

Histomorphological and Histochemical Studies on Lymphoid Tissue of Meckel's Diverticulum in Khaki Campbell Breed of Duck (*Anas platyrhynchos*)

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ABSTRACT

The histomorphological and histochemical studies were carried out on the lymphoid tissue of Meckel's diverticulum in 30 Khaki Campbell breed of duck of either sex in different age groups as Gr. I (0-2 weeks), Gr. II (2-4 weeks), Gr. III (4-6 weeks), Gr. IV (6-12 weeks) and Gr. V (12-18 weeks). In Meckel's diverticulum, there were 4-5 lymphatic aggregations in Gr. I. They were infiltrated with reticular fibers and were covered by light capsule made by collagen fibers. In Gr. II and III birds the mucosa was heavily infiltrated by the lymphatic tissue as compared to Gr. IV and V. In the Meckel's diverticulum there was mild to moderate PAS positive reaction. The simple tubular mucous glands also showed moderate to strong reaction in all the groups.

Key words: Histochemistry, Histomorphology, Khaki Campbell duck, Lymphoid tissue, Meckel's diverticulum

INTRODUCTION

The Khaki Campbell originated in England. This breed was primarily kept for its high level of egg production. Mrs. Adel Campbell of Uley, Gloucestershire, England developed this breed at the turn of the 20th century. She commenced poultry-keeping around 1887 and

purchased an Indian Runner Duck for cross mating to create a more attractive buff-colored duck. The resultant progeny of this was Khaki Campbell. In 1924, the Khaki Campbell Duck was accepted to the Standards of the Poultry Club, UK and in 1941 it was introduced to the American Standard of Perfection¹.

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The sound health and normal growth of the bird is utmost important for the egg and meat production, which is directly related with the resistance provided by lymphoid system of the body. The lymphoid system initiates immune responses to specific antigens and is comprised of primary and secondary lymphoid organs. The primary organs are thymus and bone marrow and the secondary ones constitute the spleen, bursa, mucosa associated lymphoid tissue, and lymph nodes². They constitute body defense mechanism and neutralize the foreign body by producing antibodies or phagocytes with the help of macrophages. The immune system of birds is complex mechanism and is composed of several cells and soluble factors which work together and interact with infectious agents to produce a protective immune response. The mucosal surface of the gastrointestinal tract is the most extensive exposed area in the body and is constantly exposed to many harmful pathogens. It acts as a selective barrier between the tissues of the bird and its luminal environment. The gut associated lymphoid tissue (GALT) plays a vital role in the immune system by protecting the mucosa against the harmful antigens that enter the body through food and air. The scanning of the literature shows that the GALT is studied in avian species and it is distributed throughout the gastrointestinal tract. Lymphoid tissue is present in Meckel's diverticulum. The present study was carried out on Histomorphological and histochemical studies on lymphoid tissue of Meckel's diverticulum in khaki Campbell breed of duck (*Anas platyrhynchos*).

MATERIALS AND METHODS

This work was carried out on the lymphoid tissue of Meckel's diverticulum in the Khaki Campbell breed of duck at various age groups in 30 birds of either sex. The healthy birds were procured from the State Government Duck Rearing Farm at Wadasa, District-Gadchiroli. These ducks were divided into 5 age groups comprising 6 birds in each group as under: Group I (0-2 weeks), Group II (2-4 weeks), Group III (4-6 weeks), Group IV (6-12 weeks), Group V (12- 18 weeks). The birds were sacrificed by cervical dislocation and the

tissue samples from the Meckel's diverticulum of gut were collected. The tissue samples after collection were washed with normal saline and then subjected for fixation. The tissue pieces were fixed in 10% neutral buffered formalin solution and Bouin's fluid and processed for paraffin technique as per the method of Drury and Wallington³. The sections of 3-5 μ thickness were obtained on rotary microtome and stained for histomorphology and histochemistry per the following staining procedures.

1. The Haematoxylin and Eosin staining for general histomorphological observations⁴.
2. The Masson's trichrome staining method for demonstration of collagen and smooth muscles fibers⁴.
3. Gomori's stain for reticular fibers⁵.
4. Verhoeff's stain for elastic fibers⁵.
5. Periodic Acid Schiff's reaction for presence glycogen⁵.
6. Ab-PAS method for acid mucopolysaccharide⁵.

