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BIOCHEMICAL PARAMETERS OF BLOOD OF SPORTSMEN OF YAKUTIA IN DIFFERENT SEASONS OF THE YEAR

ABSTRACT

A biochemical study was conducted among athletes - freestyle wrestlers of Yakutia in different seasons of the year. The clinical and biochemical indices obtained by us, reflecting the state of the body of the wrestlers, show that there were no abnormalities in the athletes surveyed by us. At the same time, at the part of the sportsmen surveyed by us, the activity of enzymes (except ALP) was moderately increased in all seasons of the year, especially in the autumn-winter period. Thus, increased values of ALT activity in the autumn period were noted in 36% of wrestlers, and in winter - in 41%. ACT activity in autumn exceeded normal values in 36% of the wrestlers surveyed by us, and in winter - in 29%. Increase in activity of LDH enzymes (up to 535,5 E / L in all seasons of the year), KFK (up to 622,8 E / L in winter), transaminase (in autumn and winter periods) and creatinine (up to 113,5 μmol / l in all seasons of the year) is a consequence of the influence of intense physical loads associated with the activation of energy substrates.

Keywords: biochemical research, athletes, freestyle wrestlers.

Biochemical blood monitoring is one of the leading places in the overall complex of examinations and monitoring of the state of the body and the level of training of athletes. Biochemical parameters allow to diagnose signs of fatigue under the influence of physical activity at an early stage and to make adjustments in the training process taking into account these indicators [3].

It was found that ATP reserves in the muscles are exhausted in a few seconds when performing intensive physical work. For the resynthesis of ATP in skeletal muscle of the person there are three types of anaerobic (creatinkinase, or lactate; glycolytic, or lactic; micinsky) and aerobic mitochondrial mechanisms. With the depletion of the creatine kinase system, the bioenergy of muscle contraction is provided depending on the type of muscle glycolysis and/or oxidative phosphorylation.The described mechanisms of energy supply to the muscles are the basis for the selection of biochemical markers characterizing their condition [5]. These markers include creatine kinase, or creatine phosphokinase (KFK), lactate dehydrogenase (LDH), aspartate aminotransferase (AST). In addition to markers of muscle activity are also important indicators showing the state of metabolism.

The aim of the study was to study the changes in biochemical parameters characteristic of freestyle wrestlers, depending on the seasons of the year.

Materials and methods of research. The object of our study were 102 men of yakut nationality, aged 18 to 29 years, athletes – freestyle wrestlers of School of the highest sports skill of Yakutsk and students of the Institute of physical culture and sports NEFU in the name of M.K. Ammosova having high sports qualification: candidates for masters of sports, masters of sports, masters of sports of international class, honored masters of sports. The study was conducted in different seasons: summer (June), autumn (October), winter (December), spring (March).

The material for biochemical analysis was serum taken from the ulnar vein in the morning on an empty stomach in a state of relative muscle rest.

Laboratory studies were conducted in the laboratory of biochemical mechanisms of adaptation of the Federal state budgetary scientific institution «Yakut Science Centre of complex medical problems».

Determination of the activity of aspartate- (AST) and alanine aminotransferase (ALT), lactate dehydrogenase (LDH), creatinekinase (KFK), gammaglutionpeptidase (GGT), creatinine, urea, total protein, glucose, total cholesterol, very low (VLDL), low (LDL) and high density lipoprotein cholesterol (HDL), triglycerides (TG), serum albumin were carried out by enzymatic method on the biochemical analyzer «Labio 200» using the reagents «BIOCON» (Germany).

The obtained data were statistically processed using the package of applied statistical programs SPSS 17.0. Arithmetic mean values (M) and errors of mean values (m) were calculated for all indicators in each group. The level of significance was considered significant at $p \leq 0,05$. The significance of the differences was determined using nonparametric Mann-Whitney tests. To identify the conjugacy of indicators, the Spearman linear correlation coefficient was calculated.

The results and discussion

Biochemical parameters of blood serum of the athletes studied by us are presented in table 1. According to our data, the level of total protein, total cholesterol, glucose, alkaline phosphatase, creatinine, urea, uric acid and the activity of gammaglutamyltransferase in the blood of the examined athletes corresponded to normal values. At the same time, the activity of transaminases in the blood serum of wrestlers increased in autumn and winter.

