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GAMMA-BACKGROUND ENVIRONMENT DURING MAGNETIC STORMS AND THE CONTENT OF HIGH DENSITY LIPOPROTEIN IN PATIENTS WITH ARTERIAL HYPERTENSION DEPENDING ON THE VARIANT OF ANTIHYPERTENSIVE THERAPY

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Arterial hypertension and coronary heart disease continue to lead in the structure of cardiovascular diseases. In the years of high solar activity and the period of magnetic storms in a healthy and sick body, functional changes occur, which are associated with the exacerbation of cardiovascular diseases. The objective of the study was to establish the relationship between the dynamics of γ-background of the environment in the period of magnetic storms and the blood content of total cholesterol and high-density lipoproteins in patients with hypertension with different temperament and anxiety, taking options for antihypertensive therapy: targeted and not targeted (empirical) on the blockade of psychosomatic characteristics of patients, and to determine the most effective treatment option. The prevailing temperament – choleric, sanguine, phlegmatic and melancholic – was determined using the psychological test John Ayzenk and A. Belov, the presence and severity of depression – psychological tests of Je. Akhmetzhanov. The gamma background of the medium was measured using the dosimeter «Master». It was established that the content of total cholesterol in the blood increased, and high – density lipoproteins decreased in a series of temperamental: choleric – sanguine – phlegmatic–melancholic. During the period of magnetic storms with increased γ-background power (within the regional norm) in healthy individuals and patients with hypertension on the background of any variant of antihypertensive therapy, total cholesterol in the blood increased: a day before the magnetic storm in cholerics, on the 1st day of the magnetic storm in sanguine, and phlegmatic and melancholic on the 2nd day from the beginning of the magnetic storm. The peculiarity of the reaction is that during the magnetic storm, associated with an increase in the γ-background of the medium, the content of high – density lipoproteins in patients with choleric and sanguine against the background of the empirical version of antihypertensive therapy did not change, and in phlegmatic and melancholic patients decreased, while against the background of a targeted treatment option in choleric and sanguine it increased, and in groups of phlegmatic and melancholic patients-did not change, as in healthy individuals of the corresponding temperament. Compared with empirical antihypertensive therapy, against the background of a targeted treatment option, the period of returning the content of indicators to the initial values, as well as their level in the blood and the degree of severity of the reaction (according to the correlation analysis) were the same as in healthy individuals of the corresponding temperament, which indicates the advantage of the treatment option targeted at relieving the psychosomatic features of the patient.

Keywords: arterial hypertension, temperament, magnetic storms, γ-background, lipids, therapy.

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Introduction. Arterial hypertension (AH) and atherosclerosis remain one of those diseases, complications of which lead to disability and (or) death of persons of working age [5, 10, 13, 14]. Intense life activity, occurring in a rapidly changing meteorological factors, combined with an increase in blood lipid content, changes in the flow of the most important physiological processes in the body [4, 7, 8, 11, 16, 17]. The increase in total cholesterol (OH) in blood with a decrease in high-density lipoproteins (HDL) may be associated with the debut and (or) development of atherosclerosis [8]. However, no studies have been found on the relationship between gamma (γ)-background of the environment in the period of magnetic storms (MS) and the content of OH, as well as HDL in the blood of patients with AH with different temperament.

Objective: to establish the relationship between the dynamics of γ-background of the environment in the period of MB and the blood content of OH and HDL in patients with AH-II (HD-II) with different temperament and anxiety, taking different options of antihypertensive therapy (AHT): targeted (TAHT) and not targeted (empirical – EAHT) on the blockade of psychosomatic characteristics of the body of patients.

