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THE MORPHOLOGICAL AND MORPHOMETRICAL STATE OF THE LIVER IN OFFSPRING BORN TO MOTHERS WITH CHRONIC TOXIC HEPATITIS UNDER CONDITIONS OF MEDICATION CORRECTION BEFORE PREGNANCY (experimental study)

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ABSTRACT

Chronic toxic hepatitis in mothers, when corrected with medication during the pre-pregnancy period, has a positive impact on the morphofunctional state of the liver in both the mother and her offspring. This leads to a reduction in inflammatory-reactive and dystrophic processes, and under conditions of recovery and regeneration, the zones of liver parenchyma damage in both the mother and offspring are significantly reduced. As a result, this contributes to the early elimination of pathomorphological changes in the vascular-tissue structures of the liver in both the mother and offspring. Preventing morphofunctional disorders in the liver of mothers and their offspring, predicting diseases in children born to mothers with liver pathologies, and developing effective

methods for early diagnosis and treatment can enhance the resistance of the offspring to various harmful external and internal environmental factors.

Key words: chronic toxic hepatitis, "mother-offspring system," liver, morphology, postnatal ontogenesis.

INTRODUCTION

Relevance of the Topic: The impact of various unfavorable external and internal environmental factors on living organisms, as well as their offspring, is an issue of not only medical but also social significance. These problems are associated with the fact that, despite the decline in birth rates (demographic stagnation) and advancements in medical technology over the past decades, infant mortality rates remain high worldwide [2,4,7]. This issue is further compounded by the increasing number of women of reproductive age suffering from various extragenital diseases, among which pathologies of the hepatobiliary system hold a special place. These conditions remain one of the leading causes of perinatal diseases in offspring [1,3,5,6].

Objective of the Study: To investigate the morphological and morphometric changes in the liver of offspring born to experimental rats with chronic toxic hepatitis under conditions of medication correction during the pre-pregnancy period.

Materials and Methods of the Study: The study involved 16 intact white laboratory rats and their offspring, as well as 16 offspring from rats with chronic toxic hepatitis that underwent 10 days of medication correction. The rats were kept in vivarium conditions. Female rats with chronic toxic hepatitis were treated with the hepatoprotector "Livson" suspension at a dose of 5 ml/kg, administered intragastrically via a probe, along with a vitamin complex once daily for 10 days before pregnancy. The experimental model included a 60-day duration of chronic toxic hepatitis. The study focused on the liver of rat offspring at postnatal ontogenesis stages of 3, 7, 14, 21, and 30 days. The research utilized general morphological, morphometric, electron microscopic, and variation-statistical analysis methods.

Results and Analysis: Microscopic examination of histological macropreparations of the liver from animals with chronic toxic hepatitis (CTH) treated with medication before pregnancy revealed that the overall structure of the liver remained unchanged. However, in some areas of the liver, lympho-histiocytic infiltration processes were observed. Polygonal liver lobules were clearly visible, surrounded by weakly developed connective tissue, through which blood vessels, nerves, and bile ducts passed, forming the hepatic triad. Most periportal sinusoidal

spaces were somewhat dilated, and the enlargement of hepatocyte nuclei indicated ongoing reparative processes (Figure 1).

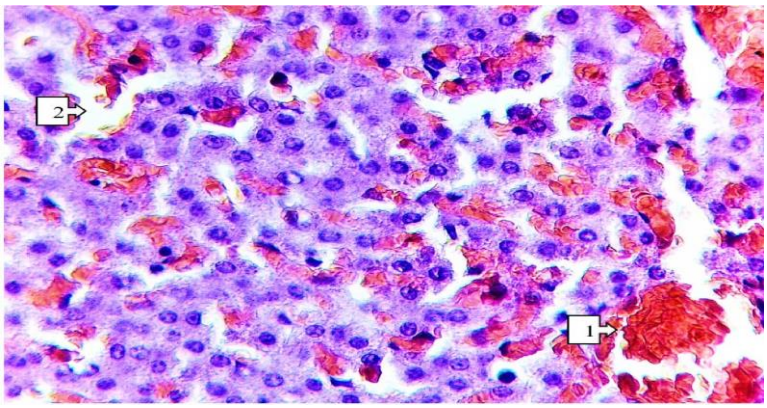

Figure 1. Morphological state of the liver in female rats with chronic toxic hepatitis after medication correction. The periportal sinusoidal spaces are somewhat dilated, and the nuclei of hepatocytes are enlarged. Hematoxylin-eosin staining. 40x10.

