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Gross anatomical studies on the glycogen body in post hatch broiler chicken with reference to age

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Abstract
A study was conducted on the seventy (70) day old broiler chicks which were reared up to 42 days (market age) of post hatch period. The whole experimental period of study was divided into seven (07) groups, each containing ten (10) birds irrespective of sex accordingly. Glycogen body (GB) is a transparent gelatinous, ovoid massand it extends from the level of 26 to 29 spinal nerves i.e. in lumbo-sacral (L-S) plexus. The average length and width increased 1.60 times and 1.43 times with ranged 4.31mm to 6.91mm and 2.54 mm to 3.64 mm, respectively, from group I to group VII. The mean weight of the glycogen body from group I to group VII was gradually increased with advancement of age. A highly significant difference was observed in the length as well as width in Group I to group VII with age.

Keywords: gross anatomical, broiler chicken, age, glycogen body

Introduction
Birds shows many unique morphology as compared to the mammals having many anatomical modifications in different systems like skeletal, digestive, respiratory, urogenital, nervous system etc. The spinal cord in birds has different characteristic in respect to its structural peculiarity unlike the mammals. The avian lumbosacral vertebral column and spinal cord show a number of specializations which are unique to birds. Lumbar and sacral vertebrae are fused with each other and with the bones of the pelvic girdle to form a synsacrum [1]. In the middle of this region the spinal cord splits dorsally to form a rhomboid sinus which houses a large glycogen body containing uniform Glycogen body cells [12] derived from astrocytes [7] and have glial fibrillary protein [6]. The glycogen accumulation in glycogen body cells may act as possible source of energy for the avian central nervous system [3]. Few reports hypothesised that this organ may be involved in the equilibrium of locomotion and transmission of hydrostatic pressure change during movement on the ground [8] and even its role in myelin formation [2]. Because of the specific topographical location and functions, it is of special interest. As age wise information on Glycogen body is scanty, therefore, present research was conducted to explore the sequential growth and morphological features in post hatched broiler chicken.

Materials and Methods
Ethical approval
The present study was duly approved by the Institutional Animal Ethics Committee (IAEC), Faculty of Veterinary and Animal Sciences, West Bengal University of Animal & Fishery Sciences, Kolkata-37. (References no. IAEC/67/II (B) dated 19/08/2019).

Rearing of Birds
Seventy (70) day old broiler chicks were reared up to 42 days in the experimental pens (cage system) at Department of Animal Nutrition, West Bengal University of Animal and Fishery Sciences, Belgachia, Kolkata- 700037, India. Standard management practice (housing, feeding, vaccination etc.) was followed uniformly for all the birds. All the birds were given feed (starter followed by grower feed) and water *ad libitum* throughout the experimental period. The whole experimental period of study was divided into seven groups at weekly

interval (days 3, 7, 14, 21, 28, 35 & 42). The birds were randomly allocated to seven (07) groups (Groups I to VII), each containing ten (10) birds irrespective of sex accordingly.

Collection of specimen

The birds were euthanized by injecting overdose of Sodium pentobarbital IP at the dose rate of 120 mg/kg at weekly interval from group I to group VII and lumbosacral part were harvested carefully [5]. The lumbosacral part of spinal cord with intact glycogen body was exposed very carefully with the help of forceps, scissors, and scalpel. The weight (mg), length and width (mm) of Glycogen body was measured by using digital balance and Vernier caliper. All values were expressed as means ±SE. The statistical significance was considered at $P<0.05$.

Statistical analysis

All the recorded data were analyzed statistically as per the standard method given by [9] with SPSS software 19.0.

Results and Discussion

Glycogen body (GB) is a transparent gelatinous, unusual cellular mass occupying the dorsal rhomboid sinus in avian spinal cord (Fig.1). It extends from the level of 26th to 29th spinal nerves i.e. in lumbo –sacral (L-S) plexus (Fig.2). The glycogen body tissue was completely separated from vertebral column and easily removed from the nervous tissue of the spinal cord. The area from L2 to reach its maximum at L4 and after that it decreases upto S2 moved toward caudal region (Fig.3). The present findings were in accordance with [9] in domestic fowl found that the Glycogen body in the L4 to S2 region of spinal cord and observed that it was an ovoid mass transparent jelly like structure in the rhomboid sinus of spinal cord. However, [11] reported that the glycogen body extended along the whole length of the spinal cord in domestic chicken.

