

Histo-morphological Study on Thymus of Aseel chicken

Abdul Haseeb*, Muhammad Ghiasuddin Shah*, Jameel Ahmed Gandahi*, Ghulam Murtaza Lochi*,
Muhammad Shoaib Khan**, Muhammad Faisal***, Faisal Ayub Kiani****, Raza Ali mangi*,
Susheel Kumar Oad****

*Department of Anatomy & Histology Faculty of animal Husbandry & Veterinary science Sindh Agriculture
University Tandojam Sindh Pakistan

**Gomal University D I Khan KPK Pakistan (University Putra Malaysia (UPM))

***Department of Veterinary Pathology, of Animal Husbandry & Veterinary science Sindh Agriculture University
Tandojam Sindh Pakistan

****Department of Surgery and Obstetrics, Faculty of animal Husbandry & Veterinary science Sindh Agriculture
University Tandojam Sindh Pakistan

ABSTRACT

Histomorphological studies were conducted on the thymus of 24 Aseel chicken of both sexes in three age groups viz., A (2 month) B (4 months) and C (6 months). Gross morphological parameters were studied immediately after collection of specimen and then the tissue samples were fixed in neutral buffered formalin, for routine tissue preparation technique for light microscopy. Gross morphological studies showed thymus located on parallel to the vagus nerve and internal jugular veins, having long chain of thymic lobes, on either side of neck. The number of lobes ranged from 7-9 on right side and 6-8 on left side of neck. The color of the thymus was pale white to yellowish white and the shape of the lobes of thymus was elongated and flattened. Histological structure of thymus showed regression of thymic lobules with increased number of Hassall's corpuscles with advancement of age. The range of length and width of thymic lobules was 621.02-747.87µm, 375.75-445.87µm, respectively among different age groups. There was significant (P<0.001) difference found in the length and width of thymic lobules among three age group. Statistically no significant difference was noted with respect to sex.

KEYWORDS: *Histo-morphological, Thymus of Aseel chicken, sindh*

INTRODUCTION

The Aseel chicken is famous as a game bird. It is especially bred by bird lover communities in different areas of Pakistan (Babar *et al.*, 2012). Due to its unique aggressive behavior and meat value, it is especially bred in different rural areas of Pakistan under backyard poultry farming. Backyard poultry farming is very common in rural areas of Pakistan (Ebako and Morishita, 2001). Aseel are characterized by a muscular but compact body, broad shoulders, wings carried against the body, short and hard feathers, drooping tails, a large curved beak similar to that of an eagle, pea comb and no wattles.

The thymus is primary lymphoid organ in birds. Gross anatomically located on each side of the neck there are separate lobes, extending from the third cervical vertebra to the upper thoracic segments (Kendall, 1980). The thymus produce and cultivate lymphocytes and is responsible for cell mediated immunity (CMI), including immunosurveillance (Janeway *et al.*, 1988). The avian thymus undergoes age-dependent structural changes. However, the timetable of the involution process different among species (Ciriaco *et al.*, 2003).

Information about the histomorphology of the thymus of Aseel chickens is limited and most of investigations are performed in broilers and layers. Therefore, the present research has been designed to collect data to understand the histomorphology of thymus of Aseel chickens.

MATERIAL AND METHODS

Chickens:

A total of 24 healthy normal Aseel chickens of both sexes with 3 different age groups namely A, B and C; 2, 4 and 6 months old respectively, were used for this study. Each group was comprised of 8 birds consisting equal number of male and female. The birds were purchased from backyard poultry farms of Hyderabad, Pakistan.

Collection of samples:

The chickens were slaughtered by halal method and soon thereafter the samples were collected from each bird. The thymus was collected by ventral neck dissection. All the procedures were done at the laboratory of department of anatomy and histology.

Gross morphological study:

Gross morphological study was performed immediately after collection of the thymus, which includes the parameters, location, shape and color.

Histomorphological study:

The specimen (tissues) obtained from the chickens were marked and fixed in the 10% neutral buffered formaldehyde solution and were dehydrated in the series of ascending grade of alcohol followed by clearing in three changes in xylene and the tissues then were infiltrated in two changes of melted paraffin in the oven. The tissues were embedded in paraffin and finally the sections will be cut at 6 μ thickness by using a rotary microtome. After cutting, the sections were put in luke-warm water in a floatation bath at 55-60⁰ C for stretching and then the sections were mounted on clean slides smeared using an adhesive (egg albumin) and were dried in a hot air oven. The sections were stained with Hematoxylin and Eosin (H&E). The histological structures of the lymphoid tissues were observed with the help of light microscope under x10 and x40 magnifications (Akhtar *et al.*, 2006; Sultana *et al* 2011). Photographs from the selected specimens were prepared for better illustration of the results. Micrometry was done with the help of digital microscope with Digi-pro software.

