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CONTENTS

MATERIALS OF INTERREGIONAL SCIENTIFIC-PRACTICAL CONFERENCE «BIOMEDICAL ADAPTATION IN THE NORTH»

MAY 26, 2016

Metabolic aspects of human adaptation in the North

- 4 Kim L.B., Putiatina A.N., Kozhin P.M., Gevorgyan M.M., Ruskikh G.S., Voronina N.P., Kozaruk T.V.
The correlation between collagen and lipid metabolisms in residents of the Arctic Zone of the Russian Federation
- 7 Krivoshapkina Z.N., Semenova E.I., Olesova L.D., Sofronova S.I.
Comparative analysis of biochemical parameters of blood in the indigenous men, living in Yakutia rural and urban areas
- 10 Olesova L.D., Krivoshapkina Z.N., Semenova E.I., Yakovleva A.I., Efremova S.D.
The frequency of dyslipidemia among the Arctic region population of Yakutia
- 14 Mokrushnikov P.V., Osipova L.P., Gol'tsova T.V., Rozumenko A.A.
Erythrocyte membranes microviscosity in the population of Samburg village Yamalo-Nenets Autonomous Okrug
- #### Formation of the pathology in children and adult population of the North
- 16 Dutkin M.P., Yakovleva E.P.
Gender education in the prevention of suicidal behavior among the people of the Arctic Zone
- 19 Malysheva L.A., Zakharova F.A., Strekalovskaya A.A.
Age and women's health in the perimenopause
- 21 Sevostyanova E.V., Mitrofanov I.M., Nikolaev Yu.A.
Impact of comorbidity on meteosensitivity in hypertensive patients, residents of the Republic Sakha (Yakutia)
- 24 Ryabichenko T.I., Skosyreva G.A., Timofeeva E.P., Kulakova Yu.V., Kos'yanova T.G., Patrusheva Yu.N.
Features of the central nervous system pathology in children and adolescents of the Mirnyj region the Republic Sakha (Yakutia)
- 26 Verkhoturova E.N., Golderova A.S.
Gastroesophageal reflux disease complicated by Barrett's esophagus (at the example of the Medical unit Health of the Ministry of Internal Affairs of the RF on RS (Y))
- #### The regulatory system of the human body in the North
- 30 Marinova L.G., Savvina N.V., Savvina I.L.
Adolescent: growth and development in the North (review)
- 32 Lutov Ju.V., Selyatitskaya V.G., Deev D.A.
The association of insulin resistance and visceral adipose tissue dysfunction with components of metabolic syndrome in men of Western-Yakut industrial region
- 35 Poteryaeva O.N., Ruskikh G.S., Biushkina N.G., Rozumenko A.A., Churkina T.V., Goltsova T.V., Osipova L.P., Polyakov L.M.
Hormonal status and lipid profile in the residents of the village Samburg Yamalo-Nenets Autonomous District
- 37 Semenova E.I., Olesova L.D., Krivoshapkina Z.N.
Hemogram status of population of the Northern and Central Yakutia
- 41 Konstantinova L.I., Mironova G.E., Okhlopko E.D., Efremova A.V.
Status of pro- and antioxidant balance in freestyle wrestlers in Yakutia in different seasons
- 43 Mestnikova E.N., Makharova N.V., Pinigina I.A., Gavrilyeva K.S.
Electrophysiological adaptation of the cardiovascular system of sportsmen in the North
- #### Environment and health status of the North population
- 45 Alekseev A.Yu., Adamenko L.S., Zabelin V.A., Makarchuk A.L., Shestopalov A.M.
Bioremediation of oil contaminated areas as a basis for a system of measures to improve the human environment in Northern Siberia



- 48 Ivanov P.M., Abramov A.F., Tomskiy M.I., Makarova N.N., Goldereva A.S., Nikolaeva T.I., Zharnikova T.N., Myreeva S.A., Ivanova F.G., Nikolaev V.M., Kiprijanova N.S.
State of the environment and the population malignant neoplasms' morbidity in the Arctic regions of Yakutia
- 53 Samsonov S.N., Strekalovskaya A.A., Malysheva L.A., Petrova P.G., Zakharova F.A.
Relationship of the geomagnetic disturbance to the state of the cardiovascular system at high latitudes on the growth phase of the 11-year solar activity cycle
- 55 Bessonov P.P., Bessonova N.G.
Prevalence and risk factors of acid diseases in the adult population of the Republic Sakha (Yakutia)
- 57 Efremova A.V., Mironova G.E., Konstantinova L.I.
Actual nutrition indexes of the indigenous rural population of Yakutia
- 60 Tyaptirgyanov M.M., Tyaptirgyanova V.M., Chernyh A.V.
Evaluation of the quality water in the Kolyma River on an aquatic biota
"The Yakut Medical Journal" ISSUE MATERIALS
- Original researches**
- 64 Chugunova S.A., Nikolaeva T.Ya., Egorova T.S.
Characteristics of intracerebral hematomas associated with anticoagulant therapy
- 68 Kroshka D.V., Dolgalev A.A., Bragin E.A.
Time and graphic parameters of masticatory movements of subjects with temporomandibular joint and masticatory muscles dysfunction
- 71 Kazanov V.N., Garmaeva D.K., Khairullin R.M.
Topo- and morphometrical characteristic of the breast asymmetry in women of Yakutia in age 20-40
Methods of diagnosis and treatment
- 74 Pakharukova M.Yu., Dushkin A.V., Mordvinov V.A.
Comparison of anti-opisthorchiasis effect of praziquantel and complexes of albendazole with arabinogalactan
- 77 Pinelis I.S., Pinelis Yu.I., Ushnitsky I.D.
Treatment of keloid scars of auricles
- 78 Bashirov E.V., Duglas N.I.
Laparoscopic uterine artery occlusion as the stage of effective technology of treatment of uterine fibroids
Healthcare, medical science and education organization
- 80 Timofeev L.F.
Primary morbidity of the population of the Republic Sakha (Yakutia) in 2013-2014
- 83 Tarabukina S.M., Boyarova Z.A.
Minimum range of medicines compliance in the pharmaceutical institutions of the Republic Sakha (Yakutia)
Nutrition in the North
- 85 Abramov A.F., Sleptsova T.V., Efimova A.A., Vasilieva V.T.
The biological value of Yakut carp protein depending on its age
Scientific reviews and lectures
- 87 Vinokurov M.M., Savelyev V.V., Yalynskaya T.V.
The use of "DNA-comet" method for the detection and assessment of damage to the blood mononuclear cells induced by endogenous intoxication at the acute destructive pancreatitis
Clinical Case
- 90 Tappakhov A.A., Nikolaeva T.Ya., Alexeeva A.D., Okoneshnikova L.T., Klarov L.A., Davydova T.K.
Differential diagnosis of multiple system atrophy and essential tremor with Parkinson's disease
The chronicle of events



MATERIALS OF INTERREGIONAL SCIENTIFIC-PRACTICAL CONFERENCE «BIOMEDICAL ADAPTATION IN THE NORTH»

METABOLIC ASPECTS OF HUMAN ADAPTATION IN THE NORTH

Kim L.B., Putyatina A.N., Kozhin P.M., Gevorgian M.M.,
Russkikh G.S., Voronina N.P., Kozaruk T.V.

THE CORRELATION BETWEEN COLLAGEN AND LIPID METABOLISMS IN RESIDENTS OF THE ARCTIC ZONE OF THE RUSSIAN FEDERATION

ABSTRACT

The purpose of the study is to examine the relationship between collagen metabolism and lipid profile and the risk of cardiovascular pathology in middle-aged men living in the Arctic.

Material and methods. The study based on written consent was included apparently healthy middle-aged overweighted men, living and working in the European North (n=28). Anthropometric survey was conducted by measuring body height and weight, waist and hip circumference (WC, HC). Assessment of cardiovascular risk (CVR) was carried out on a scale of SCORE. The comparison group consisted of men, residents of Western Siberia (n=6). Blood and urine sampling was carried out in the morning. In the urine, assessed were the contents of total hydroxyproline (tGOP) and its forms: free (fGOP), peptid-bound (peGOP), protein-bound (prGOP). The serum contents of cholesterol and triglycerides, HDL, LDL, apolipoprotein A1 and apolipoprotein B (Apo A1, Apo B), matrix metalloproteinases - MMP-1, MMP-2, MMP-3, MMP-9, tissue inhibitors of matrix metalloproteinases - TIMP-1 and TIMP-2, TIMP-4 were measured. The results were processed using Statistica package applications.

Results of the study. The northerners had 2 times increase in the content of tGOP mainly due to peGOP and prGOP. The enhanced fibrosis involves local activation of the regulation system, which is manifested as an increase in the content of MMP-1 and MMP-9 and TIMP-1 and TIMP-4. Contents of LDL, HDL, Apo A1 and Apo B were in line with the reference values. Atherogenic coefficient in northerners was higher than 3, but less than that in the comparison group, but the cardiovascular risk was higher. Correlations between the contents of the GOP and cardiovascular risk factors, MMP and TIMP were established.

Conclusion. Increased cardiovascular risk scale SCORE, a relationship between the content of hydroxyproline and cardiovascular risk factors among northerners are evidences of the involvement of altered collagen metabolism in the pathogenesis of atherosclerosis.

Keywords: hydroxyproline, lipids, MMP, TIMP, cardiovascular risk, Arctic zone.

INTRODUCTION

The relevance of the study of collagen metabolism in the Arctic region is connected with the problem of fibrosis and the development of structural and functional changes in tissues and organs, which manifest in varying degrees of functional impairment. Clinical and morphological features of fibrosis in lungs and heart of the northerners have been described [3]. It has been found that the magnitude of changes in respiratory function depends on the state of organism adaptation, seasonality, physical activity and duration of exposure to extreme environmental factors (low temperature, dust, etc.) [8]. Revealed changes of external respiration, oxygen transport function of blood, the oxygen permeability of capillaries and the oxygen balance of blood, which are associated with polar experience and photoperiod, showed the involvement of these systems in the development of northern tissue hypoxia [1]. Regardless

of the pathogenesis of hypoxia, it is a powerful inducer of collagen synthesis [9]. Type I collagen is particularly sensitive to hypoxia: organ deposits of type I collagen increase sharply in hypoxia [10]. Since the main function of type I collagen is to prevent tissue distension [7], its accumulation can be expected to decrease the elasticity of tissues and vessels, which is especially important. However, data on the content of this extracellular matrix component in northerners are not available, since there were no direct investigations in the Arctic region.

It is known that men aged 40-59 years are more susceptible to atherosclerosis [4]. This is partially associated with hormonal status changes induced, among other factors, by the function of sex hormones. Male northerners aged 30-39 years have been shown to have 1.4 and 1.2 times lower levels of testosterone and dehydroepiandrosterone sulfate levels, respectively, than men under 29

[5]. There is evidence that Finnish men (24-45 years old) with low testosterone had higher levels of triglycerides and LDL [13]. The relationship between testosterone and risk of cardiovascular disease is widely discussed [11, 14]. Thus, the combination of factors such as northern tissue hypoxia, male gender, reproductive age, and low temperatures can increase the risk of pathology associated with impaired lipid and collagen metabolism.

The purpose of the study is to examine the relationship between collagen metabolism and lipid profile and the risk of cardiovascular pathology in middle-aged men living in the Arctic.

MATERIALS AND METHODS

Apparently healthy men (n = 28, average age 47.1 ± 2.3 years) working at mining facility in Murmansk region (67° N) were enrolled in the study on the basis of a written informed consent. Calculated average life expectancy in the North was 22.6 ± 2.1 years. The study

was conducted in the period of polar night (November-December). **Comparison group** (Novosibirsk citizens, n = 6) and northern group had no differences in gender, age, body mass index, marital status and chronotype.

The study was approved by RIECM Bioethical Committee and performed in compliance with the "Ethical principles for medical research involving human subjects" and in accordance with the "Rules of clinical practice in the Russian Federation".

Anthropometric examination, including measurement of height (cm), body weight (kg), waist circumference (WC, cm) and hips (HC, cm) was performed. Body mass index (BMI - kg / m²) was determined, and WC/HC relationship was evaluated. Cardiovascular risk (CVR) was assessed in accordance with National guidelines on cardiovascular prevention (2011).

Biological material (blood plasma and urine) was collected in the morning after an overnight fast, and was deep-frozen at -70°C after pre-treatment. Lipid profile was assessed using an automatic biochemical analyzer 480 AU Beckman Coulter (USA). Thermo Fisher Scientific sets (USA) were used to determine the levels of cholesterol (cholesterol, mmol / L) and triglyceride (TG, mmol / l). Levels of HDL (mg / dL), LDL (mmol / L), Apolipoprotein A1 (apo A1 mg/dl), and apolipoprotein B (Apo B mg/dL) were determined using DiaSys sets (Germany).

The level of the following components was determined in blood plasma using ELISA kits according to instructions: matrix metalloproteinases MMP-1, MMP-2, MMP-9 (Sigma-Aldrich Co. LLC, USA), MMP-3 (AESKU DIAGNOSTICS GmbH & Co. KG, Germany), tissue inhibitors of matrix metalloproteinases TIMP-1 and TIMP-2 (Sigma-Aldrich Co. LLC, USA), TIMP-4 (R & D Systems Inc., USA). The results were read using a microplate reader Stat Fax-2100 (Awareness Technology Inc., USA).

Collagen content was evaluated by the level of total hydroxyproline (tGOP) and its forms in the urine: free (fGOP), peptide-bound GOP (peGOP), protein-bound GOP (prGOP) [6]. The calibration curve was obtained for GOP standard dilutions (MM - 131,13, «Sigma»). Measurement of the optical density of the analyte was performed using a spectrophotometer PD-303S («Apel», Japan) at a wavelength of 560 nm.

The study was performed using the equipment of RIECM Shared Equipment Center "Modern optical systems".

Statistical processing of the results

Table 1

The content of hydroxyproline in urine and the content of matrix metalloproteinases and tissue inhibitors of matrix metalloproteinases in serum of men in the European North

Index	European North	Western Siberia	p
tGOP, mcg/ml	25,13±1,94	12,15±1,51	0,001
fGOP, mcg/ml	5,25±0,66	3,17±0,36	0,010
peGOP, mcg/ml	17,71±1,56	7,87±1,24	0,002
prGOP, mcg/ml	2,17±0,22	1,12±0,38	0,033
Index of fibrosis, SU	5,60±0,91	2,85±0,24	0,010
MMP-1, ng/ml	0,90±0,09	0,73±0,15	0,020
MMP-2, ng/ml	67,95±6,76	52,08±10,26	
MMP-3, ng/ml	31,90±2,73	35,17±5,20	
MMP-9, ng/ml	380,29±28,69	239,00±41,64	0,033
TIMP-1, ng/ml	713,05±79,29	310,42±62,92	0,015
TIMP-2, ng/ml	206,52±24,45	271,50±92,16	
tGOP, mcg/ml	1,62±0,14	1,17±0,11	0,020

Table 2

Anthropometric indices, lipid profile and the degree of cardiovascular risk in men in the European North

Index	European North	Western Siberia	p
BMI, kg/m ²	26,74±0,73	28,06±1,61	
WC, cm	93,68±2,05	100,17±4,50	
HC, cm	100,82±1,36	106,20±2,52	
WC/HC	0,93±0,01	0,91±0,01	
Cholesterol, mmol/l	5,01±0,23	5,08±0,31	
TG, mmol/l	1,37±0,19	2,03±0,35	
HDL, mmol/l	1,21±0,09	0,77±0,06	0,009
LDL mmol/l	2,70±0,14	2,95±0,21	
Apo A1, mg/dl	148,40±3,89	121,62±3,17	0,001
Apo B, mg/dl	50,64±3,48	91,38±10,20	0,001
Atherogenic coefficient, SU	3,53±0,35	5,88±0,90	0,018
Risk SCORE, %	3,89±0,83	0,96±0,56	0,044

was carried out using Statistica v. 10 (Stat Soft Inc., USA). To compare the two groups, Mann-Whitney U test was used. Relationships between parameters were established using Spearman's rank correlation. The results were presented as M ± m. Differences were considered statistically significant at p < 0.050.

RESULTS AND DISCUSSION

tGOP urine concentration in northerners was 2 times higher than in men from comparison group (Table 1). The increased concentration was caused by the increased level of all GOP forms, especially prGOP, which had 2 times higher level than in the comparison group. The results of a special pilot study in-

volving young Swedish men showed that increased excretion of tGOP and fGOP in the urine is caused by low temperatures [12].

There is an opinion that peGOP reflects the rate of biological collagen turnover (both synthesis and degradation), fGOP reflects the degradation of collagen and prGOP reflects synthesis of a young, immature collagen [6]. If so, the index of fibrosis can be calculated by obtaining the fGOP concentration value from tGOP concentration value and subsequent assignment to fGOP. This index reflects the synthesis of collagen (Table 1). In northerners, this index was 2 times higher than in the comparison group.

Table 3

Correlation between the content of individual forms of hydroxyproline and lipid, anthropometric indices in men in the European North (r; p)

Index	tGOP	fGOP	peGOP	prGOP
BMI	-0,56; 0,002	-0,41; 0,032	-0,47; 0,011	-0,48; 0,010
WC	-0,55; 0,002	-0,46; 0,014	-0,42; 0,024	-0,58; 0,001
HC	-0,57; 0,001	-0,40; 0,034	-0,47; 0,011	-0,57; 0,002
WC/HC	-0,39; 0,038	-0,44; 0,019	–	-0,43; 0,024
TG	-0,47; 0,018	-0,61; 0,001	–	-0,47; 0,016
cholesterol	–	-0,45; 0,022	–	–
LDL	–	-0,45; 0,025	–	–
Apo B	–	-0,47; 0,017	–	–
Atherogenic coefficient	-0,46; 0,025	-0,41; 0,045	-0,42; 0,042	–
MMP-1	–	–	0,55; 0,018	–
TIMP-4	–	–	0,48; 0,040	–
TIMP-4, ng/ml	1,62±0,14	1,17±0,11	0,020	

There is a hypothesis that serum prGOP is a component of the C1q complement, which is also related to acute-phase proteins [16]. However, high level of prGOP was shown to promote atherosclerosis in healthy males aged 40-59 [4].

Local regulation of extracellular matrix metabolism based on MMP/TIMP system seems to play a key role in increased content of GOP and the index of fibrosis. Northerners had an increased levels of MMP-1 and MMP-9, whereas the level other enzymes (MMP-2, MMP-3) did not differ from the control group (Table. 1). The levels of TIMP-1 and TIMP-4 in northerners were increased, while TIMP-2 level was similar to those of the comparison group.

Notably, the TIMP-4 level in blood plasma of miners in the European North did not differ from those of Finnish middle-aged men, who had no symptoms of cardiovascular disease [15]. The authors noted the direct association of TIMP-4 concentration with age, LDL, thickness of the carotid artery intima-media, and systolic blood pressure, which show the effect of TIMP-4 on the process of atherogenesis.

Thus, fGOP level increase can be attributed to increased levels of MMP-1 and MMP-9, and a significantly increased level of another GOP forms, peGOP, can be attributed to the high values of TIMP-1 and TIMP-4. However, TIMP-1 and TIMP-4 inhibitory effect on MMP-9 was insufficient.

Anthropometric indices northerners did not differ from those of comparison group (Table. 2). There were no differences in the content of cholesterol and triglycerides. Contents of LDL, HDL, Apo A1 and Apo B corresponded to the reference values, but varied between the groups. Atherogenic coefficient exceeded the limit in both groups, but the risk of cardiovascular disease on a scale of SCORE was significant only in the group of northerners (Table. 2). It is important that the results of men in the European North were similar to the results of men (40.4 ± 0.6 years) working at the mine in Mirny (North Asia). For example, total cholesterol content in blood serum in a group of overweight men (25.0-29.9 kg / m²), was 5.25 ± 0.07 mmol / l, HDL was 1.21 ± 0.02 mmol / l, TG was 1.30 ± 0.05 mmol / l, and atherogenic coefficient was 3.66 ± 0.10 SU [2].

The relationship between collagen metabolism and lipid metabolism in northerners is presented in Table 3. There was a reverse medium strength

correlation between anthropometric indicators (BMI, WC, HC) and all forms of GOP. There was a significant inverse relationship of medium strength between triglyceride and tGOP, fGOP, prGOP; as well as between cholesterol, LDL, Apo B, and fGOP; between atherogenic coefficient and tGOP, fGOP, peGOP. We established a direct correlation between MMP-1 and TIMP-4 with peGOP reflecting the dependence of this form of GOP on regulatory system.

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The authors:

FGBNU «Institute of Experimental and Clinical Medicine»; 630117, Timakov Street, 2, Novosibirsk:

Kim Elena Borisovna (Kim L.B.) - Chief Researcher, Head of the connective tissue biochemistry group, MD, Associate Professor, lenkim@

centercem.ru;

Putyatina Anna Nikolaevna (Putyatina A.N.) - Researcher, PhD, putyatina@ngs.ru;

Kozhin Pyotr Mikhailovich (Kozhin P.M.) - researcher; kozhinpm@gmail.com;

Gevorgyan Margarita Mailovna (Gevorgian M.M.) - Head of clinical and diagnostic department, PhD, gevorgyanmm@ngs.ru;

Russkikh Galina Sergeevna (G.S.) - researcher; PhD, sovet@niibch.ru;

Voronina Natalia Petrovna (Voronina N.P.) - doctor of clinical laboratory diagnostics; PhD (Biology);

Kozaruk Tatiana Vladimirovna (Kozaruk T.V.) - doctor of clinical laboratory diagnostics.

Krivoshapkina Z.N., Semenova E.I., Olesova L.D., Sofronova S.I.