Material and methods. In the period from 1998 to 2017, 848 engineering and technical workers of men aged 44-62 years (on average 54±1.8 years) were examined in the polyclinic, in whom hypertension in stage II (HD-II, degree 2, risk 3) was established in the cardiology Department. The disease duration is 11.6±1.4 years on average. The presence of essential hypertension was established according to the criteria set out in Russian recommendations [13, 14]. The control was a group of 422 healthy men, compatible with the main anthropo-social indicators. The prevailing temperament – choleric (Ch), sanguine (Sg), phlegmatic (Ph) and melancholic (M) – was determined using the psychological test of John Ayzenk in A. Belov's modification [15] by 3-fold testing before treatment (0)

and after 3, 6, 9 and 12 months of AHT. The presence and severity of depression were determined by the method of E.R. Akhmetzhanov [2]. The value of reactive and personal anxiety was determined by the method described in Questions of psychology [18]. To low anxiety (LA) defined as those who scored 32,0±0,6, and highanxiety (HA) – between 42.8±0.4 points and above. The serum OH content was determined by enzyme methods using proprietary sets «Centrifugal-600», and the cholesterol content of high-density lipoproteins (HDL) was determined after preliminary deposition of the total fraction of low-density lipoproteins (LDL) and very low-density lipoproteins, as well as triglycerides on the autoanalyzer «Technicon-AAII» [6].

Gamma (γ)-background (μr/h) of the medium was measured at the workplaces of the surveyed persons (dosimeter «Master») from 8.00 to 10.00 daily (up to 20 measurements) and compared with the data of the Department of ionospheric-magnetic prediction of the West Siberian Department of Hydrometeorology and environmental monitoring (Novosibirsk). The variations of γ-background power values from 1998 to 2017 did not exceed the normal regional values.

The method of superimposed epochs [9] was used, which takes into account the days before the magnetic storm (-), in the period (0) and after the beginning of MS (+): -7 -6 -5 -4 -3 -2 -1 - 0 - +1 +2 +3 +4 +5 +6- +7 accordingly. The results were processed by the method of variation statistics (M±m) using the standard software package "Statistica 11.0" and parametric t–student test, as well as the calculation of the correlation coefficient (r) Pearson. Values at $p<0.05$ were considered statistically significant. The study was carried out in compliance with the provisions of the Helsinki examination and treatment of people and approved by the ethics Committee of the Novosibirsk state medical University of 20.11.2009, Protocol No. 18.

Features of antihypertensive therapy. According to the method of depression degree [2], a mild degree was noted only in highly anxious phlegmatics (HA/Ph) and melancholics (HA/M). At the conclusion of the psycho in the inpatient treatment they need. Perfectionism choleric (HA/Ch) and sanguine (HA/Sg) received anxiolytic that 96% sibazon 2.5 mg in the morning and at night and HA/fPhand HA/M - antidepressant – 96% coaxil 12.5 mg in the morning and at night (in 4% of the zoloft at 25 mg /day), except for LA-entities [1, 5, 7]. Studies conducted by us using the criteria specified in [3] showed predominant prevalence of sympathetic division (SNS) of the autonomic nervous system (ANS) and hypothalamic-pituitary-adrenal system (HPAS, cortisol) in Ch and Sg, compared with Ph and M patients, and parasympathetic (PSNS) Department of ANS with predominant activity of renin-angiotensin-aldosterone system (RAAS, aldosterone) in Ph and M, compared to Ch and Sg. Based on the differences above, AHT included drugs that have been approved by order No. 254 of the health Ministry of Russia dated 22.11.2004 for the treatment of hypertension [12]: beta-adrenoblockers (β-AB), ACI inhibitors (aceis), diuretics (hydrochlorothiazide), cardiomagnyl. From β-AB patients in 96% received metoprolol 200 mg / day (in 4% of cases its analogues), and NT/X and NT/S 100 mg/day.) and hydrochlorothiazide: HA/Ch and HA/Sg 25 mg/day, and LA 12.5 mg / day. From ACI, patients in 96% of cases took enalapril 20 mg/day (in 4% of cases its analogues) + veroshpiron 100-200mg/day (in 75% of cases), less often (in 25% of cases) hydrochlorothiazide 25 mg/day, because the potassium content in the blood was lower than in Ch and Sg [7, 12]. LA/Ph LA/M were administered enalapril 10 mg/day + hydrochlorothiazide (hydrochlorothiazide) - 12.5 mg/day. All patients received Panangin 2 tab./day and cardiomagnyl on 1 tab./ day. Since Ch and patients differed from the Ph and M patients with a predominance of the sympathetic division of the ANS, as well as the predominant activity of the hypothalamic-pituitary-adrenal system (HPAS for cortisol), they were prescribed in 96% of cases β-AB + hydrochlorothiazide. Patients Ph and M differed from Ch and Sg patients by predominance of mainly parasympathetic division of ANS and activity of renin-angiotensin-aldosterone system (RAAS by aldosterone). In this regard, the latter was appointed in 96% of cases of ACEI + veroshpiron. All other treatment options are called empirical.

