Morphogenesis of the internal organs of mice with the use of adaptogens and physical activity

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Abstract. Maximum physical exercise has a negative effect on physiological and morphological processes in the body. However, in some cases, the body responds with adaptive properties, which leads to smoothing out the negative effects of exercise. Establishing causes and factors that positively affect the processes of adaptation to increased activity and identifying the mechanisms of this process is one of the urgent problems of adaptation. Adaptation processes have a certain structure, and therefore, the goal of our research was to study the physiological processes and morphogenesis of individual organs and systems of the animal organism. One of the first to conduct a comprehensive assessment of the histological changes in experimental animals when giving adaptogens against the background of maximum activity. As adaptogens, the components of the military nature were used, tincture of safflower-like leuzea and ovesol, which were administered for 28 days at a dose of 2 to 6 μl according to the developed scheme. In this case, ovesol was used only at the final stage of the experiment from 22 to 26 days. It was found that ultra-high physical exercise leads to histological and physiological changes in the body of experimental animals.

1. Introduction

After physical exertion, athletes must restore the morphological and physiological functions of the body. This is necessary in order to exclude the chronic nature of the occurrence of functional disorders [1–9]. A number of scientists in their works proved that physical loads affect morphological changes in organs and muscle tissue [6–14]. In order to minimize the negative impact of physical exercise on the body and to maintain physical performance, it is advisable to resort to the use of biologically active substances, the so-called adaptogens. By their nature, they can be of plant and animal nature [9–16]. Scientists in this field recommend the use of specialized writing supplements and adaptogens to improve physical qualities [16–21]. We propose to study the effect of the adaptogen of plant nature on muscle fibers and the structure of organs.

2. Condition, materials and methods

Experimental studies were carried out on 60 white mice, which were selected on the basis of analogues: experimental studies consisted in comparing mice of the control and experimental groups. The dosage of adaptogens was calculated according to the method proposed by Clark, based on the live weight of

the animals. Which was 2 μl at the beginning of the experiment, and subsequently the dosage was increased to 6 μl for all experimental groups. We gave distilled water to the first group, and the experimental group received tincture of leuzea and ovesol. Ovesol was given in a dose of 4 μl from Day 22 to Day 26. The total duration of the experiment was 28 days.

3. Analysis and results

In the control group of animals, skeletal muscle tissue formed by bundles of muscle fibers. Edema of muscle fibers with the decay of myocytes was detected. A vascular vascular reaction was observed (figure 1). In the experimental group, which received levzea and ovesol, muscle fibers are located in parallel, they are elongated, the nuclei are located in the sarcoplasm (figure 2).

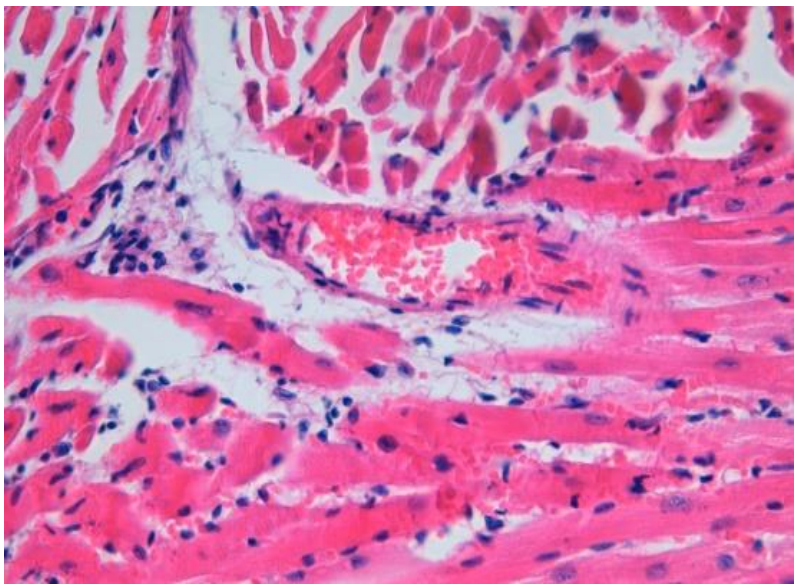

Figure 1. Perivascular edema of the skeletal muscle tissue of an animal in the control group. Stained with heme.-eosin. Micrograph. Approx. 10, about 20.