Increased activity of transaminases during exercise is also associated with transamination of amino acids, which are oxidized to alpha-ketoacids and «burn» in the Krebs cycle. Increased activity of AST is not only a marker of heart damage, and in 99% of cases indicates the degree of catabolism of amino acids in healthy people, as well as the intensity of thermogenesis. And increased ALT activity in 99% of cases indicates the rate of anabolism in the body of practically healthy people associated with the synthesis of glucose from pyruvate formed as a result of transamination of alanine [6]. The increased ALT and AST values obtained by us are consistent with the literature data. Thus, in N.M. Gorokhova and L.V. Timoshenko (2007) noted that «The athletes of such sports as Taekwondo, lightweight, and

Dynamics of biochemical parameters of blood serum of freestyle wrestlers, depending on the season of the year

Summer (n=18)	Autumn (n=11)	Winter (n=17)	Spring (n=33)	p
LDH (225-450 u/l)				
-	436,0 (406,0; 532,0)	496,0 (369,0; 535,5)	499,0 (420,0; 535,0)	0,717
KFK (<190 u/l)				
-	345,0 (195,0; 412,0)	454,5 (151,0; 622,8)	274,0 (191,0; 487,8)	
KFK-MB(<25 u/l)				
27,2 (6,9; 32,0)	-	-	-	
ALP (до 258 u/l)				
218,0 (187,8; 258,5)	236,0 (187,0; 252,0)	218,0 (179,0; 261,5)	221,0 (191,5; 266,0)	0,960
TRIG (0,5-1,7 mmol/l)				
0,7 (0,6; 0,9)	0,9 (0,6; 1,2)	0,7 (0,4; 1,0)	0,7 (0,6; 0,9)	0,187
CHOL (3,6-6,5 mmol/l)				
4,3 (3,6; 5,1)	5,5 (4,2; 5,9)	4,8 (4,1; 5,4)	4,7 (4,2; 5,0)	0,055
Uric acid (268-488 μmol/l)				
287,0 (252,34 330,8)	307,5 (260,3; 368,0)	336,0 (225,0; 355,0)	316,0 (263,0; 366,0)	0,739
GGT (11-50 u/l)				
18,5 (13,8; 21,8)	17,0 (13,0; 21,0)	16,0 (12,0; 24,5)	23,0 (20,0; 29,0)	0,392
ALT (up to 30 IU)				
25,0 (21,8; 28,3)	27,0 (18,5; 43,5)_	27,0 (21,0; 36,0)	22,0 (18,5; 27,5)	0,117
AST (up to 40 IU)				
27,5 (23,8; 37,0)	41,0 (27,0; 70,0)	35,0 (26,5; 43,5)	31,0 (25,5; 36,0)	0,047
GLU (3,3-5,5 mmol/l)				
4,4 (4,1; 4,6)	4,8 (4,8; 5,4)	4,7 (4,5; 5,1)	4,8 (4,6; 5,4)	0,047
UREA (1,7-8,3 5 mmol/l)				
5,5 (4,4; 6,5)	5,8 (5,0; 6,2)	5,4 (4,9; 5,8)	5,8 (5,3; 6,8)	0,682
CREA (53-97 μmol/l)				
91,0 (85,8; 107,3)	93,0 (83,0; 102,0)	92,0 (90,0; 100,5)	103,0 (96,5; 113,5)	0,196
BELOK (65-85 g/l)				
77,0 (74,6; 79,3)	78,7 (77,2; 81,4)	77,0 (74,5; 78,3)	78,3 (75,9; 81,9)	0,552
Albumin (34-48 g/l)				
48,6 (47,4; 50,2)	47,9 (46,0; 49,6)	46,4 (44,0; 49,9)	49,6 (47,8; 51,3)	0,392
HDL (0,78-2,2 mmol/l)				
1,2 (1,1; 1,3)	1,2 (1,1; 1,3)	1,3 (1,0; 1,6)	1,6 (1,3; 1,7)	
LDL (1,68-4,53 mmol/l)				
2,4 (2,0; 3,3)	4,1 (3,4; 4,4)	2,9 (1,7; 3,2)	2,6 (2,3; 3,1)	
VLDL (0,8-1,5 mmol/l)				
0,3 (0,3; 0,4)	0,3 (0,3; 0,5)	0,2 (0,2; 0,3)	0,3 (0,3; 0,4)	
CATR (<3)				
2,4 (1,8; 3,3)	3,9 (2,2; 4,2)	2,0 (1,4; 2,4)	1,9 (1,6; 2,7)	

Note-the data are presented in the form of median and interquartile distribution in Me format (Q1; Q3); p-achieved level of statistical significance of differences in comparison of groups (Friedman criterion).

weightlifting, with short-term physical stress is an increase in the activity of ALT and AST. The increase in the activity of AST is associated with the intensification of cellular respiration due to the more intense formation of oxaloacetate entering the tricarboxylic acid cycle and the synthesis of ATP necessary for muscle contraction» [2].

