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Gross Anatomical Studies on Primary Lymphoid Organs (Thymus and Bursa of Fabricius) of Kadaknath Birds

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Abstract

The gross anatomical study of thymus and bursa of Fabricius was carried out on 30 Kadaknath birds of different age groups ranging from day old to 26 week. The birds were divided into five equal groups according to age as day old to 2 week, 2 to 4 weeks, 4 to 8 weeks, 8 to 16 weeks and 16 to 26 weeks, each consisted of six birds. The shape, colour and location were observed. The thymus gland in Kadaknath consisted of two long chains having 6-8 irregular shaped lobes. The shape and color of thymic lobes as well as length and width of thymus varied amongst groups. Grossly there was no regression of thymus after 26th week of age. The bursa of Fabricius was located on the dorsal wall of proctodeum of cloaca. The shape and color of bursa of Fabricius varied amongst age groups. Grossly there was complete regression of bursa after 25th week of age. The dissimilarities in these findings might be due to species difference.

Keywords: Kadaknath, Bursa of Fabricius, Thymus, Anatomy, Shape, Colour

Introduction

Kadaknath is only Black Meat Chicken (BMC) breed of India. It is a native bird of Madhya Pradesh, reared mainly by the tribal communities of Bhil and Bhilala. The commonly available colours of Kadaknath are jet-black, penciled and golden. The bird is very popular among the adiwasis mainly due to its adaptability to the local environment, disease resistance, tasty meat quality, texture and flavor, though the flesh of this breed is black, it is considered not only a delicacy of distinctive taste, but also of medicinal value (Pandey *et al*., 2002). Thymus gland is found in all the vertebrates except in the cyclostomes and derives its name from the resemblance of its lobes in human beings to a leaf of the thyme plant. The thymus gland is regarded immunologically as a primary lymphoid organ (Muthukumaran *et al*., 2011). The bursa of Fabricius is a lymphoepithelial organ which is peculiar to birds originated from the proctodermal wall of the cloaca. The bursa of Fabricius also functions as a peripheral immunological organ associated with intestine (Tamilselvan *et al*., 2017).

Materials and Methods

The thymus and bursa of Fabricius were collected from apparently healthy Kadaknath birds. The study was carried out on thirty birds of different age groups, ranging from day old to 26 week. These

birds were divided into five equal groups according to age; viz., day old to 2 weeks, 2 to 4 weeks, 4 to 8 weeks, 8 to 16 weeks and 16 to 26 weeks and each group consisted of six birds. The birds were sacrificed ethically. The collected samples were washed in normal saline and mopped with blotting paper and the shape and color were recorded. The length and width of thymus and bursa of Fabricius were measured by vernier caliper.

Results and Discussion

The gross observations of thymus in Kadaknath showed that it was located into two long chain having thymic lobes on the either side of neck region and situated parallel to jugular and vagus nerve (Fig. 1). The present findings are similar to the findings of Gulmez and Aslan (1999) in native geese and Sultana *et al*. (2011) in indigenous duckling.

The number of lobes in Kadaknath was 6 to 8 each on right and left side which was similar to the observation of Muthukumaran *et al*. (2011) in turkey, and of Khan *et al*. (2014) and Aktar *et al*. (2006) in broiler chicken. However, this result differ from Gulmez and Aslan (1999) who have reported that 6 to 9 thymic lobe on right side and 5 to 9 lobes in left side of native geese. Sultana *et al*. (2011) reported 5 lobes on both side in indigenous duckling, Song *et al*. (2012) reported 5 to 6 lobes on both side in ostrich chicks and Haseeb *et al*. (2014) reported 7 to 9 lobes on right side and 6 to 8 on left side in Aseel chicken. The dissimilarities in these findings might be due to species difference.