COMPARATIVE ANALYSIS OF BIOCHEMICAL PARAMETERS OF BLOOD IN THE MEN, LIVING IN YAKUTIA RURAL AND URBAN AREAS

ABSTRACT

We surveyed the men of Yakutia indigenous population ($n = 150$) living in rural and urban areas. The shift of lipid metabolism in the direction of dyslipidemia was observed in men in Central Yakutia, while among urban residents the signs of disadaptation were more marked. The men who lived in the north of Yakutia, there was no deviation from the norm. We revealed the correlation of lipid metabolism index (atherogenic index) with metabolic equilibrium index (De Ritis Ratio) that allows recommending the use of De Ritis Ratio for the formation of groups at risk of cardiovascular pathology and timely implementation of preventive measures.

Keywords: indigenous population of Yakutia, the activity of enzymes, lipids, metabolic equilibrium, De Ritis Ratio.

Recent studies show that in today's socio-economic environment of genetically enshrined mechanisms of energy metabolism in the restructuring of the indigenous population is not enough [2, 4, 8, 9, 11, 14]. Increased metabolism of lipids needed for adaptation to the climate and geographical conditions of the North, with a small amount of replenishment of reserves of the body can lead to pre-pathological changes in the body. Currently functional exhaustion manifested in the increase of cardiovascular diseases among the indigenous population of Yakutia [1, 5, 6]. The role of lipid metabolism in the development of atherosclerotic vascular disease which is a risk factor for cardiovascular diseases, early detection of changes in biochemical parameters involved energy metabolism is important.

Purpose of the study. Detection of maladjustment biochemical parameters of blood in indigenous men depending on place of residence.

MATERIAL AND METHODS

In total we studied 150 indigenous men of Yakutia aged 22 to 70 years (mean age 43.23 ± 1.23 yrs). People living in the northern regions were 55, in Central Yakutia: 68 living in urban area, in rural area - 27. Criteria of exclusion were: exacerbation of chronic diseases, the presence of cancer, infections and viral diseases. In addition, people with coronary artery disease who underwent heart attack and stroke were excluded.

To assess the objective state during survey questionnaire was conducted, developed in FBGNU "Yakult Science Center of complex medical problems"; we obtained informed consent of respondents to be studied, blood test. Blood for biochemical studies was taken from the cubital vein on an empty stomach in the morning, 12 hours after a meal.

Determination of biochemical parameters was carried out by enzymatic method on an automatic biochemical analyzer «Cobas Mira Plus» company «La

Roche» (Switzerland) using reagents «Biocon» (Germany). Calculation of LDL cholesterol (low density lipoprotein) and LDL (cholesterol VLDL) was performed according to the formula Friedewald et al. (1972). Atherogenic coefficient was calculated according to the formula proposed by A.N. Klimov (1977): $Ca = (\text{cholesterol} - \text{HDL cholesterol}) / \text{HDL-C}$.

The study was approved by the decision of the local Ethics Committee of the Yakult Science Center of complex medical problems.

RESULTS AND DISCUSSION

Blood biochemical parameters in men living in rural areas in the north of Yakutia were varied in the range of normal values (Table). The relatively high level of albumin in this group compared with the Central Yakutia residents can be attributed to the increased energy metabolism, as one of the important functions of albumin is his participation in the transport of fatty acids. In addition, albumin is the low molecular anti-

oxidant. In rural men of Central Yakutia above normal values were gamma-GT and alkaline phosphatase. In this group, compared to the northern rural men activity of alkaline phosphatase was significantly higher, creatine kinase, ALT (alanine aminotransferase), AST (aspartate aminotransferase), and creatinine were significantly associated with a lower level of glucose. The high activity of these enzymes may be related to the maintenance and restoration of the total protein level through on the glucose-alanine shunt: the combustion of substrates with the participation of AST, maintaining glucose levels with the participation of ALT and increasing transport of amino acids with the participation of gamma-GT. The increase of alkaline phosphatase in the blood, not only provides the dephosphorylation and glucose output from the cell, but also forms a large amount of inorganic phosphate affecting bioenergy in the cell and the organism as a whole. Significant increase in serum creatinine and creatine kinase, which is part of the CK-system is probably related to a component of ATP and increased the body's need for energy substrates.

The men living in urban areas in Central Yakutia demonstrated high activity of creatine kinase, and a high level of creatinine may be associated with the adaptation of indigenous people to urban conditions, depending on the CPC-system (including creatine, phosphocreatine, creatinine) is the transfer of phosphate energy of mitochondrial ATP in the cell base. Roslyj I.M. et al. consider creatine kinase (CK) completely stress-dependent enzyme, which is a measure of the implemented energy potential of the organism. At rest, creatine kinase can be determined (zero activity), but when any stress, creatine kinase activity is increased to virtually unlimited values [12]. On maladaptive changes in blood biochemical parameters among urban males also indicate that exceed activity ALT and glucoses level.

At high latitudes, energy metabolism switches from carbohydrate to lipid type, i.e., the carbohydrate contribution to the energy exchange is lower a the fat and higher. This is a typical manifestation of adaptive changes in the body, aimed at recycling more energy-intensive materials. Indigenous adapted to climate-geographical high latitudes, increase blood levels of the atherogenic fractions of cholesterol (LDL and VLDL) does not lead to the development of atherosclerotic vascular changes due to the high activity of lipoprotein lipase and hepatic triglyceride lipase, and the balance of

atherogenic and antiatherogenic cholesterol fractions (HDL) is preserved [10].

In our study, shift of lipid metabolism in the direction of dyslipidemia was observed in men in Central Yakutia, while in the urban dwellers disadaptive signs were distinct. Men living in the north of Yakutia had no abnormality. Dyslipidemia in men in Central Yakutia indicate failure due to genofenotypically mechanisms of adaptation to extreme environmental factors. Factors of depletion of functional reserves of the body are not only a departure from the traditional way of life and diet, but also social and economic reforms carried out in recent decades. Conducted in Yakutia medical and social research has shown that high levels of trait anxiety among rural residents, primarily was associated with low quality of life [11]. A prolonged state of emotional stress is one of the causes of failure of adaptive reactions of the organism [3, 9].

These significant differences in the activity of enzymes show different intensities of adaptive metabolic processes, depending on the place of residence. One of the indicators of metabolic balance is a de Rytis factor, since the activity of AST and ALT are a simplified common metabolic marker: ALT - the level of anabolism, AST - a level of catabolism [12].

Metabolic balance is achieved within 1.3-1.5. In study conducted by us assigned genetic resistance to the extreme conditions of the North is kept in the northern men. In Central Yakutia low levels of factor de Rytis combined with high atherogenic indicate a depletion of functional reserves of the body and is a sign of disadaptation.

Such biochemical parameters of blood as cholesterol, glucose and total protein are an absolute constant. The sum of two summands - cholesterol and glucose - rigid biological constant and in healthy people it is equal to 10.0 mmol / l. At an energy deficit it is caused reciprocity of these two terms: lowering glucose level leads to higher blood cholesterol level, or vice versa, but at the adaptive condition of the body there is a constant dozen [13].

Just on the north of Yakutia in men the intensity of energy metabolism meets the needs of all functional systems at the moment in these conditions, which is confirmed by biochemical blood parameters: the sum of cholesterol and glucose (10.08 mmol / L), coefficient de Rytis ($1.50 \pm 0,08$) and the atherogenic ratio below 3 (2.69 ± 0.18).

The carried out correlation analysis

showed that atherogenic factor had a direct link with the place of residence ($r = 0.293$, $p = 0.000$). Direct conjugate relation with coefficient atherogenic had: γ -GT activity ($r = 0,357$, $p = 0.000$), serum uric acid (the low molecular weight antioxidant) ($r = 0,356$, $p = 0.000$) and serum creatinine ($r = 0,228$, $p = 0.016$). Besides atherogenic factor had direct communication with ALT levels ($r = 0.385$, $p = 0.000$) and AST ($r = 0.224$, $p = 0.007$), indirect communication with the coefficient de Rytis ($r = -0.247$, $p = 0.003$).

CONCLUSION

1. The most pronounced disadaptation changes of blood biochemical parameters were found in urban men who had departed from the traditional way of life and, perhaps, the traditional food.

2. Identified correlation indicator of lipid metabolism disorder (atherogenic index) with an indicator of metabolic equilibrium (coefficient de Rytis) can be recommended to use a coefficient de Rytis to form groups at risk of cardiovascular disease and timely preventive measures.

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Table 1

Biochemical parameters of blood in men, depending on the place of residence

Biochemical parameters	The inhabitants of the northern regions (n=55)	Villagers Central Yakutia (n=68)	Urban residents of Central Yakutia (n=27)
Lactate dehydrogenase, U / L	389,12±18,62	379,12±8,39	419,09±22,12
Gamma-GT, U / L	40,58±3,73	56,57±5,92	44,46±9,42
Alkaline phosphatase, U / L	214,47±11,60	270,40±8,53 *p=0,000	228,78±17,71
Creatine kinase, U/l	109,83±9,56	130,63±9,69 *p=0,015	284,45±52,98 *p=0,000 **p=0,005
ALT, U / L	18,33±1,37	28,45±2,17 *p=0,000	34,63±4,07 *p=0,000
AST, U / L	24,11±1,18	33,91±3,22 *p=0,007	32,30±1,96 *p=0,000
Coefficient de Rytis	1,50±0,08	1,28±0,06 *p=0,032	1,21±0,15 *p=0,015
Triglycerides, mmol / l	0,86±0,06	1,04±0,07 *p=0,038	1,08±0,12
Cholesterol, mmol / l	5,30±0,14	5,79±0,15	6,0±0,25 *p=0,016
HDL-C, mmol / l	1,58±0,07	1,49±0,05	1,48±0,12
LDL-C, mmol / l	3,32±0,12	3,80±0,15 *p=0,044	3,94±0,31
VLDL-C, mmol / l	0,39±0,03	0,48±0,03 *p=0,026	0,68±0,11 *p=0,001 **p=0,024
Coeff. atherogenicity	2,69±0,18	3,17±0,19	3,44±0,32 *p=0,035
Glucose, mmol / l	4,78±0,08	4,24±0,06 *p=0,000	5,65±0,21 *p=0,000 **p=0,000
Creatinine, mmol / l	74,09±2,33	82,04±1,21 *0,001	93,67±3,19 *p=0,000 **p=0,003
Urea, mmol / l	4,88±0,25	5,31±0,14	5,15±0,83
Uric acid, µmol / l	280,23±9,96	309,45±11,51	309,22±22,08
Total protein, g / l	78,29±0,67	78,71±0,47	77,54±1,09
Albumin, g / l	49,66±0,67	48,85±0,49	47,62±0,83

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Authors:

Krivoshapkina Zoja Nikolaevna – candidate of biological sciences, the senior researcher of biochemical mechanisms of adaptation FGBNU “Yakut Scientific Center of complex medical problems”; 677019, Yakutsk, Sergeljahskoe shosse, 4; zoyakriv@mail.ru.

Semjonova Evgenija Ivanovna – candidate of biological sciences, candidate of biological sciences, the senior researcher of biochemical

mechanisms of adaptation FGBNU “Yakut Scientific Center of complex medical problems”; 677019, Yakutsk, Sergeljahskoe shosse, 4; kunsuntar@mail.ru.

Olesova Ljubov’ Dygynovna – candidate of biological sciences, the head of the laboratory biochemical mechanisms of adaptation FGBNU “Yakut Scientific Center of complex medical problems”; 677019, Yakutsk, Sergeljahskoe shosse, 4; oles59@mail.ru.

Safronova Sargilana Ivanovna – candidate of medical sciences head of the organizational department FGBNU “Yakut Scientific Center of complex medical problems”; 677019, Yakutsk, Sergeljahskoe shosse, 4.

Olesova L.D., Krivoshapkina Z.N., Semenova E.I., Yakovleva A.I., Efremova S.D.

THE FREQUENCY OF DYSLIPIDEMIA AMONG THE ARCTIC REGION POPULATION OF YAKUTIA

ABSTRACT

Biomedical research of the indigenous Arctic population of the Republic Sakha (Yakutia) for 1994 and 2013 showed reduction in the proportion of people with normal cholesterol level and increase of proportion of the individuals with borderline high and high cholesterol. There has been growth of triglyceride level as well. High cholesterol is not always accompanied by a shift towards the atherogenic changes, in 75% of men and 76% of women increased cholesterol level can be considered as a consequence of the process of adaptation to changing conditions of life. The imbalance in lipid profile was identified also in people with normal cholesterol level, which is indicating the need for a mandatory determination of lipid fractions, regardless of its level. The tension of regulatory mechanisms of metabolism of proteins and carbohydrates, associated with atherogenic changes in lipid profile requires assessment of all risk factors and mandatory correction of the diet.

Keywords: adaptation, indigenous people, lipid metabolism, atherogenic changes.

Violation of adaptation of the indigenous inhabitants of the Arctic observed in recent decades is confirmed by the demographics. The average duration of life of northerners of Russia decreased by 11 to 14 years, mortality has increased in 1.4 times in comparison with industrialized northern countries [20]. In the Republic Sakha (Yakutia) in the Arctic group of regions the coefficient of total mortality of the working-age population by 2012 against 1990 increased in 2.5 times, and it is significantly higher than average republican index. The process of depopulation is associated primarily with high mortality from diseases of the circulatory system (345.7 per 100.000) [8], although until recently the incidence of hypertensive heart disease, coronary disease and obesity among the small peoples of the Russian North has been at a rather low level [2, 13, 21]. The deterioration of population health in the Arctic is associated with the deterioration

of the quality of life, when to the natural risk factors, were added difficult socio-economic, health infrastructure and anthropogenic factors [11, 16, 19, 24]. Stress factors, the gradual departure from the traditional lifestyle and change of diet, increased in recent years, could not fail to affect homeostatic body systems, in particular on the regulation of lipid metabolism. The imbalance in lipid profile towards atherogenic is regarded as one of the major risk factors of cardiovascular diseases.

Therefore, the evaluation of lipid metabolism of the indigenous population of the Arctic region in dynamics is relevant in the justification of increasing the efficiency of preventive measures for preservation and strengthening of health, improvement of quality of life of indigenous peoples of the North.

The purpose of the study was to assess the frequency of the atherogenic lipid profile of the indigenous population

of Sasyklyah Anabar district Sakha Republic (Yakutia).

MATERIAL AND METHODS

In the spring season of 1994 in a cross-sectional epidemiological study we examined a random sample of the indigenous population of Sasyklyah Anabar district Sakha Republic (Yakutia). We surveyed 134 indigenous people (22 men and 109 women). The average age was 38.8±1.19. In April 2013 in the village we surveyed 170 people aged 18 to 75 years (107 women and 63 men). The average age of patients was 46.6±0.77 years (men were at the age 46.3±1.53; women - 46.8 ± 0.90). To identify changes in the level of cholesterol and triglycerides of them we selected a group of 139 individuals in the appropriate age-sex structure as the sampling of 1994 (29 males, 110 females, average age of them 38.8±1.19). All study participants were representatives of indigenous populations: Yakuts, Evens and Evenks.

The study was approved by the local Committee on biomedical ethics of "Yakut scientific center of complex medical problems" and carried out subject to voluntary informed consent of participants.

Biochemical parameters were determined by enzymatic method using standard kits on a biochemical analyzer. In the morning on an empty stomach serum, we take into account the activity of aspartate aminotransferase (AST), alanine aminotransferase (ALT), gamma-glutamyl transferase (γ -GT), glucose, total cholesterol (TC), triglycerides (TG), cholesterol of high density lipoproteins (HDL cholesterol). The concentration of low density lipoproteins cholesterol (LDL cholesterol) and cholesterol of lipoproteins of very low density (VLDL cholesterol) was calculated by the formula of Friedewald et al. [26]. To assess the atherogenic lipid profile of blood were used the following markers of atherogenicity: the ratio of total cholesterol to cholesterol of lipoproteins of high density (total cholesterol/HDL cholesterol) (more than 5); cholesterol low-density lipoproteins to high (LDL cholesterol/HDL LPV) (3.3) [19, 25]. The atherogenic coefficient (K_a) was calculated by the formula proposed by A. V. Klimov (1990): $CA = \text{total cholesterol} - \text{HDL cholesterol} / \text{HDL cholesterol}$ (< 3.0). K_a 4.1 is used as an indicator of risk of development of atherosclerosis. Statistical processing of obtained results was performed using the statistical package SPSS 11.5 for Windows. Quantitative data are represented as averages (M) and standard error of the mean (m) under the normal distribution. The statistical significance of differences was determined by paired t-Student test for independent samples, the threshold level of statistical significance was considered at value of $p < 0.05$. Correlation analysis was carried out by the method of Spearman.

THE RESULTS AND THE DISCUSSION

The change of lipid metabolism of Saskylah indigenous people for 19 years is characterized by growth of average level of total cholesterol (TC) by 10.7%, reduction in the share of persons with an "optimal" level of total cholesterol (< 5.2 mmol/l) by 19%; increase the proportion of persons with "borderline high" (5,21 - 6,19 mmol/l) and "high" levels of total cholesterol (≥ 6.2 mmol/l) in 15% and 4%, respectively (Fig.).

The proportion of violations of the cholesterol in dynamics, %

Average triglyceride levels increased

by 19%. The increase of cholesterol levels was observed by increasing the content as triglycerides, LDL cholesterol, and HDL cholesterol. The increase of cholesterol levels was observed by increasing the content as triglycerides, LDL cholesterol, and HDL cholesterol. Lipids atherogenicity is detected not only in persons with high total cholesterol, but also those whose level of total cholesterol is within normal values, i.e. there is a destabilization of the balance of the lipid profile. On the concept of Panin L. E. (1978) metabolic adaptation of indigenous people to the rigors of high latitudes was accompanied by the formation of "polar metabolic type" with increasing energy the role of protein and fat. Lipid metabolism of the Northern peoples in comparison with the migrant population was characterized by lower blood levels of total cholesterol, triglycerides and higher levels of antiatherogenic fraction of lipoproteins [1, 6, 7, 10, 15].

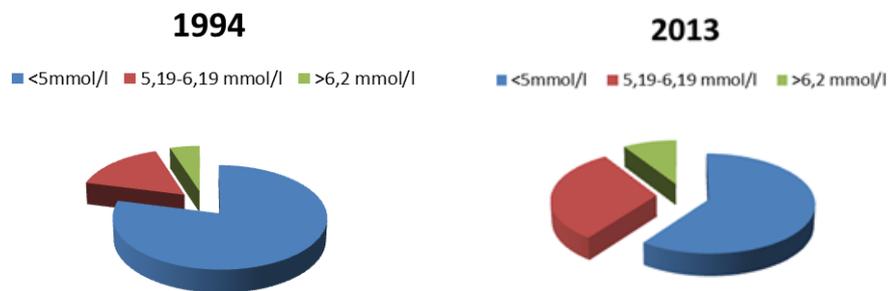
In men with normal content of cholesterol atherogenic violation is observed in 20% of patients, and for women to 43% depending on the indicators of atherogenic markers. Among persons with borderline high total cholesterol (> 5.2 mmol/l) risk of

developing atherosclerosis was detected in 30% of men and 37% women (table 1).

The average percentage of atherogenic shifts according to the ratio of total cholesterol/HDL cholesterol, LDL cholesterol/HDL cholesterol and according to K_a does not have significant gender differences. In the examined population the proportion of persons with atherogenic shift in lipid profile among men was on average 25% (23%, 26,9%, 25,3) respectively), among women the average - 24% (22,3%, 28,8%, 22% respectively). In the remaining 75% of the surveyed men and 76% of women a high level of total cholesterol has not atherogenic changes (table 2).

Percentile distribution of indicators of markers of atherogenic and frequency of atherogenic disorders

According to the other authors among the indigenous population of the Gornyj and Zhigansky districts of Yakutia, hypercholesterolemia in 80% of cases in men and 87 % in females was not accompanied by a shift in the direction of atherogenic fractions and was compensated adaptive in nature [18]. Negative correlation of marker of atherogenic and de Rytis coefficient indicates a metabolic shift, since the



The frequency of atherogenic disorders, depending on the level of cholesterol

Table 1

The frequency of atherogenic infringements depending on the level of cholesterol

TC, mmol/l	TC/HDL chol. > 5		LDL chol / HDL chol > 3,3		Atherogenic coefficient > 4,1	
	Men	Women	Men	Women	Men	Women
<5,20	20 (8/40)	14,2 (14/98)	20 (8/40)	19,4 (19/98)	20 (8/40)	43,9 (43/98)
$\geq 5,20$ <6,20	29,4 (5/17)	28 (14/50)	41,1 (7/17)	34 (17/50)	29,4 (5/17)	26 (13/50)
$\geq 6,20$	33,3 (2/6)	59,1 (13/22)	33,3 (2/6)	59,1 (13/22)	33,3 (2/6)	59,6 (13/22)

Note. The data presented in the format % (n/N).

Table 2

Percentile distribution of indicators of markers of atherogenic and frequency of atherogenic disorders

parameter	n	Percentiles					The share of persons with a violation, n (%)
		10	25	50	75	90	
Men							
TC/HDL cholesterol	63	3,27	3,66	4,26	4,98	6,62	15 (23)
LDL chol./HDL chol.	63	1,82	2,38	2,80	3,62	5,05	17 (26,9)
Atherogenic coefficient	63	2,20	2,67	3,30	4,02	5,64	16 (25,3)
Women							
TC/HDL cholesterol	170	2,83	3,41	4,20	4,91	6,18	38 (22,3)
LDL chol./HDL chol.	170	1,69	2,16	2,83	3,42	4,32	49 (28,8)
Atherogenic coefficient	170	1,90	2,40	3,20	4,00	5,07	39 (22)

change of transaminases in the blood reflects adaptive mechanisms of metabolic nature. The change in the balance of correlation transaminases - coefficient de Rytis downward shows the violation of lipid metabolism, therefore, on the assessment of Krivoschapkina Z. N. (2010) the low coefficient de Rytis (liver variant) can be used as an inexpensive marker of disorders of lipid metabolism and disadaptive reactions of the organism [9]. One of the main causes of changes in lipid metabolism of the surveyed population over the past decades is the changing nature of power. In extreme environmental conditions, the formation of "polar metabolic type" indigenous peoples have contributed to the traditional way of life and protein-lipid type of food, which is more than adequate, stress-resistant, and reduces the ecological stress due to low levels of cortisol than people with another type of food [3, 14, 17, 23]. By assessment of S. L. Safonova (1995) in residents of Yakutia the nature of power has gradually shifted from protein-lipid type on protein-carbohydrate type [17]. This fact concerning to residents of Arctic village Saskylah is confirmed by the results of the evaluation of the actual nutrition that we held in 2007. The imbalance in the daily diet is due to the excessive intake of carbohydrates, including pure sugar (93.3 g, instead of 35g recommended by the WHO) [21]. As a result, in this period of time, there is an increase in the average glucose in the blood by 6.7% and increase the proportion of persons with high glucose levels. A

direct correlation of glucose levels and a stronger connection of high glucose levels with markers of atherogenic is a testament to the tension regulation of metabolism of carbohydrates and lipids. In addition, environment of Anabar district is under quite high anthropogenic and technogenic impact. The water of the river Anabar near village Saskylah and soil are contaminated with heavy metals [4, 5, 22] that on the food chain get into the human body.

