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MARKERS OF ADAPTATION TO MUSCULAR ACTIVITY IN ATHLETES

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One of the most important problems of modern sports science and practice is the problem of adaptation to muscular activity. It is known that any adaptation is the output of the biosystem to a new level of homeostasis. Regulatory mechanisms are the first to be restructured. Only after this, physiological or morphological changes occur. Constantly increasing volumes of training loads can cause a number of violations of the functional condition of athletes, lead to overstrain of the body systems, increased injuries, decreased levels of sports results, as well as reduced duration of performances at the stage of preserving sport achievements. To prevent these phenomena, constant monitoring of the functional condition of athletes is required using a number of methods that allow assessing the readiness to perform significant workloads, the rate of recovery processes, the efficiency of the functioning of various physiological systems, the degree of mobilization and use of reserve capabilities of the organism, the direction and effectiveness of the training effect of the workloads. The aim of this work is to study the dynamics of free histamine and lactate levels in biological fluids at rest and after physical exercises in rowers on kayaks and canoes at the general preparatory stage of the preparatory period.

Materials and Methods. Investigations were conducted at the Republican scientific and practical center of sports medicine with the participation of 24 rowers on canoes and kayaks (men and women, age 19-25, with the sports qualifications of master of sports, master of sports of international level) who are at the preparatory period. The control group consisted of 16 functionally healthy students. To determine histamine, 1 ml of mouth fluid of athletes were collected in centrifuge tubes with 4 ml of 10% trichloroacetic acid. Then, the level of histamine was determined in these centrifuge fluids. Quantitative determinations of the histamine level in serum and oral fluids were carried out by gas chromatography coupled with mass spectrometry (GC-MS/MS) of Thermo Fisher Scientific TSQ 8000 EVO mass spectrometer. At the same time, the lactate content in the blood of athletes at rest and after physical exercises was determined using the ROSH biochemical analyzer COBAS-311, using reagents from the same company. The heart rate (HR) and the arterial pressure (AP) by the auscultatory method were determined to assess the functional state of the cardiovascular system at rest and after physical exercises of athletes. The testing was carried out on the “Tredmile” track (Germany). Pulse regimens were recorded using the “Sport Tester” heart rate monitor.

Results. In the process of stress loads in athletes rowing on canoes and kayaks, an individual “histamine profile” is formed, characterized by an increased content of free histamine in the body. In this situation, medical examination and electrocardiography did not detect any deviations in the health status of this contingent of athletes with consistently high concentrations of histamine in biological fluids. Obviously, a high level of free histamine in the blood in this case represents a long-term stable adaptation to regular physical loads. This is also true with respect to the adaptive increase in the level of histamine in the oral fluids of the athletes. With the daily conduct of training sessions, it is possible that each subsequent training falls on the phase of super-recovery in the histamine system after the previous one. In this case, as a result of the cumulative training effect, the histamine content in the body increases. As training improves, the recovery of consumed histamine during the work begins to occur at a faster rate. In this case, the super-recovery phase ends before the next training begins. Thus, the impact of regular training workloads leads to a steady increase in the level of free histamine in the body of athletes in conditions of rest. Accumulation of a substance with such a high biological activity cannot be influenced on one or other aspects of the vital activity of the athlete’s body. As the study showed, for each mode of operation there is an optimal level of histamine in the oral fluid and in the blood. Thus, the accumulation of free histamine in the body with a decrease in the oxygen capacity of the blood is aimed at preventing the weakening of the oxidative function, which is possible due to the ability of histamine to enhance coronary circulation, dilate blood vessels, increase local blood flow and, thus, improve the supply of the heart and other organs and tissues with blood and oxygen. Accumulating in the body, histamine inhibits acetylcholineresterase, thereby contributing to an increase in the concentration of acetylcholine and activation of the parasympathetic part of the autonomic nervous system. It is possible that the high level of histamine in the body of athletes (formed as an adaptation to high physical stress) in the future can lead to the development of an allergic disease. At the majority of surveyed athletes, the content of lactate at rest was in...
accordance with the normative one. Observed in the overwhelming majority of oarsmen, high utilization of lactate indicates their high training. The obtained results indicate the individual correction of the athlete’s condition based on the study of the level of histamine in saliva and blood, give appropriate pharmacological recommendations to optimize it, which can contribute to the solution of specific problems facing athletes during the general preparatory stage of the preparatory period.

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STUDY OF THE RESPIRATORY SYSTEM OF FOOTBALL PLAYERS DEPENDING ON THE DEGREE OF THEIR PHYSICAL EFFICIENCY

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It is known that the respiratory system plays a strategic role in the process of supplying oxygen to working muscles and in removing carbon dioxide from the body[1], which allows the body to maintain gas homeostasis not only under extreme conditions, but also under conditions of high physical exertion. Low functional activity of this system significantly affects the physical and mental performance, reducing the body’s resistance to harmful factors and psychoemotional stresses [2,3]. Therefore, the study of this issue is very relevant for professional athletes engaged in various sports, with varying motive loads. Particular importance is attained in those sports that have an increased demand for aerobic capabilities [7]. Football belongs to such sports.

In this work, we have studied the indicators of the functional state of the respiratory system in football players. It is known that excessive physical activity makes an increased requirement for oxygen supply to the body, in particular to the respiratory system, we have studied the functional state of the respiratory system, taking into account the degree of physical efficiency of the athlete.

The aim of the study was to evaluate lung function of football players, depending on their physical efficiency and playing position.

Materials and Methods. 300 football players were included into the study. The age of the players was between 18 and 25 years old. Depending on the degree of physical performance athletes were divided into the following groups: with high, above average, average, below average and low working capacity. Considering that during the game in the field football players perform different tasks in physical activity, each group was also separated into goalkeepers, defenders, midfielders and forwards by their role. The function of external respiration was studied in athletes at rest on a spirometer «BTL-08 Spyro» device. The forced vital capacity of the lungs (FVCL), the forced exhalation volume for 1 second (FEV1), the forced expiratory flow at 75%, 50% and 25% of the vital capacity of the lungs (MOS75, MOS50, MOS25), vital capacity lungs (VCL), vital capacity of lungs on inhalation and exhalation (ERV, IVC), maximal ventilation of lungs (MVL) were used as indicators of the function of external respiration. Assessment of physical performance was carried out by conducting an ECG study before and after the individually calculated load. Indicators of the function of external respiration of 19 healthy volunteers-students of a medical institute, corresponding ages were served as the control index.

Results. The results of the performed studies of the FER indices in football players in comparison with the parameters of the FER of the control group indicate the presence of distinct differences. The FVCL indices of football players in a rest were 17.4% higher than in the control group. Consequently, the football players have a relatively fast response from the respiratory system to physical activity. This is apparently due to the “training of the respiratory system,” which contributes to an accurate and adequate “adjustment” of the level of pulmonary ventilation to the metabolic needs of the athlete’s organism during activities of a familiar nature and associated energy costs [4,5]. The study of another indicator of the respiratory system - VFE1, measured in conditions of relative rest, shows that its value exceeds the...