www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; SP-11(10): 1480-1484

www.thepharmajournal.com
Received: 14-08-2022
Accepted: 20-09-2022

A Deka
Assistant Professor, Department of Anatomy & Histology, College of Veterinary Science, Assam Agricultural University, Khanapara, Guwahati, Assam, India

DJ Kalita
Professor Cum Head, Department of Biochemistry, College of Veterinary Science, Assam Agricultural University, Khanapara, Guwahati, Assam, India

BN Bhattachayya
Professor Cum Deputy Director, College of Veterinary Science, Assam Agricultural University, Khanapara, Guwahati, Assam, India

J Kachari
Assistant Professor, Veterinary Clinical Complex, College of Veterinary Science, Assam Agricultural University, Khanapara, Guwahati, Assam, India

S Choudhury
Assistant Professor, Livestock Production and Technology, College of Veterinary Science, Assam Agricultural University, Khanapara, Guwahati, Assam, India

A Das
Assistant Professor, Veterinary Clinical Complex, College of Veterinary Science, Assam Agricultural University, Khanapara, Guwahati, Assam, India

U Barman
Assistant Professor, Veterinary Clinical Complex, College of Veterinary Science, Assam Agricultural University, Khanapara, Guwahati, Assam, India

P Talukdar
Assistant Professor, Department of Animal Nutrition, College of Veterinary Science, Assam Agricultural University, Khanapara, Guwahati, Assam, India

Corresponding Author:
A Deka
Assistant Professor, Department of Anatomy & Histology, College of Veterinary Science, Assam Agricultural University, Khanapara, Guwahati, Assam, India

Histo-topography of B and T lymphocytes in certain lymphoid organ of Pati duck (*Anas platyrhynchos domesticus*) of Assam

A Deka, DJ Kalita, BN Bhattachayya, J Kachari, S Choudhury, A Das, U Barman and P Talukdar

Abstract
Purpose: The study of histo-topography of B and T lymphocytes in certain lymphoid organ of Pati duck (*Anas platyrhynchos domesticus*) is great value in regards to the immunity of duck. The aim of this study was to know the immune status of duck.
Materials and Methods: In present study, 40 numbers of Pati duck of Assam were utilized. The samples were collected from lymph node, Gut Associated Lymphoid Tissue of different parts of the intestine and bursa of Fabricius of Pati duck. These samples were fixed in 10% neutral buffered formalin solution and were processed as per the standard technique of procedure (Luna, 1968). The paraffin blocks were sectioned in Shandon Finesse microtome at 5µm thickness and the sections were stained with Mayer's Haematoxylin and Eosin staining technique for histo-topography of B and T lymphocytes as per the standard methods of Luna (1968). By the Mayer's Haematoxylin and Eosin staining technique, the B and T–lymphocytes can identify in high magnification. The B-lymphocytes were nucleated and T-lymphocytes were non-nucleated.
Results: In the current investigation, the lymph node and gut associated lymphoid tissue of intestine as well as bursa of Fabricius of Pati duck were studied. In present study, showed that there were two lymph nodes: cervical and lumbar lymph nodes. Gut associated lymphoid tissue normally included Peyer's patches and solitary lymphatic nodules. Both the cervical as well as lumbar lymph node of Pati duck composed of inner cortex and outer medulla. Different sizes of numerous follicles were observed in cortex of lymph node of Pati duck. B-lymphocytes were observed in the centre of cortex whereas T-lymphocytes were observed in the periphery of the germinal centre of these follicles. The B-lymphocytes were nucleated and T-lymphocytes were non-nucleated. The inner surface of the bursa of Fabricius was composed of several mucosal folds which were projected into the lumen. Numerous polyhedral shaped bursal follicles were observed in the lamina propria of each fold. Each bursal follicle was consisting of outer cortex and inner medulla. The cortex of bursal follicle was occupied by closely packed small B-lymphocytes. The paler medulla contained fewer B-lymphocytes of various sizes. Peyers patches as well as solitary lymphoid nodules were distributed in the important strategic areas of intestine of Pati ducks. The lamina propria of duodenum was made up of loose connective tissue and diffuse lymphatic tissue. These diffuse lymphatic tissue contained B-lymphocytes and T-lymphocytes. The tunica muscularis layer of jejunum contained lymphoid follicles which were remained in cluster. These lymphoid follicles were separated from each other by a narrow inter follicular area. The centre of these follicle contained B-lymphocytes along with plasma cell whereas the periphery of these follicle contained T-lymphocytes. The B-lymphocytes were nucleated and T-lymphocytes were non-nucleated. The tunica muscularis layer of Ileum contained cluster of lymphoid follicles. These lymphoid follicles were separated from each other by narrow inter follicular area. B-lymphocytes were observed in the centre of lymphoid follicle whereas T-lymphocytes were observed in periphery of lymphoid follicle. Lymphoid follicles were found in the ileo-caecal junction. The centre of these lymphoid follicle contained B-lymphocytes whereas the periphery of the lymphoid follicle contained T-lymphocytes. There was less infiltration of lymphatic tissue in lamina propria of colo-rectum compared to the other part of intestine. The solitary lymphatic nodules were found in the lamina propria and tunica muscularis of rectum but there was no aggregation of nodules.
Conclusion: This study will helpful to the duck farmer, poultry scientist, physiologist and microbiologist for vaccine production and duck meat, egg production and diseases control regime.