CONCLUSION

The change of lipid metabolism indigenous residents of the Arctic village Saskylah from 1994 to 2013 is characterized by a decrease in the proportion of persons with normal cholesterol levels and increase in the proportion of persons with borderline high and high cholesterol. Violation of lipid metabolism is accompanied by an increase in blood levels OH, TG, hol-LDL and decreased hol-HDL. High cholesterol is not always accompanied by a shift in the direction of atherogenic changes; in about 75% of men and 76% women increased level of cholesterol has compensated adaptive character. The occurrence of atherogenic changes among people with normal cholesterol indicates the need for determining fractions of lipids regardless of the level of total cholesterol. As an inexpensive marker of disorders of lipid metabolism can be used the low coefficient de Rytis (liver variant), which has feedback with markers of atherogenicity. A positive correlation of atherogenicity markers with glucose level and a stronger

connection with high glucose level is a testament to the regulation tension of metabolism of carbohydrates and lipids. Great importance for the prevention of atherosclerosis would be correction of the violated traditional diet of the indigenous population of the Arctic.

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Information about the authors

1. Olesova Luibov Dygynovna, PhD, Head. laboratory biochemical mechanisms of adaptation FGBNU «Yakut Scientific Center complex medical problems.» 677010, Yakutsk, Sergelyakh highway, 4; 8 (4112) 447857; oles59@mail.ru;

2. Krivoschapkina Zoya Nikolaevna, PhD, senior Scientist r of the laboratory of biochemical mechanisms of adaptation FGBNU «Yakut Scientific Center of complex medical problems», 677010, Yakutsk, Sergelyakh highway, 4; 8 (4112) 447857; zoyakriv@mail.ru;

3. Semenova Evgenia Ivanovna, PhD, Senior Scientist of studying the mechanisms of adaptation FGBNU "Yakut Scientific Center of complex medical problems", 677010, Yakutsk, Sergelyakh highway, 4; 8 (4112) 447857; kunsuntar@mail.ru;

4. Yakovleva Alexandra Ivanovna, junior Scientist of the laboratory of biochemical mechanisms of adaptation FGBNU "Yakut Scientific Center of complex medical problems", 677010, Yakutsk, Sergelyakh highway, 4; 8 (4112) 447857; sashyak@mail.ru;

5. Efremova Svetlana Gmitrievna, researcher, laboratory of immunopathology FGBNU "Yakut Scientific Center of complex medical problems", 677010, Yakutsk, Sergelyakh highway, 4; 8 (4112) 447857; esd@mail.ru.

P.V. Mokrushnikov, L.P. Osipova, T.V. Goltsova, A.A. Rozumenko

ERYTHROCYTE MEMBRANE MICROVISCOSITY IN THE POPULATION OF SAMBURG VILLAGE

ABSTRACT

We studied the indices of relative microviscosity of the erythrocyte membranes in the two groups of inhabitants of the village Sumburgh Yamalo-Nenets Autonomous District: indigenous (tundra and forest Nenets) and non – indigenous arrived from central Russia. We revealed a significant increase in microviscosity of lipid-lipid interactions in the native women aged 46-55 years ($p < 0.05$) compared with the non – indigenous ones. Increased membrane microviscosity may obstruct erythrocytes passage through microcapillary channel and lead to the development of the northern hypoxia.

Keywords: microviscosity of erythrocyte membranes, the indigenous people of the North, the Yamalo-Nenets Autonomous District.

INTRODUCTION

Climate conditions of the North regions impel the human organism to change its level of homeostasis. This affects the biochemical reactions, functioning of cell membranes, and rheological properties of blood. A change in relative microviscosity of membranes can serve as a marker of the metabolic state of cells. It is known from the literature that microviscosity of human membranes increases with age, which is related to an excess of cholesterol [1], accumulation of lipid peroxidation (LPO) products, and changes in the composition of phospholipid bilayer. Therewith, biological membranes become rigid and porous, the cell shape is distorted [1]. The state of erythrocyte membranes changes with alteration of the lipid composition of blood [5] and in type 1 and 2 pancreatic diabetes [9]. These changes show up as a decrease in fluidity (an increase in microviscosity) of membranes, which is attributed to the glycolysis of membrane proteins and to the action of insulin, which is involved in the activation of LPO and facilitates the growth of intracellular calcium level [2].

An increase in erythrocyte membrane microviscosity may be caused by a decreased content of the main antioxidant, tocopherol, and accumulation of lipid peroxidation products (diene conjugates) as well as lysoforms of phospholipids, which can disturb the diffusion of gases (CO_2 , O_2) through erythrocyte membranes [6,8]. Our earlier *in vitro* study demonstrated

and increase in erythrocyte membrane microviscosity with raising the concentration of hormones (cortisol, adrenalin, noradrenalin, androsterone, and testosterone) in the ghost suspension [1]. This is caused by a simultaneous interaction of carbonyl and hydroxo groups of the hormones with CO and NH_2 groups of membrane proteins and phospholipids [11].

The **objective** of the work was to investigate age-related changes in erythrocyte membrane microviscosity in non-indigenous and indigenous population of Samburg village (YNAO).

MATERIALS AND METHODS

Material for the study was collected during the expeditions to the Yamalo-Nenets Autonomous Okrug in 2012-2014 by researchers from the Laboratory of population ethnogenetics at ICG SB RAS under the supervision of Ph.D. (biol.) Osipova L.P. Blood donations were obtained in compliance with international rules using the informed consent from volunteers who were practically healthy at the time of the study. The study involved indigenous persons and non-indigenous population of Samburg village (latitude $67^\circ 0'$ north, longitude $78^\circ 25'$ east), Purovsky district, YNAO. Overall 136 inhabitants (60 men and 76 women) 25 – 65 years of age were examined. Among them were 98 representatives of indigenous nation (tundra and wood Nenetses) and 38 – non-indigenous Caucasian inhabitants of Samburg village.

Blood was taken from the ulnar

vein after 10-12 hours of night fasting. Erythrocyte ghosts were obtained by haemolysis in a hypotonic phosphate buffer (pH 7.35) containing 2.75 mM KH_2PO_4 and 8.5 mM Na_2HPO_4 . Ghosts were sedimented by centrifugation at 5500 g, the supernatant was decanted. Ghosts were obtained and stored at 4°C . Microviscosity of erythrocyte membranes was measured on a RF-5301(PC)SCE (Shimadzu) spectrofluorimeter by a technique reported elsewhere [9,10].

Statistical treatment was carried out with Statistika 9.0 software using nonparametric statistical methods (Mann-Whitney rank sum test). Membrane microviscosity was measured at the Shared Equipment Center of Spectrometric measurements (FSBI Research Institute of Biochemistry (Novosibirsk).

RESULTS AND DISCUSSION

Relative microviscosity of erythrocyte membranes was measured in indigenous and non-indigenous men and women that were divided into four groups according to their age: 25-35, 36-45, 46-55 and 56-65 years. The study showed a significant increase in relative microviscosity of membranes by 26% ($P < 0.05$) in the region of lipid-lipid interaction in indigenous men of age 56-65 as compared to the group of indigenous men of age 25-35. No significant differences were found in other groups.

A significant age-related increase in relative microviscosity of membranes was revealed also in women (Table).

Table

Relative microviscosity (L) of membranes in the region of lipid-lipid and protein-lipid interaction for women

Relative microviscosity (L) of membranes	Lipid-lipid region	p	Protein-lipid region	p
1. Indigenous women of age 25-35 (n = 9)	0.43±0.04		0.44±0.03	
2. Indigenous women of age 36-45 (n = 17)	0.47±0.03	1-3, p < 0.01	0.47±0.03	1-3, p < 0.01
3. Indigenous women of age 46-55 (n = 16)	0.61±0.02	–	0.62±0.02	–
4. Indigenous women of age 56-65 (n = 14)	0.61±0.03	2-4, p < 0.01	0.62±0.02	2-4, p < 0.01
5. Non-indigenous women of age 25-35 (n = 8)	0.44±0.03		0.46±0.02	
6. Non-indigenous women of age 36-45 (n = 4)	0.48±0.06	–	0.50±0.08	–
7. Non-indigenous women of age 46-55 (n = 4)	0.50±0.05	3-7, p < 0.05	0.55±0.05	–
8. Non-indigenous women of age 56-65 (n = 4)	0.57±0.05	–	0.65±0.06	–

Indigenous women of age 56-65 showed a significant increase in relative microviscosity of membranes by 42% in the regions of lipid-lipid and protein-lipid interaction in comparison with the group of indigenous women of age 36-45. A significant increase in relative microviscosity in the region of lipid-lipid interaction was found in the group of indigenous women of age 46-55 as compared to non-indigenous women of the same age (Table). It seems interesting that erythrocyte membrane microviscosity starts to increase earlier in indigenous women (after 46 years of age) as compared to non-indigenous women (after 56).

Under the conditions of Far North, an elevated energy demand of the body requires an intense consumption of fat, so the human organism should move from carbohydrate diet to the lipid one [6]. A growing role of fats in energy metabolism of the body creates an increased oxygen demand of tissues that is needed for intense oxidation processes. An increased microviscosity (rigidity) of erythrocyte membranes hinders the passage of erythrocytes through the capillary bed [4, 5, 7]. Such conditions can induce the development of north tissue hypoxia. Several causes of such hypoxia are reported in the

literature.

The main cause is insufficient oxygen delivery to tissues due to deterioration of rheological properties of blood. Such deterioration can be produced, in particular, by This can result from an increase in the blood concentration of cholesterol, which raises the concentration of cholesterol in erythrocyte membranes. Cholesterol molecules penetrate into lipid bilayer, thus increasing the membrane microviscosity [1].

Conclusion

It was shown that erythrocyte membrane microviscosity in indigenous women of age 46-55 significantly exceeds this parameter in non-indigenous women. This may be related to adaptation of the female organism to conditions of the North.

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Information about authors:

Mokrushnikov Pavel Valentinovich Ph.D. (phys.-math.), Senior researcher, Laboratory of molecular cell biology, Federal State Budgetary Scientific Institution "Research Institute of Biochemistry", Timakova str. 2, Novosibirsk 630117, Russia;

Associate professor, Chair of physics, FSBEI Novosibirsk State University of Architecture and Civil Engineering (Sibstrin), Leningradskaya str. 113, Novosibirsk, 630008, Russia; pwm64@ngs.ru

Osipova Lyudmila Pavlovna Ph.D. (biol.), Head of Laboratory of population ethnogenetics, Federal State Budgetary Scientific Institution Federal Research Center Institute of Cytology and Genetics of Siberian Branch of the Russian Academy of Sciences, Russia, Novosibirsk, 630090, Academician Lavrentyev Avenue, 10;

ludos77@yandex.ru
Goltsova Tatiana Vladimirovna
Scientific Secretary, Federal State Budgetary Scientific Institution "Research Institute of Biochemistry", Timakova str. 2, Novosibirsk 630117, Russia; ibch@niibch.ru

Rozumenko Aleksandr Anatolievich Ph.D. (biol.), Senior researcher, Laboratory of medical biotechnology, Federal State Budgetary Scientific Institution "Research Institute of Biochemistry", Timakova str. 2, Novosibirsk, 630117, Russia; alexandr.rozumenko@gmail.com.

FORMATION OF THE PATHOLOGY IN CHILDREN AND ADULT POPULATION OF THE NORTH

M. P. Dutkin, E. P. Yakovleva

GENDER EDUCATION IN THE PREVENTION OF SUICIDAL BEHAVIOR AMONG THE PEOPLES OF THE ARCTIC ZONE

ABSTRACT

Russia occupies one of the first places in the world by the level of children's and adolescents suicides. In Russia itself, in the number of suicides the northern regions are in the leading position, where mainly small in number people live.

The problem of suicide among indigenous people is typical not only for Russia but also for other countries in the Arctic zone, including highly-developed countries, such as Canada and the United States. Suicide worldwide is predominantly «male» phenomenon. An important reason for suicidal behavior is a weakening of the institution of the family - «paternity crisis.» The lowest suicide rate is observed in the regions of North and South Caucasus countries, due, apparently, to the development of folk pedagogy of the Caucasus, where the fathers mainly bring up boys.

Thus, an important task in the prevention of youth suicide in the Russian Federation is a gender education, which implies the return of interest in the origins of folk pedagogy and strengthening the institution of paternity.

Keywords: suicides, children's and teenage suicides, the high level of suicide among indigenous youth in the Arctic, «paternity crisis,» the father's absence, incomplete family, folk pedagogy of the Caucasus, the prevention of suicidal behavior, gender training.

Suicidal behavior is currently the global socio-psychological problem. Every year more than 800 thousand people commit suicide. Therefore, the World Health Organization (WHO) considers suicide prevention a public health care priority. In 2014 the first WHO report "Preventing suicide: a global imperative" aimed at understanding by the public health care suicide significance was published. In the WHO actions Plan on mental health for 2013-2020 States - WHO members committed themselves to achieving the global target of reducing the suicide rate in countries on 10% by 2020 [14].

Particularly alarming in recent years is the increase of suicides among teenagers. According to WHO, the number of suicides among persons aged 15-24 years has increased in 2 times. In 2012 suicides ranked second as the cause of death of adolescents and adults.

By the level of children's and teenage suicides, Russia ranks one of the first places in the world. In Russia itself, in the number of suicides the northern regions are in the leading position, where mainly indigenous people live.

In the Republic Sakha (Yakutia) the rate of suicide among younger adolescents aged 10-14 years is 13,4 cases of suicide per 100 thousand, while among youth 15 to 19 years reaches to 74,2 per 100 thousand (for comparison: in Moscow region the level of suicide in this age group is 4,4 per 100 thousand) [14]. Among the indigenous population of Yakutia, the rate of suicide is in 4 times higher than that recorded among the non-indigenous population. This indicates the decrease in the level of resilience of the titular nations and is a consequence of the negative social processes occurring in the Arctic regions.

As the world practice shows, the

problem of suicide among indigenous peoples of the North are characteristic not only for Russia but for other countries of the Arctic zone, including highly developed, such as Canada and the USA. In the US the rate of suicide among the indigenous population of Alaska (Inuits, Aleuts, Tabaski, Haida, Tlingit) in 3.3 times exceeds the average for the country [9]. The highest rate of suicide is among aboriginal youth aged 20 to 29 years [10].

Due to "Strategy for the circumpolar Inuit health in 2010 – 2014" data in Canada the frequency of suicide among the Inuits is in 6-11 times higher than the average figure for the rest of the population [12]. Moreover, the frequency of suicides in the regions inhabited by the Inuits, over the past 15 years increases. Of particular concern is the fact that 51% of the suicide rate in Inuit regions of Canada fall to the share of men younger

than 25 and 14% of women of the same age. The suicide rate in average for Russia in 2005 was 32.2 per 100 thousand people and among indigenous peoples of the North in 3-4 times more often. In the early 90-ies of XX century in East Greenland, the suicide rate reached 1500 on 100 thousand population – the highest figures recorded in the world! The global level of completed suicides is 16 cases per 100 thousand population per year. In recent years the number of suicides among youth in Nuuk has declined significantly, but in the rest of the West Greenland it is not decreasing, and in the East Greenland it is still the highest [12].

The formation of mental health of children in the Arctic regions of our country and abroad is influenced by a variety of factors, among which the main role play family environment, and social and environmental factors [4].

An important factor of suicide is the weakening of the family institution and destruction of internal harmony of family relationships. The weakening of the institution of the modern family in different countries is the nature of the disease of the century, especially for economically developed countries. Not only the uncertainty of public life, but the disorder in his personal life and loneliness can serve as a motive to suicide. Among the encroaching upon their lives the high proportion is of single, divorced, widowed, but it is well known fact that sometimes family miseries often lead to the decision to kill herself.

The basis for the development of painful personality traits that play a role in the occurrence of suicidal behavior in adverse situations are conditions of development in childhood and adolescence. According to V. S. Efremov, MD more than 60% of suiciders were brought up in a single-parent family, the breakdown of which occurred at the age when the child was not yet 8 years [2]. Surviving parent families were characterized by a complex emotional relationship, periodic conflicts, immersion into own personal experiences, formal interest in the fate of the children. Suiciders were characterized by a constant feeling of neglect in childhood and adolescence.

Doctor of philosophical sciences I. Kon believed that a large role in increasing rate of suicide play a fatherless state, the physical absence of the father in the family, the insignificance and poverty of paternal contact with children compared to maternal, pedagogical incompetence of fathers, their disinterest and inability to perform the educational functions be-

came a subject of mass controversy and scientific debate [3].

Actually on a weakening or inefficiency of paternity the Old Testament prophets, and the ancient Greeks of the classical period, and the French enlighteners and Russian writers of the nineteenth century, for example, F. Dostoevsky complained. The author of the book "Fatherless America" Dr. J. Blankenhorn, Director of the Institute for American values, calls the fatherless "the most destructive trend of our generation" [8]. The absence or weakness of father's beginning strongly statistically associated with all psychological and social pathologies – crime, violence, drug and alcohol dependence, poor academic performance, suicide and mental disorders. Almost 80% of Americans, who responded to the questionnaire by Gallup in 1996, acknowledged the paternity the most serious problem of modern times [11].

In modern Russia, about half of marriages end in divorce, and in the West two-thirds of marriages fail. According to the state statistics Committee in 2007, for every 100 marriages accounted for 54 divorces in 2013 per 100 marriages accounted for 53 of the divorce. These data demonstrate the crisis of the institution of the family and a huge number of children growing up without a father.

Especially adverse situation of incomplete families is in the Arctic zone of the Russian Federation. Conducted by doctor of medical sciences N. B. Semenova analysis of families by number of spouses revealed a high prevalence of single-parent families among the indigenous population of the Sakha Republic (Yakutia) [4]. In the Northern regions of the Republic, every third family is incomplete (32.2%); in the Central regions - 27.6%, in southern areas - 22.6%.

That for boy it is essential to have fellowship with the father, wrote the famous American suicidologist E. Shneidman in his book "The Suicidal Mind": "a Man with suicidal tendencies said that his father never loved him, and throughout his life he symbolically unsuccessfully looking for this love... In the identity of these people was lack of the internalized figure of their endorsing father, which (like healthy heart) is needed for a long life" [7].

An absence of a father, single-parent families, especially for boys, is, thus, one of the main suicide provoking factors.

Suicide, as we know, in general is the phenomenon of "men" (men commit suicide 3-4 times more often than women). Modern boys brought up by single mothers, have no one to take the example

of masculinity, no one to teach them the ability to withstand life's challenges. They feel a sense of inferiority and strive to overcome that feeling. Overcoming a sense of inferiority, according to A. Adler, leads to two different forms of behavior: 1) aggressive behavior during puberty as a result of overcompensating (weak trying to look strong, seems cowardly hero); 2) "deviate" behavior. A portion of adolescents can compensate the feeling of inferiority. This "decompensate" is expressed in the appearance and consolidation in the nature of such negative traits as shyness, isolation, anxiety and suspiciousness.

N. B. Semenova as a result of their expedition trips found in indigenous youth of the North, peculiarities of emotional-personal sphere, which lie in the increased level of anxiety, insecurity, suspiciousness, an increased level of guilt, negative feelings [4].

The low number of suicides in the Republics of the North Caucasus and Transcaucasia (Azerbaijan, Armenia, Georgia) can be explained not only by the influence of the factor of religion. It is believed that the population professing Islam, are less prone to suicide, since this religion condemns such behavior. While, in Armenia, Georgia, the Republic of North Ossetia, where the population is Christians, suicide rates are also low: in Armenia, the rate of suicide in 1985 was 2.3 per 100 thousand population, and in 2003 to 1.8 per 100 thousand population; in Georgia the figure in 1985 was 4.6 per 100 thousand population, and in 2001 to 2.2 [13].

Socio-economic conditions in this region of the world are not the best. The thesis of the founder of suicidology E. Durkheim about the direct correlation between suicide rate and social living conditions is not confirmed here [1].

Paradoxically low rate of suicide in the Republics of the North Caucasus and Transcaucasia allows making a conclusion about the direct relationship between people's education in the Caucasus and the suicidal index. Methods of folk education in the Caucasus are effective in the prevention of suicidal behavior.

The main feature is a clear accentuation on the formation of gender identity. At the age of seven education for boys in the Caucasus, passed into the hands of men, accustoming them to exclusively male occupations. The boys usually rotate in a circle of adults, could be present when men were talking (though had no right to interfere in their affairs).

Folk pedagogy of the Caucasians

sharply condemned self-love, self-praise, conceit, envy and lies [5]. Great attention was paid to the education of the children of such moral traits such as discipline, sense of collectivism, obedience, respect for parents and elders, loyalty in friendship, love of country. The boys were brought up by persistence and dedication, the girls – up by patience.

