

Морфологічні показники селезінки після короткочасного переохолодження

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Morphological Indices of Spleen Under Short-Term Hypothermic Exposure

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The spleen is a peripheral organ of hematopoiesis and immune protection. It is very sensitive to various adverse factors (Dunaievska, 2016), such as changes in conditions, biotic and abiotic environmental factors, effects of poisonous substances and toxins, *etc.* As a result, its morphofunctional state can quickly be disturbed. Considering this, the morphological indices of the spleen can be used as biomarkers (Makarenko, 2021). It should be noted that to confirm the effect of negative factor, establish diagnosis and principles of treatment, a complex study of other morphofunctional indices of cells, tissues and organs is required, which allows a detailed analysis of body's state and dynamics of the effect. The time and interval between sampling and examination should be minimal. Because cells and tissues can change their structure and function, die after a while. Accordingly, it became relevant to investigate the morphological indicators of the spleen in sexually mature male rats under conditions of short-term hypothermic exposure (6 ± 2)°C.

The work was carried out in 7-month-old non-linear laboratory male rats of the species *Rattus norvegicus* weighing 310–340 g ($n = 30$). All animals were divided into 2 groups ($n = 15$ each): intact (without exposure), which were immediately examined; experimental after short-term hypothermic exposure for an hour at a temperature of (6 ± 2). After that, the animals sacrificed by displacement of the cervical vertebrae, they were decapitated, an autopsy was performed, and the spleen was removed. Histological preparations were obtained according to generally accepted methods using the program for analysis ZEISS ZEN 3.5. The histological features of the white pulp of the spleen such as the area and diameter of lymphoid follicles, central arteries and the number of lymphocytes per unit area ($400 \mu\text{m}^2$); the ratio of white pulp to red pulp, were analyzed.

No statistically significant differences were found when comparing the morphological indices of the intact and the experimental groups. When analyzing the white pulp of the spleen in the experimental group of rats, the area and diameter of the follicles and the number of lymphocytes per unit area corresponded to the physiological norms of the given age of the animal and practically did not differ from the intact group. The ratio of the area of white to red pulp is almost the same in both groups.

As a result of the study, it was found that short-term hypothermic exposure for an hour at a temperature of (6 ± 2) did not affect the morphological structure of the peripheral organ of hematopoiesis and immune protection – the spleen. Within an hour, the cells are preserved and remain within the physiological norms of the given age of the animal.

Вплив кріосублимації на склад сироватки пуповинної крові

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Impact of Cryosublimation on Cord Blood Serum Composition

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Recently, cord blood serum (CBS) has been effectively used in experimental and clinical studies, regenerative therapy, and tissue engineering. So, in culture systems, CBS is applied to develop optimal compositions of nutrient media for different cell types. In clinical studies, the effectiveness of CBS has been shown in the treatment of corneal lesions, female infertility, and a number of neurodegenerative diseases. In tissue engineering, the application of bioscaffold materials incorporating CBS is considered as the most promising approach to improving the healing and regeneration of various types of tissues. The strong regulatory and reparative potential of CBS biological action is associated with a large number of growth factors, neurotrophic factors, cytokines, and biologically active molecules within its composition. Complete preservation of the CBS composition is a necessary condition for its widespread use for research, biotechnological or therapeutic purposes. One of the methods that maximizes the long-term preservation of biomaterials is cryosublimation.

The purpose of the work was to determine the content of protein fractions and hormones in human cord blood serum before and after cryosublimation.

Human cord blood was obtained from the umbilical vein of the postpartum placenta at 40 weeks of gestation, with the informed consent of the women. After separation of the clot (by centrifugation twice at 3,000 rpm for 10 minutes), the supernatant (CBS) was removed. CBS samples were stored for 1 month at a temperature of -40°C in 1.0 ml cryovials, after which they were subjected to cryosublimation. The content of protein fractions, the levels of prolactin, human chorionic gonadotropin (hCG), alpha-fetoprotein (AFP), cortisol and somatotrophic hormone (STH) in CBS before and after cryosublimation were studied using the immunoenzymatic analysis.

It has been shown that cryosublimation of CBS does not lead to changes in the content of protein fractions and levels of hCG, AFP, cortisol, and STH. The content of prolactin in CBS after cryosublimation tended to decrease.

Thus, the content of protein fractions and the levels of prolactin, human chorionic gonadotropin, alpha-fetoprotein, cortisol and somatotrophic hormone in human cord blood serum before and after cryosublimation were determined. The data obtained are promising for the development of effective protocols for cryopreservation, cryogenic drying and recommendations for long-term storage of cord blood serum.

