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HISTOLOGICAL STRUCTURE OF THE THYROID GLAND OF RATS UNDER CONDITIONS OF GENERAL DEHYDRATION

Abstract. *In case of general dehydration of a mild degree the signs of inconsiderable decrease of the functional activity are found in the TG specimens, but in the TG tissue the signs of activation of protective compensatory-adjacent reactions are found – increased proliferation of the follicular epithelium, histoarchitectonics of the gland particles is preserved. In case of a severe degree of general dehydration an abrupt disorder of histological structures occurs in the TG tissue, the amount of coarse fibrous stroma and degenerative structures in the gland parenchyma increases, and morphofunctional activity of the gland decreases considerably.*
Key words: *thyroid gland, dehydration, rats.*

Introduction. Nowadays diseases of the thyroid gland (TG) are rather topical issue of medical science and practical heath care, and the study of its morphology in combination with the conditions of existence arouses more interest of modern morphologists. Scientific studies of this issue enable to determine the character environmental factors impact on different structures of the organ and examine the mechanism of adaptation to environmental [1, 2]. One of such factors is dehydration of the body occurring due to restriction of water intake by the organism or in case of its excessive loss. As a result, complications develop which are considered as hypovolemic form of shock. Therefore, water is a compulsory component of all the biological processes in the body and it considerably influences on the formation, stabilization of the native structure of macromolecules, biopolymers, biological membranes and more complicated supramolecular formations [3, 4].

There are a number of causes leading to dehydration of the body, for example: intensive training, exhausting work or working under hyperthermic conditions, a number of surgical or infectious diseases or diseases of childhood etc. [5, 6]. All these factors promote the need for more detailed examinations of the thyroid gland under dehydration conditions, since this organ is able to change considerably its structural components under the influence of different activities [7].

Objective: to examine histomorphological structure of the thyroid gland by means of histochemical method of examination under conditions of general dehydration of mild and severe degrees.

Materials and methods. While simulating general dehydration of a mild and severe degree experimental study of 24 albino laboratory mature male rats was performed. The rats were taken from the vivarium of Sumy State Medical Institute. It was exactly these animals taken for the experiment since the structure and functional state of the thyroid gland of rats and man are rather similar. The animals were distributed into two series: control and experimental. At the stage of experimental general dehydration the animals were divided into two groups. The first one included animals with simulated mild degree of dehydration, the second one – with severe degree. General dehydration was simulated by keeping the animals on completely water-free diet. They were kept on exclusively dry food. A mild degree of dehydration was achieved in three days, while a severe degree occurred on the tenth day of the experiment.

The right lobe of the thyroid gland was taken as biological material for histochemical examination. The obtained tissue was fixed in 10% neutral formalin solution during 24 hours [8]. After fixation the specimens were washed under running water for an hour. There are many methods of preparing histological specimens (Lilli R., 1974), but paraffin blocks were made according to the common method [9]. After that serial paraffin cuts 8-10 mcm thick were made by means of a sliding microtome MC-2. Subcapsular and intermediate portions of the gland were stained with hematoxylin-eosin. The pictures of the obtained histological and histochemical specimens were made and examined on the digital morphometric complex consisting of a binocular microscope and digital system by means

of which the image was displayed on the screen «SEO Scan ICX 285 AK-F IEE-1394». Histochemical method enables to investigate the mechanism and specificity of PAS – reaction.

Results and discussion. The thyroid gland is one of the biggest endocrine glands consisting of two lobes connected with the isthmus and located on the anterior surface of the neck fixed to the anterior and lateral surfaces of the trachea and larynx by means of the connective tissue, and having a powerful blood supply. During our experiment we received the evidence of histochemical peculiarities of the thyroid gland and admitted an active ability of this organ to changes when it is affected by certain factors [10, 11, 12].

TG examination of the experimental animals kept under conditions of simulating general dehydration of a mild degree on the 3rd day is indicative of the fact that the organ tissue is completely differentiated into the central and peripheral parts, small size particles constitute the prevailing surface of the organ. Follicles do not reach considerable size, although a moderate level of colloid accumulation is found in their lumen (Fig. 1).

The follicle colloid is fine-grained having a moderate saturation with glycosaminoglycans. Follicular epithelium is of a reduced height, which in association with tinctorial colloid properties is indicative of its inconsiderably decreased morphofunctional activity (Fig. 2). Desquamated follicular epithelium is found in the lumen of certain particles of follicles. The majority of the particles are delimitated by the layers of swelling stroma. Perifollicular blood capillaries have irregular blood supply, and the vessels are more plethoric on the periphery.

Availability of follicles-satellites and perifollicular buds in the TG tissue should be mentioned which is indicative of certain increase of proliferative activity. After completion of the experiment of general dehydration of a severe degree an abrupt disturbance of the particle structure in the thyroid gland is found (Fig. 3), differentiation of the organ on the central and peripheral parts is disturbed. Follicles are of different size and shape, a considerable part of them is ruined: ruptured wall of the follicle, massive desquamation of the epithelium and uncovering of the basal membrane. A part of follicles in the lumen contain thickened, condensed colloid, but the majority of them look optically empty (Fig.4). A part of the colloid after destruction of follicles gets into the stromal compartment of the tissue. Thyroid cells are of

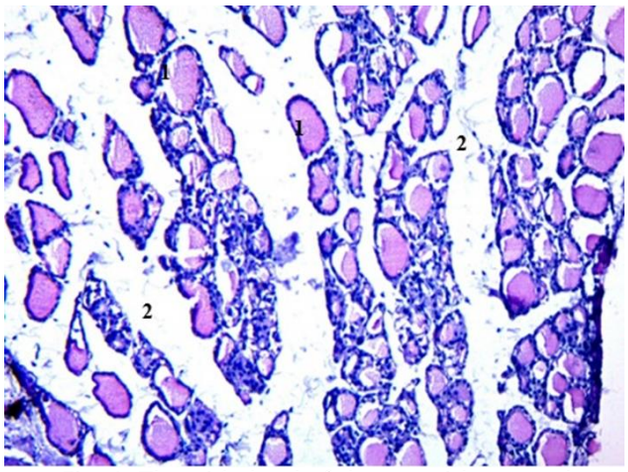

Fig. 1. Thyroid gland of the rat with general dehydration of a mild degree (initial stage). Staining PAS-reaction. Magnification x100. 1 – follicles with the signs of colloid accumulation, 2 – delimitation of particles by swelling stroma.

