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# STATUS OF PRO- AND ANTIOXIDANT BALANCE IN FREESTYLE WRESTLERS IN YAKUTIA IN DIFFERENT SEASONS

**ABSTRACT**

We studied a state of pro- and antioxidant balance in the athletes - freestyle wrestlers of Yakutia, aged from 18 up to 29 years. It is revealed that the CAOP/LPO characterizing pro-antioxidant balance depends on a season. The lowest CAOP/LPO values are noted during the winter period that is caused by the prooxidant processes connected with increase of Thiobarbituric acid reactive substances (TBARS) concentration. The intensification the CAOP/LPO in spring time is connected with activation compensatory adaptation reactions from antioxidant protection (increase of activity of SOD and CAT).

**Keywords:** lipid peroxidation, antioxidant protection, pro- and oxidant balance, seasons.

## INTRODUCTION

The most important component of the adaptive reactions of the body is a system of "lipid peroxidation (LPO) - antioxidant protection (AOP)", which allows evaluating the stability of biological systems to the effects of external and internal environment. In normal living conditions in the functioning of systems in terms of the physiological optimum exists pro- and antioxidant balance, which is an essential mechanism of oxidative homeostasis.

It is known that intense exercise leads to excessive formation of reactive oxygen species and a significant increase in the speed of lipid peroxidation (LPO). In the few publications it is shown that lipid peroxidation processes play an important role in the development of fatigue and reduced physical performance [1,16]. Analysis of published data shows that the state of the pro- and antioxidant balance in the different stages of the training cycle at the freestyle wrestlers, practicing in the Republic Sakha (Yakutia), little studied. There are only a few works [5, 6, 7, 8].

The **aim** of this study was to evaluate the state of the pro- and antioxidant balance in athletes of the Republic of Sakha (Yakutia), engaged in wrestling.

## MATERIAL AND METHODS

As objects of study we chose athletes - wrestlers of high school sports in Yakutsk. A total of 45 ethnic Yakut men, aged 18 to 29 years old, were under study. Athletes had the highest sports skills and were candidates for master of sports, master of sports of international class masters of sports, Honored Master of Sports.

The intensity of free radical oxidation of lipids was evaluated spectrophotometrically by accumulation of erythrocyte membranes products react with thiobarbituric acid (TBA-RP) [9]. Indicators of non-enzymatic antioxidant defense level were determined by the total content in the blood serum of low molecular weight antioxidants (LMAO) [10]. Characteristics of enzymatic antioxidant defense unit (AOD) were determined by the activity of the enzymes superoxide dismutase (SOD) in blood erythrocytes [12], catalase (CAT) in the blood serum [2].

To determine the antioxidant status at equilibrium at different stages of study was calculated using the formula coefficient:

$C_{AOP}/_{LPO}$ = (LMAO + SOD + CAT) / TBA-RP.

The obtained data were statistically processed by the statistical package STATISTICA software application.

## RESULTS AND DISCUSSION

According to our data, the content of low molecular weight antioxidants (LMAO) in the membranes of red blood cells in athletes winter statistically significantly increased in 1,43 times in comparison with the level in the autumn of the year. In the spring there was a decrease of this index by 18%. Changes in the activity of superoxide dismutase (SOD) and catalase (CAT), depending on the season was the same. We note the tendency of increase of these enzymes. The lowest values were observed in the autumn, the highest in winter (Table. 1).

The level of TBA-reactive products (TBA-RP) in winter was significantly higher ($p < 0.01$) than in the autumn and spring seasons (Fig. 1). A significant increase of TBA-RP in the winter was probably due to the fact that at this time

of the year increased the number of events as a Republican, Russian and international importance. The specifics of the competition are not only connected with an increase in physical activity, but also psycho-emotional stress, with the change of time zones, as part of the competition take place outside the country.

In order to determine the state with antioxidant balance, depending on the season, we have analyzed changes CAOP coefficient / LPO was calculated to the formula: $C_{AOP}/_{LPO}$ = (LMAO + SOD + CAT) / TAC-RP.

Fig. 2 illustrates the dynamics of the coefficient characterizing the state in antioxidant balance, depending on the time of year.

As can be seen from Fig. 2. autumn $C_{AOP}/_{LPO}$ was 0,13 standard units in winter, there was a decrease of this ratio to 31% compared to the autumn season. That is, in the body of the surveyed athletes in winter prevailed prooxidant processes. Significant reduction $C_{AOP}/_{LPO}$ winter caused a statistically significant increase in the concentration of TBA-RP and LMAO and increased activity of SOD and CAT. Low value $C_{AOP}/_{LPO}$ the winter is a sign of fatigue and overwork, which means reduction of organism resistance to the effects of factors external and internal environment, which may lead to disruption of homeostasis and development of pathological processes.