In the present findings, the weight of Glycogen body in post hatched broiler chicken from groupI to group VII were 15.5±0.14 mg, 20.1±0.09 mg, 21.8±0.15 mg, 24.5±0.11 mg, 32.1±0.07 mg, 38.9±0.12 mg and 44.3±0.10 mg respectively (Table -1). The weight of Glycogen body was not reported in the available literature.

In present findings, it was noted that the length of the Glycogen body in Group I ranged between 4.23 mm to 4.39 mm with mean value of 4.31±0.04 mm, in Group II, it was varied from 4.38 mm to 4.67mm with an average value of 4.53±0.08 mm, in Group III, the mean value was 4.87±0.03 mm which ranged between 4.78 mm to 4.91mm, in Group IV, it ranged between 4.88 mm to 5.23 mm with mean value of 5.03±0.07mm, in Group V, its mean value was 5.28±0.05 mm which ranged between 5.19 mm to 5.38. In group VI and VII, the length was varied between 5.58 mm to 5.96 mm and 6.38 mm to 7.12mm with mean value of 5.76±0.08 mm and 6.91±0.05 mm, respectively (Fig. 4).

The Width of the whole Glycogen body ranged between 2.49 mm to 3.71 mm with mean value of 2.54±0.04mm to 3.64±0.07 from group I to group VII (Table. 2 and Fig.5). In adult domestic fowl who recorded the glycogen body length and width were 1.68 ±0.24 cm and 0.1.08± 0.24 cm respectively [8] (Table. 2).

The statistical analysis of data for various parameters viz. weight, length and width of the Glycogen body were significantly correlated with age in post hatch broiler chicken. The weight of the Glycogen body was highly correlated with age ($P<0.05$). The length and width of Glycogen body were positive correlated with age ($P<0.05$).The statistical analysis of data revealed highly significant difference between the biometrical parameter of the post hatched broiler chicken from group I to group VII and all biometrical parameters of the Glycogen body increased significantly from group I to group VII. The average weight of Glycogen body increased 2.86 times (15.5 mg to 44.3 mg) from group I to group VII. The average length and width increased 1.60 times and 1.43 times with ranged 4.31mm to 6.91mm and 2.54mm to 3.64mm respectively, from group I to group VII.

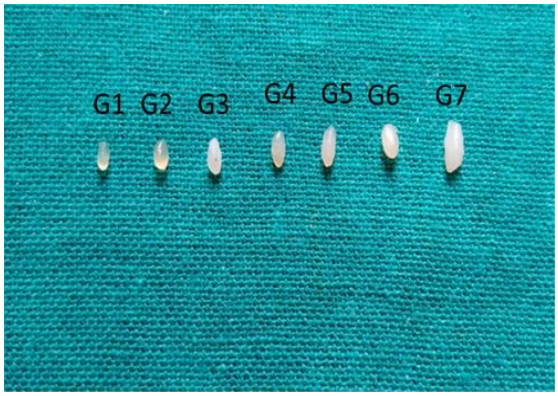

Fig 1: Photograph showing Glycogen body of different groups (G1-G7).

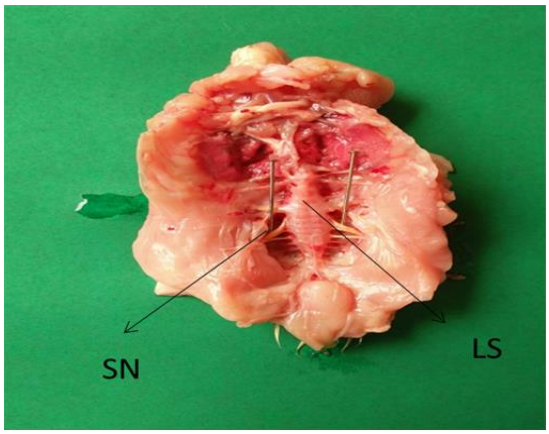

Fig 2: Photograph showing Ventral view of Lambo-sacral mass of 14-day old post hatch broiler chick with sciatic Nerve (SN) and Lambo-sacral mass (LS).

Fig 3: Photograph showing Ventral view of Rhomboid sinus (RS) of 21-day old post hatch broiler chick with Lumber 4 - Sacrum 2 (L4-S2), Spinal cord (SC) and Glycogen body (GB).

