

FEATURES OF THE THYMIC MORPHOLOGY IN HENS AND DUCKS

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Abstract. *The features of the thymic morphology in hens and ducks were studied. Samples were obtained from 3 adult birds of each species. They were studied by light microscopy using classical methods of morphological research. The tissue samples were fixed in 10% neutral buffered formalin and embedded in paraffin block and finally the sections were cut at 5-10 μm thickness using sliding microtome and stained with hematoxylin and eosin, according to Van Gizon and Weigert and impregnated with silver nitrate according to Kelemen.*

It was established that the thymus of birds was represented by isolated cervical parts, which, in the form of strands, were located under the skin on the lateral surfaces of the neck, along the trachea, along the course of the neurovascular bundle, and consisted of individual lobes. In hens 5 to 8 lobes were included in each thymus and extended from the 3-cervical vertebra to the start of the thoraco-abdominal cavity. Thymus of ducks consisted of 3-4 lobes and was located in the posterior third of the neck. Its cranial end was at the level of 10-11 cervical vertebrae, and caudal end reached 12 cervical vertebra. Individual lobes of duck's thymus had a greater absolute mass than the lobes of hen's thymus. They were also more separated from each other. Lobes of hen's and duck's thymus had a variety of shapes. Among them, there were mainly oval, convex-oval, bean-shaped, rounded, flat and, sometimes, sickle-shaped. Morphofunctional units of the thymus were lobules, which consisted of a cortex and a medulla. In birds the medulla occupied a larger area than the cortex. In the medulla, there were Hassall's corpuscles, that were better developed in ducks.

Keywords: *hens, ducks, thymus, lobes, lobules, cortex, medulla, Hassall's corpuscles*

Introduction. Among all immune and hemopoietic organs the thymus has a high value. According to the data, it is a central organ of the immune system. In the thymus, T-lymphocytes develop and biologically active substances (tyrosines) synthesized. They influence are proliferation and maturation of T-lymphocytes, their differentiation into effector cells, body growth and decrease the level of sugar and calcium in blood [1, p. 110-130; 2, p. 82-96]. Most of researches describe the development, structure and functions of thymus in mammals and humans [3, c. 67-

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72; 4]. In poultry, including hens and ducks, these data are disparate, not full and contradictory [5, c. 42-44; 6, c.141-145].

The purpose of research – to study the features of topography, macro- and microstructure of the thymus in hens and ducks.

Material and methods. Samples were obtained from 3 adult birds of each species: hens of Shewer's cross and favorit ducks. They were studied by light microscopy using classical methods of morphological research. The tissue samples were fixed in 10% neutral buffered formalin and embedded in paraffin block and finally the section were cut at 5-10 μm thickness using sliding microtome and stained with hematoxylin and eosin, according to Van Gizon and Weigert and impregnated with silver nitrate according to Kelemen [7,8].

Results. The macroscopic study have shown that the thymus of hens and ducks didn't have the thoracic part, compared to the thymus of mammals. It was represented by isolated paired cervical parts, which were located under the skin on lateral surfaces of neck, along trachea, along vascular-nerve bundle, and consisted of separate lobes (Picture 1).

