

MICROMETRICAL STUDIES OF LYMPHOCYTES AND LYMPHATIC NODULES OF THE INTESTINE IN THE KADAKNATH BREED OF POULTRY (*Gallus gallus domesticus*)

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Abstract: The micrometrical studies of lymphocytes and lymphatic nodules of the intestine was carried out on 30 birds of Kadaknath breed of chicken, divided into 3 different age groups as GI (6 weeks), GII (12 weeks) and GIII (18 weeks).

The lymphoid tissue was scattered throughout the intestine in the diffuse and aggregated form in all the groups under present study. The aggregated solitary lymphatic nodules were present in the caeco-colic junction called as caecal tonsils which corresponds to the mammalian Peyer's patches. The lymphatic tissue was predominant in Gr.II birds. The intraepithelial lymphocytes were also occurred in all parts of small intestinal epithelium disrupting the architecture of epithelial lining. The epithelium covering the lymphoid nodules was different from that of the villus epithelium and was devoid of goblet cells. The encapsulated and non-encapsulated lymphatic nodules were observed. The mean nuclear diameter of lymphocytes of duodenum, jejunum, ileum, caecum and colon showed no significant variation within groups. Micrometrical observations on nuclear diameter of Lymphocyte in Lymphatic Nodule of Caecum of different age group of chicken showed significant variation within groups.

Keywords: Kadaknath, lymphocytes, lymphatic nodule, micrometry, intestine.

Introduction

The Indian poultry industry has undergone a paradigm shift in structure and operation from merely a backyard venture into a major commercial and most progressive activity in a very short time. India is ranking currently fifth in the world as a broiler producer and fourth in the egg production. The annual egg production in India is recorded as 53,000 million and poultry meat as 3.2 million tones (Saxena, 2009).

Kadaknath breed of poultry is reared since long time by tribals of Bhil and Bhilala community of Jhabua and Dhar districts of Western Madhya Pradesh. The black coloration of the flesh is due to the deposition of melanin pigment in the connective tissue of organs and in the dermis (Rao and Thomas, 1984).

The lymphoid tissue of the gut has a significant role in preventing diseases caused by gut pathogens (Hanger and Heath, 1994). It is possible that this tissue respond to antigen, gaining

access via the mucous membrane. Hence it is essential to study micrometry of lymphocytes and lymphatic nodules of the intestine in the Kadaknath breed of poultry.

Materials and methods

The present research work was carried out on micrometrical studies of lymphocytes and lymphatic nodules of intestinal lymphoid tissue in 30 birds of Kadaknath breed of poultry. The samples were divided into three age group viz. GI (6 weeks), GII (12 weeks) and GIII (18 weeks). The micro- metrical observation on the following parameters were carried out nuclear diameter of lymphocytes of different parts of intestine (μm) and diameter of lymphatic nodule of Caecum (μm).

Result

Duodenum

The intraepithelial lymphocytes (IEL) were found in the epithelium. The IEL were occurred as individual cells as well as in the form of small clusters. The average diameter of Lymphocytes in the Duodenum was $3.27 \pm 0.21\mu\text{m}$, $3.41 \pm 0.20 \mu\text{m}$ and $2.95 \pm 0.33 \mu\text{m}$ in I, II and III group of birds, respectively (Table 1).

Jejunum

The IEL were present individually and also in the form of clusters in all age group .The average diameter of lymphocytes in the jejunum, was $3.73 \pm 0.33 \mu\text{m}$, $3.58 \pm 0.24 \mu\text{m}$ and $3.38 \pm 0.20 \mu\text{m}$ in I, II, III group of birds, respectively (Table 2).

Ileum

The IEL were found in all groups. They were observed to be reduced towards the terminal part of ileum, and were replaced by many goblet cells. The intestinal glands were numerous (Table 3). The average diameter of lymphocytes in ileum was $3.22 \pm 0.18 \mu\text{m}$, $3.06 \pm 0.24 \mu\text{m}$ and $3.58 \pm 0.29 \mu\text{m}$ in I, II and III group of birds respectively.

Caecum

The diffuse lymphatic tissue of the caecum showed the lymphocytes, plasma cells, macrophages, and some eosinophils and erythrocytes. The average diameter of lymphocytes in the caecum was $3.37 \pm 0.18 \mu\text{m}$, $3.23 \pm 0.32 \mu\text{m}$ and $3.11 \pm 0.22 \mu\text{m}$ in I, II and III group of birds respectively (Table 4).