Keywords: Assam, B-lymphocytes, certain, duck, histo-topography, organ, Pati, T-lymphocytes

Introduction
The Pati duck is a major indigenous duck breed of Assam. The Annual egg production per Pati duck is70-95eggs, (Kalita *et al*., 2009). The lymph node, gut associated lymphoid tissue

(GALT) and Bursa of Fabricius play an important role in defense mechanism, by secreting IgA. The study of the GALT of Pati duck of Assam is of great value in regard to normal academic and bio-medical research aspects. It is also pre-requisite for correct diagnosis and evaluating the treatment of certain diseases like duck virus enteritis, duck cholera, aflatoxicosis, botulism etc, caused by different types of pathogens, food poisoning and food allergy. The vaccination failure and failure to control the enteric disease is a cause of concern for poor farming community as it results in huge and irreparable economic loss. Since there is scanty of literature on the histo-topography of B and T lymphocytes in certain lymphoid organ *viz.*, lymph node, GALT of intestine and bursa of Fabricius of Pati duck being a local breed of Assam, hence the present study was designed to establish a histo-topographical norms on B and T lymphocytes in certain lymphoid organ *viz.*, lymph node, GALT of intestine and bursa of Fabricius of Pati duck of Assam.

Aim and Objective

The study of histo-topography of B and T lymphocytes in certain lymphoid organ of Pati duck (*Anas platyrhynchos domesticus*) is great value in regards to the immunity of duck. The aim of this study was to know the immune status of duck.

Materials and Methods

In present study, 40 numbers of Pati duck of Assam were utilized. The ducks were procured from Pathsala, Barpeta district of Assam for histological and micrometrical observation. The samples were collected from lymph node, Gut Associated Lymphoid Tissue of different parts of the intestine and Bursa of Fabricius of Pati duck. These samples were fixed in 10% neutral buffered formalin solution and were processed as per the standard technique of procedure (Luna, 1968). The paraffin blocks were sectioned in Shandon Finesse microtome at 5µm thickness and the sections were stained with Mayer's Haematoxylin and Eosin staining technique for histo-topography of B and T lymphocytes as per the standard methods of Luna (1968). By the Mayer's Haematoxylin and Eosin staining technique, the B and T – lymphocytes can identify in high magnification. The B-lymphocytes were nucleated and T-lymphocytes were non-nucleated.