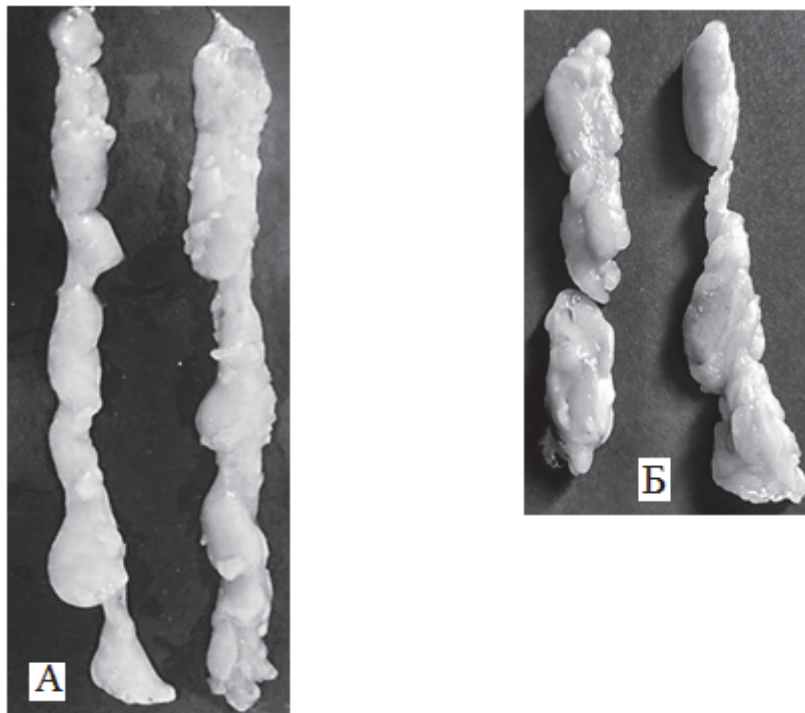


Рис.1. А. Thymus of the hen. Б. Thymus of the duck. (Macro samples)

In hens, each chain had 5 to 8 lobes, which were connected by a loose fibrous connective tissue. Lobes were located from 3-neck vertebra to the entrance into thoraco-abdominal cavity. Thymus of ducks consisted of 3-4 lobes and was located in the posterior third of neck. Its cranial end was located on the level of 10-11 neck's vertebrae, and its caudal reached 12-neck vertebra. Individual lobes of duck's thymus had greater absolute weight ($540,32 \pm 21,5$ mg), than lobes of hen's thymus ($380,25 \pm 19,7$ mg). They were also more separated from each other.

Lobes of hen's and duck's thymus had diverse shapes. Among them, there were oval, convex-oval, boboblike, spherical, flat and sometimes serpentine. The lobe's colour was pale pink, the consistency was tight. In ducks, adipose tissue was well developed. It also surrounded these lobes. In hens this tissue was less developed.

Thymus of birds, like a thymus of mammals, consisted of stroma and parenchyma (lobules). In hens stroma occupied $21,50 \pm 0,46$ %, parenchyma – $78,50 \pm 0,46$, and in ducks accordingly – $17,35 \pm 0,65$ and $82,65 \pm 0,65$ %. Stroma was formed by loose fibrous connective tissue, consisted of delicate elastic, reticular and tougher collagen fibers, blood and lymphatic vessels. It formed capsule and trabecules (septa). Capsule covered lobes from outside. Trabecules emanated from it. Adipositas cells and small accommodations of them were registered there (Picture 2). They divided lobes into well developed lobules. Some lobules were not fully separated from each other.

Lobules are main structural and functional units of the thymus, because they contained a parenchyma of this organ (Picture 3). They had mainly polygonal shape and different sizes. Basis of the lobules was formed by epithelial cells with processes. Among their processes cells of lymphoid series were located. In lobules clearly stood out cortex (in the periphery) and medulla (centrally localized) where were numerous blood vessels. Cortex of lobules was intensely stained, lymphocyte density in it was higher. Medulla was lightly stained, lymphocyte density in it was lower. In birds they occupied different areas. The area of medulla was much greater, than the area of cortex. In hens medulla was $61,17 \pm 1,12$ %, in ducks - $63,25 \pm 1,23$ %, and cortex – in accordingly $38,83 \pm 1,12$ and $36,75 \pm 1,23$ %. Into cortex in certain places penetrated loose fibrous connective tissue, which emanated from trabecules. There blood vessels were found. In the medulla of the thymus were registered spherical and sometimes ovoid Hassall's corpuscles, which were better developed in ducks (Picture 3).

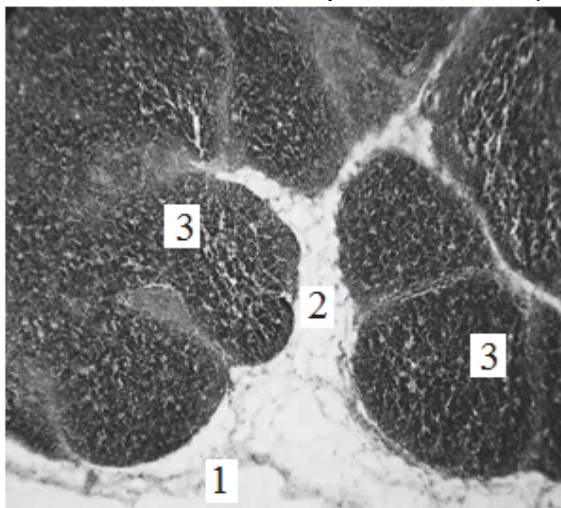


Рис. 2. Hen's thymus: 1 –capsule; 2- septa; 3 - parenchyma. Hematoxylin and eosin, x90