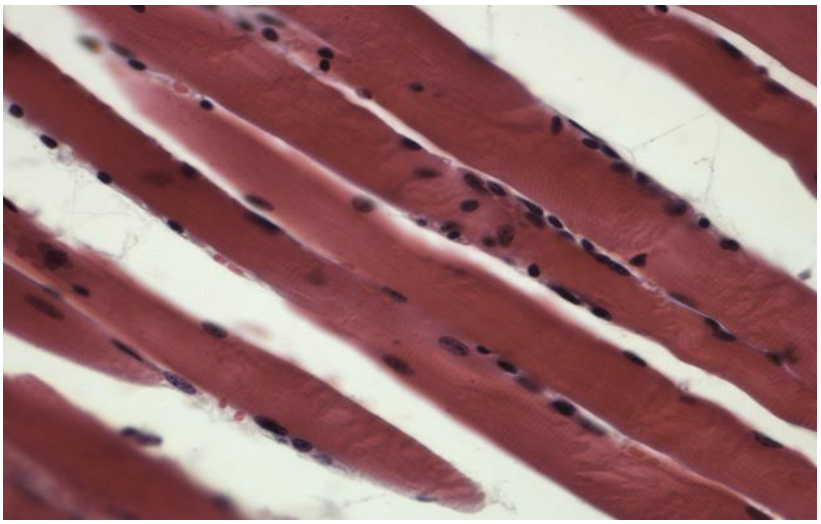

Figure 2. Longitudinal section of the striated muscle tissue of the skeletal type of animals Stained with hematoxylin-eosin. Micrograph. Approx. 10, about 40., received levzea and ovesol.

In the Control group, in the myocardium, vasodilation and blood filling were determined (Figure 3). Cardiomyocytes had dystrophic changes. Pericardium found cellular infiltrates. Edema zones were observed in the myocardium. No pronounced changes were detected in the myocardium of mice treated with leuzea and ovesol (figure 4).

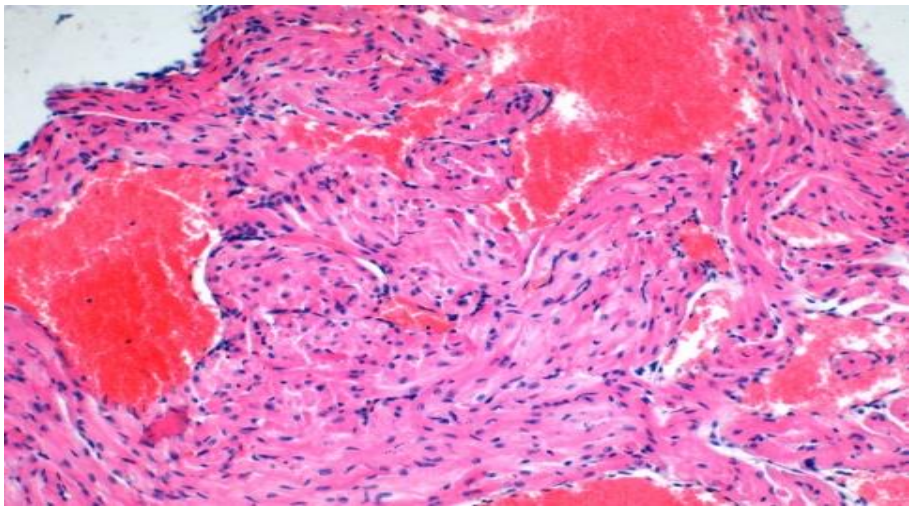

Figure 3. Myocardial cardiomyocytes of the animal of the control group. Hemozosin stain. Micrograph. Approx. 10, vol. 10.