The results of the study and their discussion. The data obtained during the study period showed a significant increase in blood levels of OH and a decrease in HDL in healthy and patients in the temperamental series of HA(LA) Ch–Sg–Ph–M (table. 1, 2). In HA persons, the content of OH was significantly higher, and HDL was lower than in lowanxiety persons of the corresponding temperament, and in HA(LA) healthy OH content was lower, and HDL was higher than in HA(LA) persons of the corresponding temperament. Thus, HA (LA) melancholic the OH content was the highest, and HA(-LA) the choleric is the lowest. On the contrary, the contents of HDL have HA(LA) melancholic was the lowest, and HA(LA) the choleric is the highest from all investigated individuals. the differences can be linked to the prevalence of SNS activity-division of the ANS and HPAS (cortisol) HA(LA) the choleric and sanguine, compared to the HA(LA) phlegmatic and melancholic. The latter, in contrast to Ch and Sg, dominated the activity of the RAAS (aldosterone) and PSNS-section of VNS (index Martinez Felipe and initial vegetative tonus).

The study showed a significant increase in the γ-background of the environment (within the limits of the regional norm) for the day (-1) before the MS, and a return to the initial values was observed on (+4) day from the beginning of the magnetic storm (Table 1- 2). It is most likely that this phenomenon is due to an increase in the concentration of radioactive radon gas, as indicated in [4, 19]. The study showed a significantly higher content of OH in Ch and Sg patients, taking the option of EAHT, compared with the same Ch and Sg, taking the option of TAHT, and, on all days of the method of superimposed eras (Table 1).

In the period of MS in healthy individuals and in patients (against the background of both variants of AHT), an increase in the content of OH in the blood was established (table. 1). In groups Ch, a significant increase in the content of OH was noted one day before the onset of MS, in groups Sg – on the first day, and in groups Ph and M (healthy and patients), an increase in the content of OH was noted on the second day of MS. However, the return of the indicator values to the original (up to MS) against the background of EAHT in group Ch was noted at +3, in group Sg at +4, and in groups Ph and M – at +5 days from the beginning of MS (table.1). On the background of TAHT return to the original values observed on the day before and on the same days as that of healthy persons of corresponding temperament, namely: Ch–Sg–Ph–M: +1 - +2 - +3 - +4 respectively.

In the present study, γ-background variations did not exceed the limit of normal values. However, the influence of γ-background under the conditions of the earth's perturbed magnetic field probably could not but influence the shift of homeostasis towards acidosis of the medium due to the formation of reactive oxygen species [19]. In this regard, the correlation analysis is justified. The data of correlation analysis between the values of the γ-background and content of OH in patients on days the method of

Table 1

Dynamics of γ-background (ur/h) environment, and a cholesterol (mmol/l) in the serum of individuals HA in the background, EAHT (E) and TAHT (T) in the days of magnetic storms during the study period from 1998