The simultaneous increase in ALT and LDH activity is the result of accelerated glucose oxidation. It is known that the increase in the threshold of anaerobic oxidation of glucose is associated with an increase in the fitness of athletes. LDH level in blood plasma of the wrestlers surveyed by us was increased in all seasons of year, but is most expressed – in the winter-spring periods of year. In winter, the elevated values of LDH was observed in 53% of the athletes (the activity of the enzyme ranged from of 369,0 u/l to 535,5 u/l). In the spring the high activity of this enzyme were detected in 36% of the wrestlers. The increase in LDH activity to 535,5 E / l can be due to the high rate of oxygen utilization and developing hypoxia in working muscles, because the high demand of muscles for energy substrates in conditions of oxygen deficiency is satisfied by anaerobic oxidation of glucose.

It is impossible to exclude influence of climatic factors of the North. Therefore, the increase in LDH activity in more than half of the wrestlers we examined in winter is associated not only with an increase in anaerobic oxidation of glucose, but also with the influence of extreme climatic conditions in which athletes train in Yakutia. Back in the 80s of the last century, it was shown that «a Characteristic feature of the processes of adaptation to the extreme conditions of the North is the development of a kind of syndrome that resembles chronic hypoxia and is called «circumpolar hypoxic syndrome». The main physiological manifestation of this syndrome is hidden or apparent respiratory failure» [1,4].

The content of creatine kinase in the blood of the athletes studied during the year exceeds the normal values by 2-2,5 times and the increase in lactate dehydrogenase in the autumn, winter and spring periods of the year, probably indicate an overstrain of muscle tissue when performing high-intensity physical activity. We should not forget that such an increase in the activity of KFK may indicate damage to cardiomyocytes [7]. On the other hand, a statistically significant increase in KFK in freestyle wrestlers compared to the control group (236,65±40,17 E/l) (p<0,05) is a consequence of the adaptation of the body to intense physical activity, requiring a significant reserve of creatine phosphate – a source of ATP. It should be noted that the surveyed students who made up the control group engaged in the General program of Universities, LDH activity was equal to 361,05±12,06 E/l.

By measuring the plasma activity of sarcoplasmic enzymes (KFK, LDH), the diagnosis of micro-injuries of muscle tissue is carried out. The increase in their activity in the blood plasma reflects a significant change in the permeability of the membrane structures of the myocyte, up to its complete destruction. This fact reflects the adaptation of the athlete's body to high intense physical activity. In the diagnosis of injuries from time to time use a combination of biological and clinical parameters, for example, the activity of LDH and KFK in plasma concentrations of myoglobin and malondialdehyde, white blood cells, and physiological muscle parameters. In the biochemistry of sports, a significant increase in tissue enzymes in the blood is an indicator of the inadequacy of physical activity, the development of fatigue. The rate of disappearance of tissue enzymes indicates the rate of recovery of the body. If their activity in the blood is maintained during the rest, it indicates a low level of training of the athlete, and possibly the pre-pathological condition of the body. The above points to the need for biochemical control in high performance sports.

There was a slight increase in serum albumin in the spring, probably due to weight loss.

The analysis of lipid metabolism in athletes revealed a relatively high coefficient of atherogenicity (3,94±0,77) ($p<0{,}01$) in the autumn, due to a decrease in HDL cholesterol (1,17±0,27) ($p<0{,}05$), an increase in LDL cholesterol (3,83±0,41) ($p<0{,}01$) and VLDL cholesterol (0,39±0,06), probably this is due not only to nutritional factors, but also with increased utilization of cholesterol. The level of HDL cholesterol and LDL cholesterol in all seasons were within the normal range.

Reduction of VLDL cholesterol to 0,39 mmol/l may be due to the high rate of cholesterol utilization as a precursor of steroid hormones (activation of the adrenal cortical layer under intense physical activity).

Thus, the data obtained by us the results of clinical and biochemical parameters, reflecting the basic metabolism, indicate that the pathological deviations in the examined athletes were not. The increase in the activity of enzymes (LDH, KFK, transaminases) is a consequence of the influence of intense physical activity associated with the activation of energy substrates and with the intensification of cellular respiration and ATP synthesis necessary for muscle contraction. The increase in the autumn season of the atherogenicity coefficient due to the reduction of HDL cholesterol, increase in LDL cholesterol and VLDL cholesterol is probably due not only to nutritional factors, but also to increased utilization of cholesterol.

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