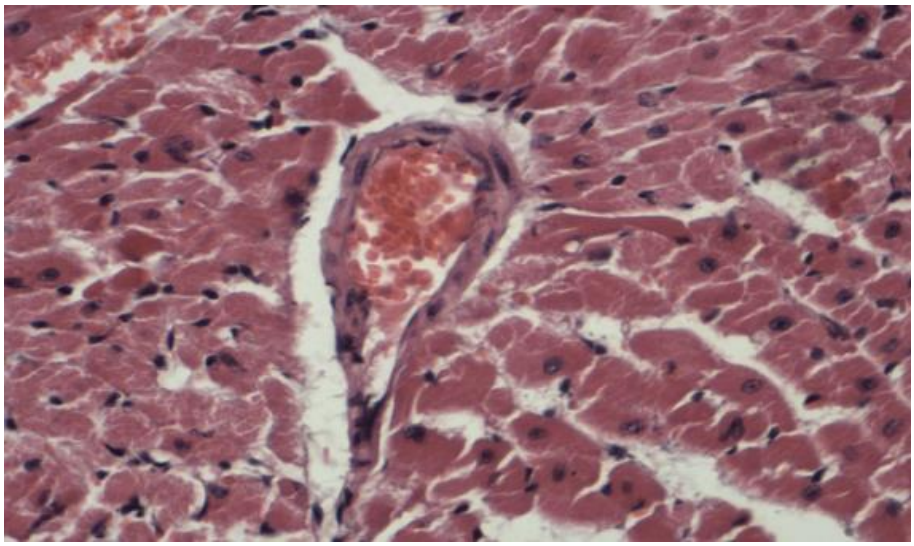

Figure 4. Myocardial artery of the heart of animals treated with leuzea and ovesol. Hematoxylin-eosin stain. Micrograph. Approx. 10, vol. 40.

In the lungs of mice of the control group, small bronchi, lined with two-three-row ciliated epithelium, arterial and venous vessels were dilated and blood-filled, are observed. A strong expansion of the alveoli was found. Along the blood vessels and airways, accumulations of lymphoid cells were detected (figure 5).

In the group of mice that received levzea and ovesol, the lungs are formed by the airways and respiratory section. In all sections of the airways, the adjacent membrane is lined with a single-layer multilayer ciliated epithelium. In bronchioles, alveolar passages and sacs, smooth muscle cells of the mucous membrane gradually disappear. In the loose connective tissue of the mucous membrane of the airways, accumulations of lymphoid cells of various intensities are determined. Lymphoid cells are also

found along the blood vessels, sometimes lymphoid cells around the blood vessels are arranged in the form of a ring (figure 6).

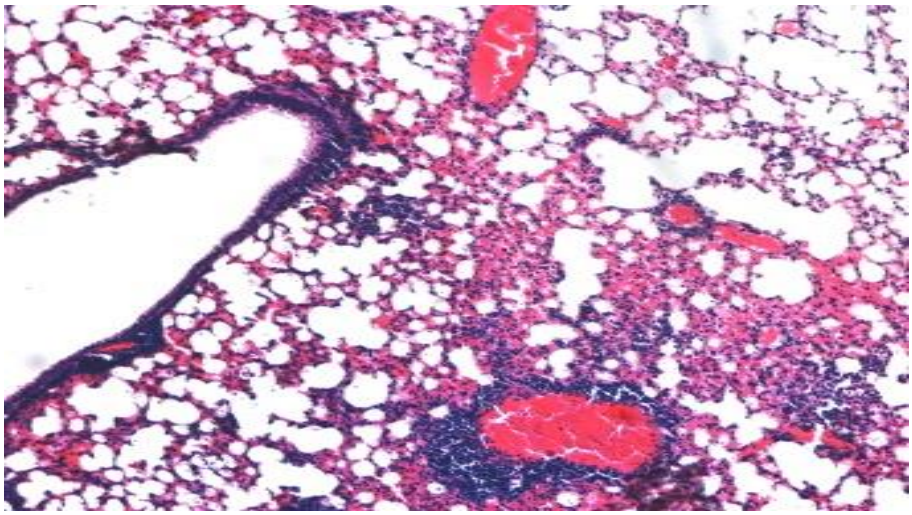

Figure 5. Blood-filled vessels of the lung of the control group of animals. Color gem. eosin. Micrograph. Approx. 10, about 40.

