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## THE STATE OF ANTIOXIDANT PROTECTION OF THE BODY IN PATIENTS WITH CORONARY HEART DISEASE IN THE NORTH, DEPENDING ON ETHNICITY

### ABSTRACT

The state of antioxidant protection of the body in patients with coronary heart disease, depending on ethnicity in the North, was under study.

It was revealed that dyslipidemia in patients with coronary heart disease is characterized by an increase in the level of triglycerides in blood. Dysadaptation to the northern conditions occurs due to the activation of lipid peroxidation processes, which is caused by the accumulation of malonic dialdehyde and is accompanied by inhibition of the antioxidant potential of the organism.

**Keywords:** coronary heart disease, lipid peroxidation, antioxidant protection of the organism, North.

**Introduction.** In the course of a long evolution under the influence of environmental factors, certain morphofunctional (including metabolic) features of northern populations were formed. These features, combined into «adaptive types» [7] represent the norm of biological responses to a complex of environmental factors that ensure the viability of the population in northern conditions.

One of the general patterns changes of metabolism in the population of these regions, with indigenous and alien residents, is an increase in the content of fats in blood and tissues, predominantly unsaturated fatty acids, and an increase in their consumption with food [1, 3, 6]. It was found that the low prevalence of dyslipidemia among the indigenous inhabitants of the northern regions depends on the nature of nutrition, namely, the consumption of fish with a high content of  $\omega$ 3-polyunsaturated fatty acids [2, 12]. In general, we can talk about the «polar metabolic» type [7, 8], as one of the most important manifestations of human and animal adaptation in the Far North.

With acclimatization in the Far North, a person is exposed to a number of environmental factors: cold, severe aerodynamic conditions, changes in photoperiodism [4] and phenomena of an electromagnetic nature [6].

Coronary heart disease is characterized by high rates of morbidity, high degree of disability, mortality and currently has a tendency to rejuvenate [5, 9]. In patients with atherosclerosis, the rate of generation of lipid peroxides increases. The measurement of hydroperoxides correlates with angiographic changes in the walls of the coronary vessels [5, 13].

In the newcomer population of the Far North, there has been an increase in the

incidence of myocardial infarction and cardiovascular mortality (CVD). In the indigenous inhabitants of the Far North, leading the traditional way of life, myocardial infarction is relatively rare, the prevalence of IHD was lower than in middle latitudes [5, 11, 13, 14].

Normally, the levels of free radical and antioxidant processes are in dynamic balance. The imbalance between these two systems, which develops against the background of a violation of the blood supply to the myocardium, is important for the pathogenesis of IHD. It is one of the causes of metabolic and myocardial dysfunction, takes part in the genesis of pain syndrome, rhythm disturbances, leads to a decrease in contractility of the myocardium [2].

**Purpose of the study.** Assessment of the state of antioxidant protection of the body in patients with IHD, depending on ethnicity in the conditions of North.

### Material and methods of research.

The study was performed with the participation of 92 patients with coronary heart disease, aged 35 to 75 years who were hospitalized in the department of cardiology of the Republic of Belarus No. 1 NCM. The patients were divided into 2 groups according to ethnicity: I group - Yakut (indigenous) - 52 men, II group Russian (outsiders) - 40 men. The second group consisted of patients who came from different cities of Russia (Cherkassk, Moscow, Voronezh, Baku, etc.), but lived at the time of research in the North.

Blood for biochemical studies was taken from the ulnar vein in the morning hours on an empty stomach, 12 hours after eating. Whole blood was used to study antioxidant indices and products of free radical oxidation.

To determine the intensity of LPO and antioxidant parameters, standard analysis techniques were used. Biochemical analyzes were performed on a biochemical analyzer «Cobas Mira Plus» (Switzerland), using «Biocon» reagents (Germany). The content of products of LPO and AOP of the organism was determined on a spectrophotometer «Specord-40».