Results

In the present investigation, the lymph node and gut associated lymphoid tissue of intestine as well as bursa of Fabricius of Pati duck were studied. In current study, reveal that there were two lymph nodes: cervical and lumbar lymph nodes. Gut associated lymphoid tissue normally included Peyer's patches and solitary lymphatic nodules. Peyer's patches were located at the small intestine whereas solitary lymphatic nodules were present at the large intestine. Both the cervical as well as lumbar lymph node of Pati duck composed of inner cortex and outer medulla. The cortex and medulla became obscured. Different sizes of numerous follicles were observed in cortex of lymph node of duck. The center of these lymphoid follicle contained germinal centre. B-lymphocytes were observed in the centre of cortex whereas T-lymphocytes were observed in the periphery of the germinal centre of these follicles (Fig.1). The B-lymphocytes were nucleated and T-lymphocytes were non-nucleated. The medulla composed of medullary sinuses and medullary cords. The medullary cords were occupied by B lymphocytes and Plasma cells. The inner surface of the bursa of Fabricius was composed of several mucosal folds which were projected into the lumen. Numerous polyhedral shaped bursal follicles were observed in the lamina propria of each fold. Each Bursal follicle was consisting of outer cortex and inner medulla (Fig.2). The colour of the cortex was dark whereas the colour of medulla was pale. The cortex of bursal follicle was occupied by closely packed small B-lymphocytes (Fig.3). The paler medulla contained fewer B-lymphocytes of various sizes. Peyers patches as well as solitary lymphoid nodules were distributed in the important strategic areas of intestine of Pati ducks. The lymphoid compartment of the gut associated lymphoid tissue in duck consisted of follicular structure, dome, follicle associated epithelia and inter-follicular area. The lamina propria of duodenum was made up of loose connective tissue and diffuse lymphatic tissue. These diffuse lymphatic tissue contained B-lymphocytes and T-lymphocytes (Fig.4). The B-lymphocytes were nucleated and T-lymphocytes were non-nucleated. The lamina propria mucosae of jejunum contained scattered as well as diffuse lymphatic infiltration. The tunica muscularis layer of jejunum contained lymphoid follicles which were remained in cluster. These lymphoid follicles were separated from each other by a narrow inter follicular area. These findings were total agreement with the findings of McGarry and Bourns (1980) [13] in mallard duck and Barman *et al.* (1998) [3] in duck. The centre of these follicle contained B-lymphocytes along with plasma cell whereas the periphery of these follicle contained T-lymphocytes (Fig.5). Lamina propria mucosae contained numerous lymphocytes. Apart from the lymphocytes some lymphatic nodules were also found in the lamina propria of ileum (Fig.6). The tunica muscularis layer of Ileum contained cluster of lymphoid follicles. These lymphoid follicles were separated from each other by narrow inter follicular area. B-lymphocytes were observed in the centre of lymphoid follicle whereas T-lymphocytes were observed in periphery of lymphoid follicle. The B-lymphocytes were nucleated and T-lymphocytes were non-nucleated. The caecum contained diffuse lymphocytes as well as lymphatic nodules. Lymphoid follicles were found in the ileo-caecal junction. Apart from these lymphoid follicle some solitary lymphatic nodules were found in lamina propria as well as tunica sub mucosa of caecum. The centre of these lymphoid follicle contained B-lymphocytes whereas the periphery of the lymphoid follicle contained T-lymphocytes (Fig.7). There was less infiltration of lymphatic tissue in lamina propria of colo-rectum compared to the other part of intestine. The solitary lymphatic nodules were found in the lamina propria and tunica muscularis of rectum but there was no aggregation of nodules (Fig.8). B-lymphocytes were present in the centre of lymphoid follicle and T-lymphocytes were present in periphery of lymphoid follicle along with inter follicular area (Fig.9).

Discussions

In the present investigation, the lymph node and gut associated lymphoid tissue of intestine as well as bursa of Fabricius of Pati duck were studied. In current study, reveal that there were two lymph nodes: cervical and lumbar lymph nodes. Gut associated lymphoid tissue normally included Peyer's patches and solitary lymphatic nodules. Peyer's patches were located at the small intestine whereas solitary lymphatic nodules were present at the large intestine. Both the cervical as well as lumbar lymph node of Pati duck composed