Days		-7 - -6	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	+6	+7	Всего
γ-background		8.51-8.50±0.01	8.46±0.01	8.58±0.01	8.41±0.01	8.45±0.01	8.70±0.01	8.78±0.01	8.80±0.01	8.65±0.01	8.70± 0.01	8.59±0.01	8.47±0.01	8.62±0.01	8.49±0.01	8.58±0.007
Choleric	E	5.60-5.64±0.04 44-45	5.66±0.04 44	5.60±0.04 43	5.70±0.04 48	5.70±0.04 43	6.40±0.04 49	6.80±0.04 48	6.60±0.04 46	6.67±0.04 47	5.33±0.04 44	5.31±0.04 43	5.60±0.03 44	5.21±0.04 43	5.70±0.04 45	5.83±0.01 676
	T	5.00-5.02±0.04 44 - 43	5.04±0.05 44	5.20±0.05 46	5.10±0.04 44	5.00±0.03 45	5.60±0.03 44	5.80±0.04 46	5.90±0.05 44	5.06±0.04 44	4.55±0.04 48	4.50±0.04 43	5.11±0.03 46	4.37±0.04 43	5.12±0.04 44	5.09±0.02 668
	H	4.99- 5.00±0.05 45 - 44	5.01±0.04 45	4.70±0.05 44	5.10±0.04 46	5.00±0.04 44	5.70±0.03 46	5.80±0.03 44	5.85±0.04 45	5.50±0.03 44	4.62±0.04 46	4.57±0.04 44	5.40±0.04 44	4.40±0.04 46	5.20±0.04 46	5.12±0.02 673
Sanguine	E	6.20-6.22±0.04 46 - 46	6.24±0.03 44	6.20±0.04 47	6.30±0.03 44	6.20±0.04 43	6.10±0.04 48	7.90±0.04 49	8.00±0.03 44	8.10±0.04 43	6.87±0.03 45	6.36±0.03 43	6.40±0.04 46	6.01±0.04 47	6.30±0.03 47	6.63±0.01 682
	T	5.70-5.72±0.03 44 - 46	5.74±0.03 47	5.60±0.04 43	5.80±0.04 44	5.60±0.03 43	5.80±0.03 47	6.30±0.04 48	6.50±0.03 50	6.60±0.04 47	5.36±0.04 44	5.70±0.04 48	5.80±0.03 48	5.41±0.04 45	5.60±0.04 46	5.78±0.02 690
	H	5.55-5.56±0.03 48 - 45	5.78±0.04 44	5.40±0.04 48	5.70±0.05 44	5.40±0.04 44	5.60±0.04 45	6.20±0.04 48	6.30±0.06 46	6.45±0.06 44	5.21±0.04 46	7.09±0.04 48	5.70±0.05 46	5.22±0.05 46	5.70±0.04 49	5.70±0.01 691
Phlegmatic	E	6.78-6.70±0.04 44 - 46	6.57±0.03 45	6.80±0.03 47	6.60±0.04 48	6.57±0.04 48	6.79±0.04 49	6.77±0.04 52	9.00±0.05 54	7.79±0.04 47	8.46±0.05 46	6.30±0.05 49	6.41±0.06 48	7.00±0.05 44	6.40±0.03 48	7.05±0.02 715
	T	5.90-6.00±0.04 44 - 43	6.03±0.03 44	6.10±0.04 46	6.20±0.005 44	6.00±0.05 46	5.90±0.04 46	6.20±0.06 48	6.70±0.06 47	6.80±0.06 49	6.60±0.07 44	6.20±0.07 43	6.40±0.06 44	6.20±0.04 43	6.10±0.04 48	6.23±0.02 679
	H	5.87-5.99±0.04 49 - 49	5.89±0.06 44	6.10±0.06 46	6.00±0.06 44	5.90±0.06 44	5.70±0.04 45	6.00±0.05 49	6.50±0.05 55	6.80±0.05 49	6.60±0.06 46	6.60±0.06 44	6.00±0.06 49	5.80±0.04 48	5.80±0.04 48	6.18±0.02 708
Melancholic	E	6.80-6.78±0.04 44 - 45	6.77±0.03 44	6.83±0.04 43	6.69±0.04 44	6.71±0.04 43	6.82±0.03 44	7.00±0.05 47	8.76±0.04 44	7.84±0.05 43	8.21±0.04 44	8.21±0.04 43	6.74±0.05 44	7.80±0.04 43	6.69±0.04 46	7.18±0.02 661
	T	6.20-6.30±0.04 44 - 47	6.15±0.03 47	6.30±0.04 48	6.00±0.05 45	6.30±0.05 48	6.30±0.04 45	6.25±0.06 48	6.70±0.06 45	6.60±0.05 46	6.00±0.05 44	6.00±0.05 43	6.13±0.05 44	6.46±0.04 46	6.10±0.04 44	6.25±0.02 684
	H	6.10-6.12±0.03 46 - 45	6.14±0.04 46	6.01±0.06 46	6.10±0.07 44	6.20±0.06 44	6.10±0.03 45	6.20±0.05 48	6.60±0.05 49	6.70±0.04 44	6.70±0.03 46	6.70±0.03 47	6.30±0.04 46	6.06±0.04 46	6.20±0.04 44	6.27±0.02 686