Prevention of suicidal behavior among the peoples of the Arctic must be based on gender education, which was previously ignored by suicidologists. Gender identity is stored lifelong, as a rule, and it is produced in children if this behavior is modeled in front of the child and is accepted by others, which is achieved when the man shows the boy a sample of male behavior, and the mother encourages such actions.

In accordance with such a statement the words of the Russian teacher K. Ushinsky that education created by the people and based on national basis, has the attractive force, which is not in the best systems, based on abstract ideas - become relevant.

At the present time, when many boys have low self-esteem, suffer from anxiety and insecurity, the experience of folk pedagogy is of particular importance.

The revival of gender education in modern conditions will be met enormous challenges, as globalization has already led to the dominance of women in all sectors of the economy and politics, the loss of truly masculine character traits in the recent representatives of the “strong” sex. The education of boys in our feminized society women did, from “Kindergarten” through to University.

If we want to avoid the depopulation of the Arctic, we must look back at our past and try to revive the principles of national education, to try to revive at

least such male traits like “persistence” and “perseverance” in the Arctic youth. You need to attract men to work in the system of additional education. The media should create an “aura of masculinity” around a man of the North, as this is presented, for example, in the Discovery TV show “The Boys from the Yukon”.

Suicide is a complex issue and therefore suicide prevention requires the coordination and cooperation of different sectors of society, including health, education and the mass media. These efforts must be comprehensive and integrated, since no single approach can have an impact on an issue as complex as suicide.

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The authors:

Dutkin Maxim Petrovich, candidate of philosophical sciences, associate Professor of neurology and psychiatry, Medical Institute M. K. Ammosov NEFU, Yakutsk, Russia. e-mail: maksdutkin@mail.ru;

Yakovleva Evdokia Pavlovna, candidate of philosophical sciences, associate Professor of philosophy M. K. Ammosov NEFU, Department of philosophy, St. Kulakovskiy, 42, Yakutsk, Russia.

L. A. Malysheva, F. A. Zakharova, A. A. Strekalovskaya

AGE AND WOMEN'S HEALTH IN THE PERIMENOPAUSE

ABSTRACT

To study the prevalence of metabolic syndrome (MS) risk factors and the structure of morbidity in women - M.K. Ammosov NEFU workers during premenopause under the annual medical examination of the NEFU employees we questioned and examined 50 women aged 43-70.

The most common pathologies in the examined women break down as follows: arterial hypertension, mammary glands pathology (mastopathy), endocrine system pathology, gynecological disorders. More than 50% of the surveyed women have signs of type 2 metabolic diabetes and cardiovascular diseases. In particular, 51.9% of the women had arterial hypertension.

Keywords: premenopause, metabolic syndrome, body mass index, cardiovascular diseases.

Background

The issue of preserving health at different stages of ontogeny, reducing morbidity and premature mortality, slowing down the aging, ensuring working capacity of women is one of the leading areas in biomedical research [8, 1].

Clinicians are particularly interested in perimenopause, which includes the three phases of menopause: premenopause, menopause, and postmenopause. To date, it is assumed that a variety of clinical manifestations in this period is due to the wide range of endocrine status changes at all levels of the hypothalamic-pituitary-ovarian system associated with involutinal processes in ovaries and their decreased hormonal functions. About 60-80% of women have clinical signs of estrogen deficiency [3], which is accompanied by neurovegetative, metabolic and psycho-emotional disorders [9].

It is known that the activity of a university lecturer is characterized by increased psycho-emotional, nervous and long-hours teaching load. They have to work a lot on the computer, which leads to inactivity. All these factors worsen the climacteric syndrome during menopause and contribute to the development of MS and a range of various diseases. In its turn, the metabolic syndrome is a major pathogenetic trigger in the development of cardiovascular diseases and type 2 diabetes mellitus (NIDDM).

Material and methods

The survey aimed to identify activity of metabolic syndrome risk factors and morbidity patterns in NEFU women in the premenopause period. Under the annual health survey of NEFU staff, we questioned and examined 50 women aged 43-70 employed by NEFU (the average age made 56.8 years). The main criterion for random sampling of the women was the perimenopause condition.

Results and discussion

The most common pathologies in the examined women breakdown as follows: arterial hypertension – 51.9%, mammary glands pathology (mastopathy) – 48.1%, endocrine system pathology – 48.1%, gynecological disorders. IHD occurred in 25.9%.

Table 1 presents the morbidity level (%) and patterns.

Anthropometrically, the average height of women was 160.3 cm (ranging from 151 to 170 cm), weight – 75.6 kg (ranging from 50 to 100 kg), BMI – 28.2±5.9. The women in the range of 151-159 cm made 48.1%. The standard BMI was found in 29.2% of the women, overweight women (BMI ≥ 25 kg/m²) made 33.3%, obesity (BMI ≥ 30 kg/m²) – in 37.5% (Figure 1).

The distribution of the adipose tissue was assessed by waist-hip ratio. WHR was considered high with the index value ≥ 0.8. High WHR was found in majority of the women with overweight and obesity, which indicates abdominal form of obesity.

According to some researchers,

female patients with BMI of more than 24 and WHR of more than 0.76 can be attributed to the group with an increased risk for developing NIDDM [7]. BMI and WHR, along with the data of biochemical studies, serve as clinical methods of the survey, allowing suspecting NIDDM on the early stages, when the disease is manifested by only symptoms of anxiety and depressive state under changing hypoglycemia and hyperglycemia, which is similar to the symptoms of menopause.

Estrogen deficiency, which develops with age, is the cause of a number of cardiovascular diseases. In Russia, the mortality rate from cardiovascular diseases ranks first, well ahead of the risk of dying of breast cancer. The frequency of this disease is increasing especially in postmenopausal women. With the frequency of hypertension in premenopausal women in Moscow at 8.2%, in postmenopausal women this figure rises to 52%. These indicators increase both the risk of ischemic heart disease by 3 times and stroke –by 7 times. The progressive rate of hypertension (HT) in women after 50

Table

Morbidity level and patterns (%) in the women

	Diseases	%
1.	IHD	25.9
2.	Hypertension	51.9
3.	Diabetes mellitus	22.2
4.	Thyroid gland pathology	25.9
5.	Gastrointestinal tract diseases	11.1
6.	Hepatobiliary disorders	22.2
7.	Kidney diseases	7.4
8.	Musculoskeletal and locomotor system disorders	22.2
9.	Mastopathy, mastitis	48.1
10.	Endometritis	25.9
11.	Ovarian cyst	11.1
12.	Endometriosis	7.4
13.	Uterine fibroids	37.0

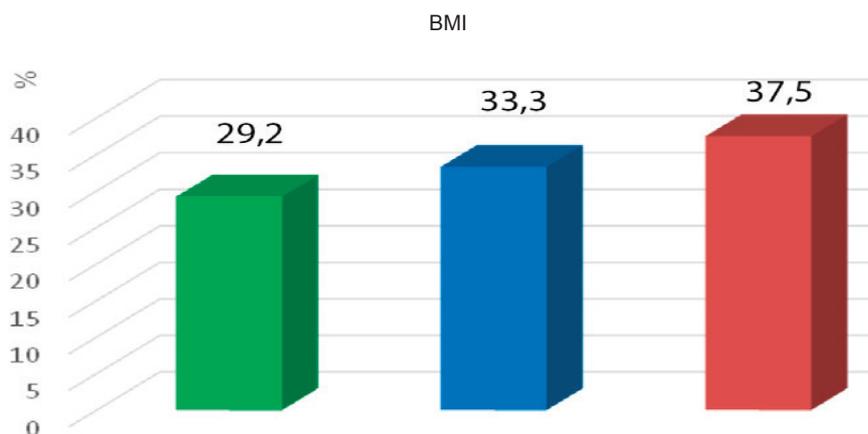


Figure 1. BMI distribution (%)

years, with little change in this index in men, suggests a possible role of sex hormone deficiency as an additional risk factor for hypertension [2].

The leading risk factor for developing cardiovascular pathology during perimenopause is metabolic syndrome (X syndrome), which manifests itself in the form of reduced glucose tolerance, dyslipidemia, along with the central type of obesity, hypertension, and plays a leading role in the development of atherogenesis process and violation of fibrinolytic activity of blood.

The etiology and pathogenesis of MS are studied quite well. However, there is still no consensus on the main pathogenetic factors of MS, which causes all the other symptoms. According to some authors (G.V.Poryadin, L.N. Oskolok, 2011), the main pathogenetic factors of MS are insulin resistance (IR) and obesity. The genetic predisposition to the development of IR and obesity is a consequence of the presence of 'thrifty genotype'—a complex of certain genes ensuring survival of an organism under poor nutrition. In modern conditions, when a person moves little and consumes a large amount of high-calorie food, the thrifty genotype contributes to the development of obesity and IR. It is proved that IR directly depends on the degree of obesity and is diagnosed in people who are overweight long before the manifestation of diabetes mellitus. However, 25% of people leading a sedentary lifestyle develop IR regardless the body weight [7].

The results of a population-based study, being conducted over 12 years in women aged 38-60 years, suggest that the risk factors for myocardial infarction are as follow: increasing WHR (waist-hip ratio); increased levels of triglycerides and glucose in serum; and hypertension [4].

The violation of fat metabolism is an important factor that increases the incidence of cardiovascular diseases. The onset of menopause is accompanied by changes in the atherogenic blood lipid profile, namely increased cholesterol in low-density lipoproteins (LDL) and decreased cholesterol in high-density lipoproteins (HDL), as well as increased prevalence of obesity and diabetes mellitus [7]. A number of epidemiological studies have shown that after menopause, 60% of women experience an increase in body weight by 3.5-5 kg, as well as redistribution and accumulation of adipose tissue mainly in the abdominal-visceral area (visceral type of obesity).

The changes in the level of steroid hormones, especially estrogen, are considered the etiological factors of metabolic disorders. The data on some genes involved in the regulation of metabolism serve an evidence of the genetic nature of metabolic disorders. In particular, this refers to the obesity gene (obgen), discovered by Zhang et al. in 1994. This gene encodes the production of leptin, a hormone produced by fat cells, and its receptors. It is believed that there is an interaction between the hypothalamus-pituitary-ovarian system and leptin, which acts as a bridge, adjusting food intake and being an affective saturation signal for the hypothalamic centers that regulate metabolism. Another important factor, potentially underlying the genetic nature of obesity, is the reduced level of adrenal androgens, which possess anti-diabetic and anti-sclerotic properties. Moreover, estrogens have an effect on catecholamine secretion and accumulation, as well as on receptor activity thereon in the CNS. On the local level, catecholamines regulate lipolysis by their receptors in fat tissue.

Women with android and visceral

obesity have an increased risk of developing such pathological conditions as impaired glucose tolerance and non-insulin dependent type II diabetes (NIDDM).

In the recent years, numerous studies have been focused on non-insulin dependent type II diabetes (NIDDM), under which insulin resistance (IR) develops. The analysis of a number of indicators characterizing the features of metabolic disorders shows that female patients with BMI greater than 24 and WHR of more than 0.76 can be attributed to the group with an increased risk for developing NIDDM [5].

Conclusion

The main symptoms of MS in women during menopause are as follows: high body mass index, obesity, arterial hypertension and insulin resistance.

According to the results of our study, over 50% of the surveyed women have symptoms of metabolic syndrome and can be attributed to the group with an increased risk for developing NIDDM and cardiovascular diseases. In particular, 51.9% of the women had arterial hypertension.

Recommendations

As obesity and IR are the main causes of MS pathogenesis, in order to prevent their occurrence and progression, it is necessary to follow a straight lifestyle: eliminate excessive consumption of fats and fast-digesting carbohydrates, do regular exercise, minimize stress, avoid alcohol and tobacco. When the first symptoms of MS appear, it is necessary to start the treatment of obesity, hyperglycemia, arterial hypertension, and dyslipidemia.

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The authors

10. Malysheva Larisa Afanas'evna, PhD, docent, MI NEFU, Yakutsk, Sakha (Yakutia) Republic, Russia, e-mail: mallaaf@mail.ru; Zakharova Fedora Appolonovna, MD, Prof., MI NEFU, Yakutsk, Sakha (Yakutia) Republic, Russia, e-mail: patfiz63@mail.ru; Strekalovskaya Alena Anatol'evna, PhD, docent, MI NEFU, Yakutsk, Sakha (Yakutia) Republic, Russia, e-mail: a_strekalovskaya@mail.ru.

Sevostyanova E.V., Mitrofanov I.M., Nikolaev Yu.A.

IMPACT OF COMORBIDITY ON METEOSENSITIVITY IN HYPERTENSIVE RESIDENTS OF THE REPUBLIC SAKHA (YAKUTIA)

ABSTRACT

Purpose. To study the correlation between severity of comorbidity and pathological meteosensitivity in the residents of the North with hypertension, as well as to evaluate some psychophysiological and biorhythmological factors that determine this correlation.

Materials and methods. 347 patients with hypertension - alien inhabitants of the North, men and women in the age - 20-65 years, examined and treated at the Clinic of the FSBSO Scientific Center Experimental and Clinical Medicine (Novosibirsk), residing in the North (the Republic of Sakha, Yakutia) were investigated. The method used was the collection of clinical data and evaluation of pathological disorders of the major functional systems of an organism, psychophysiological parameters, as well as the severity of pathological meteosensitivity using the original computer system of screening assessment of disadaptive, meteoropathic and pathological conditions «SCREENMED».

Results. We described the most common pathological disorders at hypertension in the North: disorders of the endocrine system and metabolism; disorders of the sensory organs; of the central and peripheral nervous system; of liver. The association between the severity degree of comorbidity and the level of pathological meteosensitivity ($r = 0.41$, $p < 0.05$) was found. The growth of cognitive disorders, disorders of sensory-motor functions, attention and desynchronization with the increasing degree of comorbidity was revealed.

Conclusion. The findings indicate that hypertension in alien inhabitants of the North is developing against the background of a pronounced degree of comorbidity. The correlation between severity of comorbidity at hypertension in the North and the level of pathological meteosensitivity, which is an important risk factor for hypertension in extreme environmental conditions is traced.

Keywords: comorbidity, North, hypertension, meteosensitivity, psychophysiological functions.

Hypertension is a major health and social problem in the world, representing the leading risk factor for cardiovascular morbidity and mortality [9, 10]. The greatest significance of the problem of prevention and treatment of hypertension acquires in the northern regions of Russia, which occupy nearly two-thirds of the country where two-thirds of its resource potential is concentrated [2]. It is in high latitudes where there are the highest morbidity and mortality rates from hypertension and pronounced features of the pathogenesis and course, associated with a reduction in human organism adaptive resistance to extreme weather and heliogeophysical factors [4, 2, 5].

Recently the issues of associated diseases, which are considered in the term of comorbidity, are becoming increasingly important in the internal

medicine clinic. Comorbidity is defined as a combination of two and/or more syndromes or diseases, pathogenetically interconnected or overlapping in time in the same patient, regardless of the activity of each [1]. Among those persons with comorbidity higher mortality rates, higher risk of hospitalization, lower quality of life and reduced functional possibilities are registered [1]. Of particular importance in the formation of co-morbidity are disorders of the cardiovascular system, which are not only naturally, drawn up in the form of cardiac pathology, but also determine the further development of diseases (disorders, pathology) of other physiological systems, since it is the cardiovascular system that provides normal activity of all other systems of an organism. At present, the study of comorbidity prevalence in the middle and high latitudes, depending

on gender, age and socio-economic characteristics is actively carried out [6]. However, the questions of relationship between comorbidity in hypertension and disorders of human adaptation to the specific environmental conditions of the North remain unexplored.

Previously, it has been found that the most important factor in the development of hypertension in the North is an increased and / or pathologically changed meteosensitivity (pathological meteosensitivity) [8]. Pathological meteosensitivity is one of the most important manifestations of the human organism disadaptation to the natural conditions [3, 11] and is defined as the organism's ability to respond to changes in climatic, meteorological and heliogeophysical factors in the form of development of pathological meteoropathic reactions [3]. Despite of its

important role in the development of pathology, the questions of relationship between comorbidity and pathological meteosensitivity in hypertension in the North remain unexplored.

The aim of the study was to investigate the relationship between comorbidity and pathological meteosensitivity in the residents of the North with hypertension, as well as assessment of some psychophysiological and biorhythmological factors that determine this relationship.

OBJECT AND METHODS

347 patients with hypertension - alien inhabitants of the North, men (n = 165) and women (n = 182) in age - 20-65 years with a mean age of 44.2 ± 0.5 years, having been examined and treated on the basis of Clinic of the FSBSO Scientific Center Experimental and Clinical Medicine (Novosibirsk), residing in the North (the Republic of Sakha, Yakutia), were investigated. The study was conducted in accordance with the Helsinki Declaration (in the revision of the 41st World Medical Assembly, 1989).

Verification of diagnoses of the surveyed persons was carried out with the use of modern methods of clinical, functional and laboratory diagnostics. For study, the method of collection of clinical data and evaluation of pathological disorders of the major functional systems of an organism, as well as evaluation of the severity of pathological meteosensitivity using the original computer system of screening assessment of disadaptive meteopathic and pathological conditions "SCREENMED" (N of state registration - 970035 from 29.01.1997), was used. Also statistical analysis of medical documentation was conducted. All identified diagnoses in the form of clinical entities were taken into account.

Assessment of comorbidity was conducted by the conventional method of measuring comorbidity - CIRS system - the cumulative scale rating diseases (Cumulative Illness Rating Scale) [7]. Psychophysiological functions were determined according to assessment of the totality of the psychophysiological tests, included in the computer system "SCREENMED". Proofreading test using Anfimov's table, analysis of duration and variability of the latent periods of simple sensory-motor reactions; test to determine the accuracy of subjective perception and playback of time intervals (individual minute test) were conducted.

Statistical processing of the data was performed using STATISTICA

Table 1

Indicators of adaptive capacity, in hypertensive patients with different degrees of comorbidity (M ± m)

	Low degree of comorbidity (0-18) (n=46)	Moderate degree of comorbidity (19-37) (n=216)	High degree of comorbidity (38 and more points) (n=85)	P
Pathological meteosensitivity, point	1.58±0.19	2.55±0.09	3.37±0.12	1-2=0.000013; 1-3=0.000000; 2-3=0.000001
LP SSMR of right hand, msec	204.6±5.7	219.4±2.6	220.2±3.6	1-3=0.01
LP SSMR of left hand, msec	202.8±6.3	211.2±2.7	211.7±4.1	
Proofreading test, points	9.5±0.4	8.3±0.2	7.7±0.3	1-3=0.002
Individual minute, sec	49.6±3.3	45.2±1.2	42.1±1.9	1-3=0.03
Synchronization of endogenous and exogenous rhythms, points	6.1±3.9	4.8±3.6	4.4±3.9	1-3=0.02

Note: LP SSMR - latent period of simple sensory-motor reaction.

Table 2

Indicators of adaptive capacity, in hypertensive patients with different degrees of comorbidity (M ± m)

	Low degree of comorbidity (0-18) (n=46)	Moderate degree of comorbidity (19-37) (n=216)	High degree of comorbidity (38 and more points) (n=85)	P
Pathological meteosensitivity, point	1.58±0.19	2.55±0.09	3.37±0.12	1-2=0.000013; 1-3=0.000000; 2-3=0.000001
LP SSMR of right hand, msec	204.6±5.7	219.4±2.6	220.2±3.6	1-3=0.01
LP SSMR of left hand, msec	202.8±6.3	211.2±2.7	211.7±4.1	
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Synchronization of endogenous and exogenous rhythms, points	6.1±3.9	4.8±3.6	4.4±3.9	1-3=0.02

Note: LP SSMR - latent period of simple sensory-motor reaction.

(StatSoft, USA) software package version 7.0. For comparison the average values, for a normal distribution, paired Student's t test (t) was used. When the distribution did not meet the criteria of normality, nonparametric U-test of Mann-Whitney was used. For multiple comparisons correction of Bonferroni

was applied. Correlation analysis was performed using Pearson's parametric test for a normal distribution and Spearman nonparametric test when normal distribution was not observed. Differences were considered statistically significant at $p < 0.05$.

RESULTS AND DISCUSSION

The average index of comorbidity (by the CIRS system) for the total sample was 29.6 ± 0.5 points, in men – 27.0 ± 0.7 points, in women – 32.1 ± 0.7 points. The most common were combinations of hypertension with disorders of the endocrine system and metabolic disorders - 92.5%; disorders of the sensory organs - in 83.5%; disorders of the central and peripheral nervous system - 78.1%; disorders of liver - in 76.9% (Table 1.).

An index of pathological meteosensitivity in the sample was 2.6 ± 0.07 points, in men – 2.3 ± 0.10 points, in women – 2.8 ± 0.10 points.

To solve the main objective of the study, all patients were divided into 3 groups depending on the degree of comorbidity (by CIRS): Group 1 – low degree of comorbidity (0-18 points) ($n = 46$); moderate degree of comorbidity (19-37 points) ($n = 216$) and high degree of comorbidity (38 points or more) ($n = 85$). An analysis of severity of pathological meteosensitivity in hypertensive patients with different degrees of comorbidity was carried out. An increase in pathological meteosensitivity with increasing degree of comorbidity was revealed (Table. 2).

The correlation analysis showed a statistically significant ($p < 0.05$) relationship between the degree of comorbidity (by CIRS) and the level of pathological meteosensitivity ($r = 0.41$).

Previously, the importance of psychophysiological and biorhythmological mechanisms in the development of pathological meteosensitivity was established [8]. We have studied a number of indicators that characterize the physiological and biorhythmological functions important in the process of organism's adaptation to the environment, in the hypertensive residents of the North with different degrees of comorbidity. Analysis of psychophysiological indicators characterizing the cognitive and sensory-motor functions, in the hypertensive residents of the North with different degrees of severity of comorbidity, showed a decline in sensory-motor speed of response, increase in inhibitory processes in the central nervous system, reduction in the productivity of attention and deterioration of cognitive processes among hypertensive residents of the North with increasing degree of comorbidity. Hypertensive patients with high degree of comorbidity showed significantly higher rates of latent periods of simple sensory-motor reaction of the right hand, and significantly lower rates

of proofreading tests than in patients with low degree of comorbidity (Table. 2).