of inner cortex and outer medulla. Similar observation was reported by Hodges (1974) [8] in duck, King and Mclelland (1975) [12] in duck and Nickel *et al.* (1977) [14] in duck. The cortex and medulla became obscured. Different sizes of numerous follicles were observed in cortex of lymph node of duck. The center of these lymphoid follicle contained germinal centre. These findings were in accordance with the finding of Sugimura *et al.* (1977) [18] in duck. B-lymphocytes were observed in the centre of cortex whereas T-lymphocytes were observed in the periphery of the germinal centre of these follicles. The B-lymphocytes were nucleated and T-lymphocytes were non-nucleated. The medulla composed of medullary sinuses and medullary cords. The medullary cords were occupied by B lymphocytes and Plasma cells. The inner surface of the bursa of Fabricius was composed of several mucosal folds which were projected into the lumen. These findings were in accordance with the findings of Ebru *et al.* (2015) [4] in Long-Legged Buzzard, Peng *et al.* (2012) [15] in Ostrich, Gultiken *et al.* (2010) [7] in Turkey. Numerous polyhedral shaped bursal follicles were observed in the lamina propria of each fold. These findings were in accordance with the findings of Jain *et al.* (2010) [9] in CARI Shyama and Vanaraja breeds of poultry. Each Bursal follicle was consisting of outer cortex and inner medulla. The colour of the cortex was dark whereas the colour of medulla was pale. The cortex of bursal follicle was occupied by closely packed small B-lymphocytes. The paler medulla contained fewer B-lymphocytes of various sizes. These statements were supported by King *et al.* (1977) [11] in duck and King and Mclelland (1975) [12] in fowl. Peyers patches as well as solitary lymphoid nodules were distributed in the important strategic areas of intestine of Pati ducks. The lymphoid compartment of the gut associated lymphoid tissue in duck consisted of follicular structure, dome, follicle associated epithelia and inter-follicular area. These findings were similar with the findings of Gedam *et al.* (2016) [6] in Khaki Campbell duck. The lamina propria of duodenum was made up of loose connective tissue and diffuse lymphatic tissue. These findings were in agreement with the findings of Hodges (1974) [8] in fowl and Khaleel and Atiea (2017) [10] in Indigenous duck of Iraq. These diffuse lymphatic tissue contained B-lymphocytes and T-lymphocytes. The B-lymphocytes were nucleated and T-lymphocytes were non-nucleated. The lamina propria mucosae of jejunum contained scattered as well as diffuse lymphatic infiltration. Similar findings were reported by Rahman *et al.* (2003) [16] in desi chicken, Aughey and Frye (2001) [2] in domestic birds and Gedam *et al.* (2016) [6] in Khaki Campbell duck. The tunica muscularis layer of jejunum contained lymphoid follicles which were remained in cluster. These lymphoid follicles were separated from each other by a narrow inter follicular area. These findings were total agreement with the findings of McGarry and Bourns (1980) [13] in mallard duck and Barman *et al.* (1998) [3] in duck. The centre of these follicle contained B-lymphocytes along with plasma cell whereas the periphery of these follicle contained T-lymphocytes. Lamina propria mucosae contained numerous lymphocytes. These findings were similar with the findings of Gedam *et al.* (2017) [5] in Kadaknath fowl. Apart from the lymphocytes some lymphatic nodules were also found in the lamina propria of ileum. The tunica muscularis layer of Ileum contained cluster of lymphoid follicles. These lymphoid follicles were separated from each other by narrow inter follicular area. These findings were in accordance with the findings Barman *et al.* (1998) [3] in duck and Aughey and Frye (2001) [2] in domestic birds. B-lymphocytes were observed in the centre of lymphoid follicle whereas T-lymphocytes were observed in periphery of lymphoid follicle. The B-lymphocytes were nucleated and T-lymphocytes were non-nucleated. The caecum contained diffuse lymphocytes as well as lymphatic nodules. Lymphoid follicles were found in the ileo-caecal junction. These findings were supported by Gedam *et al.* (2016) [6] in Khaki Campbell duck. Apart from these lymphoid follicle some solitary lymphatic nodules were found in lamina propria as well as tunica sub mucosa of caecum. These findings were supported by Akter *et al*. (2006) [1] in broiler chicken. The centre of these lymphoid follicle contained B-lymphocytes whereas the periphery of the lymphoid follicle contained T-lymphocytes. There was less infiltration of lymphatic tissue in lamina propria of colo-rectum compared to the other part of intestine. The solitary lymphatic nodules were found in the lamina propria and tunica muscularis of rectum but there was no aggregation of nodules. These findings were in accordance with the findings of Schummer (1973) [17] in Chicken and Gedam *et al.* (2016) [6] in Khaki Campbell duck. B-lymphocytes were present in the centre of lymphoid follicle and T-lymphocytes were present in periphery of lymphoid follicle along with inter follicular area.