Note. In the tables 1-2 H-healthy; the denominator indicates the number of examined.

superimposed epochs showed the presence of significant direct and high (on the background of EAHT) and average (in the background, TAHT) the degree of significance of the relationship. The degree of importance of the background of TAHT coincided with that of healthy persons of corresponding temperament (table. 3). In contrast, EAHT, equality in content, the timing of the return to the original values, and the degree correlations on the background of TAHT with those in healthy persons of corresponding temperament indicates higher efficiency version of TAHT.

In contrast to the dynamics of changes in the content of OH in the period of MS in groups of patients Ch and Sg, taking the option of EAHT, a significant change in HDL content in the blood was not found, and against the background of TAHT, a significant increase in HDL content was found. In the Ph and M groups of patients who took the EAHT variant in the specified period, we found a decrease in HDL in the blood, and in the Ph and M groups who took the TAHT variant, it did not change significantly (Table 2).

Correlation analysis conducted between the dynamics of γ-background in the MS period and HDL content in the blood showed the presence of a significant and weak degree of communication in groups Ch and Sg, taking the option of EAHT. In contrast, in the groups Ch and taking TAHT received authentic video of a high degree of significance of correlation relationship, indicating that the increase in the content of HDL in the blood. The same relationship was obtained in groups Ch and Sg of healthy individuals (Table 3). In the Ph and M groups of patients receiving EAHT, the correlation between the studied parameters was significant inverse and high degree of significance, indicating a decrease in HDL in the blood. On the contrary, against the background of TAHT in the same groups, the relationship was the same direction, but very weak (table. 2). As stated above, by studying the variants of AHT, the authors found that in contrast to EAHT, TAHT essentially brings the value of the indicator and the degree of severity of the reaction of the body during MS (according to the correlation analysis) to those of the HA(LA) healthy persons of corresponding temperament.

Thus, the increase in the power of γ-background of the medium during the day before and during the MS period under the conditions of the earth's perturbed magnetic field was combined with an increase in the blood OH. The increase in the content of OH and decrease in HDL with simultaneous increase in intravas-

Table 2

Dynamics of γ-background (ur/h) environment and content in HDL (mmol/l) in the serum of individuals HA in the background, EAHT (E) and TAHT(T) in the days of magnetic storms during the study period from с 1998 по 2017 г.

