

The Gland of the Third Eyelid (Harderian gland) in the Broiler Chickens. I. Some Morphometrical Parameters of the Harderian gland Secretory Epithelium During the First Eight Weeks After the Hatching

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Harderian gland obtained from 90 broiler chickens originating from a commercial stock, from both genders at the age of 1, 7, 14, 21, 28, 35, 42, 49 and 56 days were investigated. On the durable histological specimens the micrometric parameters of the secretory epithelial cells in the acini and in the various glandular tubules were determined by a light microscopy using a micrometer eye piece. The data was statistically processed by Student's t-test and ANOVA analysis with PC programme (StatMost for Windows, 1994) and the results were in tabular form and graphically presented. The analysis of the obtained data showed, that the height of the acinar epithelial cells from hatching to the 56th day was increased from 8.92 μm to 26.40 μm . The height of the main collecting duct epithelium increased from 9.36 μm to 20.09 μm , primary secretory tubules from 12.88 μm to 24.32 μm ; secondary from 8.74 μm to 17.35 μm and tertiary from 5.28 μm to 11.48 μm . The results illustrated the nine – week ontogenesis of the HG- secretory epithelium. They suggest that the growth of the acinar and tubular epithelial cells in the broiler chicken's HG is one irregular, but partially cyclic processes.

Key words: Harderian gland, broiler chickens, morphometry.

Introduction

Glandula membranae nictitantis (most commonly called Harderian) and the lachrymal gland are known to be intraorbital glands in the birds. In contrast to the mammals, in birds the better developed from the both glands is the Harderian are [5, 8, 10, 12, 13].

The complexly built system of canals and acini in the Harderian gland in the hen is covered with secreting glandular epithelium, whose cells possess different shape and size depending on their situation in the organ, so as their functional and age status. There already exists evidences for the active role of the glandular epithelium in the "assimilation" of immune bodies that got in the Harderian gland with the blood flow, or synthesized by the epithelium itself [6, 10, 5, 12, 9]. It was found, that it is possible a migration of synthesized Ig A from the tubular glandular epithelium of the chickens Harderian gland to other organs [2]. It was demonstrated the presence of Ig A and Ig G

containing plasmatic cells in the Harderian gland of broiler chickens and wild fowls in Bangladesh [7]. Most of the fore quoted authors attach these abilities of the glandular cells to the secretory function of the epithelium, connecting it always with the form and size of its cells. It is an undeniable fact, that determinant for the functional and clinical sufficiency of every gland are the structural and morphometrical parameters of its secretory epithelium which are individually, functionally and age related constants. The data published in the literature is mainly about the structural peculiarities of the birds intraorbital glands. The data concerning the morphometrical parameters of the birds Harderian gland and their age dynamics is scarce, and such ones for broiler type of birds lacks at all.

Giving an account of the great significance of the epithelium of the birds Harderian gland into the provision of its functional and clinical status we aimed into this study to determine the height of the epithelial cells in all the classes of acinus and tubules of the Harderian gland of the broiler chickens from the hatching till the 8th week of its development using the micrometrical method.

Materials and Methods

For the conduction of the present study was used material from the Harderian glands of 90 stock broiler chickens, which were 1, 7, 14, 21, 28, 35, 42, 49 and 56 days old. Each age group consisted of 5 male and 5 female birds. The Harderian glands were obtained after an ether narcosis of the birds, decapitation, orbitotomy and a careful detachment from the surrounding muscles and tissues [1]. The obtained 180 glands were fixated in a 10% neutral formaldehyde, the fixating mixtures of Bouen, Karnua and embedded in paraffin. From single and serial sections (5 μ m) after stainings with Ehrlich's hematoxylin and eosin and a polychrome Haidenhain's Azan's staining, durable histological specimens were made [11]. The micrometrical study was conducted with a light microscope (Ergaval) and micrometricaleypiece (Zeiss). The measurements were made over 10 ocular fields of the microscope for every slide for each of the 10 birds in the 9 age groups [3]. The obtained data was statistically processed with the Student's t-test and ANOVA with the computer software (StatMost for Windows, 1994), and the results were presented in tabular and graphical forms.