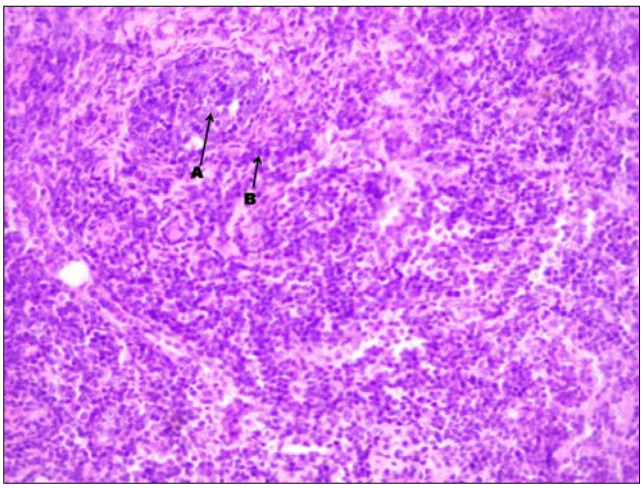

Fig 1: Photomicrograph showing the B-Lymphocytes (A) and T-Lymphocytes (B) of Lymph node of Pati duck (*Anas platyrhynchos domesticus*) of Assam.H&E,40X

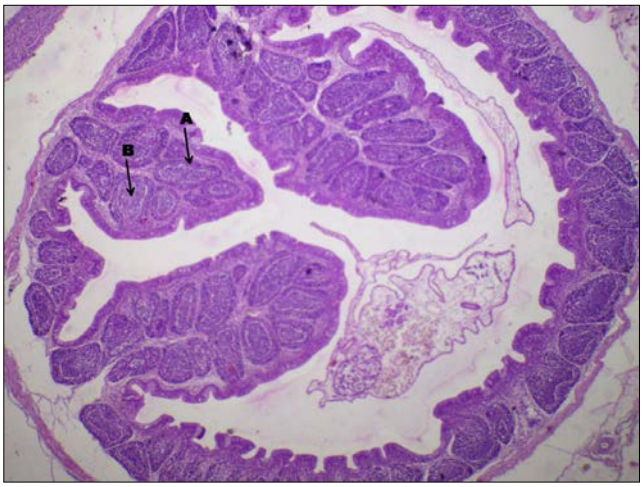

Fig 2: Photomicrograph showing the Cortex (A) and Medulla (B) of Lymphatic nodule of Bursa of Fabricius of Pati duck (*Anas platyrhynchos domesticus*) of Assam. H&E, 10X

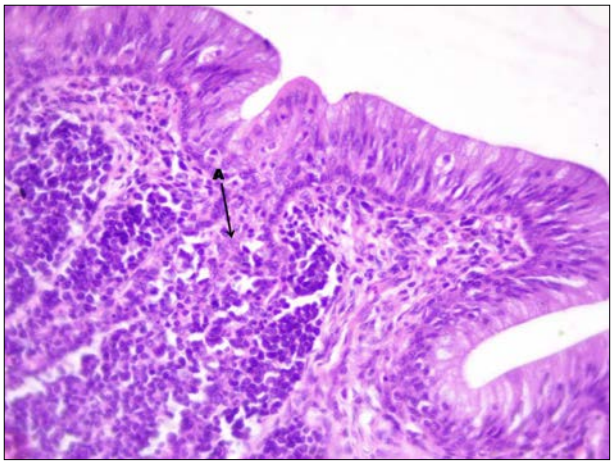

Fig 3: Photomicrograph showing the B-lymphocytes of Bursa of Fabricius of Pati duck (*Anas platyrhynchos domesticus*) of Assam. H&E, 40X