Taking in consideration an important role of the temporal organization of an organism and its synchronization with external factors in the processes of adaptation to the environment [8] it seems to be important to investigate the integrated indicators, characterizing the severity of chronobiological disorders in the examined persons. Analyses of biorhythmic characteristics in the selected groups have showed that patients with high degree of comorbidity have a higher degree of desynchronosis, than patients with low degree of comorbidity. Hypertensive patients with high degree of comorbidity have a statistically significant lower rates of synchronization of endogenous and exogenous rhythms and duration of individual minutes as compared to hypertensive patients with low degree of comorbidity (Table. 2).

CONCLUSION

The present study has revealed that hypertension in alien inhabitants of the North is developing against the background of a pronounced degree of comorbidity. The association between severity of comorbidity at hypertension in the North and the level of pathological meteosensitivity is traced. The relationship of comorbidity and pathological meteosensitivity may be mediated by the disorders of psychophysiological and biorhythmological organism's functions important in the processes of adaptation to the natural conditions of the North. Pathological meteosensitivity, in its turn, as have been shown previously [8], is an important risk factor for hypertension in the North.

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AUTHORS:

Sevostyanova Evgeniya Viktorovna, PhD, senior scientist of the laboratory of somatic diseases pathogenesis, FSBSO Research Institute of Experimental and Clinical Medicine, 630117, Novosibirsk, Timakova 2, E-mail: luck.nsk@rambler.ru; Phone: mob.89138974968

Mitrofanov Igor Mikhailovich – MD, a leading researcher of the laboratory of

somatic diseases pathogenesis, FSBSO Research Institute of Experimental and Clinical Medicine; 630117, Novosibirsk, Timakova 2; E-mail: mim07@mail.ru; Phone: mob. 89139104936.

Nikolaev Yuriy Alekseevich, MD, Chief scientist, acting deputy director for research and clinical work, leader of the laboratory of somatic diseases pathogenesis, FSBSO Research

Institute of Experimental and Clinical Medicine, 630117, Novosibirsk, Timakova 2; E-mail: nicol@centercem.ru; Phone: +7 (383) 334-83-12. mob. 89039048746.

T.I. Ryabichenko, G.A. Skosyreva, E.P. Timofeeva,
Yu.V. Kulakova, T.G. Kos'yanova, Yu.N. Patrusheva

FEATURES OF THE CENTRAL NERVOUS SYSTEM PATHOLOGY IN CHILDREN AND ADOLESCENTS OF THE MIRNYJ REGION THE REPUBLIC SAKHA (YAKUTIA)

ABSTRACT

We present results of an analysis of chronic diseases of the central nervous system in children and adolescents in the region of Mirnyj in Yakutia. The pathology of the nervous system of the underlying disease was 34.8%. A high percentage of CNS pathology in children from an early age indicates that it is a consequence of undergoing intrauterine hypoxia on the background of the pathological course of pregnancy.

Keywords: central nervous system, children, adolescents.

INTRODUCTION

The document "The national strategy of actions in the interests of children for years 2012 - 2017" determines the measures on development of healthy way of life, realization of monitoring of the life's quality of children, including emotional, communicative and psychosomatic components, the warning of emergence and/or distribution of diseases, early detection, involving of the health care technologies, effective organizing and medical technologies, technologies of complex diagnosis and early medical-and-social help to the children with rejections in development and health [5]. The state of health of children's population today is one of main directions of social politics in our country. The importance of realization of this statue is determined by the following: the health of children largely is the integral indicator of the health quality, the fundamental basis for the formation of the health potential of adult members of society, because the number of population able to work is being reduced. The analysis of child morbidity according to the official statistics in 2006-2015 testifies that the children's health continues to deteriorate [1, 4]. During the last five years the frequency of the pathology of diseases of the nervous system is increased significantly [1, 2]. Depending on the number (specific weight in population) of children with damage of central nervous system, with disabilities in intellect and behavior, the intellectual potential of the future society is being

defined [1,3,4].

Study purpose: to analyze the frequency of pathology of the Central nervous system being occurred at children and adolescents in region Mirnyj (Yakutia).

MATERIALS AND METHODS

In the special children's hospital departments in Novosibirsk 2875 children living in region Mirnyj (Yakutia) in age of 1 month up to 17 years are examined and treated. The research was performed in compliance with consent of children and their parents and with the permission of the Committee of Ethics, in accordance with the standards of ethics of the Helsinki Accord (adopted at the 59th WMA General Assembly, Seoul, 2008). The research was carried out under the contract with the Ltd Society "ALROSA" for the period from 1993 till 2015.

The complex examination of children included: complaints, data of anamnesis, date of survey of parents and children, the study of personal medical records, physical examination, results of EEG, REG, M-ECHO of brain, MRT of brain, X-ray of skulls in two projections, X-ray of cervical spine with functional tests, assessment of ocular fundus, ECG, ECHO - KG, ultrasound examination of abdominal organs, ultrasound examination of pelvic organs, assessment of the vegetative nervous system, assessment of the conjunctive tissue. Along with the above mentioned complex study the specific examinations were performed in compliance with the each type of pathology. The psychomet-

ric study included the questionnaires of children and their parents with the use of validated Russian versions of several questionnaires (assessment of personal, social, psychological, mental health and quality of life).

The verification of the clinical diagnosis was carried out on the base of the results of the patients' assessment. According to the standardized classification of ICD - X revision the primary and associated diseases were diagnosed to each child. The underlying disease was accepted as that one, which is characterized by the most serious changes of any system and might result in chronic illness and disability of the child. The statistical software package "Statistica 6" was used for the statistical processing of the study results.

RESULTS AND DISCUSSION

2 875 people in age of 1 month till 18 years were surveyed and treated in specialized departments of the children's clinics in Novosibirsk during the period of 1993-2015.

All the children were accepted after the selection at the place of residence. The children of town Mirnyj accounted for 72.2%, of the Mirnyj's villages (Udachny, Aikhal, Arylakh, Chernyshevsky, Almazny, Svetly, etc.) - for 27.8 percent. The analysis of the distribution of children as to the social status of parents showed that children of employees in the Mirnyj region is accounted for 58.9%, children of workmen 41.1, the majority of children living in the Mirnyj's villages – they are children of workmen

(66.4%).

According to the age aspect the vast majority are children of the first 7 years of life (57.3%). Basic information about development of child was stated, as well as his diseases and treatment of diseases. The dynamic analysis showed that more than 2/3 of children were previously treated at the place of residence, and 22% of children were examined and treated for the first time. Among the children who were placed into the hospitals in Novosibirsk boys prevailed (1579 boys and 1296 girls). Notable is the fact that, since 2000 the number of teenagers has increased till 38.6 % of the total number.

In the structure of diseases according to classification ICD-X for the period from 1993 till 2015 the following structure of diseases is noted: pathology of - CNS- 34,8%, pathology of blood - 1,9, diseases of endocrine system - 3,2, of the organs of vision - 1, diseases of the cardiovascular system - 8,9, of respiratory system - 17,1, of gastrointestinal tract 6,7, of urinary tract - 20,5%, etc.

The pathology of CNS as the underlying disease was frequently observed consistently in all the years of the contract. But beginning from 2007 till 2015 the percentage of children with the underlying CNS diseases declined slightly and remained stable in the range 21.6% -20.6 percent in 2015.

At the examination of children the high proportions make comorbidities. The analysis showed that most children, in addition to the underlying disease, had concomitant illnesses: without comorbidities - 17.3%, with 1 additional disease - 16,0, with 2 diseases 18.6, with 3-4 diseases 30.6, with 4 diseases or more 17.3% of children. It was revealed that more than half of children had 2 or more comorbidities. The analysis showed that at children with CNS pathology the most frequent concomitant diseases were: pathology of the digestive system, chronic infections of the nasopharynx, vascular dystonia and connective tissue dysplasia (in 50, 0 %, 25, 0, 25,0% of children respectively).

At children of early age (0 - 3 years) the CNS pathology was noted in 31.2 percent, the chronic forms were at 80 % of children. The data history shows that more than 84.2 percent of the cases the CNS pathology was a consequence of intrauterine hypoxia on the background of pathological course of pregnancy. Such adverse background of childbirth was also preceded with complication that together with hypoxia promoted the trauma in child-

birth. The following syndromes are identified: cerebral palsy of shield (CP), hypertension&hydrocephalic syndrome, hyperosmolality, giovanbattista, minimal brain dysfunction, cerebrasthenic syndrome, delay in speech development. In addition, in 1 case we observed a giant cyst of the parietal-occipital region, as well as an arachnoid cyst in the left temporal region. We also identified 1 case of polyneuropathy, infectious-and-allergic genesis with a slight lower peripheral paresis.

Cerebral palsy is motor impairment at children with sequelae of perinatal brain lesions that include: dystonic attack, hyperkinesis, increased pastanesi reflexes. In the neurological status were observed: the increase or decrease of muscle tone, hyperreflexia, developmental delay, oculomotor symptoms. MRT revealed cortic-subcortical atrophy, periventricular leucomalacia [2, 4].

At children of 4-7 years the CNS disease was observed in 18,7% of children, the chronic diseases were observed in all children. We marked hypertension-hydrocephalic syndrome, delayed psycho-motor and neuro-psychological development, episyndrome, syndrome similar to autism, cerebral palsy, disorder of attention deficit and hyperactivity disorder (ADHD). Early brain damage in most cases manifests itself in future in varying degrees of impaired development. With age in the absence of adequate assistance gradually impairments will be fixed and the complex pathology will be formed.

The manifestations of ADHD can lead to family conflicts, poor relationships with peers, impaired social and school adaptation, difficulties in learning, reduced performance, accidents and injuries, smoking, substance abuse (drug addiction, drug abuse), delinquency, antisocial behavior, thereby exerting a negative impact on all spheres of life of the patient. Symptoms of ADHD can persist in adults, that leads to difficulties at work, low self-esteem, problems in family life, alcohol abuse, substance abuse, criminal behavior [2- 4].

Autism is a complex disorder of mental development, requiring interdisciplinary approach, interaction and understanding of doctors of various specialties. Formally, from the neurologist's point of view, such a child is truly neurologically healthy [2-4].

In 8-12 years children the CNS pathology was noted in 12,5% in the form of epilepsy, hypertension-and-hydrocephalic syndrome, cerebro-asthenic syndrome with cervical insufficiency, mini-

mal brain dysfunction with cephalgias syndrome, hyperactivity syndrome, dyslexia, delayed behavioral development, bedwetting, asteno-neurotic syndrome, syndrome of vegetative-vascular dysfunction with paroxysmal states. There was revealed also a cyst in the temporal region, coarse organic lesion of CNS on the background of congenital abnormalities of the brain. Thus, CNS pathology is also characterized by chronic lesions.

In the age group of children of 13-17 years the CNS pathology was at 37.5%. These were children with vegetative-vascular dystonia of puberty period of the mixed type, asthenic-neurotic, cephalgias and cerebro-asthenic syndromes. In addition, idiopathic epilepsy, infantile autism, microadenoma of the pituitary gland, neuropathy, a variant of Charcot-Marie of the 3rd type, Wakea syndrome were diagnosed.

The CNS pathology in the form of a concomitant disease was noted in 46.6% of children. 15,6% of children are classified as having chronic disease in the form of residual manifestations of perinatal encephalopathy with hypertension-and-hydrocephalic syndrome, syndrome of hyperactivity. The CNS pathology in other children was attributed to the group of functional disorders (asthenic-neurotic syndrome, minimal brain dysfunction, increased neuro-reflex excitability).

All the children in the hospital received comprehensive therapy with nootropics, cerebrolysin, actovegin, symptomatic anticonvulsant therapy, vitamins B and other medications. In the treatment of children, where the CNS pathology was as comorbidity, the complex of treatment included all the therapeutics stated above. All children were discharged from hospital with improvement, and with recommendations for parents and for professionals at the place of residence.

CONCLUSION

High percentage of CNS pathology in children beginning from early age indicates that it is a consequence of the intrauterine hypoxia on the background of pathological course of pregnancy. At a such adverse background the childbirth is also proceeded with complication that contributed to the trauma of the child during his birth. Thus, hypoxic-traumatic perinatal encephalopathy is the main cause of pathology in children of all age groups. The data received by us are consistent with the results of other authors. This suggests that the basis of prevention from CNS pathology should be health improvement of women in their reproductive age. Timely detection and treatment of disease of children from the

newborn period will reduce the number of chronic forms and disability in older children.

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Information about the authors:

1. Ryabichenko T. I. - doctor of Medical Sciences, Professor, a leading researcher at the laboratory of reproduction immunology Novosibirsk Center for Clinical and Experimental Medicine, Siberian Branch of Russian Academy of Medical Sciences ("NIIEM"), Professor of the Department of propaedeutics of children's diseases Novosibirsk State Medical University of Minzdrav of Russia.

630108, Novosibirsk. 1st lane Parkhomenko D str., 6, sq. 9, 2925871, e-

mail:2925871@mail.ru

2. Skosyreva G. A. - doctor of Medical Sciences, a senior Research Laboratory of reproduction immunology Novosibirsk Center for Clinical and Experimental Medicine, Siberian Branch of Russian Academy of Medical Sciences, 630049, Novosibirsk, D. Kovalchuk str., 260/1, sq. 69, e-mail: skosyreva43@mail.ru

3. Timofeeva E.P. - candidat of Medical Sciences, assistant professor, Department of propaedeutics of children's diseases Novosibirsk State Medical University of Minzdrav of Russia, 630063, Novosibirsk, Chekhov str., 254, sq. 5, e-mail: timofeevae.p@mail.ru

4. Kulakova Y.V. - Director of the medical center of AK "ALROSA" (JSC), Mirnyj, Lenina str., 4. The Republic Sakha (Yakutia).

5. Kosyanova T. G. - Junior researcher "NIIEM", Novosibirsk, Petukhova str. 144, sq. 81, e-mail: 2925871@mail.ru

6. Patrusheva Y. N. - graduate student "NIIEM", Novosibirsk, D. Davidov str., 6, sq. 10, e-mail: 2925871@mail.ru.

E.N. Verkhoturova, A.S. Golderova

GASTROESOPHAGEAL REFLUX DISEASE COMPLICATED BY BARRETT'S ESOPHAGUS (AT THE EXAMPLE OF THE MEDICAL UNIT HEALTH OF THE MINISTRY OF INTERNAL AFFAIRS OF THE RF ON RS (Y))

ABSTRACT

The article presents the data of endoscopic examination of patients of the Medical unit the Health Ministry of Internal Affairs of the RF in the RS (Y) with a diagnosis gastroesophageal reflux disease and its complicated forms. We compared the chromoendoscopy data with the results of histological examination of biopsy samples. We analyzed risk factors frequency of patients with a verified diagnosis Barrett's esophagus.

Keywords: gastroesophageal reflux disease, Barrett's esophagus, chromoendoscopy.

INTRODUCTION

The gastroesophageal reflux disease (GERD) is the topical issue of the gastroenterology as well as the internal medicine. This disease is characterized by inflammatory processes in the mucosa of the distal part of the esophagus and/or specific clinical symptoms caused by frequent passage of gastric and/or duodenal contents into the esophagus.

The actual prevalence of GERD remains unestablished, that caused by big variety of clinical symptoms. According to the researches in Europe

and the USA, 20-25% of the population has the clinical symptoms of GERD and 7% have these ones every day. In the presence of the general medical practice, 25-40% of the patients diagnosed with GERD have the esophagitis that based on endoscopic data, but most people with GERD don't have endoscopic symptoms.

The actual prevalence of GERD is notably higher than its statistics data, considering that among other things as few as 1/3 people with GERD seek medical advice. According to the data of

the FGHI «Medical room of the Interior Ministry of the Russian Federation for the Novosibirsk region» among 630 officers, having visited the military-medical commission in 2002-2009, GERD was diagnosed among 256 officers (40,6%).

Some separate researches on clinical-morphofunctional characteristics of GERD in various age and ethnic groups of the population were done in Yakutia [1, 3, 9]. Meanwhile, the symptoms of the complicated forms of the GERD were under-investigated among our population.

Barrett esophagus is well recognized as a non-heritable condition and a complication of GERD. In Barrett esophagus, planocellular epithelium within esophageal mucosa is replaced with columnar one formed as a specialized intestinal metaplasia [6, 10].

The clinical importance of Barrett esophagus lies in the fact that it is a contributory cause to a progression of ulcers and peptic esophageal stricture and, consequently, is a transition from premalignancy to malignancy [2, 11]. It should be noted that intestinal columnar epithelium resulted from a metaplasia increases risk of esophageal cancer in 30-125 times. Averagely, Barrett esophagus is formed in 40 years old, but is detected in 60. Its approximate prevalence in Western countries is one person per 100 people aged 60 and older and one person per 20 people diagnosed with GERD [12].

According to the data of the world literature, risk of malignant progression/transformation in patients with Barrett esophagus varies from 5% to 50% and directly depends on a dysplasia rate, revealed during the morphological examination. Yakutia remains an endemic region because of a high prevalence of esophageal cancer – more than 150 people per 100 thousand inhabitants [5, 4].

So, the importance of the research topic is caused by the high prevalence of GERD, typical and atypical clinical symptoms, having the negative influence on the quality of life of the patients, and insufficient information on the clinical-morphofunctional characteristics of the complicated forms among the population of Yakutia. In particular, Barrett esophagus, a serious complication of GERD, comes into importance because it increases risks of the progression of the esophageal adenocarcinoma. The incidence rate of GERD and its complications warrant more research and the implementation of the contemporary mechanisms of the systemic diagnosis of this disease.

The objective of the research is to compare the results of the chromoesophagoscopy with the results of the morphological examination and to give the incidence rate, age and ethnic characteristics of GERD, complicated by Barrett esophagus.

DATA AND METHODS OF THE RESEARCH

996 patients were observed by use of the method of fiberoptic esophagogastroduodenoscopy (fiberoptic EGD) on the basis of the Federal

Table 1

Table №1.
The results of the chromoesophagoscopy and the histological examination for patients with the erosive form of GERD (n=50)

The conclusion of the histological examination	The results of chromoesophagoscopy	
	Absolute numbers	%
Layers of squamous epithelium with the <u>lympholeucocytic infiltration</u>	7	14
Thickened layers of the squamous epithelium with/ <u>without anabrosis</u>	10	20
Layers of squamous epithelium with parakeratosis and <u>leukoplakia</u>	5	10
Focal dysplasia (I grade)	6	12
Focal dysplasia (II grade)	3	6
Focal dysplasia (III grade)	1	2
Barrett esophagus	18	36

Government Health Institution (FGHI) «Medical room of the Interior Ministry of the Russian Federation for the Republic of Sakha» during 2014. 344 patients (34.5%) from 20 to 75 years old were diagnosed with GERD, including its erosive and non-erosive symptoms. The endoscopy was held by use of the fiberoptic esophagogastroduodenoscope «Pentax» (Japan).

The pathomorphological researches were done on the basis of the anatomic pathology department of the Republic hospital №1 (National Center for Medicine) in Yakutsk. Biopsy material was taken from the mucosa of the distal part of the esophagus and all the suspicious areas by the use of 4-quadrant method at 2 cm intervals. The chromoesophagoscopy with the further multiply target biopsy was done

for 50 patients to detect morphological transformations of the erosive reflux esophagitis revealed by the use of the endoscopic method. Researches were done with the use of methylene blue (0.25%), which is capable to enter cytoplasm of the transformed cells. The dye-ware colors (vital dyes) were needed to get extra information about the previous functional and morphological transformations. The results of chromoesophagoscopy were treated in the following way: untransformed mucosa doesn't take a dye; the areas of dysplasia, leukoplakia, anabrosis and ulcercovered with fibrin take a blue dye; the areas of mucosa diseased by cancer take an intense blue dye.

RESULTS AND DISCUSSION

There were 290 men (84,3%) and 54 women (15,7%) among 344 patients diagnosed with GERD. 46,7% of the

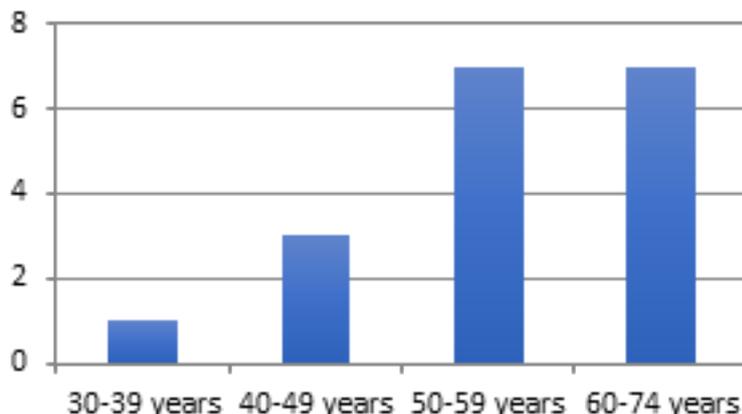


Fig. №1. Disposition of patients with Barrett esophagus, according to their age

patients (161 patients) were officers with a special rank, 16,7% - officers and workers of another law enforcement authorities (The Administration of the Federal Service for Corrections, Ministry of Civil Defense and Emergency Response) and 36,6% - the civilian employees, the elderly and the members of the officers' families.

The chromoesophagoscopy with the further target biopsy was done for 50 patients with the erosive form of GERD (table №1). The analysis of the data comparison of the chromoesophagoscopy with the results of the histological examination revealed that the mucosa of the esophagus of 22 patients (44%) was characterized by lympholeucocytic infiltration, thickened layers of the squamous epithelium and the areas of the parakeratosis with the leukoplakia. 10 patients (20%) had more apparent findings as focal dysplasia (low-grade, medium-grade and high-grade).