Statistical analysis:

Means, standard error means (SEM) were calculated for each parameter with the help of computer software Microsoft Excel. Statistical analyses were performed by using the statistical computer software (Graphpad instat).

RESULTS

Gross morphology

Location, shape and color

The thymus in Aseel chicken was observed to be located on parallel to the vagus nerve and internal jugular veins, having long chain of thymic lobes, extended from the anterior cervical region to the thoracic region (front of the chest) on either side of neck. Each lobe was well separated from other, and lying in the sub-dermal connective tissue of the neck region. The number of lobes ranged from 7-9 on right side and 6-8 on left side of neck. The color of the thymus of Aseel chicken was pale white to yellowish white and the shape of the lobes of thymus was elongated and flattened (plate 1).



Plate: 1 Thymus of male Aseel chicken (ventral aspect)

Histomorphology

Histology of thymus

The thymus of Aseel chicken was observed to be enclosed by a thin connective tissue capsule. It was divided into incompletely separated lobules by several fine septa of connective tissue originated from the

capsule. Each lobule was organized into a peripheral cortex and a central medulla (plate2). The parenchyma of cortex was enriched with lymphocytes. The medulla was comprised of epithelial reticular cells that mainly served as structural support for lymphocytes, macrophages, etc. Numerous Hassall's corpuscles were observed in the medulla.

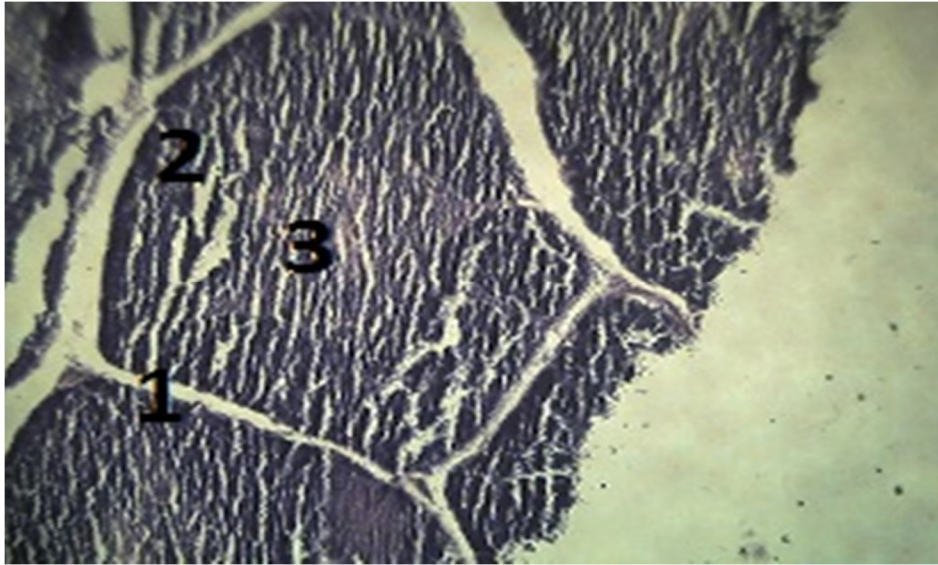


Plate2: Thymus of Aseel chicken 1: septum 2: cortex 3: medulla (H&E, X80)

Histological changes according to the age and sex

A clear developed capsule and septa divided lobes into lobules containing distinct cortex and medulla were observed in thymus of group A. A well developed thymic lobules with clear appearance of cortex and medulla was observed in group B (plate3). Whereas a clear distinction between cortex and medulla is lost and there was a progressive reduction of the cortical area and in the number of cortical and medullary epithelial cells with increased number of Hassall's corpuscles were observed in group C (plate3). Histological observations revealed that there was no considerable difference in both sexes.