RESULTS AND DISCUSSION

Meckel's diverticulum

The solitary lymphatic nodules and the few aggregations were recorded in the different part of the small intestine in various age groups under present study. Meckel's diverticulum, the remnant of yolk sack and stock was one of the important locations of the lymphoid tissue. It was grossly visible in all the birds of the present study. In Gr. I, there were 4-5 lymphatic aggregations in the form of nodules. Few follicles were found to be merged. These were infiltrated by the reticular fibers. The nodules were covered by light capsule made by collagen fibers. The lymphoepithelium was consisted of columnar epithelial cells, goblet cells and intra epithelial lymphocytes. These observations are in agreement with those noted by Barman *et al.*⁶ and Khomych and Mazurkevych⁷. It was difficult to recognize the "M" cells in light microscopy, but the cells adjacent to the lymphocytes were larger having folds in apical border were considered as "M" cells, the antigen sampling cells⁸. In Gr. II and Gr. III birds, the mucosa was heavily infiltrated by the lymphatic tissues. The epithelium

associated with lymphatic follicles was disrupted. The lymphatic nodules were 7-8 in numbers and were present deep in submucosa. Some were found to be invading the tunica muscularis. These findings collaborate with those reported by Khomych and

Mazurkevych⁷. In Gr. IV and V, there was less infiltration of lymphatic tissue in the Meckel's diverticulum, this may due to parallel post natal development of the lumbar lymph nodes which develop up to the 4th week of age in Khaki Campbell duck.



Fig. 1: Photomicrograph of T.S. of jejunum (group I) showing

- A) Meckel's diverticulum
- B) Cross section of jejunum
- C) Lymphoid tissue (H.E.50X)

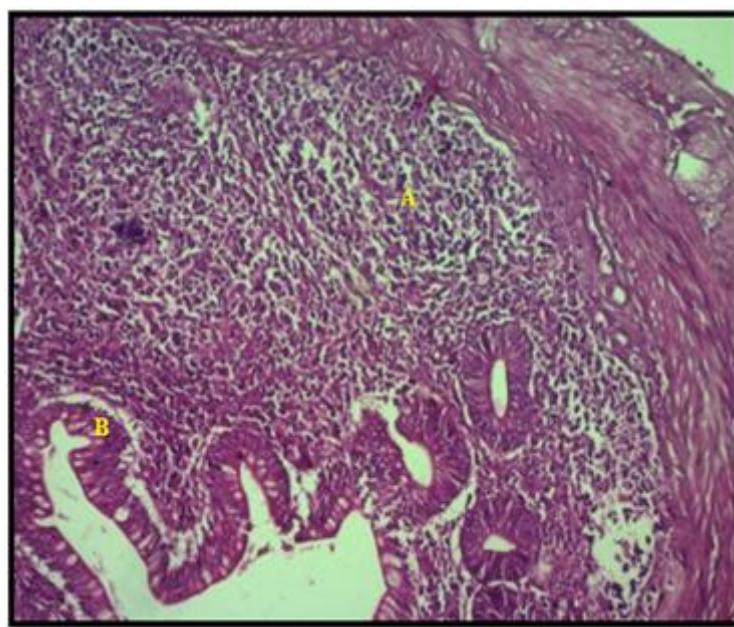


Fig. 2: Photomicrograph of T.S. of Meckels diverticulum (group I) showing

- A) Lymphatic tissue
- B) Crypt (H.E.200X)