Results and Discussion

The statistically processed results of the conducted morphometrical analysis of the height of the secretory glandular epithelium in the broiler chicken's Harderian gland during the first eight weeks of its postnatal development are presented in Table 1.

The presented in the table results shows, that the height of the glandular epithelial cells (HGEC) in the acins of the Harderian gland (HG) for the monitored 56 days period is increasing 2.95 times. From the presented data is evident, that HGEC in the acins of the Harderian gland during the second and fifth weeks (at the 14th and 35th day) almost do not increase or do not increase. The growth is moderate during the first, third, sixth and the eight weeks (7th, 21st, 42nd and 56th day) and well pronounced during the last one (49th day) of the studied period. It was determined an of increase of 2.18 times in the HGEC in the tertiary secretory ducts of the Harderian gland for the eight studied weeks. The results showed that there is a minimal increase of the HGEC only in two (at the 35th and the 42nd days) of the weeks of the monitored period. In the secondary secretory ducts the epithelium increases its height for 56 days with 1.89 times. It was determined from a slight to a moderate increase of the HGEC during the first, second, fifth and sixth weeks.

Table 1. Harderian gland in broiler chickens (1-56 day)

| | | Height of the acinar glandular cells (μm) | Height of the main collecting duct epithelial cells (μm) | Height of the epithelial cells in the secretory ducts (μm) | | |
|--------|---|---|--|--|--|--|
| | | | | I-Primary | II-Secondary | III-Tertiary |
| 1 day | | $\bar{x} = 8.9265$ $S\bar{x} = 0.4196$ | $\bar{x} = 9.3660$ $S\bar{x} = 0.1768$ | $\bar{x} = 12.8865$ $S\bar{x} = 0.3117$ | $\bar{x} = 8.7450$ $S\bar{x} = 0.2351$ | $\bar{x} = 5.2800$ $S\bar{x} = 0.1847$ |
| | For the all group (sum of I+II+III ducts) | | | | $\bar{x} = 8.9705$ $S\bar{x} = 0.2301$ | |
| 7 day | | $\bar{x} = 11.1045$ $S\bar{x} = 0.6707$ | $\bar{x} = 10.5870$ $S\bar{x} = 0.1819$ | $\bar{x} = 15.8895$ $S\bar{x} = 0.2879$ | $\bar{x} = 10.1475$ $S\bar{x} = 0.2242$ | $\bar{x} = 6.0555$ $S\bar{x} = 0.1521$ |
| | For the all group | | | | $\bar{x} = 10.6975$ $S\bar{x} = 0.2677$ | |
| 14 day | | $\bar{x} = 11.7200$ $S\bar{x} = 0.7020$ | $\bar{x} = 11.1540$ $S\bar{x} = 0.1936$ | $\bar{x} = 17.2825$ $S\bar{x} = 0.2092$ | $\bar{x} = 11.2035$ $S\bar{x} = 0.1924$ | $\bar{x} = 6.6495$ $S\bar{x} = 0.1996$ |
| | For the all group | | | | $\bar{x} = 11.7118$ $S\bar{x} = 0.2772$ | |
| 21 day | | $\bar{x} = 14.2560$ $S\bar{x} = 0.8270$ | $\bar{x} = 11.8305$ $S\bar{x} = 0.1724$ | $\bar{x} = 18.4965$ $S\bar{x} = 0.2474$ | $\bar{x} = 11.7150$ $S\bar{x} = 0.1983$ | $\bar{x} = 7.3592$ $S\bar{x} = 0.2012$ |
| | For the all group | | | | $\bar{x} = 12.5236$ $S\bar{x} = 0.2929$ | |
| 28 day | | $\bar{x} = 14.8830$ $S\bar{x} = 0.8158$ | $\bar{x} = 12.6385$ $S\bar{x} = 0.5707$ | $\bar{x} = 18.5295$ $S\bar{x} = 0.2621$ | $\bar{x} = 11.9295$ $S\bar{x} = 0.2186$ | $\bar{x} = 7.5570$ $S\bar{x} = 0.1628$ |
| | For the all group | | | | $\bar{x} = 12.6720$ $S\bar{x} = 0.2895$ | |
| 35 day | | $\bar{x} = 18.7110$ $S\bar{x} = 0.8482$ | $\bar{x} = 14.1900$ $S\bar{x} = 0.1905$ | $\bar{x} = 20.4270$ $S\bar{x} = 2.108$ | $\bar{x} = 13.4475$ $S\bar{x} = 0.2050$ | $\bar{x} = 8.9925$ $S\bar{x} = 0.1614$ |
| | For the all group | | | | $\bar{x} = 14.2890$ $S\bar{x} = 0.2941$ | |
| 42 day | | $\bar{x} = 20.4920$ $S\bar{x} = 0.7258$ | $\bar{x} = 14.7015$ $S\bar{x} = 0.2652$ | $\bar{x} = 22.6680$ $S\bar{x} = 0.2188$ | $\bar{x} = 15.7080$ $S\bar{x} = 0.1941$ | $\bar{x} = 10.5435$ $S\bar{x} = 0.1425$ |
| | For the all group | | | | $\bar{x} = 16.2955$ $S\bar{x} = 0.3075$ | |
| 49 day | | $\bar{x} = 24.5190$ $S\bar{x} = 0.6898$ | $\bar{x} = 17.2260$ $S\bar{x} = 0.1983$ | $\bar{x} = 23.6280$ $S\bar{x} = 0.1623$ | $\bar{x} = 16.5495$ $S\bar{x} = 0.1762$ | $\bar{x} = 10.8075$ $S\bar{x} = 0.1580$ |
| | For the all group | | | | $\bar{x} = 16.9950$ $S\bar{x} = 0.3179$ | |
| 56 day | | $\bar{x} = 26.4000$ $S\bar{x} = 0.6116$ | $\bar{x} = 2.0970$ $S\bar{x} = 0.2982$ | $\bar{x} = 24.3255$ $S\bar{x} = 0.1980$ | $\bar{x} = 17.3580$ $S\bar{x} = 0.1715$ | $\bar{x} = 11.4840$ $S\bar{x} = 0.1738$ |
| | For the all group | | | | $\bar{x} = 17.7225$ $S\bar{x} = 0.1043$ | |

