**MORPHOLOGICAL AND MORPHOMETRIC CHANGES IN RAT**

**LIVER IN EXPERIMENTAL METABOLIC SYNDROME**

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**Introduction.** Metabolic syndrome (MS) is a disease that is accompanied by obesity, type 2 diabetes mellitus, arterial hypertension, atherosclerosis and other diseases that are risk factors for the development of pathological processes in organs and body systems. The liver is the organ where all metabolic pathways intersect and key metabolic processes are carried out. In this regard, conducting research aimed at clarifying the extent to which the cellular elements of the liver are affected in MS is relevant.

**The aim** of the study was to assess the main morphological and morphometric changes in the liver of rats with experimental metabolic syndrome.

**Materials that methods.** The experiment was carried out on 21 sexually mature female Wistar rats with an initial body weight of 190–200 g at the age of 2–2,5 months. Modeling of metabolic syndrome was carried out according to the patent for invention № 137024 Ukraine IPC G09B 23/28 "Method for modeling metabolic syndrome in the experiment" (Kuzmina I.Yu., Shutova N.A., Nikolaeva OV) – №. 118945, Bul. № 6, 2019.

The animals were divided into 2 groups: the main group (15 rats), which was simulated by experimental MS and the control group, which included 6 rats that received the usual diet of the vivarium. The animals were taken out of the experiment by decapitation under etaminal anesthesia, in compliance with the bioethics rules approved by the European Convention for the Protection of Vertebrate Animals Used for Laboratory or Other Purposes.

 Pieces of the liver were fixed in a 10 % aqueous solution of formaldehyde, sections of the liver, 5 μm thick, were stained with hematoxylin and eosin according to the standard technique, and morphometric and histological examination was carried out using a LEICA DM 750 microscope.

Statistical processing of the research results was carried out by the method of variation statistics using the Statistica 6.0 software package using the parametric Student's t-criterion. Differences between the compared values were considered statistically significant at p <0.05.

**Results.** With experimental MS, the absolute weight of the liver of animals increased almost 1,6 times, compared with the control group. The beam structure of the hepatic lobules and the structure of the organ are preserved, however, in the parenchyma, extensive areas of hepatocytes with fatty degeneration are determined in the form of numerous, different diameters of lipid drops. In the hepatic lobules, areas with signs of impaired blood circulation and lymph flow are determined: alternation of areas of dilated blood sinusoidal capillaries with areas of their spasm, microthrombosis, erythrocyte stasis, dilatation of lymphatic spaces with their infiltration by cells of the lymphoid series, migration of lymphocytes to the parenchyma and pericentral regions. An increase in the relative area of the parenchyma was found by 17%, while the proportion of hepatocytes with signs of fatty degeneration was 77% of the number of all parenchymal cells in the study area, and the average size of hepatocytes increased by 6.9%. The increase in the relative area of the nuclei (by 44% compared to the control) exceeded the growth of the cytoplasm of parenchymal cells (by 16% compared to the control) and, as a result, the nuclear-cytoplasmic ratio increased significantly – almost 1.6 times. During experimental MS, structural and functional rearrangements in hepatocytes took place against the background of organ stroma activation, which was expressed in an increase in the relative area of sinusoidal liver cells (by 58%) and in an increase in the average size of a “sinusoidal cell” (by 88%). Analysis of pathohistological preparations of rat liver revealed a 2,5-fold decrease in the relative area of the network of sinusoidal capillaries in the intermediate zone of the hepatic lobules.

It was morphometrically established that in rats with experimental MS the parameters of parenchyma and stromal cells, as well as the microvasculature, have significant statistically significant changes. The relative area of cytoplasm in animals of this experimental group increased from 70.84 ± 0.34 (control) to 73.42 ± 0.29, p <0.05 (in the experimental group) The relative area of hepatocyte nuclei also increased, amounting to 8.92 ± 0.19 in the control and 13.7 ± 0.28 p <0.05 and in the experimental groups Thus, the relative area of the parenchyma increased by 14%, while the proportion of hepatocytes with signs of fatty degeneration was 76% of the number of all parenchymal cells on the investigated area, and the average size of the hepatocyte increased by 9.2%, which indicates hepatocyte hypertrophy.

 **Conclusion.** Thus, with experimental MS, the development of fatty degeneration in the parenchyma of the organ, and on the other hand, stimulates the functional activity of hepatocytes, which can be regarded as a compensatory response in response to increased consumption of animal fats. Structural changes in parenchymal cells are accompanied by functional tension of the connective tissue structures of the liver. , as well as impaired blood circulation and lymph flow in it.