grain saving poultry alternative for production in the developing world. Concept of utilizing guinea fowl as an alternative to chicken is gaining support in the population now-a-days (Singh and Tanwar, 2011). The work on blood cells cellular morphology and histochemistry have been done earlier in Uttarafowl (Mohd *et al*, 2016a, Mohd *et al*., 2016b and Mohd *et al*., 2015) and in Kadaknath (Yadav *et al.*, 2015) birds. But the cellular morphological studies on blood and lymph associated structures are meagre. The avian bursa cloacalis Fabricii is a unique primary lymphoid organ, which is responsible for the development and differentiation of B lymphocytes (Glick and Olah, 1993). In addition to its central role in B-lymphocyte maturation, the bursa of Fabricius also functions as a peripheral immunological organ associated with intestine. It has a significant role in immune system of birds. Hence, the present study was undertaken due to its importance in immunological competence and to provide microscopic details of cells of bursa of Fabricius in guinea fowl.

Materials and Methods

The bursa of Fabricius was collected from apparently healthy guinea fowls (pearl variety) from Poultry Research Station, Madhavaram milk colony, Chennai-51. The bursa of Fabricius was collected from day old to six months of age at monthly intervals. Bursa of total 42 birds in seven different age groups was collected and each group consisted of six birds (3 male and 3 female). The tissues of bursa of Fabricius were fixed in 10 per cent neutral buffered formalin and Bouin's fluid. Fixed tissues were processed through ascending grades of alcohol, cleared in xylene and embedded in paraffin wax at 58-60^{o}C. Sections of 3-5 mm thickness were made and stained with Ehrlich's haematoxylin-Eosin method for routine cellular architecture of bursa, Van Gieson technique and Masson trichrome technique for collagen, Verhoeff's method for elastic fibres and Gomori's method for reticular fibres (Bancroft and Stevens, 1996) and Unna's method (Luna, 1968) for mast cells.

Results and Discussion

Each lymphoid follicle contained an outer cortex with small and medium lymphocytes and an inner medulla with medium and large lymphocytes. The cortex of the lymphoid follicle consisted mainly of small (Fig. 1) and medium lymphocytes. The medulla consisted largely of medium (Fig. 2) and large (Fig. 1) lymphocytes with chromatin granules as reported by Jayachitra *et al*. (2009) in turkeys, Hassan *et al*. (2011) in quails, Sultana *et al*. (2011) in ducklings and Kumar *et al*. (2014) in Khaki Campbell ducks.

The medulla composed of medium and large lymphocytes. This finding is not in agreement with the findings of Indu *et al*. (2005) in White Pekin duck where they reported that the medulla composed of large lymphocytes. It may be concluded that, the medulla is the germinal centre for the production of lymphocytes so that the young, large and medium lymphocytes were found in the medulla and the matured, medium and small lymphocytes might be migrated from the medulla to the cortex. The lymphocytes in various stages of mitotic division, apoptotic cells with crescent shaped condensed nucleus and lymphoblasts with clear nucleolus were also noticed both in the cortex and medulla as stated by Indu *et al*. (2005) in White Pekin ducks and Jayachitra *et al*. (2009) in turkeys. The stellate shaped reticuloepithelial cells (REC) were noticed in the cortex, medulla and connective tissue component. These cells formed a network for lymphocytes. This finding is agreeable with the findings of Indu *et al*. (2005) in White Pekin ducks, Jayachitra *et al*. (2009) in turkeys and Leena *et al*. (2012) in domestic fowl.

The undifferentiated epithelial cells were single layer of cuboidal cells, located at the corticomedullary junction that clearly

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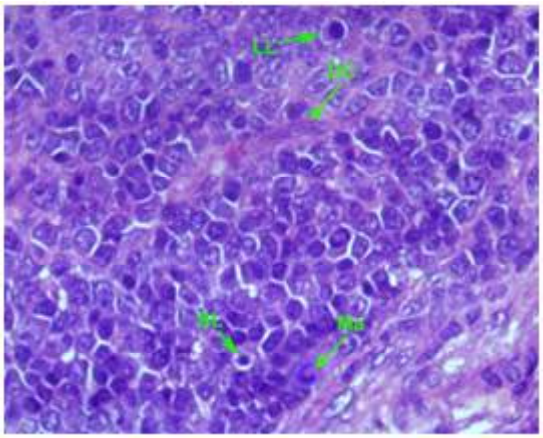

Fig. 1: Showing Small Lymphocytes (SL), Large Lymphocytes (LL), Dendritic cells (Dc) and Macrophage (Ma) in lymphoid follicle H & E x 1000

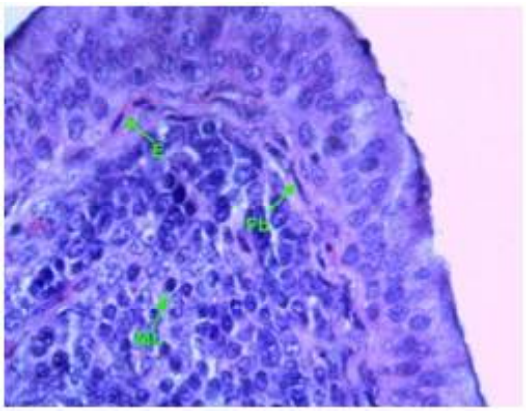

Fig. 2: Showing Medium Lymphocytes (ML) in medulla and Fibroblast (Fb) and Erythrocyte (E) in the subepithelial region H & E x1000

