DISTRIBUTION OF LYMPHOID TISSUE IN THE OVIDUCT OF JAPANESE QUAIL *(Coturnix coturnix japonica)*

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ABSTRACT

Distribution of lymphoid tissue in the quail oviduct was studied at different stages of growth. Lymphocytes first appeared in the oviductal wall at 15 days of age in the subepithelial connective tissue layer. Lymphocytes in the scattered form could be seen in the lamina propria and loose connective tissue among bundles of smooth muscle in the tunica muscularis throughout the oviductal wall. Lymphoid aggregates were occasionally noted in the infundibular neck and vagina and were not encapsulated. Distribution of the lymphoid tissue in the oviduct was maximum in 40 days-old birds and thereafter it decreased

.INTRODUCTION

Lymphoid tissue reacts to foreign antigens by producing antibodies thereby providing adaptive immunity. Peripheral component of the avian lymphatic system includes all areas of lymphocytic aggregation and proliferation outside the central component which includes the bursa of Fabricius and thymus. Ectopic lymphoid tissue are so widely spread among avian species that in order to arrive some evaluation of the foci, they should be studied in as large number of species as possible. Presence of lymphoid tissue in the oviduct of domestic fowl has been reported by many workers (Kimijima, 1989 and Khan *et al*., 1997). In the case of Japanese quail published reports on distribution of lymphocytes in the oviduct are meagre. Hence the present work is undertaken to study the distribution of lymphoid tissue in the wall of quail oviduct at different stages of postnatal development.

MATERIALS AND METHODS

In all, 72 birds were used for the present study. Quail chicks were selected randomly from a single hatch and reared from day-old to 60 days of age under intensive system of management. Material was collected at three days interval up to 15 days, five days interval up to 30 days and ten days interval up to 60 days of age. Tissue pieces from various segments of the oviduct were fixed in 10% neutral buffered formalin and processed conventionally and 5mthick sections were made. The sections were stained using Haematoxylin and Eosin (H&E), van-Gieson's, Gomori's rapid one step trichrome and Gomori'sreticulin methods (Drury and Wallington, 1967).

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RESULTS AND DISCUSSION

Lymphocytes first appeared in the quail oviduct at 15 days of age in the subepithelial connective tissue layer of the vagina. At this age, the oviductal wall was made up of primary mucosal folds lined by simple columnar epithelium and a subepithelial connective tissue layer beneath. Various segments of the oviduct were not differentiated at this age except the uterus and vagina. Lymphatic tissue appeared in a sequential pattern from caudal end to cranial regions indicating the pattern of exposure to antigens from cloacal end to more anterior regions as reported in Kuttanad ducks by Patki (2010).

Distribution of lymphocytes in the various segments of the quail oviduct was maximum at 40 days-old birds; thereafter it decreased. Biggs (1956) reported that in fowl, the number and size of lymphoid tissue in peripheral organs varied with the antigenic stimuli. Transport of lymphocytes from bursa to thymus and peripheral organs occurred in day-old, 9 days-old, two to three weeks old and six weeks old chicks, but not in 14 weeks old fowl (Woods and Linna, 1965). According to Khan *et al.* (1997), in Dekalb strain of White Leghorn chicken, B lymphocytes first appeared in the lamina propria of

chicken oviduct at five weeks of age and their frequency of occurrence peaked at 15 weeks from infundibulum to the uterus, while in vagina, it did so at 21 weeks.

In the infundibulum, distribution of the lymphocytes was more in the neck region when compared to the fimbriated end. They were located mainly in the lamina propria, the connective tissue surrounding the blood vessels and among the bundles of smooth muscle in the tunica muscularis. Lucas (1951) reported that the presence of free lymphocyte population in the binding loose connective tissue of the pancreas of duck were those that have migrated from the blood vessels to the parenchyma.

Lymphoid aggregates could be noticed in the connective tissue among bundles of smooth muscle in the neck region of the infundibulum at 60 days of age (Fig. 1). Bradley (1960) and Kimijima (1989) mentioned occasional presence of islands of lymphoid tissue near the middle of infundibulum in fowl. Mohammadapour and Keshtmandi (2008) identified lymphocytes in the infundibulum of the turkey and pigeon oviduct either in diffused form or in aggregates along with many plasma cells.

In the magnum, scattered lymphocytes were noticed in the connective tissue core of the mucosal folds and in the loose connective tissue between the tunica muscularis and serosa, especially surrounding the blood vessels. At the magnum-isthmus junction, lamina propria showed abundance of lymphocytes in diffuse form as reported in fowl by Kimijima (1989).