In the spring there was an increase $C_{AOP}/_{LPO}$ 2,3 times (p <0,01) as compared to the winter season, due to the activation of compensatory-adaptation reaction on the part of AOP: increases the activity of SOD and CAT level. The concentration of TBA-RP decreased by 50% (p <0,01) compared with the level in the winter season.

E.D. Okhlopkova (8) noted that the state of pro- and antioxidant balance in freestyle wrestlers depends on the stage of the training cycle. Significant reduction $C_{AOP}/_{LPO}$ at all stages of the training cycle caused a statistically significant increase in the concentration of TBA-RP and a relatively small increase in CAT activity, SOD and GP in erythrocyte membranes. The lowest values $C_{AOP}/_{LPO}$ on the recovery period of the training cycle are signs of fatigue and overexertion.

In the literature it has been reported that the content of LPO products in blood depends on the nature and intensity of exercise [11]. In respect of CAT there is evidence of reducing the activity of the enzyme under the influence of physical activity [13].

It is known that the intensity of lipid peroxidation in the body depends on the AOC organism. According to our research, in the winter season, when increased TBA-RP, it is best to respond non-enzymatic link of the AOC. It is known that the state of equilibrium of pro- and antioxidant in the body not only affect endogenous antioxidants and exogenous, which include both water soluble and fat-soluble vitamins. In the extreme climatic conditions of Yakutia antioxidant defense of the indigenous population is low in vitamins and low molecular weight antioxidants, as well as the entire population of the North. It should be noted that even in apparently healthy persons in the control group, the availability of ascorbic acid does not conform to generally accepted standards. In the middle of the last century, G.M. Danishevsky [4] found a significant exchange value of ascorbic acid in human acclimatization in the North. When elevated sympathetic nervous system function occurs enhanced utilization of ascorbic acid, this may lead to endogenous hypovitaminosis that G.M. Danishevsky calls the "acclimatization". A number of studies conducted among the population of Yakutia, identified ascorbic acid deficiency in the blood and urine of healthy individuals. Studies have shown L.E. Panin [11], the process of adaptation to the adverse climatic, geophysical and weather protection is accompanied by a decrease in the content of water-soluble vitamins (C) in the blood and urine. These changes are the author of the study relates to adaptive processes, and links them to the needs of these vitamins with fluctuations carbohydrate and fat metabolism.

Discovered fact of lipid peroxidation intensification in athletes under the influence of the conditions of the North, is consistent with the published data on the stimulating effect of specific and nonspecific factors of high latitudes in the processes of free-radical lipid degradation [3]. At very low temperatures, reduced oxygen partial pressure, and due to this hypoxia, which is one of the reasons for increasing the rate of free-radical processes [4].

Thus, our results suggest that the physical and emotional stress inherent in the sport of high achievements, lead to the growth of LPO in the winter season. It was revealed that intense exercise accelerated prooxidant processes during the winter season. Displacement of pro- and antioxidant balance in the winter in the direction of activation of lipid peroxidation is due to a statistically

**Indicators of AOP in freestyle wrestlers in different seasons**

| Index AOP | Seasons | | | P |
|---|---|---|---|---|
| | Autumn (n=11) | Winter (n=14) | Spring (n=20) | |
| LMAO, mg * eq / ml | 0,069±0,017 | 0,099±0,011* | 0,081±0,014 | p<0,05 |
| SOD, umol / mL * min | 0,053±0,001 | 0,061±0,000** | 0,076±0,010** | p<0,01 |
| CAT, mkKat / L | 0,619±0,201 | 0,731±0,107 | 0,825±0,055* | p<0,05 |

Note: ** p <0.01 compared with the autumn season; * P <0.05 compared with the autumn season (including Bonferroni corrections); * P <0.05 compared to the winter season

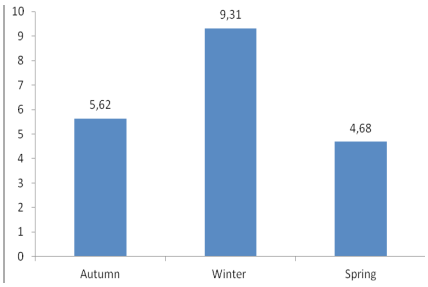


Fig. 1. TBA-RP level in erythrocyte membranes in freestyle wrestlers in different seasons (mmol / l)

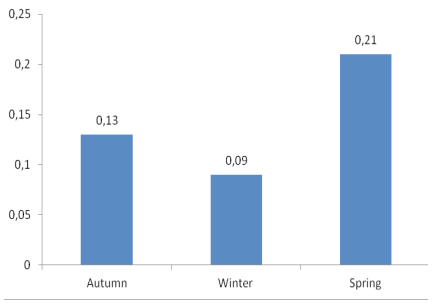


Fig. 2. Changes coefficient CAOP/LPO in freestyle wrestlers in different seasons of the year (standard units).

significant (p <0,01) increase in the level of TBA-RP.

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