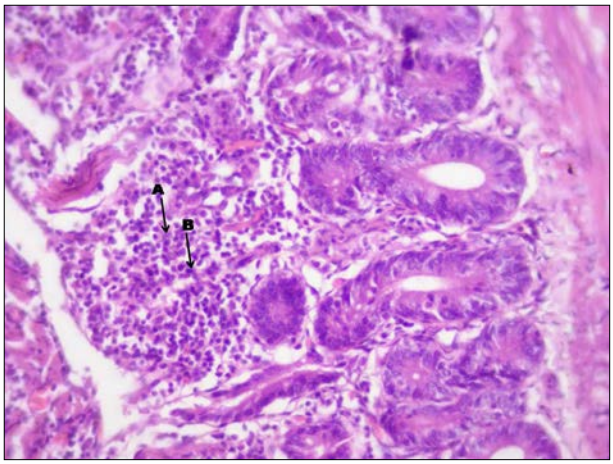

Fig 4: Photomicrograph showing the B-lymphocytes (A) and T-lymphocytes (B) of lymphatic nodule of duodenum of Pati duck (*Anas platyrhynchos domesticus*) of Assam. H & E, 40X

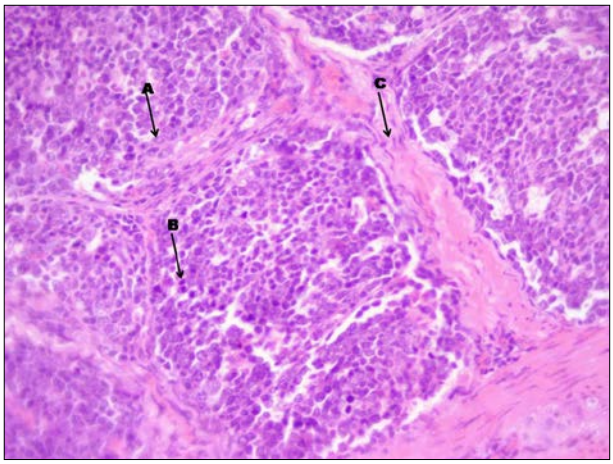

Fig 5: Photomicrograph showing the B-lymphocytes (A), T-lymphocytes (B) and inter follicular area of lymphatic nodule of Jejunum of Pati duck (*Anas platyrhynchos domesticus*) of Assam. H&E, 40X

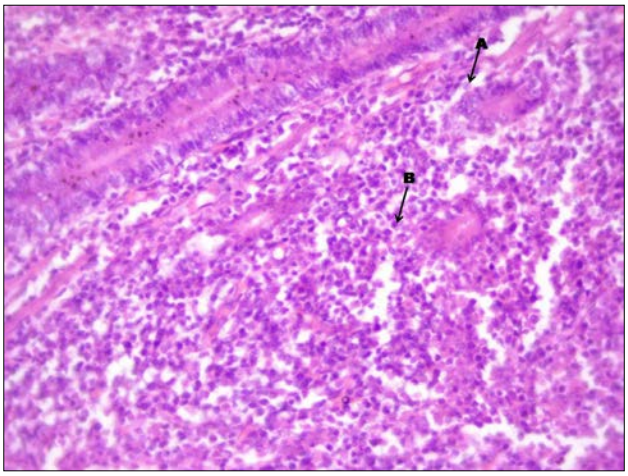

Fig 6: Photomicrograph showing the B-lymphocytes (A), T-lymphocytes (B) of lymphatic nodule of Ileum of Pati duck (*Anas platyrhynchos domesticus*) of Assam. H&E, 40X

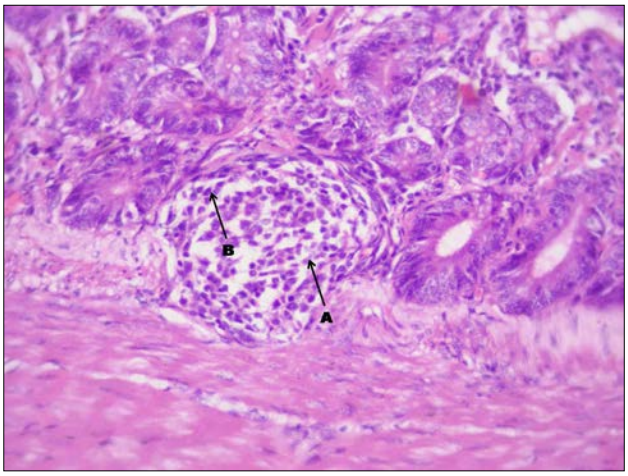

Fig 7: Photomicrograph showing the B-lymphocytes (A) and T-lymphocytes (B) of lymphatic nodule of Caecum of Pati duck (*Anas platyrhynchos domesticus*) of Assam. H&E, 40X