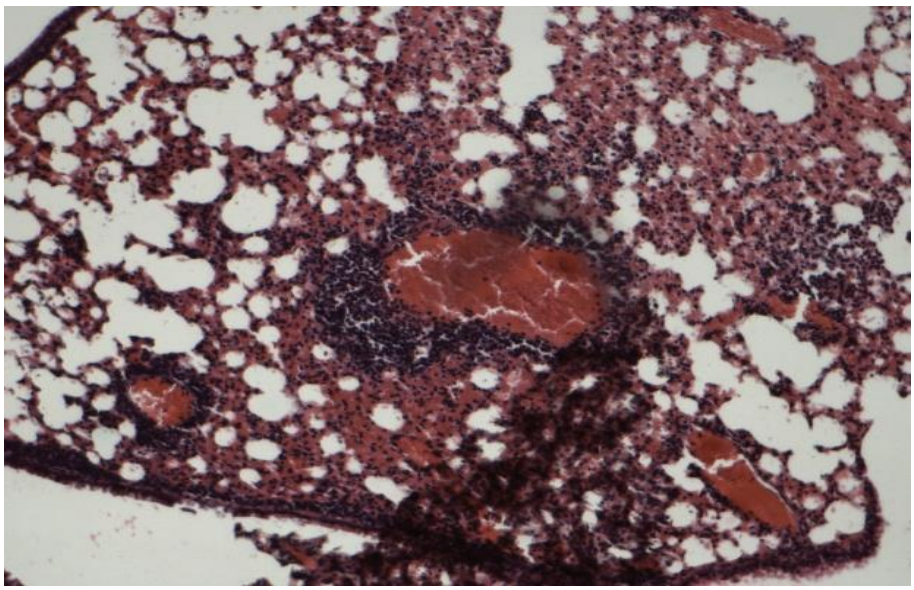

Figure 6. Accumulation of lymphoid cells along the blood vessel of the lung when animals are given a leuzea and ovesol. Hematoxylin-eosin stain. Micrograph. Approx. 10, about 40.

In the course of large blood vessels and airways, lymphoid follicles can reach significant sizes. Therefore, in experimental animals treated with leuzea and ovesol after physical exercise, vascular hyperemia is determined.

In the kidneys of the control group, pulmonary engorgements were found. The output of red blood cells was observed in the cortical substance. In the proximal and distal tubules, accumulations of blood cells underwent dystrophic changes and were identified (figure 7).

Mice that received safflower-like leuzea and ovesol covered with a connective capsule, and a cortical substance is located under the capsule. In the cortical substance and tubules of the nephron (proximal, loop, distal) and further follows the collective tube (figure 8).

