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MORPHOGENESIS OF THE THYMUS OF LABORATORY ANIMALS UNDER THE INFLUENCE OF VARIOUS FACTORS

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Abstract
Studied magazines, materials of scientific conferences, as well as other information sources for the collection of reliable information about the actions of various factors on the thymus.

Keywords: thymus, animals, various factors.

The purpose of the study: to study the safety problems of various factors on the thymus.

Materials and methods. Information sources and materials devoted to the study of various factors on the thymus were used.
Thymus (thymus) - thymus gland, goiter gland. In the works of scientists of the 70s, this organ was described together with the glands of internal secretion. This circumstance reflects the name: thymus gland. According to the results of numerous studies, no morphological signs of secretion in higher vertebrates were found in it. However, there is evidence that the thymus gland plays an important role in the lymphoid tissue system. The microscopic structure and development of this organ indicates that it belongs to the lymphoepithelial organs [1,2]. Currently, the goitre gland is considered to be the central immunocompetent organ in vertebrates. Here, T lymphocytes are differentiated, which are of the most important importance for both cellular and humoral immunity [3]. R. V. Petrov summarizes his results of thymectomy studies and comes to the conclusion that the thymus is a regulator of hematopoiesis. When it is removed, the ratio between erythrocyte, leukocyte and megakaryocyte sprouts in the bone marrow changes, which affects the composition of peripheral blood. These assumptions are supported by data [4,5], which indicate that

thymectomy of adult animals leads to an increase in the number of medium lymphocytes, lymphoblasts, as well as plasmoblasts and reticular cells. After 2-3 months after removal, the total number of platelets increases. In avian embryogenesis, the thymus gland is first identified on the 5th – 7th day. The thymus develops in the form of epithelial buds on the ventral part of the third and dorsal part of the fourth gill pockets, forming outgrowths. In the future, the outgrowths of the two pockets merge into one longitudinal strand; thickenings appear on it in the form of branches, from which lobules are formed [6,7,8]. Studies conducted by A. I. Krivutenko in the study of the formation of organs of immunogenesis in turkeys show that the structure of the thymus is covered with a capsule that passes into the partitions and divides the lobes of the gland into incompletely delimited lobules. It resembles lymph nodes in structure and color. It lies on the sides of the trachea in the neck and in the cranial part of the thoracic cavity, it is a paired organ consisting of 12 - 14 lobes, 12 - 6-7 on each side. According to the results of the research of O. V. The Vavina thymus consists of 7-8 pairs of lobes, and according to G. M. Faizova, the thymus gland has 6-8 pairs of oval-shaped lobes. The process of histogenesis of the thymus gland is complex. In the early stages of development, the rudiment of the thymus resembles the bookmark of any epithelial gland and consists of strands of epithelial cells [9, 10]. The embryo of the thymus does not have its own blood vessels, they grow into it from the surrounding mesenchyma and bring with them proliferating cells. Soon after the appearance of blood vessels, thymocytes with rounded nuclei with a rough lumpy structure of chromatin and a small amount of cytoplasm appear in the rudiment of the thymus [11, 12]. As shown by Pierpaoli W., the development of the thymus from the moment of its laying in ontogenesis occurs under the control of the endocrine system, in particular, the somatotropic hormone of the pituitary gland. The density of the network in the central and peripheral areas of the thymus lobes is not the same in color, on the basis of which the cortical and medullary matter are distinguished. The cortical substance contains up to 80% of all thymocytes. The medulla consists mainly of reticular cellular elements of various shapes and sizes [13]. The cortical area of the lobe contains a large number of small lymphocytes, tightly adjacent to each other. As a result, it has a darker color on histological sections. In the brain area, there are fewer of them and it looks lighter. Here, there are rounded clusters of lamellar cells free of lymphocytes with indistinctly expressed nuclei – Gassal's corpuscles [10]. Many scientists have studied the thymus in different species of animals and birds, determining its development and