Electron microscopic examination hepatocytes exhibit a polygonal shape. Mitochondria are round to oval in shape, with a reduced number, and their matrix and cristae are clearly defined. Microscopic examination of histological macropreparations of the liver from female rats with chronic toxic hepatitis (CTH) treated pharmacologically before pregnancy revealed that the overall structure of the liver remained intact. However, localized lympho-histiocytic infiltration processes were observed in certain areas. The polygonal liver lobules, surrounded by weakly developed connective tissue through which blood vessels, nerves, and bile ducts (forming the hepatic triad) pass, were clearly visible (Figure 2). The trabecular structure was largely preserved in most parts of the lobules.

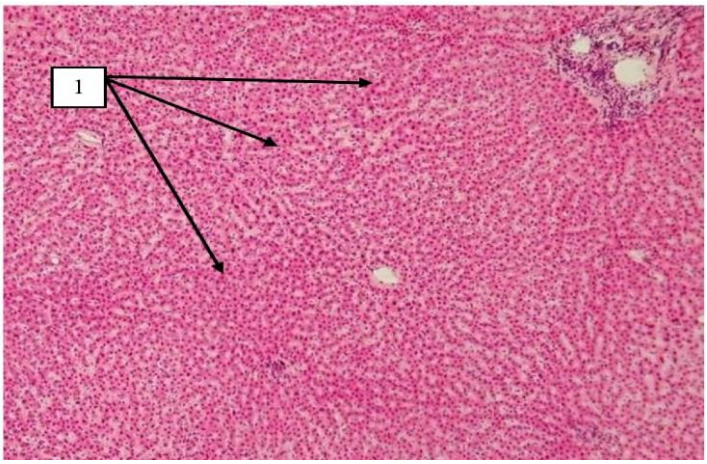

Figure 2. Morphological state of the liver in female rats with chronic toxic hepatitis after medication correction during the pre-pregnancy period. The trabecular structure of the lobules is largely preserved (1). Hepatocytes exhibit clearly defined boundaries. Hematoxylin-eosin staining. 10x10.

Electron microscopic examination it was noted that hepatocytes exhibit a polygonal shape. The number of mitochondria is relatively reduced, and they are round to oval in shape with a dense matrix and clearly defined cristae. Additionally, free ribosomes and polysomes were identified. The bile canaliculi are slightly dilated, with the presence of microvilli. Morphometric analysis results the results of morphometric studies showed a significant increase in the number of binucleated and mitotically dividing hepatocytes compared to the control group (see Table 1).

Microscopic examination of histological macropreparations microscopic examination of the liver of animals with chronic toxic hepatitis (CTH) subjected to medication correction before pregnancy revealed that the overall structure of the liver remained intact. However, localized lympho-histiocytic infiltration processes were observed in certain areas. Examination of offspring liver histological micropreparations examination of the liver histological micropreparations of offspring born to these female rats on the 3rd day of postnatal ontogenesis showed ongoing processes of blood vessel and tissue structure formation, as well as continued hematopoiesis.

Table 1

Morphological indicators of hepatocytes in the liver of female rats with chronic toxic hepatitis subjected to medication correction before pregnancy

Deadlines	Animal group	Indicators			
		Number of binucleate cells	Mitotic cell count	Area of hepatocytes (μm)	O'SN (μm)
21st day of illness	Control	35,0±0,80	2,0±0,10	274,5±5,5	0,155±0,0060
	Female rats with STH	18,0±0,50***	1,0±0,10***	206,8±6,5	0,130±0,0042
	The period before pregnancy in female rats with STG correction.	37,0±0,80	1,9±0,11	265,7±4,6	0,145±0,0036
31st day of illne	Control	35,0±0,8	2,0±0,10	274,5±5,5	0,155±0,0060

	STG-female rats	x 14,0±0,41***	x 1,0±0,12***	x 206,8±6,5	x 0,130±0,0042
	The period before pregnancy in STG-corrected female rats.	36,0±0,50	1,85±0,11	265,7±4,6	0,145±0,0036

Note: Differences are significant compared to the control group (* – P<0.05; ** – P<0.01; *** – P<0.001); compared to the previous period (xxx – P<0.05; xx – P<0.01; x – P<0.001).

Examination of histological micropreparations of offspring liver on the 3rd day of postnatal ontogenesis examination of the liver histological micropreparations of offspring born to these female rats on the 3rd day of postnatal ontogenesis revealed the ongoing formation of blood vessel and tissue structures, as well as active hematopoiesis processes. During this period, liver cells do not yet form properly oriented plates around the central vein, and the sinusoidal capillary spaces are not sufficiently wide. The central vein is not yet clearly defined. Numerous hematopoietic foci are located in the portal tracts and pericapillary areas. Thin layers of connective tissue are observed around the portal vessels, containing blood cells at various stages of development. However, these cells are absent around the hepatic triads and are instead scattered as small islands within the lobules. Fully formed triads are rare. Compared to offspring born to untreated mothers with chronic toxic hepatitis (CTH), the infiltration of cellular elements around the portal veins is less pronounced.