Fig. 1 : Photograph showing thymus in neck region c

The shape of the thymus was flattened and irregularly elongated, while the color was gray to black in all groups of Kadaknath (Fig.1). These findings are similar to Sultana *et al*. (2011) who reported elongated and flattened pale white to yellowish white thymus in indigenous duckling, Haseeb *et al*. (2014) reported elongated and flattened yellowish white thymus in Aseel chicken and Khan *et al*. (2014) reported flattened shape and yellowish white color in broiler chicken. However, the present findings differed from Akter *et al*. (2006) who reported flattened pale white thymus in broiler chicken, and Muthukumaran *et al*. (2011) reported irregularly elliptical pale red pink thymus in turkey.

The dissimilarities in these findings might be due to species difference. The length and width of thymic lobules varied amongst groups (Table 1). Sultana *et al*. (2011) in indigenous ducklings reported the length of right and left thymus as 0.83 and 0.83 cm, and the breadth as 0.30 and 0.33 cm, respectively.

There was no regression of thymus after 26 weeks of age (Fig. 2). Muthukumaran *et al*. (2011) reported that the thymus was completely involuted at the age of 8 months in females and 10 months in males.

Fig. 2 : Photograph showing thymus in neck region (26th week)

Table 1: Biometry of the thymus and bursa of Fabricius of Kadaknath birds (Mean ± SE)

Age group	Thymic		bursa of Fabricius	
	Length (mm)	Width (mm)	Length (mm)	Width (mm)
0-2 wk	08.46±1.83	15.24±1.19	20.32±1.19	07.62±1.19
2-4 wk	11.85±0.69	11.84±2.40	14.00±0.47	16.00±2.53
4-8 wk	16.90±1.38	11.80±0.60	16.00±0.47	12.00±0.37
8-16 wk	12.30±0.27	18.00±0.81	24.60±1.60	16.60±0.72
16-24 wk	11.30±1.08	11.30±0.27	21.00±3.29	15.00±2.05

The bursa of Fabricius was single lympho-epithelial organ located in dorsal diverticulum of the proctodeal wall of cloaca (Fig. 3). When fully developed it consisted of a wall surrounding a small axial, main cavity. The main cavity gives off small diverticula, and also leads into the cloaca through a small median opening in the dorsal wall of the proctodeum. These findings are in agreement with Islam *et al*. (2014) in commercial broiler chicken.

Fig. 3 : Photograph showing bursa of Fabricius in proctodeum region of Cloaca (24th week)

The color of bursa of Fabricius was gray to black (Fig. 4). These findings are in agreement with Jain *et al*. (2010) in CARI Shyama and differ from Tamilselvan *et al*. (2017) in guinea fowl who revealed that color of bursa was pale pink. Islam *et al*. (2014) in commercial broiler chicken and Sultana *et al*. (2011) in indigenous duckling observed the color of bursa of Fabricius as yellowish white. The dissimilarities in these findings might be due to species difference.

Fig. 4 : Photograph showing bursa of Fabricius (8th week)

The shape of bursa of Fabricius was round up to first two group (4th week) of age, afterwards it became globular in shape in either sexes (Fig. 4). These findings differ from Tamilselvan *et al*. (2017) in guinea fowl, wherein the shape of bursa of Fabricius was round up to two month of age afterwards it was oval in shape in both sexes. Islam *et al*. (2014) reported globular shape in commercial broiler chicken and Sultana *et al*. (2011) reported cylindrical shape in indigenous duckling.

The size of bursa of Fabricius was maximum at 16th week of age. Khenenou *et al*. (2012) in broiler chicken reported the maximum size of bursa of Fabricius at 10th week of age. Jayachitra *et al*. (2009) found maximum size of bursa of Fabricius at six month of age in turkey while Gultiken *et al*. (2010) showed it at the 9th week of age.

The length and width of bursa of Fabricius varied amongst groups (Table 1). Sultana *et al*. (2011) in indigenous ducklings reported that the length and width of bursa of Fabricius were 1.87 and 0.53 cm, respectively.

The bursa of Fabricius became completely regressed after 25th week of age. These results differ from Khenenou *et al*. (2012) in broiler chicken who noticed the total regression at 27th week of age and Chandrashekhar *et al*. (2012) in domestic fowl observed regression at 24th week of age.

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Conflict of Interest: All authors declare no conflict of interest.

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