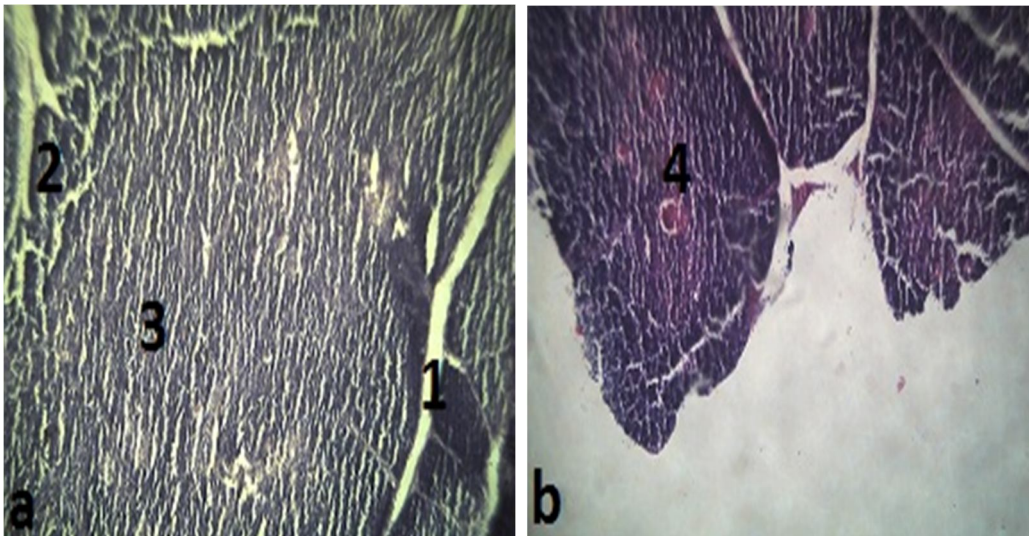


Plate3: Thymus of Aseel chicken (a) 4 month of age (H&E, X320) (b) 6 month of age (H&E, X80) 1: septum 2: cortex 3: medulla 4: Hassall's corpuscles

Length of thymic lobules

Range of length of thymic lobules was found to be 621.02-747.87 μm . Statistically no significant difference was found with respect to sex. There was significant ($P < 0.001$) difference found in the length of

thymic lobules among three age group. The birds of group B had larger thymic lobules as compared to A and C age groups (Table 1).

Width of thymic lobules

The thymic lobules were observed to have width that ranged between 375.75-445.87 μm . statistically no significant difference was calculated with respect to sex. There was significant ($P < 0.001$) difference in the width of thymic lobules among three age group. The birds of group B were noted to have wider thymic lobules than A and C groups (Table 1).

Table 1 : Histometrical values (Mean \pm SEM) of thymus of Aseel chicken.

PARAMETERS	SEX GROUPS		AGE GROUPS		
	Male	Female	A	B	C
Length of thymic lobules (μm)	750 \pm 2.04	745.75 \pm 2.18	621 \pm 2.17	747.88 \pm 1.60	687.13 \pm 1.63
Width of thymic lobules (μm)	446 \pm 2.16	445.75 \pm 1.65	375.75 \pm 1.26	445.88 \pm 1.26	394.75 \pm 1.35

For male and female no significant difference ($P > 0.05$)

For age groups significant difference ($P < 0.001$) between A, B & C

DISCUSSION

Information about histomorphology of thymus of Aseel chicken is unavailable. Therefore, the results in the present investigation are being discussed with the available data on the different species/breeds of birds. In present study, the thymus of Aseel chicken was observed to be located into two long chains of lobes on either side of neck and situated parallel to the jugular vein and vagus nerve. The Findings about location of thymus are in agreement with Hodges, (1974) in white leghorn, Muthukumaran *et al.*, (2011) in turkeys and Akter *et al.*, (2006) in broiler chickens. Available literature showed that the number of lobes is different in different species. Muthukumaran *et al.*, (2011) reported 6-8 lobes on each side of neck, in turkey, Sultana *et al.*, (2011) noticed 5 lobes on both side of neck (left and right) in indigenous ducklings of Bangladesh, Bahadir *et al.*, (1992) revealed 6-9, 5-6, 4-7 lobes on right side and 5-9, 5-7, 4-6 lobes on left side in goose, native duck and white pekin duck, respectively. In present study it was observed that the number of lobes in Aseel chicken was, 7-9 on right side and 6-8 on left side. The dissimilarities in these findings might be due to species difference. The color of the thymus of Aseel chicken is pale white to yellowish white and the shape of the lobes of thymus was observed to be elongated and flattened. These observations are in agreement with the finding of Sultana *et al.*, (2011) in duckling of Bangladesh. However, this result differs from Muthukumaran *et al.*, (2011) who reported the shape of thymic lobes irregular elliptical which varied in colour from pale red to pink in turkeys and Akter *et al.*, (2006) reported the shape of thymic lobes flattened pale white in broiler chickens. Available literature showed thymic involution in birds chiefly occurs with advancement of age. Aita *et al.*, (1995) reported in white leghorn, from 3– 6months, there was a progressive reduction of the cortical area and in the number of cortical and medullary epithelial cells. Franchini and Ottaviani (1999) observed in *Gallus domesticus* a clear distinction between medulla and cortex is lost with aging. Tarek *et al.*, (2012) noticed degeneration of the thymic lobules at the 23rd week of age in broilers. In present study, histologically degeneration of the thymus was noted with advancement of age and clear distinction between medulla and cortex was lost at 6 months of age.