The present study put on record the micrometrical observation on the lymphatic nodules of the caecal tonsils. The mean diameter of nodules of caecum was $77.64 \pm 6.21 \mu\text{m}$, $156.30 \pm 18.46 \mu\text{m}$ and $137.10 \pm 14.56 \mu\text{m}$ in GI, GII, GIII birds. The shape of the follicle was varied

but mostly oval and rounded follicles were noted. Pramod Kumar and Thandav Murthy (2007) also recorded varying shapes of nodules but they stated that most of them were oval in shapes. There was significant difference in the size of lymphatic nodules in the different age groups of the present study, but Shukla and Singh (1996) stated that the average short and long diameter of solitary lymphatic nodules did not exhibit any regression even in adults. The nodules in the present study were capsulated and non-capsulated. These observations are in accordance with the Pramod Kumar and Thandav Murthy (2007) in white leghorn birds. The encapsulated nodules were adhered to the muscularis externa of the caecum and these nodules were comparatively bigger in size than the non-capsulated nodules. These findings are supported by the Pramod Kumar and Thandav Murthy (2007).

Colon

The mean diameter of the nucleus of the lymphocytes found in the scattered lymphatic tissues of the colon was recorded as $3.38 \pm 0.2 \mu\text{m}$, $3.94 \pm 0.25 \mu\text{m}$ and $3.24 \pm 0.30 \mu\text{m}$ in Gr. I, II and Gr. III respectively.

Conclusions

There were no significant differences in the nuclear diameter of lymphocytes in different groups and also in the different parts of the intestine. It indicates that the lymphocytic proliferation, generation and their migration is a continuous process in order to provide the immunity to the gastro intestinal mucosal surface.

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Table 1: Micrometrical observations on nuclear diameter of Lymphocytes in Duodenum of different age groups of chicken.

| Source | DF | SS | MSS | F(cal) | F(tab)1% | F(tab)5% | Result |
|-----------|----|----------|---------|----------|----------|----------|--------|
| Treatment | 2 | 1.11134 | 0.55567 | 0.838481 | 5.48 | 3.35 | NS |
| Error | 27 | 17.3918 | 0.66271 | | | | |
| Total | 29 | 19.00452 | | | | | |
| | SE | 0.36403 | | | | | |

Table 2:-Micrometrical observations on nuclear diameter of Lymphocyte in Jejunum of different age groups of chicken.

| Source | DF | SS | MSS | F(cal) | F(tab)1% | F(tab)5% | Result |
|-----------|----|----------|---------|--------|----------|----------|--------|
| Treatment | 2 | 0.602747 | 0.30137 | 0.4257 | 5.48 | 3.35 | NS |
| Error | 27 | 19.11455 | 0.70795 | | | | |
| Total | 29 | 19.7173 | | | | | |
| | SE | 0.376283 | | | | | |

Table 3: Micrometrical observations on nuclear diameter of Lymphocyte in Ileum of different age groups of chicken

| Source | DF | SS | MSS | F(cal) | F(tab)1% | F(tab)5% | Result |
|-----------|----|----------|----------|----------|----------|----------|--------|
| Treatment | 2 | 1.40064 | 0.70032 | 1.169595 | 5.48 | 3.35 | NS |
| Error | 27 | 16.16683 | 0.598771 | | | | |
| Total | 29 | 17.56747 | | | | | |
| | SE | 0.346055 | | | | | |

Table 4: Micrometrical observations on nuclear diameter of Lymphocytes in Caecum of different age group of chicken.

| Source | DF | SS | MSS | F(cal) | F(tab)1% | F(tab)5% | Result |
|-----------|----|-----------|----------|----------|----------|----------|--------|
| Treatment | 2 | 0.335447 | 0.167724 | 0.265602 | 5.48 | 3.35 | NS |
| Error | 27 | 17.050050 | 0.631483 | | | | |
| Total | 29 | 17.385500 | | | | | |
| | SE | 0.355382 | | | | | |

Table 5: Mean nuclear diameter of intestinal lymphocytes and mean diameter of lymphatic nodules of caecum (µm)

| Group | Duodenum | Jejunum | Ileum | Caecum | Colon | Lymphatic Nodule of Caecum |
|--------|--------------------|--------------------|--------------------|--------------------|--------------------|----------------------------|
| I | 3.273 (0.21458) | 3.735 (0.33445) | 3.223 (0.18885) | 3.37 (0.18258) | 3.384 (0.2091) | 77.64 (6.21164) |
| II | 3.418 (0.2018) | 3.587 (0.24494) | 3.067 (0 2443) | 3.238 (0.3262) | 3.947 (0.25033) | 156.3 (18.4674) |
| III | 2.957 (0.33473) | 3.389 (0.20134) | 3.583 (0.29032) | 3.111 (0.22294) | 3.244 (0.30291) | 137.1 (14.5726) |
| F-test | N.S. | N.S. | N.S. | N.S. | N.S. | Significant |
| SE | 0.364063 | 0.376283 | 0.346055 | 0.355382 | 0.363447 | 19.86607 |
| C.D. | - | - | - | - | - | 108.36606 |