Days		-7 - -6	-5	-4	-3	-2	-1	**0**	+1	+2	+3	+4	+5	+6	+7	Всего
γ-background		8.51-8.50±0.01	8.46±0.01	8.58±0.01	8.41±0.01	8.45±0.01	8.70±0.01	8.78±0.01	8.80±0.01	8.65±0.01	8.70± 0.01	8.59±0.01	8.47±0.01	8.62±0.01	8.49±0.01	8.58±0.007
Choleric	E	1.54-1.58±0.03 44 - 45	1.54±0.03 44	1.60±0.03 43	1.52±0.03 48	1.54±0.03 43	1.53±0.02 49	1.60±0.02 48	1.59±0.02 46	1.50±0.02 47	1.58±0.03 44	1.66±0.04 43	1.58±0.03 44	1.53±0.03 43	1.60±0.04 45	1.57±0.001 676
	T	1.76-1.78±0.03 44 - 43	1.80±0.03 44	1.72±0.04 46	1.81±0.03 44	1.82±0.03 45	1.89±0.02 44	1.86±0.02 46	1.89±0.02 44	1.88±0.03 44	1.75±0.06 48	1.80±0.03 43	1.81±0.03 46	1.73±0.03 43	1.83±0.02 44	1.81±0.003 668
	H	1.78- 1.74±0.04 45 - 44	1.79±0.04 45	1.68±0.04 44	1.80±0.03 46	1.81±0.03 44	1.88±0.02 46	1.89 ±0.02 44	1.87±0.02 45	1.90±0.02 44	1.74±0.03 46	1.78±0.03 44	1.83±0.04 44	1.73±0.04 46	1.88±0.03 46	1.81±0.003 673
Sanguine	E	1.47-1.49±0.04 46 - 46	1.50±0.04 44	1.47±0.04 47	1.49±0.05 44	1.48±0.05 43	1.50±0.05 48	1.49±0.03 49	1.50±0.04 44	1.49±0.04 43	1.50±0.04 45	1.51±0.03 43	1.50±0.03 46	1.48±0.03 47	1.47±0.03 47	1.49±0.003 682
	T	1.52-1.50±0.04 44 - 46	1.58±0.04 47	1.56±0.03 43	1.57±0.03 44	1.52±0.04 43	1.54±0.03 45	1.65±0.03 48	1.67±0.04 44	1.65±0.03 46	1.58±0.03 44	1.49±0.04 46	1.59±0.03 48	1.48±0.03 45	1.58±0.03 46	1.57±0.003 690
	H	1.54-1.53±0.03 48 - 45	1.55±0.04 44	1.58±0.04 48	1.57±0.03 44	1.57±0.03 44	1.50±0.04 45	1.63±0.02 48	1.68±0.02 46	1.62±0.02 44	1.60±0.04 46	1.55±0.03 48	1.58±0.03 46	1.50±0.03 46	1.58±0.03 49	1.57±0.002 691
Phlegmatic	E	1.06-1.09±0.03 44 - 46	1.17±0.03 45	1.07±0.03 47	1.15±0.04 48	1.17±0.03 48	1.08±0.04 49	1.07±0.03 52	0.80±0.03 54	0.76±0.02 47	0.78±0.02 46	0.86±0.02 49	0.90±0.03 48	1.06±0.04 44	1.16±0.04 48	1.01±0.005 715
	T	1.33-1.30±0.04 44 - 43	1.27±0.03 44	1.32±0.04 46	1.32±0.04 44	1.34±0.03 46	1.33±0.03 46	1.30±0.03 48	1.27±0.03 47	1.26±0.03 49	1.27±0.04 44	1.30±0.04 43	1.42±0.03 44	1.49±0.04 43	1.32±0.03 48	1.25±0.004 679
	H	1.30-1.34±0.03 49 - 49	1.33±0.03 44	1.39±0.03 46	1.37±0.03 44	1.39±0.03 44	1.35±0.04 45	1.33±0.04 49	1.29±0.03 55	1.27±0.02 49	1.29±0.03 46	1.31±0.03 44	1.29±0.02 49	1.42±0.04 48	1.31±0.03 48	1.27±0.004 708
Melancholic	E	0.90-0.92±0.03 44 - 45	0.94±0.03 44	0.92±0.03 43	0.91±0.02 44	0.92±0.03 43	0.87±0.03 44	0.86±0.02 47	0.65±0.02 44	0.63±0.02 43	0.63±0.02 44	0.84±0.04 43	0.84±0.03 44	0.73±0.04 43	0.90±0.04 46	0.82±0.003 661
	T	1.23-1.20±0.03 44 - 47	1.21±0.03 47	1.20±0.04 48	1.24±0.03 45	1.17±0.03 48	1.24±0.02 45	1.22±0.02 48	1.17±0.03 45	1.20±0.03 46	1.22±0.02 44	1.18±0.02 43	1.24±0.03 44	1.20±0.04 46	1.23±0.03 44	1.21±0.005 684
	H	1.18-1.20±0.02 46 - 45	1.18±0.02 46	1.20±0.03 46	1.20±0.03 44	1.21±0.06 44	1.20±0.03 45	1.17±0.03 48	1.18±0.02 49	1.18±0.02 44	1.20±0.02 46	1.21±0.02 47	1.26±0.04 46	1.29±0.04 46	1.20±0.04 44	1.20±0.004 686

