



AGE MORPHOLOGY OF THE ADRENAL GLANDS IN CHICKENS

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Abstract. The histological structure of the adrenal glands of birds was studied and the localization of interrenalocytes of the internal zones of types I, II, III and the subcapsular gland, the shape of cell nuclei and nucleoli, and the morphological features of the structure of adrenalinocytes and noradrenalinocytes were determined.

Key words: adrenal gland, chickens, histology, morphology, cells, ontogeny, poultry farming, hematoxylin, eosin, adrenalinocyte, noradrenalinocyte, nucleus, nucleolus.

Introduction. The intensive development of the poultry industry contributes to achieving maximum meat and egg productivity from agricultural poultry. Consequently, metabolic processes within the avian organism occur at peak levels characteristic of a given genotype. However, the combined impact of various adverse factors leads to metabolic disturbances, imbalances in essential nutrients, and the development of protective-adaptive responses in poultry [1, 2-3, 4].

The adrenal glands are paired organs of oval, pyramidal, or triangular shape, weighing between 150 and 500 mg. They are located on the ventral side of the cranial lobe of the kidneys, adjacent to the lungs and the testes in males, and covered by the left ovary in females. The parenchyma of the gland consists of indistinctly separated cortical and medullary substances. In the avian adrenal gland, the interrenal and chromaffin tissues are highly diverse in terms of topography, morphology, and quantity. The cortex and medulla are



distinguished within the adrenal glands; each should be considered a separate endocrine organ. Although they originate from different primordia and secrete different hormones, they merged into a single organ during development (in lower vertebrates, the cortical and medullary substances remain separate organs throughout life, whereas in birds, they are interspersed in the form of intertwined cords).

The adrenal gland group also includes relatively small formations located in the abdominal and thoracic cavities, which are sometimes visible to the naked eye. Formations composed of cortical tissue are called interrenal bodies, while those consisting of tissue corresponding to the medulla are known as paraganglia, as they are situated near the sympathetic nerve ganglia. A paraganglion that has fused with an interrenal body is referred to as an accessory adrenal gland. The adrenal cortex, together with all interrenal bodies, constitutes the interrenal system, while the adrenal medulla and paraganglia form the chromaffin system. In the latter, the cells are capable of being stained brown by chromic acid salts. [5, 6].

Modern literature contains significant gaps regarding the histology of avian adrenal glands.

Materials and Methods. During the collection of adrenal gland samples, optimal standardization was pursued for all procedures, including fixation, processing, embedding, and the preparation of blocks and histological sections. For all studied age periods, the glands were collected and fixed in a 10% neutral buffered formalin solution. Subsequently, the morphological material was embedded in paraffin for hardening. Histological sections with a thickness of 3–5 μm were prepared using an MS-2 sliding microtome and stained with hematoxylin and eosin (H&E).

The description of the chickens' adrenal glands was guided by the recommendations "Morphological studies of avian adrenal glands in veterinary and biological practice" [3].



Results. As a result of the microscopic examinations, we identified the following zonal exposures in the adrenal glands of chickens: the interrenal cells (interrenalocytes) of the subcapsular zone and the inner zone. These cells possess cytoplasm poor in granules and contain nuclei of spherical or slightly elongated shape, sometimes displaced toward the periphery. The cells of the inner zone have spherical nuclei localized in the center of the cell or toward its basal part, with two large eccentric nucleoli and small clumps of chromatin.

The interrenal gland is characterized by three cell types. The subcapsular zone is predominantly represented by Type I cells — columnar interrenalocytes with spherical nuclei and moderately dense cytoplasm. The inner zone consists mainly of two cell types. Type II interrenalocytes are represented by large columnar and cubic cells with foamy (vacuolated) cytoplasm. Type III cells are located at the boundary between the subcapsular and inner zones, though in most cases, they belong to the former. These cells are cone-shaped or elongated-triangular in form, with pale cytoplasm (compared to the previously mentioned cells) saturated with granules. The nuclei in these cells are polymorphic.

Chromaffin cells of irregular rounded, broadly oval, and teardrop shapes form medullary islets of 3, 6, 8, and even 14 cells, which are primarily located under the adrenal capsule and in the center of the gland. In day-old individuals, the medullary islets are few in number and consist mainly of polyhedral cells. Chromaffin cells contain round or irregularly oval (broadly elongated) nuclei, which possess nucleoli and very little chromatin. The chromaffin cells are represented by epinephrine-producing (adrenaline) and norepinephrine-producing (noradrenaline) cells.

A distinguishing feature of epinephrine cells (adrenaline cells) is their broadly elongated nuclei (more rarely round) within irregularly rounded cells, which are localized in separate islets of more than six cells. Chromatin in the



nuclei of epinephrine cells is represented by dust-like granularity. Norepinephrine cells (noradrenaline cells) form islets of up to six cells, which are predominantly broadly oval or even teardrop-shaped, with rounded nuclei containing two to three nucleoli.

Conclusion. Thus, the obtained data show that chromatin in the nuclei of epinephrine cells is characterized by dust-like granularity, while norepinephrine cells form islets of up to six cells, primarily of a broadly oval or teardrop shape, containing two to three nucleoli.

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