However, according to the morphological examination 18 patients (36%) had the changes that typical for Barrett esophagus, such as columnar metaplasia with the detection of columnar epithelium of three types – fundic, cardiac and specialized intestinal. The obtained data is consistent with the results of the research of Cuban State Medical University [7] and other researches [8].

Among the patients with Barrett esophagus were 16 men (88,9%) and 2 women (11,1%) aged 30 to 75 years. This pathology was typical for the middle-aged and the elderly-aged people: 50-59 years (38,9%) and 60-74 (38,9%). This age category includes retired employees of the Interior Ministry. The group aged 30 to 40 years include only 1 patient (5,5%), 40 to 50 years – 3 patients (16,7%), which is typical for officers with a special rank (illustration №1).

The ethnic composition of the patients with Barrett esophagus has a significant difference (illustration №2). The group of the native population included 10 Yakuts and 2 evens. Non-native population was divided into 2 subgroups: 1 – people of the first generation, having come to Yakutia from various regions of the Russian Federation and Commonwealth of Independent States (CIS), 2 – people of the second population, having born in Yakutia. Among the patients with Barrett esophagus 12 persons (66%) turned out to be native, 2 persons (11%) – non-native (first generation) and 4 persons (22%) – non-native (second generation) (illustration №2).

Table 2

Hereditary burden of the patients with Barrett esophagus of the different ethnic identity

Ethnic identity of patients	Total number of patients	Hereditary burden for cancer		
		From a mother	From a father	From relatives
The native	12	-	3	1
The non-native (1 st generation)	2	1	-	-
The non-native (2 nd generation)	4	1	2	1

It should be noted that 50% of the patients with Barrett esophagus (9 of 18 patients) reported that they had a hereditary burden for cancer. Among them 44% were the native (4 persons), 55,6% - the non-native (table №2), i.e. this important risk factor is more apparent among the non-native population.

Hereditary burden of the patients with Barrett esophagus of the different ethnic identity

The analysis of the main risk factors for digestive diseases as a nutritional disorder, smoking and excessive drinking (illustration №3) revealed that 77,8% of the patients often ignored the nutrition prescription, and also preferred hot and spicy food, 66,7% were smokers, and 16,7% drink to excess.

The analysis of the clinical presentations of the reflux disease and the causes of Barrett esophagus

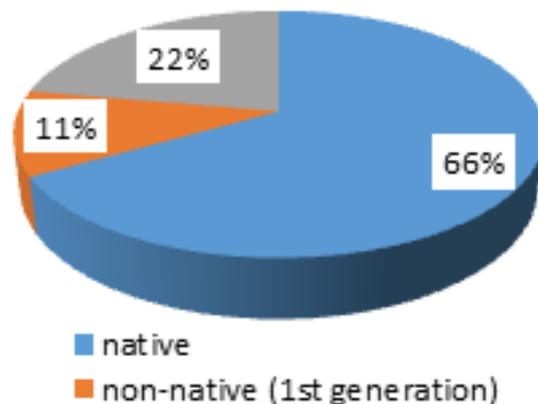


Fig. №2. Disposition of patients with Barrett esophagus, according to their ethnic identity

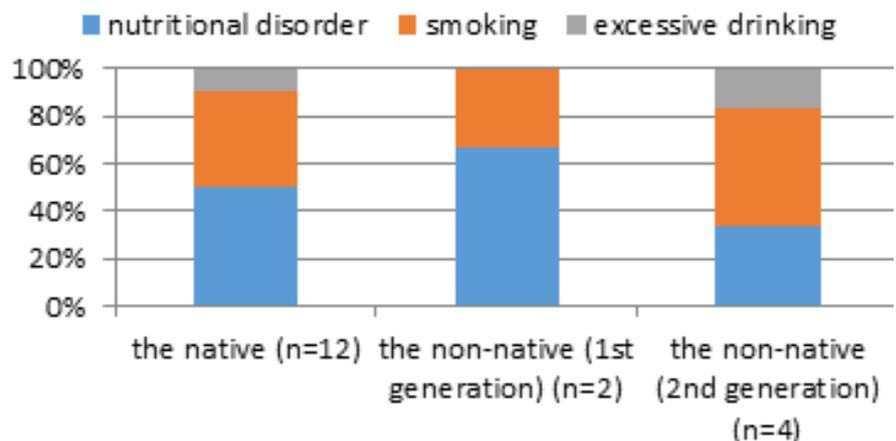


Fig. №3. Risk factors for the patients with Barrett esophagus

revealed the following main symptoms: heartburn (94,4%), regurgitation (55,6%), dysphagia and odynophagia (33,3%), pain under the sternum (27,8%), extra-esophageal symptoms as chronic cough, pharyngitis, dysphonia, sleep apnea, halitosis (27,8%).

CONCLUSION

So, among the patients diagnosed with GERD Barrett esophagus as its serious complication was detected in 18 from 344 people (5,23%). This pathology is more typical for men than women; for the middle-aged and the elderly-aged people; for native population (66%), than non-native; 50% of the patients had a hereditary burden for cancer. 77,8% of the patients eat food, that thermally and mechanically irritate esophagus, 66,7% are smokers. The key symptom of this pathology – the heartburn – was detected among 94,4%.

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The authors:

Verkhoturova Elena Nikolaevna, the endoscopist and the gastroenterologist in the Federal Government Health Institution (FGHI) «Medical room of the Interior Ministry of the Russian Federation for the Republic of Sakha», Yakutsk, Russia, e-mail: elenaverhoturova@gmail.com;

Golderova Aitalina Semenovna, Doctor of Medical Science, Chief of the Research office of the coping mechanisms in the Federal State Budgetary Scientific Institution (FSBSI) «Yakut scientific center of complex medical problems», Yakutsk, Russia, e-mail: hoto68@mai.ru.

THE REGULATORY SYSTEM OF THE HUMAN BODY IN THE NORTH

L.G. Marinova, N.V. Savvina, I.L. Savvina

THE TEENAGER: GROWTH AND DEVELOPMENT IN THE NORTH

ABSTRACT

The article reviews physical development of teenagers living in extreme climate conditions. The influence of various factors on physical development leads to phenotypical changes. The environment influences much on the children's organism as due to genetic plasticity and lability it is more acquisitive to unfavorable factors. Researches in the North where residing conditions are severe enough, considering extreme factors, such as long period of low temperatures, sharp day differences of atmospheric pressure, polar night, deficiency of solar radiation, etc., have revealed delay of terms of the beginning of growth activity, a great speed of transit of separate stages of the organism development, the accelerated maturing and early biological maturity which is explained as a phenotype approaching to the special ecological conditions.

Keywords: teenager, physical development, pubertal period, extreme North.

Healthy rising generation is an important condition of prosperity and development of any society. In this aspect children and teenagers of the North are in the most complex ecologic-hygienic and social-economic conditions.

The pubertal period is one of the most complex periods in the development of the child when reproductive performance is reached, osmotic growth comes to the end, perfection of all organs and systems occurs. During this process organism Healthy rising generation is an important condition of prosperity and development of any society. In this aspect children and teenagers of the North are in the most complex ecologic-hygienic and social-economic conditions.

The pubertal period is one of the most complex periods in the development of the child when reproductive performance is reached, osmotic growth comes to the end, perfection of all organs and systems occurs. During this process organism quantity indicators (the dimensions of separate organs and all body) increase, and also there is a perfection of organs' work and the physiological systems providing normal livingability of the mature person which high lights is labour activity and a birth of healthy children [4, 11].

According to the state statistics of the Republic of Sakha (Yakutia) since 2000 to 2010 the common sickness rate among teenagers has increased in 2.5 times. The primary diseases are: the first place is occupied with respiratory organs which have increased in 1.8 times for a decade, on the second place – traumas and poisoning and some other consequences, have increased in 2 times, on the third place – illnesses of digestive organs, have increased in 2.6 times [8,9]. As a whole, these data testifies to presence of a negative tendency – reduction of healthy teenagers in Yakutia.

Physical development (PD) is consid-

ered to be one of direct indexes of health of rising generation. In each region it is characterized by certain ethnic composition, climate-geographical and social-economic conditions and has its peculiarities [4, 6, 7, 9, 13, 17]. That's why it is recommended to use local standards as the growth and development of children in different climate-geographical regions and ethnic groups are various.

Physical development is a complex of morphofunctional properties of organism defining a store of physical strengths, capacity measure, level of biological state of organism, process of the development of, first of all, somatic indexes which can be supervised for the purpose of optimization of physical development [10,11].

One of the factors, influencing on a physical development, especially growth of the child after 2 years of life is heredity. There are 2 periods when correlation between growth of parents and children is most significant. It is age from 2 till 9 years when one bunch of genes (the first family factor) affects, and age from 14 till 18 years when growth regulation depends on other genes (the second family factor).

Social-economic conditions (education of parents, living conditions, number of children, age of the father and mother, hygienic skills, education and etc.) make essential impact on the growth processes in all ontogenesis periods. So, practically all worldwide there is a tendency: children from wellprovided families are taller and heavier, than children from poor families [9, 11].

Important value in the development of the child plays also climate-geographical factors (duration of light day, temperature, humidity). It is considered, what exactly climate-geographical factors renders maximum influence on child's organism as due to genetic plasticity and lability it is more acquisitive to unfav-

orable factors. It is scientifically proved that a hot climate and high mountains conditions possess inhibiting influence on the growth processes, but simultaneously can accelerate essentially maturing of children. Growth rate fluctuations in connection with seasons of the year (acceleration in spring and inhibition in fall-winter months) [2, 11] are widely known.

Researches in the North where residing conditions are severe enough, considering extreme factors, such as long period of low temperature, sharp day differences of atmospheric pressure, polar night, deficiency of solar radiation, etc., have revealed delay of terms of the beginning of growth activity, a great speed of transit of separate stages of the organism development, the accelerated maturing and early biological ripeness which is explained as a phenotype approaching to these ecological conditions [1,14].

Studying of the basic indexes of physical development, the analysis of their changes among teenagers has revealed a series of peculiarities for last decade. At the beginning of the XXI century stabilization of longitudinal growth and puberty processes with simultaneous sharp augmentation of indexes of body mass and fat layer was marked in the majority of the European countries,

Another tendency which is found among youth of the Russian Federation and some other CIS countries is connected with inversely directed processes when stabilization of longitudinal growth decreases indexes of body weight, body form changes to astenization and leptosomization. The examinations of children and teenagers of Moscow, Saratov and some other big cities of Russia in different time have testified about it [5].

In Yakutia the first time regional standards have been compounded and

published by the professor M.V. Handy in 1988. A series of researches for the relative analysis have been made since 1995 to 1998 and since 2000 to 2004 [9, 18].

Some features in physical development of teenagers have been determined, such as: body decrease at augmentation of body length which have led to decrease in index of proportionality and formation of gracial figure among teenagers of 10-14 years; low indexes of body length in 4,6 cm and body mass in 5,3 kg, and delay of appearance of the secondary sexual signs among girls in comparison with indexes of teenagers of the Russian Federation; teenagers prevalence with decrease in muscle strength of hands, as result of decrease of body mass for muscular component; delay of actual sizes of vital capacity and compressive force of hands from standard that defines low functionality among teenagers of Yakutia. Also in comparison with 1998 in 2003 relative density of schoolchildren with deficiency of body mass has grown in 1% on the average, and almost twice body mass has grown (from 4,5 % to 8,4 % among boys, from 3,8 % to 7,7 % among girls) [17,18].

Nowadays problems of physical development of children and teenagers continue to be investigated.

For medical practice the indexes of rather easy measurement which are called somametric more often are used: body length, body mass, chest circumference. Body external examination reveals somatoscopic indexes: form of thorax, back, foot, bearing, muscular state, adipopexis, skin elasticity, puberty signs. For the assessment of organism functionality are used physiometric indexes - vital capacity of lungs, compressive force of hands (dynamometry) [4, 11,12].

Maximum pubertal acceleration in a linear growth among girls is marked at the age of 10-13 years, among boys the high-speed peak is registered on the average in 13-15 years. Just to these periods there is a maximum intensive influence of environment on the development of child's organism [4, 11].

The body mass is considered to be rather labile index which is changing under the influence of exogenous and endocrine factors and is in direct, nonlinear dependence on length of the body; its increase descends irregularly and is conserved after the linear growth termination.

The thorax circumference has great value for the assessment of level and harmony of physical development, defi-

nition of the constitution type and sexual development [11].

One of the approaches to health forecasting is the assessment of the psychosomatic constitution of the person as adaptable possibilities and predisposition to various mental and somatic diseases correlate with accessory to defined constitutional types [3]. Constitutional type is the integrated index characterizing physical and functionality of the human body. Its morphological expression is somatotype [19]. Somatotype is defined only with the harmonious development of the child. According to R.N.Dorokhov and M.I. Bahrah's scheme, there are microsomatic, macrosomatic and mesosomatic somatotypes [12]. Research of somatotype among children, in particular among teenagers is important compounding assessment of physical development as it defines level of somatic health and functional state, is the constant characteristic and genetically determined [16].

Thus, dynamic examination of physical development of a growing organism of the child made in time is necessary for revealing individual features of growth and maturing, rate and development harmony and serves as important diagnostic criteria [19]. The objective assessment of physical development level of children is possible only with the local standards presence in each region taking into account social-economic and climate-geographical features of the region.

Nowadays, working out of standards of physical development is one of priority directions for hygiene of children and teenagers and also pediatrics.

Assessment criteria of physical development (estimated tables) are compounded for separate regions and are not static in time, therefore it is recommended to make constant update and correction of territorial standards of physical development of the children's population each 5-10 years [12,15].

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Authors information:

1. Marinova Lyudmila Germanovna – assistant of the department of pro-paedeutics of children's illnesses of MI NEFU named after M.K.Ammosov.

Contact information: address: 677000, Yakutsk, 27, Oyunsky St, room 215; phone: 89142266629; e-mail: mari-novalg@mail.ru;

2. Savvina Nadezhda Valerievna – head of the department of public health and general hygiene and bioethics of MI NEFU named after M.K.Ammosov, MD, PhD, professor.

Contact information: address: 677000, Yakutsk, 27, Oyunsky St, room 510; phone: 8(4112) 49-66-82; e-mail: nadvsavvina@mail.ru;

3. Savvina Irina Lvovna – PhD, assistant professor of department of foreign languages in technical and natural specialties.

Contact information: address: 677000, Yakutsk, 48 Kulakovsky St, room 728; phone: 8(4112) 36-61-82; e-mail: sil26@list.ru.

Lutov Yu.V., Selyatitskaya V.G., Deev D.A.

THE ASSOCIATION OF INSULIN RESISTANCE AND VISCERAL ADIPOSE TISSUE DYSFUNCTION WITH COMPONENTS OF METABOLIC SYNDROME IN MEN OF WESTERN-YAKUT INDUSTRIAL REGION

ABSTRACT

We have compared the association of parameters of insulin resistance and visceral fat dysfunction with the main and additional components of metabolic syndrome in men who permanently reside in West Yakutia industrial region and work in mining company. There was a close connection between insulin resistance and analyzed main and additional components of metabolic syndrome. However, we have found no association between the dysfunction of visceral fat tissue and disorders of carbohydrate metabolism, which is the principal component of metabolic syndrome. Cardiometabolic risk assessment using the criteria of visceral fat dysfunction can therefore result in underestimated contribution of carbohydrate metabolism disorder to cardiometabolic risk. Thus, insulin resistance criteria are more informative in population studies of metabolic syndrome epidemiology and pathogenesis than the criterion of visceral fat tissue dysfunction.

Keywords: West Yakutia industrial region, men, metabolic syndrome, insulin resistance index, visceral adiposity index.

In spite of the consensus on metabolic syndrome (MS) definition achieved by professionals from different fields of medicine and international organizations, there are still many controversial issues of metabolic syndrome pathogenesis. MS is currently considered a cluster

of factors of increased cardiovascular risk including the following five pathological conditions, which are the main components of MS: abdominal obesity (AO), arterial hypertension (AH), carbohydrate metabolism disorders (CMDs), hypertriglyceridemia (HTG),

and decreased level of high density lipoprotein cholesterol also known as hypoalphacholesterolemia (HACL) [7].

The majority of researchers believe that insulin resistance (IR) is a key element of MS pathogenesis. HOMA-IR index of insulin resistance is used to

evaluate the insulin sensitivity. This index is calculated on the basis of carbohydrate metabolism regulation parameters (glucose and insulin blood levels) [8]. It has been also demonstrated that insulin resistance is associated with other diseases and hormonal and metabolic disorders such as excess body weight (EBW), hypercholesterolemia (HCL), purine metabolism disorders (PMDs), proinflammatory and prothrombotic changes in blood system, testosterone deficiency, etc. [2, 3, 6, 9]. These pathologic states are classified as additional components of MS.

There is also an alternative viewpoint on MS pathogenesis. According to this viewpoint, pivotal role in MS pathogenesis is played by AO and visceral fat dysfunction (VFD) based on the disbalance secretion of adipokines (leptin, resistin, adiponectin, etc.) and the hyperproduction of proinflammatory cytokines, free fatty acids, etc. [5, 11]. A special model of fat distribution is therefore proposed to measure the level of individual cardiometabolic risk. This model calculates the visceral adiposity index (VAI) using the anthropometric characteristics of obesity (Kettle index and waist circumference) and biochemical markers of fat dysfunction (blood levels of triglycerides and high density lipoprotein cholesterol) [10].

There is a direct correlation between HOMA-IR and VAI indices and between these indices and MS [10]. However, it is not quite clear if these indices are equally associated with various components of MS. We need to know this to determine how exactly these indices should be used in epidemiological and pathogenetic studies of MS, especially in certain cohorts of examined people.

We have shown earlier that from 1991 to 2007 the frequency of MS in workers of West Yakutia industrial region increased more than three times [1]. In 2007 the following three components of metabolic syndrome dominated: AH, AO and HACL [4].

The aim of this study was to perform the compare the relationships between IR and VFD and the main and additional components of MS in men who permanently reside in West Yakutia industrial region and work in mining company.

MATERIAL AND METHODS

The study involved 242 non-indigenous men aged from 21 to 61 years who constantly lived in Mirny Republic of Sakha (Yakutia) and worked at the mine "International". Body length (BL, m), body weight (BW, kg), waist circumference

(WC, cm), systolic and diastolic blood pressure (SBP and DBP, mm Hg) was measured, and the concentration of glucose (mmol/L), triglycerides (TG, mmol/L), total cholesterol (TCL, mmol/L), high density lipoprotein cholesterol (HDL, mmol/L), uric acid (UA, μ mol/L) and immunoreactive insulin (IRI, reference values 4-16 MU/ml) were determined in the blood serum. The presence of AO, AH, CMDs, HTG and HACL was diagnosed according to criteria NCEP ATP III [7]. The presence of excess body weight was recorded at value of Kettle index (IK), calculated as the ratio of BW (kg) / BL (m^2), equal to or more 25.0. The presence of HCL was diagnosed at the concentration of TCL in the blood higher 5.2 mM; PMDs was defined at the concentration UA higher 400 mmol/L. The presence of MS was verified in two ways: the patient had at least three main components (according the recommendations of experts NCEP ATP III), or there are three or more any components (main and additional). HOMA-IR index was counted for determination of sensitivity to insulin according to the formula: $\text{glucose (mmol/L)} \cdot \text{IRI (MU/ml)} / 22.5$; IR was registered for values of the index more than 2.77 conventional units (CU) [8]. Visceral adiposity index was calculated by the formula: $\text{VAI} = (\text{WC} / (39.68 \pm 1.88 \cdot \text{IK})) \cdot (\text{TG} / 1.03) \cdot (1.31 / \text{HDL})$; the index value more than 1.00 CU demonstrated the presents of VFD [10].

The results are presented as mean indicator values and the standard deviation ($M \pm SD$) or the frequency of a sign (%). Average values of HOMA-IR and VAI indexes were compared using the Mann-Whitney U-test. The χ^2 test with Yates correction was used to compare the frequency of IR and VFD. Distinctions were recognized significant at $p < 0.05$.

RESULTS AND DISCUSSION

Average values of VAI and HOMA-IR indices in total sample of men were 1.68 ± 1.55 and 3.70 ± 2.64 CU, respectively. The frequencies of VFD and IR were 63.6% and 55.4%, respectively. The analysis of these parameters in relation to MS and its components are shown in table.

The table shows that VAI and VFD frequency depended on the presence of MS (irrespective of the method of its identification), its four main and three studied additional components. However, VAI and VFD were not connected with CMDs, the principal component of MS. HOMA-IR index depended on the presence of MS when

each of two verification techniques was used. HOMA-IR index also depended on all main and additional MS components. Similar relationships were identified between IR and MS and its components except for HCL, which had no influence on IR frequency. These findings suggest that VFD parameters in studied man sample were less connected with MS than insulin resistance parameters.

Total index of ratios (TIR) was calculated to range MS components by the level of their connection with VFD and IR. TIR for VFD is the sum of the ratio of average VAI values in groups with presence or absence of certain MS component and the ratio of VFD frequencies in the same groups. For instance, TIR for HTG was calculated as follows: average VAI values in groups with presence or absence of HTG were 3.63 and 1.12, respectively (table); the ratio of these average VAI values was 3.24; VFD frequencies in groups of men with HTG or without HTG were 98.1% and 53.7%, respectively, and their ratio was 1.83. TIR for HTG is therefore $5.07 (3.24 + 1.83)$. TIR for other components were calculated in the same way. In case of VFD, studied components of MS in descending order of TIR values were the following: HTG (5.07); HACL (4.75); EBW (4.61); AO (3.27); AH (3.18); PMDs (3.03); HCL (2.8); CMDs (2.41).

In case of IR, TIR values for MS components were calculated in the same way as TIR values in case of VFD: ratio of average HOMA-IR values in groups with presence or absence of certain MS component was summed up with the ratio of IR frequencies in the same groups. In case of IR, studied components of MS in descending order of TIR values were the following: EBW (3.54); CMDs (3.43); AO (3.31); HTG (3.15); HACL (3.04); PMDs (2.93); AH (2.8); HCL (2.44).