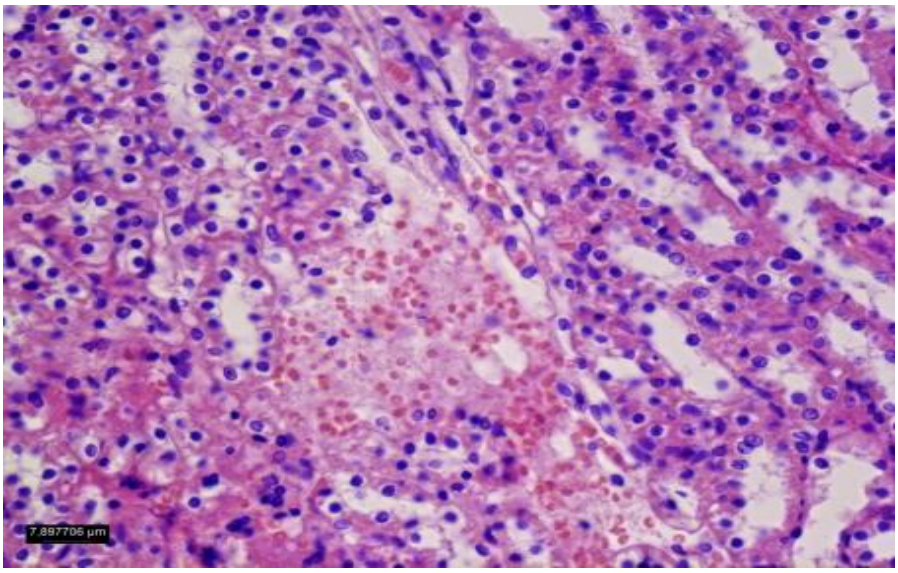

Figure 7. Venous hyperemia of the cortical substance of the mouse kidney of the control group. Stained with heme.-eosin. Micrograph. Approx. 10, about 40.

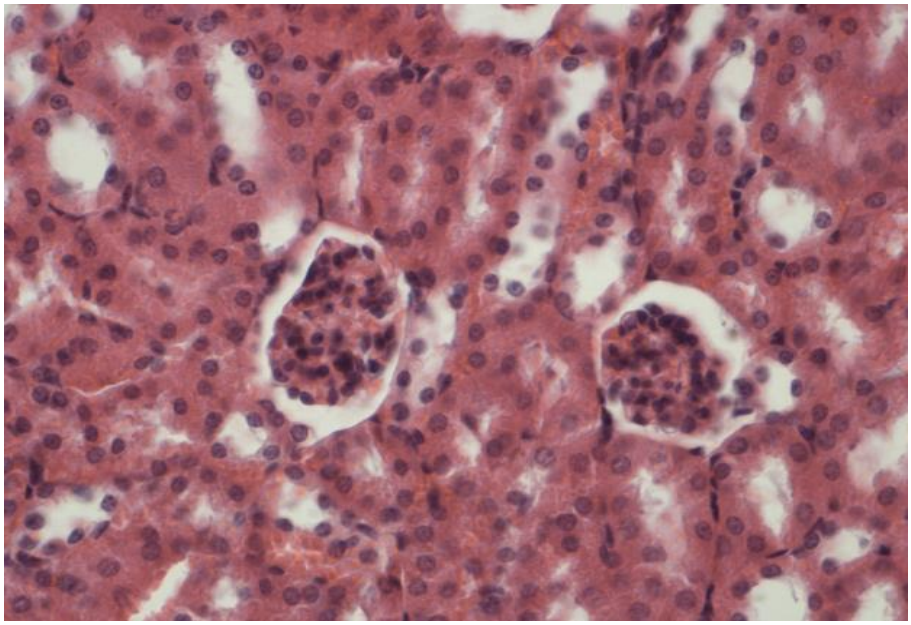

Figure 8. Renal corpuscles and tubules of the nephron of animals treated with leuzea and ovesol. Hematoxylin-eosin stain. Micrograph. Approx. 10, about 40.

The glomerular blood capillaries are characterized by moderate plethora, while the blood vessels surrounding the nephron tubules are characterized by some hyperemia, especially venous vessels. The proximal section, which provides the reabsorption of amino acids, proteins, glucose, salts and water into

the tubular capillaries around, is formed from a single-layer cubic limbic epithelium. In all parts of the tubules of the nephron, the blood capillaries braiding around them remain of moderate plethora.

4. Conclusion

Histological changes in the internal organs occur due to increased physical activity. In mice of the control group, edema of muscle fibers with the breakdown of myocytes was observed. In the myocardium, vasodilation and blood filling were determined, cardiomyocytes had dystrophic changes. Pericardium found cellular infiltrates. Edema zones were observed in the myocardium. A strong expansion of the alveoli was also observed. Along the blood vessels and airways, lymphoid cell clusters were detected. Pulmonary engorgements were found in kidneys. The output of red blood cells was observed in the cortical substance. In the proximal and distal tubules, accumulations of blood cells underwent dystrophic changes and were identified. When using adaptogens of various nature, the degree of alteration of internal organs is reduced due to the activity. In the body of mice treated with safflower-like leuzea combined with ovesol, the least histological abnormalities were recorded.

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