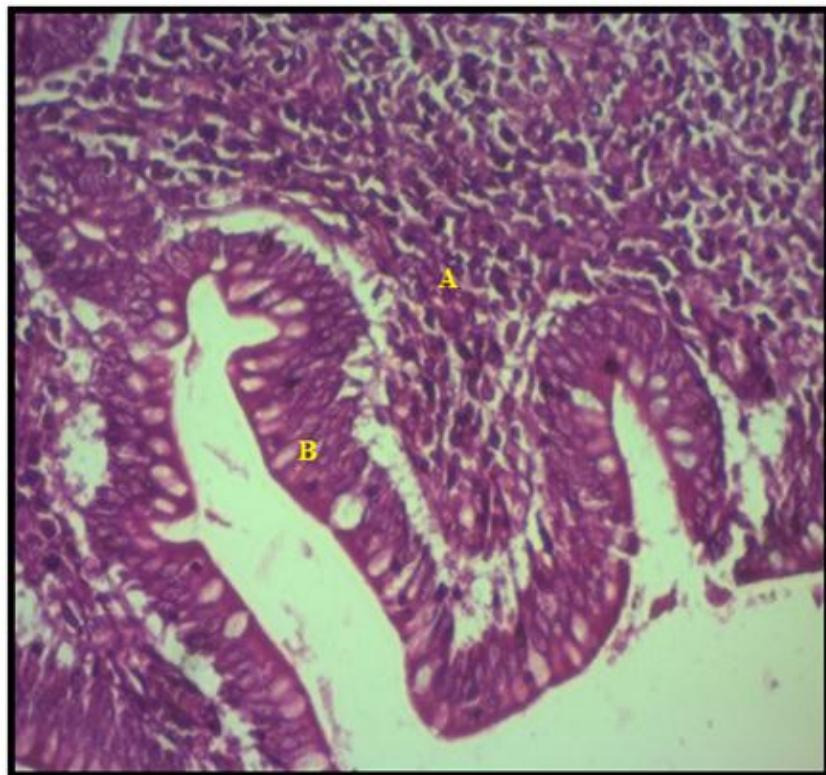


Fig. 3: Photomicrograph of L.S. of Meckel's diverticulum (group I) showing
A) Lymphatic tissue
B) Cryptal epithelium (H.E.400X)

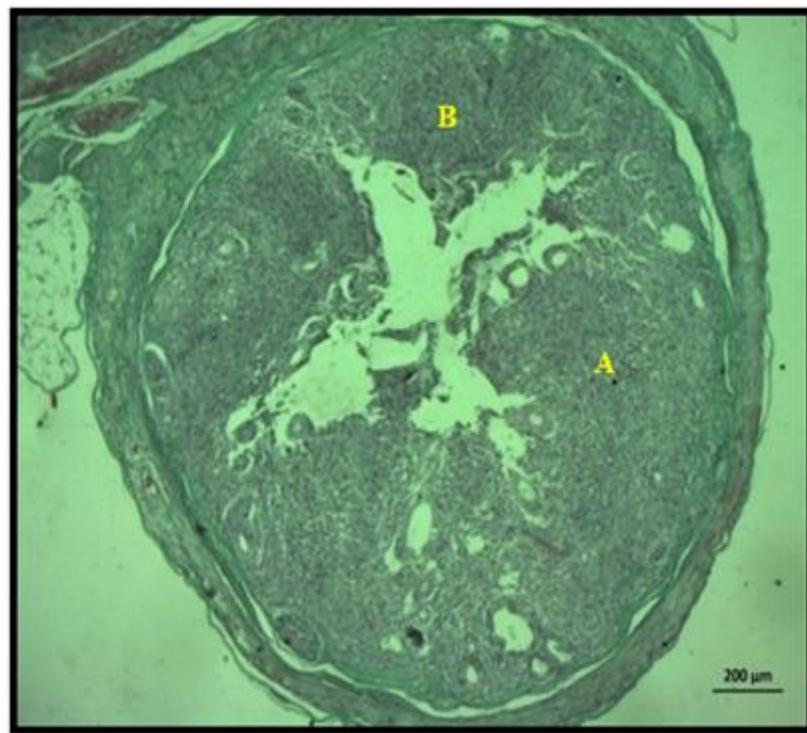


Fig. 4: Photomicrograph of L.S. of Meckel's diverticulum (group III) showing distribution of collagen fibers
A) Lymphatic nodule
B) Lymphatic follicle (Masson's trichom.50X)