The primary secretory ducts has the same increase of the HGEC during the studied period – 1.89 times. Except for the fourth and the seventh week (28th and 49th day), when there is not almost any growth, during the rest of the period it is from weak to moderate.

The statistical processing of the data for the growth of the epithelial cells from the three classes of glandular secretory ducts (the sum of the primary, secondary and tertiary tubules) in the lobule of the Harderian gland of the broiler chickens shows results similar to the one determined for every one of them. For the whole studied eight weeks period the growth of the HGEC is 1.97 times.

The secretory epithelium of the main (central) duct of the lobule in the Harderian gland of the broiler chickens for 56 days increases its height 2.14 times. Here the epithelium has a lack to moderate growth during the 7th, 35th, 49th and 56th days.

From the presented data it becomes clear, that periods of a “relative peace” (a lack of masked growth) possesses all the structural units covered with epithelium – the acins (7, 14, 21, 28th day), the main duct (14, 21, 35 and 42th day), the primary tubules (21 and 28th day), the secondary tubules (14, 21, 28th day) and the tertiary tubules (7, 14, 21, 28th day). This “break” is generally after a period of cellular growth and continues 2–3 weeks. Its simultaneous run was observed only in the glandular cells of the acins and the tertiary ducts (7, 14, 21, 28th day).

The detected in the literature information, with which we could compare our results, proposes only scarce data for the structural, weight and some macrometrical parameters of the Harderian gland in several bird species, not giving any data about the micrometrical structural and age peculiarities. We didn't find any data about micrometrical study of the Harderian gland in birds of the broiler type, and about their age related peculiarities.

On the basis of our results we can conclude, that the growth of the height of the acinar and tubular glandular epithelial cells in the Harderian gland of the stock broiler chickens is different in time and stage of manifestation for the different structural elements of the organ.

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