In the isthmus and uterus, irregularly scattered lymphocytes could be distinguished in the connective tissue core of mucosal folds and the loose connective tissue layer between the inner circular and *outer*longitudinal muscle layers of the tunica muscularis.

Among the various segments of the quail oviduct, vagina showed maximum density of lymphoid tissue. In addition to scattered lymphoytes, there were large lymphoid aggregates in the lamina propria at 40 days-old birds (Fig. 2). These aggregates lacked a limiting membrane and blended with the surrounding tissue. The nodules lacked a supporting stroma as is commonly seen in the mammalian lymph nodules. The dorsal and ventral ligaments supporting the oviduct also showed the presence of lymphocytes. Patki (2010) opined that the presence of these aggregates in the lamina propria of vagina in Kuttanad duck was beneficial for strengthening immunity against large array of antigens because of the close proximity of vagina with the cloaca.

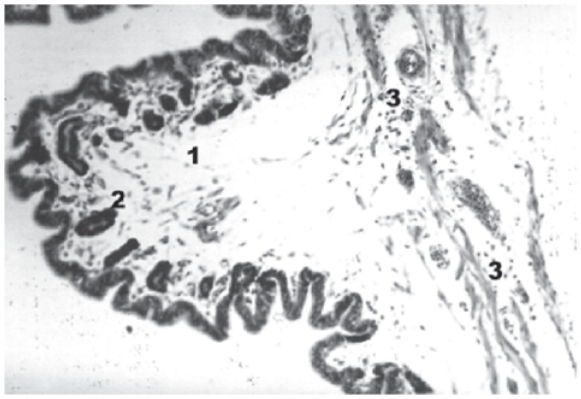

Fig. 1.C.S. of the neck of infundibulum (60 days of age). H&E. x 160

1. Mucosal fold

2. Glands in lamina propria

3. Diffuse lymphoid tissue in the tunica muscularis

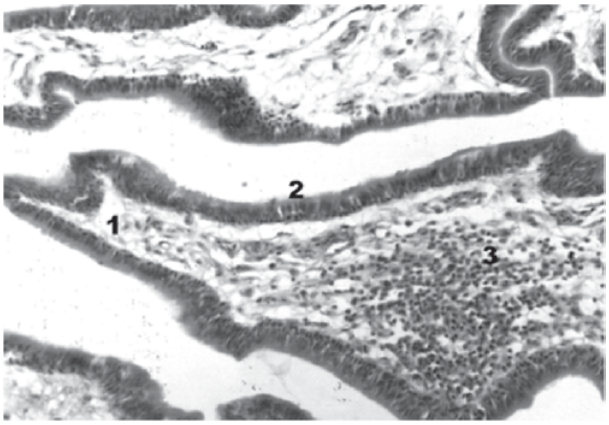

Fig. 2.C.S. of the vagina (40 days of age). H&E. x 160

1. Mucosal fold

2. Lamina propria containing large lymphoid aggregate

In short, scattered lymphocytes could be seen throughout the oviductal wall but the aggregates were noticed in the infundibular neck and vagina. Contrary to this, Das and Biswal (l968) reported that there were no lymphocytes in the oviduct ofduck. King (1974) stated that the typical lymph nodes are absent in avian species except in the case of water birds such as duck and goose. In others, they occurred as numerous lymphoid foci scattering throughout many parenchymatous organs as normal expressions of avian lymphoid tissue. In turkey, Aitken (1971) observed that lymphatic nodules and plasma cells were negligible in birds reared with minimal exposure to infection although they were a constant feature in conventionally reared birds. Khan *et al.* (1996) suggested that the postnatal developmental changes of T-cell subpopulations depended on different anatomical regions of the oviduct and on the age of the Dekalb strain of White Leghorn chicken. According to Khan *et al.* (1997), postnatal development of B lymphocytes and plasma cells in the oviduct of chicken was correlated to the oestrogen secretion. Besides sharing the general immune responses, they have a local immunological function in relation to bacteria and other antigenic substances. Uddin *et al.* (2010) cited that when mucosa is exposed to foreign antigens, the mucosa associated lymphoid tissue (MALT) act as a source of lymphocytes, polymorphonuclear leukocytes, plasma cells and macrophages. This tissue plays an important role in immunological response to micro-organisms and helps to induce immunity after oral immunization. Thus, in the absence of a well developed lymphatic system in avian, presence of such lymphatic aggregates or free lymphocytes is believed to be normal for compensating the function.

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