cular hemolysis of erythrocytes (extrapolate – and other cells of the body) in HA(LA) healthy individuals during the MS period was noted by us in an early study [8]. It is known that cholesterol is used as a component for the construction and restoration of cell membranes, and HDL prevent (extract) excessive accumulation of cholesterol in cells. Hence, it can be assumed that due to the damage and (or) destruction of cell membranes in the MS period, an increase in the content of OH in the blood is a consequence of the reaction of the body aimed at increasing the resistance of cell membranes to damaging effects, and OH here is the initial structural material. But sympathotonics Ch and on the background of EAHT the content of HDL did not change, and in the background, TAHT as in healthy individuals, increased. Perhaps it is a feature of the organism's reaction sympathotonic aimed at removing excess OH of blood on the background of TAHT can be regarded as a manifestation of «antiatherogenic» response. Indeed, groups Ph and M of patients with AH, especially HA, are at risk for atherosclerosis and complications [7, 8]. They have in the background holding EAHT the content of HDL declined, pointed to the change in the intensity of lipolytic processes. And only against the background of TAHT, the content of HDL practically did not change, as in healthy Ph and M individuals, which indicates in favor of the effectiveness of TAHT.

Conclusion. 1. In the period of MS with an increase in γ-background power (within the limits of the regional norm) the content of total cholesterol in the blood increased, and HDL decreased in a consistent temperamental series from choleric to melancholic: HA(LA) Ch–Sg–Ph–M.

2. In healthy individuals and patients with hypertension, against the background of both variants of AHT, the blood content of total cholesterol increased: a day before MS in choleric, on day 1 MS in sanguine, and phlegmatic and melancholic on day 2 from the beginning of the magnetic storm.

3. The peculiarity of the body reaction is that during the MS period the HDL content in Ch and Sg patients against the background of

Table 3

Correlation coefficients between the values of γ-background, serum cholesterol and HDL in the blood before, during and after magnetic storms in high and low anxiety patients with AH-II with different temperament against the background of empirical (E) and targeted (T) AHT during the study period from 1998 to 2017.

	Cholesterol, mmol/l				HDL, mmol/l			
	Highanxiety		Lowanxiety		Highanxiety		Lowanxiety	
	patient	health	patient	health	patient	health	patient	health
ChE	+0.588± 0.02	+0.396± 0.01	+0.451± 0.01	+0.255± 0.01	+0.203± 0.02	+0.483± 0.02	+0.476± 0.02	+0.543± 0.02
ChT	+0.403± 0.01		+0.231± 0.01		+0.486± 0.02		+0.558± 0.02	
SgE	+0.682± 0.01	+0.386± 0.01	+0.458± 0.01	+0.258± 0.01	+0.261± 0.02	+0.449± 0.03	+0.478± 0.03	+0.569± 0.03
SgT	+0.439± 0.03		+0.266± 0.01		+0.470± 0.02		+0.572± 0.03	
PhE	+0.693± 0.01	+0.451± 0.02	+0.476± 0.01	+0.267± 0.01	-0.562± 0.03	-0.248± 0.03	-0.438± 0.02	-0.235± 0.01
PhT	+0.479± 0.03		+0.260± 0.01		-0.229± 0.03		-0.246± 0.02	
ME	+0.709± 0.01	+0.459± 0.01	+0.481± 0.01	+0.277± 0.01	-0.658± 0.03	-0.222± 0.02	-0.349± 0.02	-0.252± 0.02
MT	+0.476± 0.02		+0.273± 0.01		-0.214± 0.03		-0.228± 0.02	

EAHT did not change, and in Ph and M decreased, while against the background of TAHT in Ch and Sg it increased, and in groups Ph and M – did not change, as in healthy individuals of the corresponding temperament.

4. Against the background of the TAHT, the period of return of the content of the studied parameters to the initial values, as well as their level in the blood and the degree of severity of the reaction (according to the correlation analysis) were the same as in healthy individuals of the corresponding temperament, which indicates a more effective option of antihypertensive therapy aimed at relieving the features of the psychosomatic status of patients in comparison with EAHT.