CONCLUSIONS

- 1) Regression of thymic lobules, increased in number of Hassall's corpuscles was observed with aging. A clear separation between cortex and medulla is lost with advancement of age.
- 2) No significant difference in thymus of Aseel chicken with respect to sex.

REFERENCES

- Akter, S. H., M. Z. I. Khan, M. R. Jahan, M. R. Karim and M. R. Islam. 2006. Histomorphological study of the lymphoid tissues of broiler chickens. *Bangl. J. Vet. Med.*4 (2): 87–92.
- Aita, M., A.M. Mazzone, F. Gabrielli, A.Evangelista and S. Brenna. 1995. Identification of cells secreting a

thymostimulin-like substance and examination of some histoenzymatic pathways in aging avian primary lymphatic organs. *Eur. J. Histochem.* 39:289–300.

- Babar, M. E., A. Nadeem, T. Hussain, A. Wajid, S. A. Shah, A. Iqbal, Z. Sarfraz and M. Akram. 2012.** Microsatellite marker based genetic diversity among four varieties of Pakistani Aseel chicken. *Pak Vet J*, 32 (2): 237-241.
- Bahadir, A., B. Yidiz, B. A., Serbest. A. Yimaz. 1992.** Domestic pet waterfowl goose, duck, and Peking duck native thymus, and glandula parathyroidea'si glandula thyroidea Comparative studies to macro-anatomical vesubgros. uludag university for veterinary factor. magazine., 11: 35 - 43
- Ciriaco, E., P. P. Pinera, B. Diaz-Esnal and R. Laura. 2003.** Age-related changes in the avian primary lymphoid organs (thymus and bursa of Fabricius). *Microsc. Res. Technol.* 62: 482-487.
- Ebako, M. G. and T.Y. Morishita. 2001.** Preventive Medicine for Backyard Chickens veterinary preventive medicine VME (11) Pp 1-2.
- Franchini, A and E. Ottaviani. 1999.** Immunoreactive POMC-derived peptides and cytokines in the chicken thymus and bursa of Fabricius microenvironments: age-related changes. *J neuroendocrinol* 11:685– 692.
- Hodges, R.D. 1974.** The circulatory system. In *The histology of the Fowl*, Academic Press, London: 151-241.
- Janeway, C.A., B. Jones and Hayday A. 1988.** Specificity and function of T-cell bearing $\gamma\delta$ receptors. *Immunology Today* 9: 73-76.
- Kendall, M.D. 1980.** Avian thymus glands: A review. *Dev. Comp. Immuno* 14 : 191-210.
- Muthukumaran, C., A. Kumaravel, K. Balasundaram and S. Paramasivan. 2011.** Gross anatomical studies on the thymus gland in turkeys (*Meleagris gallopavo*). *Tamilnadu J. Vet. & Animal Sci.* 7 (1): 6-11.
- Rezaian, M. and Hamedi, S. 2007.** Histological study of the caecal tonsil in the cecum of 4-6 months of age white leghorn chicks. *A J. Anim & Vet. Sci* 2(2) : 50-54.
- Sultana, N., M. Z. I. Khan, M. A. Wares and M. A. Masum. 2011.** Histomorphological study of the major lymphoid tissues in indigenous ducklings of bangladesh. *Bangl. J. Vet. Med.* 9(1): 53 – 58.
- Tarek, K., M. Mohamed, B. Omar and B. Hassina. 2012.** Morpho-Histological study of the thymus of broiler chickens during Post-Hashing Age. *Int. J. Poult. Sci.* 11(1): 78-80.