the moment when the involution of this organ begins. O. S. Kotlyarova (2013) studied the weight changes of the thymus in chickens. in his research, he noted that the weight of the thymus in a daily chicken is 100 mg and increases to 5 g at four months of age. After 13 months, the age-related involution of the thymus gland begins. By the time the bird reaches sexual maturity, the weight of the thymus decreases by 50 %. In this case, the lymphoid tissue of the organ is gradually replaced by fat cells. Babina (2001) observed that the absolute mass of the thymus gland in broiler chickens increases until the age of four months, and the growth of the relative mass occurs only until the age of two months, after which it decreases. With the onset of puberty, the thymus gradually undergoes involution, accompanied by a decrease in the volume of lobules, the number of mitoses, the slow and gradual disappearance of thymocytes, Gassal bodies, the replacement of thymus tissue with fat cells and the increase in fibrosis. B. I. Kuzik emphasizes that the formation of the thymus in chickens depends on their development. In hypotrophics, the thymus is several times smaller in volume, has the appearance of a film, with a narrow cortical zone and a wide cerebral one. In the cortical zone, there is an increased breakdown of thymocytes, and in the cerebral zone, the number of Gassal bodies increases. As a result of the conducted studies, L. L. Ovsischer (2005) found that the differentiation of the thymus parenchyma into the cortical and cerebral zones occurs in the first days of the chick's life and reaches a maximum by the age of 30 days. Up to 120 days of age, thymus growth continues, and it is during this period that its absolute mass and linear dimensions have maximum values [7]. Age-related regression of the thymus manifests itself at the age of 180 days, there is a narrowing of the cortical zone, an overgrowth of connective tissue partitions, and an increase in the number of Gassal bodies. As shown by the studies of G. M. Faizova (2010), the linear parameters of the thymus, as well as the growth and development of the area of the thymus lobes, significantly increase up to 17 weeks of life, and by 23 weeks of age, these values decrease. 14 C. Muthukumaran et al., (2011) conducted a study of thymus weight parameters in turkeys of both sexes aged from 7 days to 10 months. According to his data, the thymus gland reached its maximum weight at the age of 6 months in both sexes and amounted to 6.39 ± 0.23 g. After that, involution began. The thymus was completely involuted at the age of 8 months in females and 10 months in males. B. P. Shevchenko (2012) determined that the growth of the absolute mass of the thymus of the Orenburg downy goat is intense during uterine development and, especially, in the first 15 days after birth. In the future, the

mass of the gland increases and amounts to 24.12 g in goats at the age of 9 months, and in goats – 20.44 g, after which the rate of weight gain decreases sharply and at the age of 12 months in goats is 12.2, and in goats – 9.4 grams. V. Ya. Yurchinsky (2015) studied a number of macro-and micromorphological parameters of the thymus in representatives of four classes of terrestrial vertebrates (Amphibia, Reptilia, Aves, Mammalia, including humans). According to his data, the macromorphological characteristics of the thymus largely depend on the transformations of the plan of the structure of the whole organism, observed in the conditions of the development of a narrow specialization to a special way of life. In the comparative-morphological series, in the process of improving the level of organization, the micromorphological parameters of the thymus change rapidly. This indicates a close connection between the tissue structure of the organ and the functions performed and indicates the essential role of the thymus and immune mechanisms in maintaining homeostasis in the conditions of adaptation of animals and humans to various environmental conditions. The reason for the changes in the microstructure of the thymus of vertebrates lies in the high degree of sensitivity of the micromorphological constitution of the thymus to the effects of various environmental factors. The underlying cause of changes in the micromorphology of the thymus depends on the nature of the transformations of the metabolic and energy processes of the body [7]. According to numerous studies, it can be concluded that the thymus undergoes age-related involution when reaching sexual maturity in mammals and birds. These phenomena are characterized by a decrease in the number of lymphocytes and Gassal bodies. There is an overgrowth of the connective tissue of the lobe of the gland and a reduction of the cortical substance. In the future, the number of fat cells increases. With complete age-related involution, the thymus is a "residual fat body" [1, 12]. From the above data, it follows that the thymus, the main organ of immunogenesis involved in the regulation of hematopoiesis, persists throughout life and undergoes involution.

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