Observations among the few triads, numerous venous vessels belonging to the hepatic venous system are present. Within the triads, bile ducts with narrow lumens and well-developed structures are visible. Hepatocytes vary in size, with smaller hepatocytes being more prevalent. Binucleated and mitotically dividing cells are also observed. Some periportal hepatocytes contain vacuoles and lipid inclusions. Electron microscopic examination the accumulation of organelles in hepatocytes continues. Hepatocytes are closely packed together. The cytoplasm of hepatocytes contains a large number of mitochondria, often oval or elongated in shape. Endoplasmic reticulum is visible near the nucleus, along with numerous ribosomes and polysomes. Lipid droplets and glycogen granules of varying sizes are present in hepatocytes. The bile canaliculi are not very wide, and their microvilli are poorly developed. By the 14th day of postnatal life compared to earlier periods and the liver of offspring born to untreated mothers with chronic toxic hepatitis (CTH), the lobular structure of the liver is more clearly defined. The

radial orientation of liver plates and sinusoidal capillaries around the central vein is more pronounced. A thin layer of connective tissue is observed around the portal vessels, with infiltration of round cellular elements. In some areas, blood cells at various stages of development are present, while they are absent around some hepatic triads. The hepatic triads are fully formed.

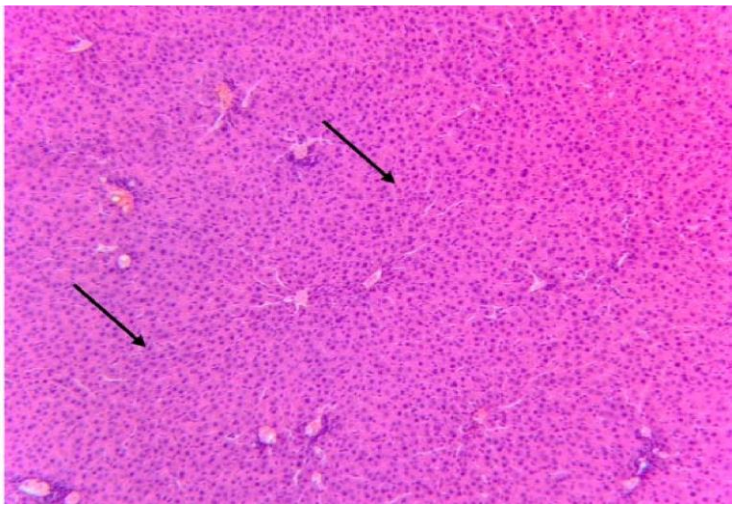

Figure 3. Morphological state of the liver of offspring born to female rats with chronic toxic hepatitis (CTH) subjected to medication correction before pregnancy. Day 14 of postnatal life. The trabecular structure of the liver lobules is preserved. Hepatocyte boundaries are clearly defined. Hematoxylin-eosin staining. 4x10.

Summary by the 14th day of postnatal life in offspring born to female rats with chronic toxic hepatitis (CTH) subjected to medication correction before pregnancy, the lobular structure of the liver is more distinctly defined, and hematopoiesis processes are nearly complete. Morphometric indicators of hepatocytes in these animals were found to be close to those of the control group.

Findings our research demonstrated that pharmacological therapy for chronic toxic hepatitis (CTH) before pregnancy not only positively affects the mother but also significantly improves the morphofunctional state of the vascular-tissue structures in the liver of their offspring. Pharmacological correction of pathomorphological changes in the maternal liver pathology leads to gradual recovery, ensuring a more favorable and physiological course of pregnancy. This, in turn, supports the normal antenatal and postnatal development and formation of the organs and systems of the offspring, aligning these processes with normative developmental standards.

Conclusions: Medication correction of chronic toxic hepatitis in mothers during the pre-pregnancy period positively influences the morphofunctional state of the liver in both the mother and her offspring. It reduces inflammatory-reactive and dystrophic processes, decreases zones of parenchymal damage under

conditions of recovery and regeneration, and facilitates the early elimination of pathomorphological changes in the vascular-tissue structures of the liver in both the mother and offspring. Preventing morphofunctional disorders in the liver of mothers and their offspring, predicting diseases in children born to mothers with liver pathologies, and developing effective methods for early diagnosis and treatment enhance the offspring's resistance to various harmful external and internal environmental factors.

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