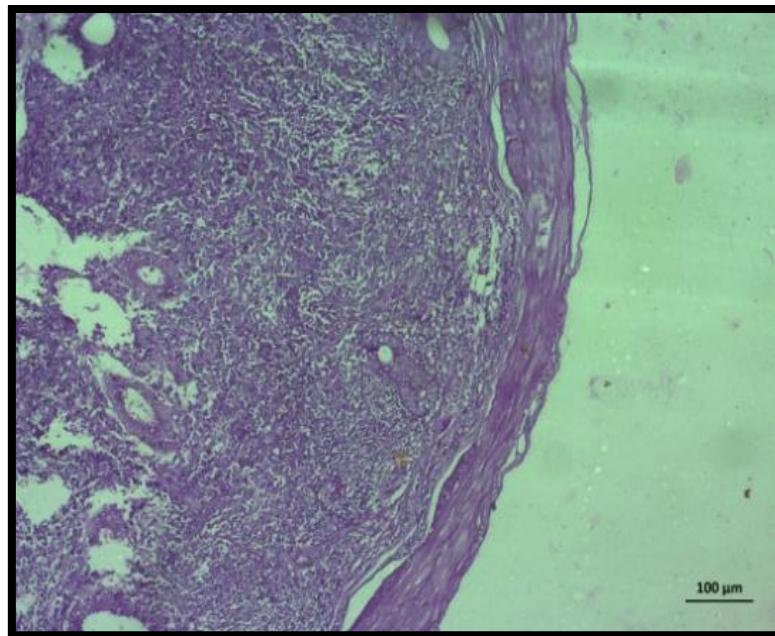


Fig. 5: Photomicrograph of L.S. of Meckel's diverticulum (group I) showing PAS reaction in lymphatic nodule and lymphatic follicle and mucous gland (PAS 100X)

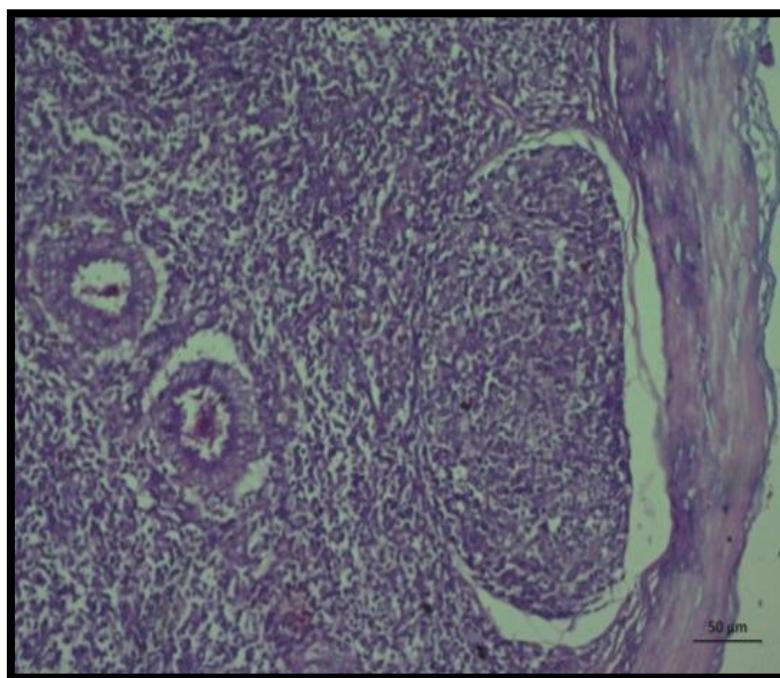


Fig. 6: Photomicrograph of L.S. of Meckel's diverticulum (group III) Showing Ab-PAS reaction in lymphatic nodule and lymphatic follicle and mucous gland (Ab PAS 200X)

In the Meckel's diverticulum the lymphatic tissue showed mild to moderate PAS positive reaction. The lymphatic nodules, the germinal centres and associated blood vessels showed strong reaction in all the groups. The simple tubular mucous glands also showed moderate to strong reaction in all the groups under present study. The lymphoepithelium showed

mild reaction. The Ab PAS reaction for lymphatic tissue in Meckel's diverticulum was mild in all the groups, but moderate to strong reaction was noted in Gr. III birds. The germinal centres of the lymphatic tissue in Gr. III also showed the moderate to strong reaction for acid mucins.

CONCLUSION

The Meckel's diverticulum, the remnant of yolk sac was one of the important locations of the lymphoid tissue, which was grossly visible in all the birds of the present study. In Group I, there were 4-5 lymphatic aggregation in the form of nodules. They were infiltrated with reticular fibers and were covered by light capsule made by collagen fibers. The lymphoepithelium was consisted of columnar cells, few goblet cells and intraepithelial lymphocytes. This epithelium was found to be disrupted over follicles. In Groups II and III birds the mucosa was heavily infiltrated by the lymphatic tissue as compared to Groups IV and V. This might be due to parallel post natal development of lumbar lymph nodes in the Khaki Campbell duck at the age of 4th week.

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