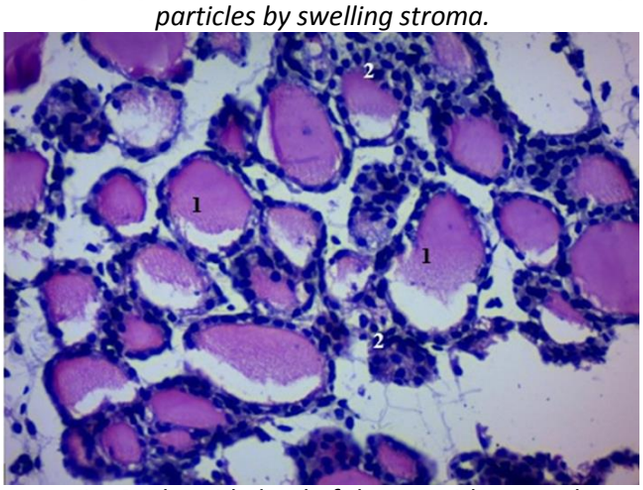

Fig. 2. Thyroid gland of the rat with general dehydration of a mild degree (initial stage). Staining PAS-reaction. Magnification x400. 1 – follicles in the condition of hypofunction, 2 – phenomena of folliculogenesis.

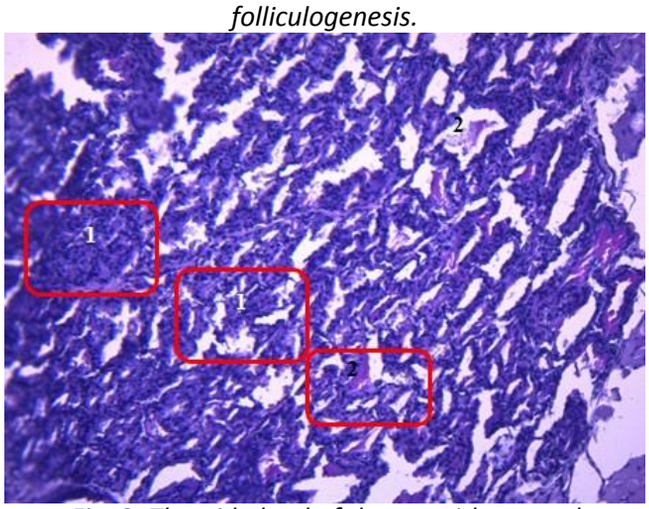

Fig. 3. Thyroid gland of the rat with general dehydration of a severe degree (final stage), the 10th day of the experiment. Staining PAS-reaction. Magnification x100. 1 – areas of structural disorders of particles and follicles, 2 – remains of the colloid in the ruined follicles.

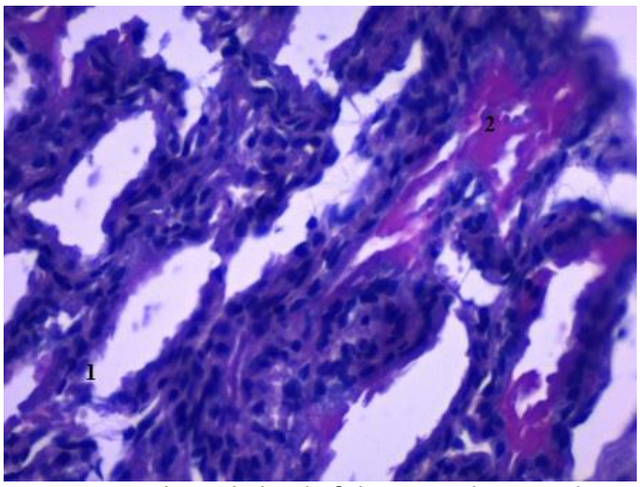

Fig. 4. Thyroid gland of the rat with general dehydration of a severe degree (final stage), the 10th day of the experiment. Staining PAS-reaction. Magnification x400. 1 – follicles with areas of bare membranes, 2 – degenerative structure in the gland parenchyma.

different shape, but mostly flattened – their reduction height is observed. The blood capillaries are dilated, aggregation of erythrocytes is found in them. Discirculation disorders become of a considerable degree of expression contrary to the previous terms of the study.

Conclusions. 1. In case of general dehydration of a mild degree the signs of inconsiderable decrease of the functional activity are found in the TG specimens, but in the TG tissue the signs of activation of protective compensatory-adjacent reactions are found – increased proliferation of the follicular epithelium, histoarchitectonics of the gland particles is preserved.

2. In case of a severe degree of general dehydration an abrupt disorder of histological structures occurs in the TG tissue, the amount of coarse fibrous stroma and degenerative structures in the gland parenchyma increases, and morphofunctional activity of the gland decreases considerably.

Prospects of further studies. Further studies are planned to deal with the investigation of morphofunctional changes of the thyroid gland during simulation of cellular and extracellular dehydration by means of scanning microscopy, as well as application of histological and morphological methods of examination.

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