Remarkably, there were significant differences between TIR-based scales demonstrating the association between VFD and MS components and association between IR and MS components. Two types of dyslipidemia (HTG and HACL) and two components characterizing obesity and fat distribution (EBW and AO) were on 4 top positions, while the same two components related to the total amount of fat in body and fat topography as well as CMDs and HTG (the type of dyslipidemia) were at the upper part of IR scale. Taking into account the revealed features of the scales and the last place of CMDs in the scale for VFD, we can conclude that CMDs contribution to cardiometabolic

Table

Indexes of visceral obesity and insulin resistance, the frequency of visceral fat dysfunction and insulin resistance depending on the presence of metabolic syndrome and its components in the men

Metabolic syndrome and its components	Index of visceral obesity (CU)	The frequency of VFD (%)	HOMA-IR (CU)	The frequency IR (%)
The presence of MS by the main components (n=59)	3,26±2,25	98,3	5,69±4,00	84,7
The absence of MS by the main components (n=183)	1,18±0,70	52,5	3,06±1,56	45,9
P	<0,0001	<0,0001	<0,0001	<0,0001
The presence of MS by the all components (n=141)	2,25±1,80	85,1	4,42±3,12	68,8
The absence of MS by the all components (n=101)	0,89±0,42	33,7	2,71±1,19	36,6
P	<0,0001	<0,0001	<0,0001	<0,0001
The presence of abdominal obesity by criterion WC (n=61)	2,36±1,44	90,2	5,01±3,31	82,0
The absence of abdominal obesity by criterion WC (n=181)	1,46±1,52	54,7	3,26±2,20	46,4
P	<0,0001	<0,0001	<0,0001	<0,0001
The presence of arterial hypertension (n=146)	1,89±1,61	77,4	4,09±2,74	63,7
The absence of arterial hypertension (n=96)	1,38±1,41	42,7	3,12±2,36	42,7
P	<0,0001	<0,0001	<0,0001	0,0021
The presence of carbohydrate metabolism disorders (n=65)	1,97±1,70	70,8	5,41±3,89	78,5
The absence of carbohydrate metabolism disorders (n=177)	1,58±1,48	61,0	3,08±1,59	46,9
P	0,0552	0,2124	<0,0001	<0,0001
The presence of hypertriglyceridemia (n=54)	3,63±2,20	98,1	5,28±4,04	75,9
The absence of hypertriglyceridemia (n=188)	1,12±0,55	53,7	3,25±1,85	49,5
P	<0,0001	<0,0001	<0,0001	0,0010
The presence of low level high density lipoprotein cholesterol (n=77)	2,97±2,11	97,4	4,72±3,56	74,0
The absence of low level high density lipoprotein cholesterol (n=165)	1,09±0,57	47,9	3,23±1,90	46,7
P	<0,0001	<0,0001	<0,0001	0,0001
The presence of overweight (n=166)	2,02±1,71	78,3	4,16±2,97	65,7
The absence of overweight (n=76)	0,95±0,67	31,6	2,71±1,23	32,9
P	<0,0001	<0,0001	<0,0001	<0,0001
The presence of hypercholesterolemia (n=110)	2,03±1,83	73,6	4,19±3,15	60,0
The absence of hypercholesterolemia (n=132)	1,39±1,19	55,3	3,30±2,04	51,5
P	<0,0001	0,0048	0,0246	0,2332
The presence of purine metabolism disorders (n=78)	2,33±2,14	76,9	4,73±3,60	70,5
The absence of purine metabolism disorders (n=164)	1,38±1,04	57,3	3,22±1,85	48,2
P	<0,0001	0,0048	<0,0001	0,0018

risk is underestimated when VFD is studied. Insulin resistance criteria with established diversified relationships with both lipid and carbohydrate disorders give more objective evidence in epidemiological or group studies on MS.

CONCLUSION

In sample of men working in West Yakutia industrial region the association of IR parameters with MS and its components proved to be closer and more diversified than that of fat distribution model parameters. Thus, insulin resistance criteria are more informative in population studies of metabolic syndrome epidemiology and pathogenesis than the criterion of visceral fat tissue dysfunction.

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The authors:

Lutov Yu.V., PhD, Senior Researcher of Laboratory of Endocrinology of Research Institute of Experimental and Clinical Medicine; 630117, Novosibirsk, Timakov st., 2, Russia; yvl1308@mail.ru;

Selyatitskaya V.G., Doctor of Biological Sciences, Professor, Chief Researcher of Laboratory of Endocrinology of Research Institute of Experimental and Clinical Medicine; 630117, Novosibirsk, Timakov st., 2; Russia, ccem@centercem.ru;

Deev D.A., Junior Researcher of Laboratory of Endocrinology of Research Institute of Experimental and Clinical Medicine; 630117, Novosibirsk, Timakov st., 2; Russia chaplainrus@gmail.com.

O.N. Poteryaeva, G.S. Russkikh, A.A. Rozumenko, N.G. Biushkina, Churkina T.V., Goltsova T.V., Osipova L.P., Polyakov L.M.

HORMONAL STATUS AND LIPID SPECTRUM IN THE POPULATION OF SAMBURG VILLAGE, THE YAMAL - NENETS AUTONOMOUS REGION

ABSTRACT

We estimated main indices of lipid metabolism and hormonal status in blood serum obtained from indigenous inhabitants (tundra Nenetses) of Samburg village and non-indigenous population (mostly Russians) who arrived from other regions. The study revealed an increased concentration of insulin in all groups and a lower level of cortisol and thyroxin (women) in non-indigenous population. Hypertriglyceridemia and hypercholesterolemia as well as a high atherogenic index were found in the representatives of non-indigenous male population. A high level of insulin, an increased content of atherogenic fractions of lipoproteins, and a decrease in HDL content at a low activity of the thyroid gland and adrenal cortex are likely to result in the development of metabolic syndrome, especially in the representatives of non-indigenous population.

Keywords: hormones, lipid spectrum, tundra Nenets, non-indigenous population, Samburg village the Yamal-Nenets Autonomous Okrug.

INTRODUCTION

Human adaptation in the Far North is accompanied by essential alteration of all physiological systems. The so-called "polar stress syndrome" emerges in non-indigenous population and deteriorates functional parameters of many systems of the body. The formation of a "northern type of metabolism" is characterized by rearrangement of the exchange of proteins, lipids and carbohydrates [2].

The study aimed to compare the level of hormonal metabolism and lipid status in non-indigenous and indigenous population of Samburg village, the Yamal-Nenets Autonomous Okrug.

MATERIALS AND METHODS

The study was carried out under the agreement on scientific cooperation with

the Institute of Cytology and Genetics SB RAS (ICG SB RAS). Material for the study was collected during the expeditions to the Yamal-Nenets Autonomous Region (YNAR) in 2014 by researchers from the Laboratory of population ethnogenetics at ICG SB RAS under the supervision of the Laboratory Head Ph.D. (biol.) Osipova L.P.

The study was approved by the bioethics Commission Institute of Cytology and genetics. Blood donations were taken in compliance with international rules using the informed consent from volunteers who were practically healthy at the time of the study. The study involved indigenous persons and non-indigenous population of Samburg village (latitude 67°0'

north, longitude 78° 25' east), Purovsky district. Overall, 80 inhabitants (40 men and 40 women) 21 – 65 years of age were examined. Among them were representatives of indigenous nation (tundra Nenetses) and non-indigenous population (mostly Russians) who came from other regions.

Blood was taken from the ulnar vein after 10-12 hours of night fasting. The concentrations of thyroxin (T4), triiodothyronine (T3), thyrotrophic hormone (TTH), cortisol, dehydroepiandrosterone sulfate (DHEAS) and testosterone in blood serum were measured with ELISA test kits (St. Petersburg), estradiol with HEMA ELISA kits (Germany), insulin with Monobind Inc kit (USA), and ACTH with Biomerica

Table 1

Blood content of hormones in representatives of indigenous and non-indigenous population of Samburg village (M ± m)

Hormones	Indigenous men	Non-indigenous men	Indigenous women	Non-indigenous women
Insulin (0.7 – 9.0 µIU/mL)	12.44 ± 1.79	16.37 ± 2.10	15.05 ± 1.40	16.18 ± 1.39
P	-		-	
Cortisol (150 – 660 nmol/L)	711.50 ± 62.01	624.55 ± 53.38	604.20 ± 61.62	499.65 ± 49.56
P	-		-	
DHEA-S (0.8 – 3.9 µg/mL)	2.34 ± 0.20	2.15 ± 0.16	1.25 ± 0.08	1.54 ± 0.15
P	-		-	
TTH (0.23 – 3.4 µIU/mL)	1.47 ± 0.15	1.70 ± 0.11	1.78 ± 0.22	1.80 ± 0.21
P	-		-	
T ₄ (53 – 158 nmol/L)	119.15 ± 5.27	133.15 ± 5.67	76.75 ± 5.01	62.55 ± 2.18
P	-		P < 0.05	
T ₃ (1.0 – 2.8 nmol/L)	1.29 ± 0.05	1.28 ± 0.08	1.80 ± 0.12	1.80 ± 0.12
P	-		-	
Testosterone (12.1 – 38.3 nmol/L)	21.42 ± 1.79	18.53 ± 1.92	1.52 ± 0.22	1.52 ± 0.22
P	-		-	

Table 2

Blood content of lipids in representatives of indigenous and non-indigenous population of Samburg village (M ± m)

	Indigenous men	Non-indigenous men	Indigenous women	Non-indigenous women
CS, mmol/L	4.76±0.22	5.60±0.34	4.73±0.19	5.16±0.27
P	P < 0.05		-	
TG, mmol/L	0.82±0.06	1.86±0.30	0.98±0.09	1.35±0.16
P	P < 0.001		-	
CS-VLDL mmol/L	0.25±0.04	0.82±0.22	0.37±0.06	0.71±0.22
P	P < 0.01		-	
CS-LDL mmol/L	3.06±0.21	3.70±0.29	3.06±0.14	3.30±0.27
P	-		-	
CS-HDL mmol/L	1.46±0.11	1.09±0.11	1.30±0.10	1.15±0.07
P	P < 0.01		-	
AI	2.49±0.26	4.81±0.55	3.00±0.29	3.82±0.41
P	P < 0.001		-	
FFA mmol/L	0.46±0.07	0.60±0.08	0.49±0.06	0.53±0.05
P	-		-	

ELISA kit (USA). The concentrations of total cholesterol (TCS), CS of very low, low and high density lipoproteins (CS-VLDL, CS-LDL, CS-HDL), triglycerides (TG) and free fatty acids (FFA) in blood serum were measured on a Labsystem (Finland) autoanalyzer using Biocon (Germany) kits; atherogenic index (AI) was calculated as a ratio of TCS-CS-HDL to CS-HDL.

Statistical treatment was carried out with Statistika 9.0 software using nonparametric statistical methods (Mann-Whitney rank sum test and Spearman correlation coefficient).

RESULTS AND DISCUSSION

The study of hormonal status revealed an increased concentration of insulin in all groups: indigenous and non-indigenous, men and women. In all groups, insulin content exceeded the reference values, i.e. it was above 9.0 µIU/mL (Table 1). In non-indigenous women, the concentration of insulin was higher and insulinemia was observed in 95% of cases as compared to indigenous persons. In non-indigenous men, this parameter was higher by 32% in comparison with indigenous population (Tables 1). Statistically significant differences in the content of insulin between men and women were not found. The increased concentration of insulin may testify to the development of insulin resistance in men and women; however, this is more pronounced in the group of non-indigenous population. Similar results were obtained in our study of female population of Tazovsky village (YNAO) [1]. A high level of insulin was found by Keyl V.R. et al. [3] in the personnel of JSC ALROSA in Mirny, the Republic of Sakha (Yakutia), particularly in ground services.

A reliable decrease in thyroxin concentration (T₄) by 23% (P < 0.01) and cortisol content by 21% was found in non-indigenous women as compared to indigenous ones (Table 1). A lower content of cortisol was observed in non-indigenous men (Table 1). Blood serum content of cortisol in indigenous persons (males and females) was at the upper limit of reference values (Tables 1).

Analysis of the lipid profile in the representatives of indigenous and non-indigenous population showed some differences: non-indigenous men had significantly higher contents of TCS, TG, CS-VLDL and atherogenic index, whereas the level of CS-HDL was lower by 34% (Table 2). Therewith, in non-indigenous men, lipid indices exceeded the reference values of physiological norm (Recommendations of the Russian

Scientific Society of Cardiologists, 2012): TCS (> 5 mmol/L), TG (> 1.7 mmol/L) and AI (> 3 units); this reliably indicates the presence of hypertriglyceridemia and hypercholesterolemia.

Thus, inhabitants of the village showed an increased concentration of insulin in all groups and a lower level of cortisol and thyroxin (women) in non-indigenous population. Hypertriglyceridemia and hypercholesterolemia as well as a high atherogenic index were found in the representatives of non-indigenous male population.

High level of insulin, increased content of atherogenic fractions of lipoproteins, and suppressed synthesis of HDL at a low activity of the thyroid gland and adrenal cortex can give rise to the development of metabolic syndrome, especially in the representatives of non-indigenous population.

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Information about the authors:

Federal State Budgetary Scientific Institution "Research Institute of Biochemistry", Russia, 630117, Novosibirsk, Timakova str. 2:

Poteryaeva Olga Nikolaevna
Dr. Sci. (med.), Leading researcher, Laboratory of medical biotechnology, e-mail: olga_Poteryaeva@mail.ru, tel. (383) 306-42-57

Russkikh Galina Sergeevna
Ph.D. (biol.), Senior researcher, Laboratory of medical biotechnology, sovet@niibch.ru, tel. (383) 306-42-57.

Rozumenko Aleksandr Anatolievich
Ph.D. (biol.), Senior researcher, Laboratory of medical biotechnology, alexandr.rozumenko@gmail.com, tel. (383) 306-42-57.

Biushkina Natalia Grigorievna
Senior researcher, Laboratory of medical biotechnology, biushkinanovosib@gmail.com, tel. (383) 306-42-57.

Goltsova Tatiana Vladimirovna
Scientific Secretary of the Institute, ibch@niibch.ru, tel. (383) 335-96-58.

Polyakov Lev Mikhailovich
Dr. Sci. (med.), professor, Head of Laboratory of medical biotechnology plm@niibch.ru, (383) 306-42-57

Federal State Budgetary Scientific Institution Federal Research Center Institute of Cytology and Genetics of Siberian Branch of the Russian Academy of Sciences, Russia, Novosibirsk, 630090, Academician Lavrentyev Avenue, 10:

Osipova Lyudmila Pavlovna
Ph.D. (biol.), Head of Laboratory of population ethnogenetics, e-mail: ludos77@yandex.ru, tel. 8(383) 363-49-54

Churkina Tatiana Valeryevna, Junior Research Associate of Laboratory of population ethnogenetics, e-mail: tanych@ngs.ru, tel. 8(383) 363-49-54

Semenova E.I., Olesova L.D., Krivoshapkina Z.N.

THE HEMOGRAM CONDITION OF THE SAKHA REPUBLIC'S NORTHERN AND CENTRAL POPULATION

ABSTRACT

We studied peripheral blood parameters of population of the northern (Anabarskij) and central (Megino-Kangalasskij) regions (uluses) of Yakutia. We revealed significant differences in the hemogram. More than 50% of the residents of the Megino-Kangalasskij ulus have increased red blood cell count and hemoglobin concentration, which is not typical for the indigenous people, especially for women. The Anabarskij ulus residents have absolute and relative monocytosis probably associated with food and the environment. The blood count is more harmonious in the population of the Anabarskij ulus.

Keywords: Arctic, hemogram, golden blood proportion, monocytosis.

INTRODUCTION

Currently the incidence rate of our population needs a serious care for human's state of health, in connection with possible harmful effects of surrounding and social environment factors, defining effects of their impact on health, which requires biomedical research with finding a morphologic composition of peripheral blood. Totality of quantitative and qualitative indices of complete blood count characterizes cell counts of the peripheral blood,

condition of the functional reserves of the body, adaptative processes of the hematopoietic system in response to the intensity and character change of influencing environmental factors. Besides that, participation of hematosis organs in forming mechanisms of protection and compensating for various pathologic processes is estimated [7]. That's why available and fast analysis of hemogram is used for rating adaptation condition of human's organism.

Purpose. Evaluation of hematologic

blood indices of Anabarsky and Megino-Kangalassky districts' residents.

MATERIALS AND METHODS

Research was conducted among working-age population from Northern and Central districts at the age of 18 to 65. In total 386 people were surveyed, 184 from Anabarsky district and 202 from Megino-Kangalassky district.

Cells of peripheral blood per unit volume (1mm³) of blood were determined by a hematologic automatic analyzer MICROS 60 (France), using

J.T. BAKER's (Netherlands) reagents.

Following parameters of peripheral blood were determined: the quantity of red blood cells (RBC) and white blood cells (WBC), concentration of hemoglobin (HGB). Determination of color index was calculated by dividing triple quantity of gram% hemoglobin to the first two numbers of erythrocyte counts. The ideal formula of white blood in the percentage calculation is close to the Fibonacci sequence (basophils, stab neutrophils -1%, eosinophils -3%, monocytes - 5%, lymphocytes 30-34%, segmental neutrophils - 58-62%), and the ratio of the sum of granulocytes to the sum of agranulocytes is close to the golden proportion (1,618) [3,4,9]. The golden proportion of blood was calculated among selected leukograms close to the Fibonacci sequence by calculating the ratio of granulocytes to agranulocytes. The harmonious formula of a healthy person's white blood shall not deviate from the golden ratio to the increasing or decreasing side that is more than 12% (1,424-1,812). If the deviation exceeds from 12 to 23% in one or another side, it would mean a light disbalance and disharmony in a white blood cell system, and the deviation of more than 24% and higher means hard disbalance [4]. Static result processing was conducted using statistical package SPSS 11.5 for Windows. Quantitative data are presented as average indices

(M) and as a standard error of the mean (m) in a normal distribution of indices. Statistical significance of differences was determined by Student's *t*-test for independent samples, threshold level of statistical significance was taken at the value of $p < 0.05$.

RESULTS AND DISCUSSION

According to the results the data obtained, the average indices of Anabarsky and Megino-Kangalassky districts' residents were within normal values, except the proportion of monocytes of Anabarsky district's inhabitants, which indices were higher than its recommended rates. Comparative analysis of hemogram revealed significant differences between the residents of both areas (tab.1).

Comparative analysis of red blood data by sex revealed that men of Megino-Kangalassky district in comparison with men of Anabarsky district had a significantly higher average number of red blood cells and the hemoglobin concentration, so they were at the upper limit of normal.

The increase of the number of red blood cells and the hemoglobin concentration was found in 48% of Megino-Kangalassky district's men and 42.6% of Anabarsky district's men; increasing the number of red blood cells was observed only in 9% of men, the level of hemoglobin was significantly lower in 45%.

Among women the average indices of hemogram were in the zone of physiological norm and were significantly different depending on the place of residence, although the average number of red blood cells was at the upper limit of normal for both Anabarsky and Megino-Kangalassky districts' residents (tab. 1).

At the same time, the increase of the number of red blood cells was found in 41% of Megino-Kangalassky district's women and 26% of Anabarsky district's women, and erythropenia was found in 3.73% and 2.15% accordingly. The increase of the level of hemoglobin concentration was revealed for the half of the surveyed women of Megino-Kangalassky district, as well as men, which was 55.4%. The decrease of the level of hemoglobin concentration in 27.8% was observed for the women of Anabarsky district.

The color index is located on the lower limit of normal range for men and women of Anabarsky district, which is 38% and 42% respectively.

It is known from the literary sources that one of the most frequent occurrences of external positive reasons for an increasing number of red blood cells and the level of hemoglobin concentration is physical activity or living in the highlands. And the negative factors include smoking, alcohol, harmful substances and helminthiasis. Increasing level of hemoglobin

Hematologic indices of blood depending on the district and gender

Hemogram indices	Anabarsky district	Megino-Kangalassky district	p	Men		p	Women		p
				Anabarsky district (n=44)	Megino-Kangalassky (n=68)		Anabarsky district (n=140)	Megino-Kangalassky (n=134)	
Erythrocytes,	4,57±0,4	4,7±0,03	0,000	4,75±0,07	5,11±0,06	0,000	4,51±0,48	4,57±0,04	
Hemoglobin	125,5±1,31	145,57±0,00	0,000	131,77±2,11	159,22±1,56	0,000	123,53±1,56	138,65±2,97	0,000
Color index	0,82±0,00	0,92±0,00	0,000	0,83±0,00	0,92±0,00	0,000	0,82±0,00	0,91±0,00	0,000
Leukocytes	6,21±0,13	5,53±0,09	0,000	6,82±0,34	5,6±30,15	0,000	6,01±0,13	5,47±0,12	0,004
Segmented, %	54,72±0,56	62,60±0,63	0,000	55,55±1,23	62,85±1,14	0,000	54,47±0,62	62,47±0,76	0,000
Lymphocytes, %	35,84±0,58	30,77±0,69	0,008	35,06±1,26	30,38±1,04	0,008	36,08±0,66	30,96±0,89	0,000
Monocytes, %	9,43±0,21	6,63±0,35	0,000	9,38±0,36	6,76±0,22	0,001	9,44±0,25	6,56±0,52	0,000
ESR, mm/h	10,81±0,66	13,66±0,76	0,005	8,18±1,19	8,89±0,93		11,63±0,76	15,89±0,97	0,000
Golden section of blood	1,281±0,03	1,842±0,05	0,000	1,345±0,08	1,880±0,09	0,000	1,261±0,03	1,823±0,06	0,000

concentration in blood leads to blood becoming more viscous, which impedes its normal advancement through the vessels, and these phenomena can lead to the formation of thrombi and blood clots and as a result it leads to vascular occlusion, heart attacks and strokes [7].