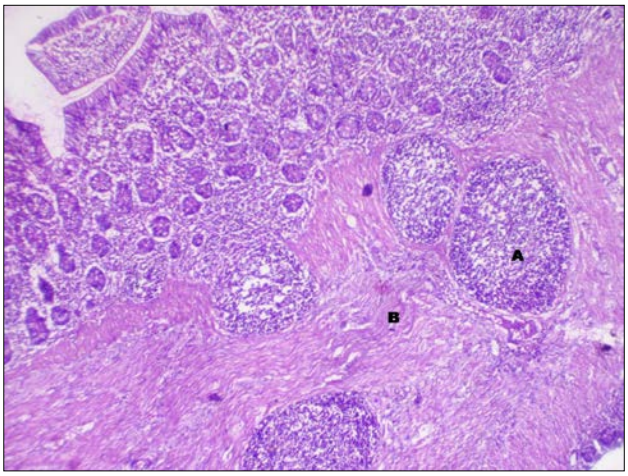

Fig 8: Photomicrograph showing the lymphatic nodule (A) and Tunica muscularis (B) of Rectum of Pati duck (*Anas platyrhynchos domesticus*) of Assam. H&E, 10X

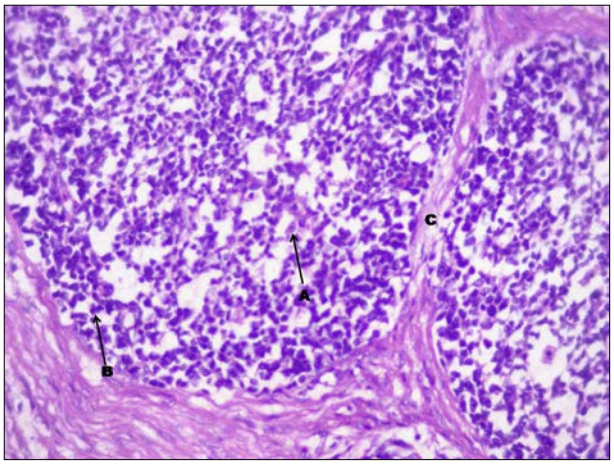

Fig 9: Photomicrograph showing the B-lymphocytes (A), T-lymphocytes (B) and inter follicular area (C) of Rectum of Pati duck (*Anas platyrhynchos domesticus*) of Assam. H&E, 40X

Conclusion

Both the cervical as well as lumbar lymph node of Pati duck composed of inner cortex and outer medulla. B-lymphocytes were observed in the centre of cortex and T-lymphocytes were observed in the periphery of the germinal centre of these follicles. The B-lymphocytes were nucleated and T-lymphocytes were non-nucleated. Numerous polyhedral shaped bursal follicles were observed in the lamina propria of each fold of bursa of Fabricius. The cortex of bursal follicle was occupied by closely packed small B-lymphocytes. The paler medulla contained fewer B-lymphocytes of various sizes. The lamina propria of duodenum contained B-lymphocytes and T-lymphocytes. The lamina propria mucosae of jejunum contained scattered as well as diffuse lymphatic infiltration. The tunica muscularis layer of jejunum and ileum contained lymphoid follicles which were remained in cluster. The centre of these follicle contained B-lymphocytes along with plasma cell whereas the periphery of these follicle contained T-lymphocytes. Lymphoid follicles were found in the ileo-caecal junction. Apart from these lymphoid follicles some solitary lymphatic nodules were found in lamina propria as well as tunica sub mucosa of caecum. The centre of these lymphoid follicle contained B-lymphocytes whereas the periphery of the lymphoid follicle contained T-lymphocytes. There was less infiltration of lymphatic tissue in lamina propria of colo-rectum compared to the other part of intestine. The solitary lymphatic nodules were found in the lamina propria and tunica muscularis of rectum but there was no aggregation of nodules. These studies would help physiologist, pathologist and poultry scientists for effective disease control regime.