Statistical analysis of the data was carried out using the program Statistica 19. Standard methods of variational statistics were used: calculation of mean values, standard errors, 95% confidence interval. The data in the tables are presented in the form  $M \pm m$ , where  $M$  is the mean,  $m$  is the mean error. To assess the statistically significant differences in the obtained data, nonparametric methods, the Student's criterion, the Spearman correlation analysis were used. Probability of the validity of the null hypothesis was assumed for  $p < 0,05$ .

**Results and discussion.** Biochemical parameters of blood serum on average varied within the limits of normal values. At the same time, there were relative differences depending on ethnicity. According to the data obtained, the activity of the enzymes participating in the glucose-alanine shunt was high in the native population. Thus, the high activity of gamma-glutamyltransferase (GGT) was statistically significant and exceeded by 1,79fold in Yakut people than in Russians. The activity of alkaline phosphatase (ALP) varied at the upper limit of the norm in the indigenous populations. The activity of GGT and ALP in indigenous people was combined with a higher level of total protein in them than in the case of new residents.

Perhaps this is due to the activation of membrane mechanisms of amino acid

transport and indicates the intensive borrowing of amino acids from tissues [10]. A statistically significant correlation between the indices of GGT and ALP activity ( $r = 0,386$ ,  $p = 0,001$ ) indicates an increased requirement of the cell in adenosine triphosphate (Table).

The relatively low level of total protein, which is at the lower limit of the norm, in unmarried men compared with indigenous men was combined with a low level of urea. A significant correlation was found ( $r = 0,342$ ,  $p = 0,044$ ) between the urea content and the total protein level.

The coefficient of deity, the index of adaptive reactions of the organism, was lower than the norm for foreigners. Given the statistically significant correlation of the urea level with the coefficient of deity ( $r = 0,615$ ,  $p = 0,002$ ).

Thus, the low level of both total protein and urea, significantly correlated with a low level of coefficient of deity in foreigners residents, indicates signs of depletion of the body's functional reserve.

The parameters of lipid metabolism of total cholesterol, LDLP cholesterol, and VLDLP cholesterol in patients with IHD corresponded to the generally accepted norms, although the level of total cholesterol was at the upper limit of the norm in foreignersmen. The level of triglycerides, regardless of ethnicity, exceeded normal values. Differences in lipid metabolism in the surveyed, depending on ethnicity, were statistically significant. Due to the violation of the ratios of atherogenic and antiatherogenic cholesterol fractions in IHD patients, the atherogenicity coefficient was high. At the same time, the coefficient of atherogenicity in native and alien ethnics exceeded permissible values of 1,85indigenousand 2,39fold in Russians.

The study of antioxidants in the blood revealed that the content of vitamin C in both groups was low. At the same time, this indicator was 1,64 fold higher in Yakuts than in Russians, but it did not correspond to the normal content of the norm, so in the Yakuts the content of vitamin C was 3,5 fold lower than normal, while for Russians it was 5,7 fold (the norm 0,7-1,4 mcg).

The level of superoxide dismutase was also 1,52fold lower in foreigners than in the Yakut. The content of low-molecular antioxidants in native was 20,9fold higher than in the case of new residents (Fig.).

The level of lipid peroxidation product of MDA in Yakut people was  $3,50 \pm 0,49$  mM/l, in Russians  $4,89 \pm 0,66$  mM/l, this fact indicated intensification and intensification of LPO processes.

Analysis of the state of antioxidant protection of the body and lipid peroxida-

tion was determined by the AOD/POL. As indicators of antioxidant protection of the body were used: the content of the vitamin C, superoxide dismutase and low-molecular antioxidants, and peroxide oxidation of lipids - the accumulation of malonicdialdehyde. At the same time, a statistically significant increase ( $p < 0,05$ ) of KAOD/POLwas observed in persons of the indigenous population in 1,98 fold than in foreigners.

### Conclusion

Proceeding from the foregoing, it can be assumed that in the foreigners the disadaptation processes are most pronounced. According to the calculated KAOD/POL, it can be argued that the prevalence of antioxidant processes over peroxidases in patients with indigenous people with coronary heart disease is higher than that of Russians almost 2fold.