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TOPICAL ISSUE

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Physiological and biochemical aspects of smoking in Yakutia

The article reports the influence of tobacco smoking on the indices of pulmonary function testing and on the biochemical indices (including the some indices of antioxidant system) of the organism of the inhabitants of Yakutsk. The indices of pulmonary function testing (PFT) were determined in accordance with the recommendations of the Russian society of pulmonologists (M., 2003, 2016). The intensity of the peroxide lipids oxidation (PLO) was determined on the concentration in the blood of malonic dialdehyde (MDA). The state of the antioxidant protection of organism was evaluated according to the activity of superoxidedismutase (SOD), catalase and total antioxidant activity of the blood plasma. The concentration of uric acid, total bilirubin and cholesterol in the blood serum was determined on the automatic biochemical analyzer Cobas mira plus of the firm La Roche.

Keywords: smoking tobacco, the chronic obstructive diseases of lungs (COPD), the pulmonary function testing (PFT), malonic dialdehyde (MDA), superoxidedismutase (SODAS), catalase.

Introduction. The respiratory system, being an open one, is one of the first to protect the body from the adverse effects of environmental factors. Smoking as an aggressive risk factor contributes to the development of bronchopulmonary, oncological and cardiovascular diseases. Tobacco smoke is one of the most aggressive smokes, so-termed "pro-oxidant pollutants". It contains a number of chemically active components: nicotine, formaldehyde, benzopyrenes, nitrogen oxide, cadmium, urethane, vinyl chloride, etc. All these components have a direct effect not only on the surface layer of the bronchoalveolar secretion and epithelial cells of lungs, but also on the internal milieu of the body, causing an increase of free-radical oxidation [11, 15, 17, 25].

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It is known that the death rate from lung cancer among smokers is 20 times higher than among non-smokers. Smokers are 13 times more likely to suffer from angina and 10 times more likely to have peptic ulcers than non-smokers. Alveolar macrophages of smoker uptake insoluble particles of tobacco smoke and undergo characteristic morphological changes, which allow them to be classified as biomarkers of a smoker. Another marker is an increased blood nicotine level. Nicotine is a thrombogenic factor that causes damage to the endothelial cells of both large and small vessels. The chemical reaction of nicotine and nitrogen oxide leads to the formation of N-nitrosamines, which have significant carcinogenic properties. Urethane, benzopyrenes, and vinyl chloride are also classified as carcinogens [23]. A smoker has a high percentage of hemoglobin associated with carbon monoxide (CO). With the formation of the CO-hemoglobin complex, the main function of hemoglobin, the transport of oxygen to the tissues, is disrupted.

In the North, the cold factor plays a significant role in the impact on the bronchopulmonary system along with smoking. Inhalation of cold air often causes deterioration of bronchial patency even in healthy people [3]. Data on the effect of smoking on the bronchopulmonary system under the Far North conditions are available only in a few works [8].

The purpose of the research: assessment of the effect of tobacco smoking on the function of external respiration and biochemical indices that characterize the state of antioxidant defense in men in Yakutsk.

Research material and methods: We examined a total of 237 men aged 24 to 50 years. The control group consisted of 140 apparently healthy non-smoking men, mean age 45.28±2.43 (Me-45). Among them, there were 70 men of Yakut nationality mean age 45.71±2.32 (Me-44), and 70 men of Russian nationality with a period of residence in the North of at least five years, without a history of lung diseases mean age 44.86±2.21 (Me-44). There were 97 men with smoking history, mean age 46.78±3.56 (Me-46). Indices of the pulmonary function were estimated by spirometry. The evaluation of the results of pulmonary function, pneumotachometry and respiratory quotient was carried out in accordance with the recommendations of the Russian Respiratory Society [6, 14]. The concentration of malondialdehyde (MDA) in blood serum was estimated by colorimetric method using thiobarbituric acid [28]. The total antioxidant activity of blood plasma was determined using G.I. Klebanov's method [9]. Chemiluminescent methods for estimating the activity of superoxide dismutase (SOD) and catalase were used to evaluate the enzymatic system of the body's antioxidant defense [13]. The content of uric acid, total bilirubin and cholesterol in the blood serum