Fig 4: Photograph showing length of glycogen body at 14th day old post hatch broiler chicken

Fig 5: Photograph showing width of glycogen body 42-day old post hatch broiler chicken

Conclusion

In broiler chicken, the Glycogen body (GB) was a transparent gelatinous, ovoid mass and it extended from the level of 26th to 29th spinal nerves in lumbo –sacral (L-S) plexus. The average length and width was increased 1.60 and 1.43 times respectively from group I to group VII. The mean value of length and width of glycogen body was varied from 4.31mm to 6.91 mm and 2.54 mm to 3.64mm respectively, from group I to group VII. The weight of Glycogen body was significantly increased (P<0.05) with advancement in age.

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Table 1: Showing average weight of Glycogen body from group I to VII

Group	Mean ±SE	Min-Max
I	15.5±0.14[a]	14.15-16.52
II	20.1±0.09[b]	19.92-21.47
III	21.8±0.15[c]	20.03-22.13
IV	24.5±0.11[d]	22.87-24.96
V	32.1±0.07[e]	30.76-33.04
VI	38.9±0.12[f]	38.06-40.29
VII	44.3±0.10[g]	43.28-45.78

* a-g value within a column with no common superscript are significantly (P<0.05) different.

Table 2: Showing average Glycogen body (GB) length and average width from group I to VII

Group	Average GB width (mm)			
	Mean ±SE	Min-Max	Mean ±SE	Min-Max
I	4.31±0.04[a]	4.23-4.39.	2.54±0.04[a]	2.49-2.58
II	4.53±0.08[b]	4.38-4.67	2.64±0.04[b]	2.60-2.69
III	4.87±0.03[c]	4.79-4.91	2.75±0.03[c]	2.70-2.78
IV	5.03±0.07[d]	4.88-5.23	2.83±0.03[d]	2.78-2.85
V	5.28±0.05[e]	5.19-5.38	2.94±0.04[e]	2.91-2.98
VI	5.76±0.08[f]	5.58-5.96	3.23±0.05[f]	3.16-3.36
VII	6.91±0.05[g]	6.38-7.12	3.64±0.07[g]	3.52-3.71

* a-g value within a column with no common superscript are significantly (P<0.05) different

References

1. Baumel JJ, Witner LM. Osteology. In: JJ (ed) Handbook of avian anatomy: nomina anatomica avium. Mass. Nuttal ornithology Club, Cambridge 1993, 45-132
2. Benzo CA, DE Gennero LD. A hypothesis of function for the avian glycogen body: A novel role for glycogen in the central nervous system. Med hypothesis 1983;10:69-76.
3. De Gennaro LD. The glycogen body. In: Farner DS, King JR, Parkers KC (eds) Avian Biology 6. Academic, New Yark 1982, 341-371.
4. Ebraheim L. Structural insights of the Glycogen body in domestic chicken. Journal of Cytology and Histology. 2016;7(1):1000391.
5. Gautam AK, Ray S, Das P, Mandal AK, Tudu NK, Singh D. Macroscopic study on the cerebrum of post hatch broiler chicken with reference to age. Journal of Entomology and Zoology studies 2020;8(3):1926-1929
6. Jankaskova B, Stastny F, Lisy B, Pearce B, Murphy S. Effect of inhibitors of gamma- glutamyltranspeptidase on the uptake of glutamate and aspartate into cultured astroglial cells from the glycogen body and cerebral hemispheres of the embryonic chick. Physiol. Bohemoslovaca 1988;23:235-249.
7. Moller W. Immunzytochemische Zelltypisierung des glykogenrpers der Vogel. Verh Anat Ges 1989;82:979-980.
8. Necker R. Specialization in the lumbosacral spinal cord of birds: morphological and behavioural evidence for a sence of equilibrium. Eur J Morphol 1999;37:211-214.
9. Raja K, Ushakumary S, Kannan TA, Rajathi S, Ramesh G. Gross and Histoarchitecture of glycogen body in domestic fowl (*Gallus domesticus*). Journal of entomology and zoology studies 2019;7(1):1567-1550.
10. Snedecor GW, Cochran WG. Statistical Methods. Iowa State University Press, Ames, Iowa 1994.
11. Uehara M, Ueshima Y. Extent of glycogen body and the glycogen content of chicken spinal cord.The Japanese Journal of Veterinary Science 1982;44:31-43.
12. Watterson RL. Development of the glycogen body of the chicken spinal cord. J Morphology 1949;85:337-390.