The persons of the foreigners are noted to activate the processes of lipoperoxidation, expressed in the accumulation of malonicdialdehyde, which may be associated with the disadaptation of the organism to the extreme conditions of the North, namely, to the cold. The predominance of prooxidant factors over antioxidants, indicates the occurrence of oxidative stress. The trigger mechanism for adaptation to stress of any origin is the activation of peroxidation processes. The physiological meaning of the stress reaction is the emergency mobilization of the energy and structural resources of the organism and the creation of a positive background for the implementation of reactions aimed at maintaining homeostasis in extreme conditions of living [6, 7, 10].

According to our research, in representatives of russian nationality, dyslipidemia is most pronounced in compari-

son with the Yakuts. This is due to the increase in triglyceride levels and the coefficient of atherogenicity from normal values in the Yakuts by 15% and 46%; for Russians by 27% and 58%, respectively.

To fully understand the nature of peroxide processes in the structure of peroxide damage in the body, as well as in the selection of a rational antioxidant correction, a comprehensive examination including evaluation of LPO products, as well as the level of factors providing protection against possible damages of the cell membrane apparatus by lipid peroxidation intermediates.

In other words, the nature of disadaptation of the alien population in patients with coronary heart disease to the extreme conditions of the North proceeds more intensively than in the indigenous population.

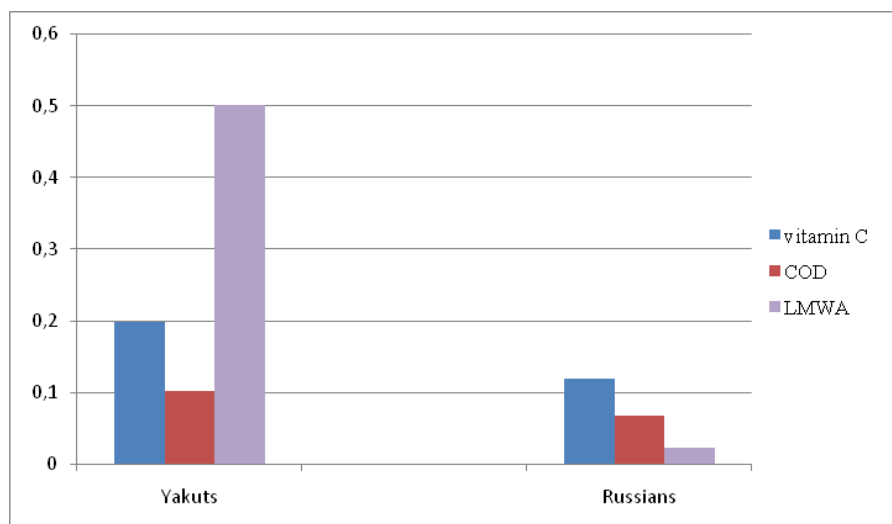
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**Biochemical parameters of blood serum in patients with coronary heart disease**

Biochemical index	Nationality	
	Yakuts (n=29)	Russians(n=26)
GGT, U/l	54,51±9,29*	30,47±5,26
ALP, U/l	150,86±10,58	141,23±11,34
Coefficient of deity	1,34±0,22	1,12±0,21
Urea, mmol/l	5,28±0,56	5,06±0,48
TP, g/l	71,90±0,91	64,34±4,83
Glucose, mmol/l	4,90 ±0,32	4,68±0,29
Chol, mmol/l	6,08±0,36	6,52±0,47*
Triglycerides, mmol/l	2,01±0,20	2,33±0,32*
HDLP, mmol/l	1,09±0,08*	0,84±0,10
LDLP, mmol/l	3,99±0,34	4,27±0,44*
VLDLP, mmol/l	0,99±0,11	1,05±0,14*
Ca	5,56±0,61	7,18±0,91*

\* - reliabilityof differences  $p < 0.05$ .



Antioxidant components in patients with IHD, depending on ethnicity

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