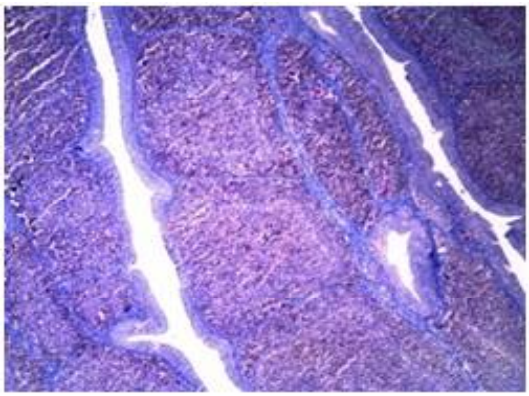

Fig. 3: Showing collagen fibres (Blue) in the subepithelial and interfollicular region. Masson Trichrome stain x100

demarcated the cortex and medulla of lymphoid follicle and capillaries were also associated with the undifferentiated epithelial cells. This is agreeable with Indu *et al*. (2005) in White Pekin duck and Romano *et al*. (1996) reported that, the undifferentiated epithelial cells which rest on the basement membrane associated with thin layer of capillaries demarcated the cortex and medulla in chicken.

The dendritic cells of the bursa of Fabricius were elongated or round in shape with a cytoplasmic processes (Fig. 1). It

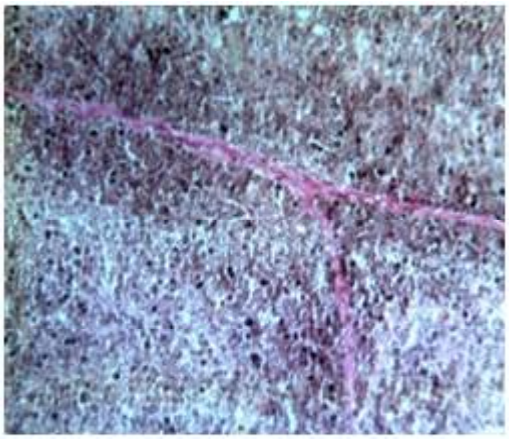

Fig. 4: Showing collagen fibres (Pink) in the interfollicular region Van Gieson x 400

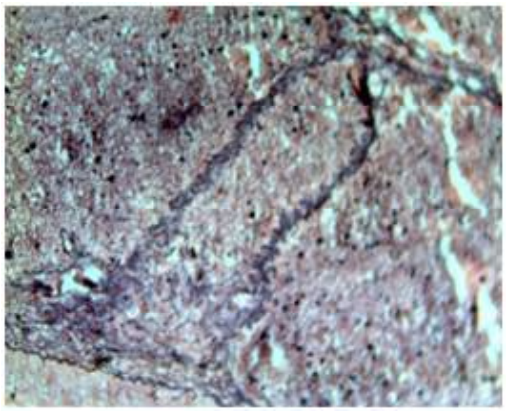

Fig. 5: Showing reticular fibre (Black) in the interfollicular region. Gomori's method x 400

contained round nucleus with basophilic granular cytoplasm. These cells were argyrophilic in nature. This finding is in accordance with Nagy *et al*. (2004), Jayachitra *et al*. (2009) and Leena *et al*. (2012) quail, turkeys and domestic fowl. The dendritic cells were present mainly at the corticomedullary junction and also noticed in the cortex and medulla as reported by Ciriaco *et al*. (1994) in pigeon, Jayachitra *et al*. (2009) in turkey and Leena *et al*. (2012) in domestic fowl. In accordance with Indu *et al*. (2005) in White Pekin ducks, Karaca *et al*. (2006) in chicken and Jayachitra *et al*. (2009) in turkeys, the metachromatically stained mast cell granules were seen most often in subepithelial region, cortex, medulla and between the follicles.

The plasma cells were distributed in the subepithelial region, cortex, medulla and interfollicular region. These findings are in agreement with Indu *et al*. (2005) in White Pekin ducks, Sari and Kurtdede (2007) in turkeys and Leena *et al*. (2012) in domestic fowl. In contrast, Kumar *et al*. (2014) stated that, few plasma cells are detected within the cortex in Khaki Campbell duck. The presence of plasma cells in the bursa of Fabricius might be attributed to its role in the production of humoral immunity. Fibroblasts (Fig. 2), Erythrocytes (Fig. 2), lymphoblasts and Macrophages (Fig. 1) were noticed in the connective tissue component of the bursa of Fabricius as stated by Indu *et al.* (2005) in ducks and Jayachitra *et al*. (2009) in

turkeys.

A large amount of loose connective tissue was noticed in the centre of the plica and small amount was noticed in interfollicular region and subepithelial region. It consisted of numerous collagen fibres (Fig. 3 and 4), reticular fibres (Fig. 5) and very few elastic fibres as mentioned by Singh *et al*. (2010) in chicken, Indu *et al*. (2005) in White Pekin ducks and Jayachitra *et al*. (2009) in turkeys. As recorded by Indu *et al*. (2005), large blood vessels were noticed in the connective tissue core of the plica. Very thin blood vessels were noticed in the interfollicular and subepithelial areas. As reported by Jayachitra *et al*. (2009) in turkeys, reticular fibre network was also seen in the cortex and corticomedullary junction.

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