Acknowledgement

The authors are grateful to the Dean, College of Veterinary Science, Assam Agricultural University, Khanapara, Assam, India for providing the required facilities to conduct this experiment.

References

1. Akter SH, Khan MZI, Jahan MR, Karim MR, Islam MR. Histo-morphological study of the lymphoid tissues of broiler chickens. Bangl. J Vet. Med. 2006;4(2):87-92.
2. Aughey E, Frye FL. Comparative Veterinary Histology with clinical correlates. Manson Publishing Ltd., London, UK; c2001. p. 134.
3. Barman NN, Goswami S, Mukit A, Islam S. Gut associated lymphoid tissues of duck: Distribution and histology. Indian J Anim. Sci. 1998;68(1):14-16.
4. Ebru KS, Hikmet A, Nevin K, Buket B. The structure of bursa of Fabricius in the Long-Legged Buzzard (*Buteo rufinus*): Histological and histochemical study. Acta Veterinaria Beograd. 2015;65(4):510-517.
5. Gedam DP, Salankar DA, Mainde DUP, Nandeshwar DN, Panda DR, Rama DT, *et al*. Histo-morphological studies on intestinal lymphoid tissues in Kadaknath breed of poultry (*Gallus gallus domesticus*). Int. J Sci. Environ. Technol. 2017;6(3):2124-2131.
6. Gedam PM, Nandeshwar NC, Salankar AM, Kawareti, PK, Dalvi RS, Mainde UP. Histomorphological studies on gut associated lymphoid tissue of Khaki Campbell breed of duck (*Anas platyrhynchos*). Int. J Sci. Envi. Tech. 2016;5(4):2415-2419.
7. Gultiken ME, Yildiz D, Karahan S, Bolat D. Scanning electron and light microscopic investigation of Burs of Fabricius in Turkey (*Meleagris gallopavo*). Eurasian J Vet. Sci. 2010;26(2):69-73.
8. Hodges RD. The Histology of Fowl. Academic Press Inc. (London) Ltd; c1974. p. 80-213.
9. Jain P, Ingole SP, Dang U. Gross and histological studies on bursa of Fabricius of CARI Shyama and Vanaraja breeds of poultry. Haryana Vet. 2010;49(2):51-53.
10. Khaleel IM, Atiea GD. Morphological and histochemical study of small intestine in Indigenous ducks (*Anas platyrhynchos*). J Agri.Vety.Sci. 2017;10(7):19-27.
11. King AS. Aves urogenital system. In: Sisson and Grossman's the anatomy of the domestic animals. Robert Getty (eds.), 5th Edn. 1977;2, W.B. Saunders Co., Philadelphia. p. 2015-2017.
12. King AS, McLelland J. Outline of Avian anatomy. Bailler Tindall, London. 6th Edn; c1975. p. 103.
13. McGarry RC, Bourns TKR. Annular bands of lymphoid tissue in the intestine of the mallard duck (*Anas platyrhynchos*). J Mor. 1980;163(1):1-8.
14. Nickel R, Schummer A, Seiferle E. Anatomy of the Domestic Birds. Verlag Paul Parey, Berlin, Hamburg; c1977. p 104.
15. Peng K, Song H, Li S, Wang Y, Wei L, Tang L. Morphological characterizaion of immune organins in ostrich chicks. Turk. J Vet. Anim. Sci. 2012;36(2):89-100.
16. Rahman ML, Islam MR, Masuduzzaman M, Khan MZI. Lymphoid tissues in the digestive tract of deshi chicken (*Gallus domesticus*) in Bangladesh. Pakistan J Biol. Sci. 2003;6(13):1145-1150.
17. Schummer A. Lymph gefaβsystem. In R. Nickel, A. Schummer & E. Seiferle (Eds.). Lehrbuch der Anatomie der Haustiere Band V: Anatomie der Hausvogel, Berlin: Verlag Paul Parey; c1973. p. 105-109.
18. Sugimura M, Hashimoto Y, Nakanishi YH. Thymus and Bursa-Dependent Areas in duck lymph nodes. Jap. J. Vet. Res. 1977;25:7-16.