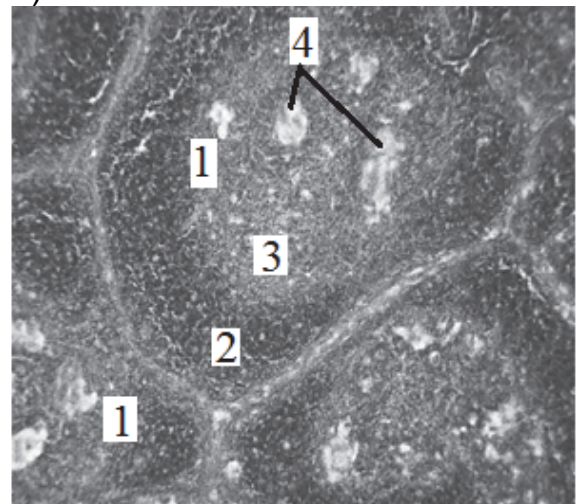


Рис. 3. Duck's thymus. 1 – lobules; 2 –cortex; 3 –medulla; 4 – Hassall's corpuscles. Hematoxylin and eosin, x90

Conclusions. In birds of studied species, thymus was a paired organ, which consisted of separated lobes – 2-8 in hens and 3-4 in ducks. Lobes had diverse shapes (oval, convex-oval, bobbed, spherical, flat, serpentine)

Medulla had greater area, than cortex in birds of studied species.

In the medulla were registered spherical and ovoid Hassall's corpuscles, which were better developed in ducks.

Prospects for further research. Further researches could be directed on studying the topography, macro- and microstructure of the thymus in other species of birds.

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ОСОБЛИВОСТІ МОРФОЛОГІЇ ТИМУСА КУРЕЙ І КАЧОК

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Анотація. Досліджували особливості морфології тимуса курей і качок віком чотири місяці ($n = \text{по } 3$). За виконання роботи використовували загальноприйняті макро- та мікроскопічні методи морфологічних досліджень. Встановлено, що тимус птахів досліджених видів представлений ізольованими одна від одної парними шийними частинами, які у вигляді тяжів розташовані під шкірою на латеральних поверхнях шиї, вздовж трахеї, за ходом судинно-нервового пучка і складаються з окремих часток. У курей до складу кожного тяжу входить від 5 до 8 часток. Частки простягаються від 3-шийного хребця до входу в грудо-черевну порожнину. Тимус качок складається з 3-4 часток і розташований в задній третині шиї. Його краніальний кінець знаходиться на рівні 10-11 шийних хребців, а каудальний – досягає 12-шийного хребця.

Окремі частки тимуса качок мають більшу абсолютну масу, ніж такі у курей. Вони також більш відокремлені одна від одної. Частки тимуса птахів досліджених видів мають різноманітну форму. Серед них зустрічаються переважно овальні, випукло-овальні, бобоподібні, кулясті, плоскі і рідше серпоподібні. Морфофункціональними одиницями тимуса є часточки, які побудовані із кіркової і мозкової речовини. У курей і качок мозкова речовина займає більшу площу, ніж кіркова. В мозковій речовині виявляються тимусні тільця (тільця Гассаля) округлої і овальної форми, які краще виражені у качок.

Ключові слова: кури, качки, тимус, частки, часточки, кіркова речовина, мозкова речовина, тимусні тільця

ОСОБЕННОСТИ МОРФОЛОГИИ ТИМУСА КУР И УТОК

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Аннотация. Исследовали особенности морфологии тимуса кур и уток в возрасте четырех месяцев ($n = 3$). При выполнении работы использовали общепринятые макро- и микроскопические методы морфологических исследований. Установлено, что тимус птиц исследованных видов, представлен изолированными друг от друга