According to evaluation of differential WBC on all types of white blood cells significant gender differences were found in districts. So, neutrophilia was detected in 20.58% of men and 21% of women in Megino-Kangalassky district. Leukopenia was detected in one-quarter of men in Anabarsky district and lymphocytosis was detected in one-quarter of women. Absolute and relative monocytosis was detected in a half of surveyed men and women of Anabarsky district, which is 54% and 55% accordingly (tab.1).

It is known from the literary sources that monocytes/macrophages have higher activity than neutrophils in an acidic environment [5]. One of the reasons for the Arctic inhabitants to have monocytosis might be native traditional nutrition with constant and high protein intake (meat of wild deer and fish), which is one of the factors of internal environment oxidation. Besides that, any stress effect of hypoxic nature in the early stages and in the process of tissue hypoxia increasing leads to mononuclear phagocyte activation of bone marrow. That is why monocytosis is a non-specific response of the body to any stress effect both internal and external [8]. Environment of Anabarsky district is under a sufficiently high anthropogenic impact. Over the recent years the mining industry is rapidly developing in the area. Mining complexes were created and now are operating at the alluvial diamond deposits. It is known that intensive developing of natural resources of the Far North, with its extremely vulnerable nature, is the cause of the ecological crisis. Soil cover of the village Saskylakh is contaminated with iron, ammonia nitrogen. Low content of organic matter also shows the pollution of soil-ground.

Water of Anabar river near Saskylakh village had a decreased mineralization (up to 102 mg/l) and is contaminated with iron (1.8), copper (1.8), suspended solids (44), COD (2.8), and ammonium ions in the summer season (5.6) [1,10]

So the response of monocytic germ of hematopoiesis to various extreme factors consists of the specific and non-specific components. Non-specific component appears in increasing the total number of monocytic cells in the bone marrow. The severity and nature of the reaction

of monocytopenia activation can be considered as a specific component, which is determined by the nature of extreme factors.

An accelerated ESR was observed in 18% of men and 22% of women in Anabarsky district and 23.3% of men and 35% of women in Megino-Kangalassky district.

The average values of the golden section of blood were within easy imbalance among residents of both districts. Harmonic formula of leukogram was detected in 13.6% of men and 18.5% of women of Anabarsky district and in 29.4% of men and 19.4% of women of Megino-Kangalassky district. A strong disharmony of leukogram towards increasing (above 2,006) was observed in 11.7% of men of the Central district. The shift of leukogram towards decreasing (below 1,229) was observed in 3% and 15% of males of both districts. Among women a strong disharmony of leukogram towards increasing was observed in 8.2% of women of Megino-Kangalassky district. A strong disharmony was not observed in inhabitants of Anabarsky district regardless of gender. A high imbalance towards decreasing was observed in 4.5% of women of Megino-Kangalassky district and in 13.6% of women of Anabarsky district.

From the standpoint of the nature, the meaning of the harmonious functioning of the organism is to make its systems, organs and cells to perform their functions with the smallest expense of energy. Harmony of components of the organism as a whole and one of its most important parts – blood - is associated with resonances in nature, in many ways based on the golden ratio (GR) [2,3,9,11].

Loss of the golden ratio – disharmony of immune system - largely depends on the state of the internal environment of the organism and severe disharmony of the golden ratio of blood towards increasing is always qualitatively worse than disharmony towards decreasing.

CONCLUSION

Thus, we could conclude, that according to the results of hematological blood tests among residents of the North Anabarsky and the Central Megino-Kangalassky districts, significant differences in the parameters of hemogram were observed. Men and women of the Central district have an increased red blood cell count and hemoglobin concentration, which is alarming and requires further in-depth biomedical research, as these changes

are rare, particularly among indigenous women of Yakutia. An absolute and relative monocytosis, found in the population of the Arctic district, might be associated with the specific nutrition and the deterioration of the ecological state of the environment, connected with the mining industry's activity in recent decades. The population of Anabarsky district, both men and women, has a more harmonious hemogram than the residents of Megino-Kangalassky district.

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Autors:

Semjonova Evgenija Ivanovna – candidate of biological sciences, candidate of biological sciences, the senior researcher of biochemical mechanisms of adaptation FGBNU “Yakut Scientific Center of complex medical problems”; 677019, g. Yakutsk, Sergeljahskoe shosse, 4; kunsuntar@mail.ru.

Olesova Ljubov' Dygynovna –

candidate of biological sciences, the head of the laboratory biochemical mechanisms of adaptation FGBNU “Yakut Scientific Center of complex medical problems”; 677019, g. Yakutsk, Sergeljahskoe shosse, 4; oles59@mail.ru.

Krivoshapkina Zoja Nikolaevna – candidate of biological sciences, the senior researcher of biochemical mechanisms of adaptation FGBNU “Yakut Scientific Center of complex medical problems”; 677019, g. Yakutsk, Sergeljahskoe shosse, 4; zoyakriv@mail.ru.

L.I. Konstantinova, G.E. Mironova, E.D. Okhlopko, A.V. Efremova, L.D. Olesova

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 of 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 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. Okhlopko (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

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

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

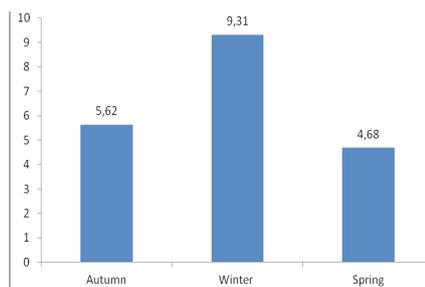


Fig. 1. TBA-RP level in erythrocyte membranes in freestyle wrestlers in different seasons (mmol / l)

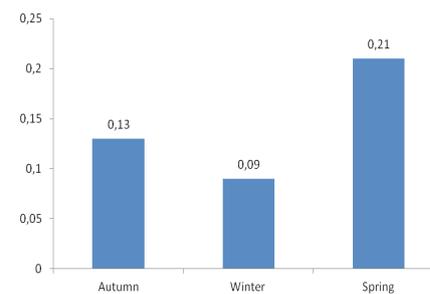


Fig. 2. Changes coefficient CAOP/LPO in freestyle wrestlers in different seasons of the year (standard units).

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

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Information about authors

Konstantinova Lena Ivanovna, Researcher of Yakut Scientific Center of complex medical problems, tel.: 8964-423-72-00, e-mail: konstanta.l@mail.ru

Mironova Galina Egorovna, Professor of the Department of Biochemistry and Biotechnology, Institute of Natural Sciences of North-Eastern Federal University, PhD (Dr.Sci. Biol), Professor, e-mail: mirogalin@mail.ru

Ohlopkova Elena Dmitrievna, Senior Researcher, Head of the Laboratory of Immunology of Yakut Scientific Center of complex medical problems, PhD., e-mail: elena_ohlopkova@mail.ru

Efremova Agrafena Vladimirovna, Senior Researcher of Yakut Scientific Center of complex medical problems, PhD., e-mail: a.efremova01@mail.ru

Olesova Lyubov Dygynovna, Senior Researcher, Head of the Laboratory of Biochemistry of Yakut Scientific Center of complex medical problems, PhD., e-mail: oles59@mail.ru

E. N. Mestnikova, N. V. Makharova, I. A. Pinigina,
K. S. Gavril'eva

ELECTROPHYSIOLOGICAL ADAPTATION OF CARDIOVASCULAR SYSTEM OF ATHLETES IN THE FAR NORTH

ABSTRACT

The article presents research data of 12-lead electrocardiography at rest (Rest ECG) and Holter ECG monitoring of athletes. Daily assessment of cardiac rhythm and conduction disturbances showed that the cardiac rhythm disorders by type of frequent supraventricular arrhythmia (up to 17 560/day) and frequent ventricular arrhythmia (up to 22 450/day) most frequently encountered in endurance-athletes (aerobic exercises), whereas the athletes training speed-strength (dynamic loads) had conduction disturbances by type of the second-degree AV block Mobitz Type 1 (with a maximum duration of pauses up to 3 seconds). However, changes in Holter ECG and EchoCG have not been revealed in athletes with Brugada-like changes, but they are still under close control.

Keywords: athlete's heart, heart rhythm disorder, Holter ECG.

The functional state of a healthy person is always connected with close interaction with the environment. The studies of the health status of the population in the Far North showed that a complex of climatic, geographical, biological, geographical and environmental factors have the most significant impact on human health [1,4,2,5]. Athletes are in a certain group of healthy people, who lead a unique way of life, and have a severe physical and psychological stress that cause "the restructuring" of the functioning of their organs and systems [10].

The human body has formed in the course of evolution the ability to adapt to changing environmental conditions. Some external factors may cause changes in the physiological status and homeostasis of a person, their morphological characteristics, etc. However, the adaptive capacity of the organism is not unlimited, thus, the athletes are not always fully able to adapt to certain environmental conditions, physical stress, resulting in maladaptation or disease of organs and systems [2].

The invention of new non-invasive methods such as ECG, daily monitoring of ECG and blood pressure, echocardiography (Echo), magnetic resonance imaging (MRI) has made possible the study and evaluation of complex structural-functional and electrophysiological adaptation of cardiovascular system of the athletes known as "athlete's heart".

The changes, resulting from the athletes' examination according to the ECG, EchoKG, may often resemble pathological changes of the myocardium in hypertensive disease (HD), hypertrophic and dilatation cardiomyopathy (DCM) or arrhythmogenic right ventricular dysplasia (ARVD), syndrome of ventricular pre-excitation (Wolff-Parkinson-White), Brugada syndrome. Thus, it greatly com-

plicates the differential diagnosis of both pathological and physiological restructuring of the athlete's heart [10,11,7].

The main characteristics of structural remodeling of the athlete's heart are: increase in the volume of the left and right ventricles (not beyond the normal range), the left atrium on the background of preserved systolic and diastolic function [8]. The degree of these physiological changes depends on anthropometric data, gender, age, race, sport and genetic factors [9]. In our early studies we identified structural and functional features of the athletes' hearts of the Yakut ethnic group (free wrestling). We found developing hypertrophy of the myocardium of the left ventricle in 10% of the athletes. The concentric hypertrophy is characterized by less favorable functional parameters [6].

Since EchoCG does not give a complete electrophysiology picture, we additionally implemented Holter monitoring (Holter ECG).

Our investigation is aimed to study the electrophysiological adaptation of cardiovascular system of the athletes in the Far North.

MATERIALS AND METHODS

We examined healthy athletes (not below the candidate for master of sports) with a different orientation of the training processes. The sports experience was at least 7 years. All tested athletes underwent standard ECG-rest (Shiller-AT-1, Switzerland) (n=400) and Holter ECG ("Cardiosens-K", Russia) (n=62). The following parameters were evaluated: heart rhythm, circadian rhythm of heart rate, conditions abnormalities.

RESULTS AND DISCUSSION

Standard ECG screening (n=400) detected the following changes: sinus arrhythmia - 37,5%, transient arrhythmias and conduction - 67,5%, namely

ventricular (0.5%) and supraventricular arrhythmias (5,25%), complete and incomplete right bundle branch block (CRBBB/IRBBB) (25%), second-degree AV block (1.25%), Brugada-like electrocardiogram abnormalities (3,75%); and early repolarization (50%), dystrophic changes in the myocardium (5%).

Transient arrhythmias and conduction (67.5%) are the most frequent pathology, which is considered as the earliest symptom of disadaptation. These changes are well-adjusted by decrease in physical activity, especially after long flights and desynchronoses. Disadaptation can lead to the development of fatigue, significant performance decrement and, further, occurrence of diseases and injuries. It is alarming that frequent cases of transient asymptomatic Brugada-like electrocardiogram abnormalities (3,75%) have been recorded recently. These ECG changes require daily monitoring of an electrocardiogram.

We performed Holter ECG in 62 athletes with some ECG abnormalities.

The analysis of heart rate during Holter ECG showed, that the average heart rate of the endurance-athletes in the daytime is 67.8 beats/min, while the rate of the athletes training speed-strength - 71,4 beats/min. The Circadian index (CI) of all tested athletes was within the normal range. Accordingly, in the nighttime hours the relevant decrease in the heart rate of these athletes was observed. The episodes of bradycardia at a rate of 39 beats/min were recorded in the endurance-athletes (athletics).

Daily assessment of cardiac rhythm and conduction disturbances showed that the cardiac rhythm disorders by type of frequent supraventricular arrhythmia (up to 17 560/day) (12.9%) and frequent ventricular arrhythmia (up to 22 450/day) (3,2%) most frequently encountered in

endurance-athletes (aerobic exercises), whereas the athletes training speed-strength (dynamic loads) had conduction disturbances by type of the second-degree AV block Mobitz Type 1 (with a maximum duration of pauses up to 3 seconds) (9.7 %). However, changes in Holter ECG and EchoCG have not been revealed in athletes with Brugada-like changes, but they are still under close control.

CONCLUSION

Thus, the monitoring of the functional state of athletes' cardiovascular system allows diagnosing the early signs of disadaptation to prevent the development of pre-pathological and pathological conditions. Nowadays, professional sport puts high requirements to level of functional training and health of the athletes. It is impossible to achieve high results, having done enormous amounts of "work" with no cost to health, without the dynamic control of functional training. The important step here is the proper organization of the system of training and recovery.

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Information about authors

1. Mestnikova Ekaterina Nikolae-vna, a cardiologist at the Department of functional diagnostics Center for Sports Medicine and Rehabilitation at the GBU of Sakha (Yakutia) "High school sports", 678000 Yakutsk ul. Oiunsky 26, block B, E-mail: katemestnikova@mail.ru;
2. Makharova Natalia Vladimirovna, MD, a cardiologist, chief medical officer of the Center for Sports Medicine and Rehabilitation at the GBU of Sakha (Yakutia) "High school sports", 678000 Yakutsk ul. Oiunsky 26, block B, E-mail: makharova@mail.ru;
3. Pinigina Irina A., MD, PhD, head of the department of functional diagnostics of the Center for Sports Medicine and Rehabilitation at the GBU of Sakha (Yakutia) "High school sports", 678000 Yakutsk ul. Oiunsky 26, block B, E-mail: Pinigina1986@mail.ru;
4. Christina Gavrilyeva Semenovna, head of the department of physiotherapy and rehabilitation of the Center for Sports Medicine and Rehabilitation at the GBU of Sakha (Yakutia) "High school sports", 678000 Yakutsk ul. Oiunsky 26, block B, E-mail: gks.79@mail.ru.

ENVIRONMENT AND HEALTH STATUS OF THE NORTH POPULATION

Alekseev A.Yu., Adamenko L.S., Zabelin V.A., Makarchuk A.L., Shestopalov A.M.

BIOREMEDIATION OF OIL-CONTAMINATED TERRITORIES AS THE BASIS OF A SYSTEM TO IMPROVE THE ENVIRONMENT OF HUMAN HABITATION IN NORTHERN SIBERIA

ABSTRACT

We assessed the effectiveness of bioremediation of oil-contaminated territories as the basis of a system of measures to improve the environment of human habitation in the Northern Siberia. We collected soil and water samples on the territory of the activities of oil companies in the South of the Yamalo-Nenets Autonomous area before and after cleaning with the association of microorganisms capable of decomposing oil and oil products. It is shown that treatment of oil-contaminated and petroleum sites with preparations on the basis of oil destructor microorganisms leads to decrease of oil products on average 56.64 ± 18.82 .

Keywords: bioremediation, petroleum products, microorganisms, the North of Siberia.

The North of Siberia (the Northern part of Khanty-Mansi Autonomous Okrug and Yamalo-Nenets Autonomous district) is an area with strong anthropogenic pressure to a certain mass extraction of natural resources, primarily gas, oil and oilgascondensate. Environmental pollution caused by gas and oil production, both due to the imperfection of the technology of production, and the result of emergency situations [7].

The overall toxicity of oil is low, however, its separate components (polyaromatic and polycyclic compounds) are highly toxic, and have severe carcinogenic and teratogenic properties. The most toxic for living organisms are aromatic compounds which can constitute up to 10% of the crude oil. The inhabitants of the areas where is oil production, have more often decreased immunity, allergies, cancer neoplasms and congenital deformities, etc [15, 18]. The presence of oil reservoirs has an adverse impact on the health of birds, fish and mammals [5]. When drops of crude oil to soil of low molecular weight fractions usually evaporate into the atmosphere. N-alkanes with chain lengths of C10-C16 and monocyclic aromatic hydrocarbons migrated into the soil and are biodegradable microbial biota. However, high molecular components, especially alkanes with a carbon chain length of more than 20 and polycyclic aromatic compounds such as naphthalene, anthracene, phenanthrene, chrysene, benzopyrene, etc., and their alkylated derivatives, are retained in the soil [19].

The problem of oil pollution today is one of the most acute environmental

problems. It is known according to Greenpeace and the Ministry of environment that only Russian oil companies are losing about 20 million tons of oil annually (5% of total production). According to the Antistikhia center of EMERCOM of Russia [13] the total area of contamination of soil by oil and oil products as at the end of 2015 on the territory of the Russian Federation is approximately 1025 hectares. The main causes of soil contamination with oil products was deterioration of the equipment, transport accidents and unauthorized connections.

A serious problem is the contamination of soils by spills of oil and more frequent with the development of shipping oil spills by marine transportation. Soil pollution is usually accompanied by groundwater contamination [5, 10] that, in turn, has negative consequences for human health, animals and plants. Cleanliness of drinking water and its availability is one of the most important factors determining quality of life. According to experts, bad for the environment due 20% of all diseases.

The spread of contaminants most often takes the course of distribution of water:

First, there is a constant leaching of contaminants to surface waters and groundwater that can be used by man for drinking and other needs.

Secondly, the pollution of soil moisture, groundwater and open water bodies into the organisms of plants and animals who consume this water, and then food chains again into the human body.

Once in the water, the organic

contaminant is a member of its cycle in nature and quickly spreads to components of the biosphere. Thus, by the water all living organisms on Earth, without exception, are involved in interaction with petroleum products. The most toxic for living organisms are aromatic compounds which can constitute up to 10% of the crude oil. They include volatile compounds (benzene, toluene, xylene; naphthalenes and polycyclic aromatic hydrocarbons), carcinogenic and mutagenic properties.

If water is one of the most important elements of distribution of oil pollution, soils largely determine the stability of the biosphere and its purification from pollutants [1, 8, 9, 10, 11, 17]. Self-purification of soil is the sum total of natural processes aimed at reducing the concentration of pollutants substances [6]. It is primarily due to the ability of soil microorganisms to decompose a wide range of natural and unnatural compounds [14]. Different soil microorganisms for which the oil products are often the source of carbon have a great influence on the persistence of chemical compounds in the soil. Even very persistent in relation to chemical compounds are decomposed by the microorganisms of the soil. In many cases such decomposition does not begin immediately, but after some time, necessary for the adaptation of microorganisms to the destruction of the chemical compound. The most easily decomposed by the microorganisms of the soil compounds of the aliphatic series, as well as hydroxycobalamin connection.

Modern technology of purification

of soils polluted with hydrocarbons, include excavation and containment of contaminated soils in secure landfills, stabilization and solidification, soil flushing, extraction, composting, chemical oxidation, thermal desorption and incineration, and bioremediation (bioaugmentation, biostimulation and phytoremediation).

Compared with physical and chemical remediation methods, bioremediation is widely regarded as the most cost-effective method and provides remediation of in situ soil without disturbing the natural ecosystems. The technology is environmentally friendly because there is a stimulation of the natural processes. In situ bioremediation also provides the ability to restore contaminated soil and groundwater without excavation, which is a big advantage.

The bacteria are available in almost all known hydrocarbons, but primarily degrades saturated hydrocarbon group. During their oxidation a number of intermediate products: biological surfactant (biopal), biopolymers, alcohols, hydroxy acid esters, carboxylic acids, aldehydes, ketones, small amounts of organic peroxides, peracids, and other compounds forms. It should be noted that the processes of oxidation of hydrocarbons occur, as a rule, during active growth and reproduction of microorganisms.

Currently there are various methods of remediation based on the oxidizing activity of microorganisms. Despite the apparent diversity, they are based on or stimulation of the indigenous soil microflora or introduction into the soil of hydrocarbon-oxidizing microflora with the introduction of complex mineral fertilizers or sorbents. Typically, microbiological methods are complemented with agronomic [4, 12].

The aim of this work was to evaluate the bioremediation of anthropogenically disturbed landscape, contaminated with hydrocarbons, as the basis of a system of measures to improve the environment of human habitation in Northern Siberia.

MATERIALS AND METHODS

Soil and water samples were gathered at the site of activity of JSC "Gazpromneft-Noyabrskneftegaz" and JSC "Gazpromneft-Muravlenco" (South of Yamal-Nenets Autonomous district) in 2005 – 2010 we collected 87 samples of soil and water samples before cleaning up and 87 soil samples and water samples after the microbiological treatment.

It is known that soils from different regions contain microorganisms, the

fittest (natural selection) to living in the region and the ecological niche. It has been established that each region requires its own specially selected composition of microorganisms, which can form the basis biotechnological preparations for cleaning soil and water from oil [3, 4, 16].

Considering the complex temperature conditions in the Northern regions of Russia, in which most of the summer temperature at a depth of 10 – 20 cm is 6-14 °C, the use of biologics for optimal performance of which requires the temperature in 18-25 °C, is inappropriate.

In this regard, as preparations for cleaning of contaminated areas and water bodies used for commercial preparation of the brand "Biooil-Yugra" (production of JSC "Biooil"), effective at low temperatures.

Analysis of the content of petroleum products in soil and water was performed by the fluorimetric method in accordance with the method of PND f 16.1.21-98.

RESULTS AND DISCUSSION

All plots were divided into conventional groups on the content of oil products to the work on biological recultivation. Groups were formed according to the content of oil products to increase by 10%, from 5% (table 1).

Thus, there were formed 6 groups according to the content of oil products:

Group № 1 – the oil content of from 5% to 15%, 10 sites;

Group № 2 – oil content from 15.1% to 25%, 45 sites;

Group № 3 – oil content from 25.1% to 35%, 14 sites;

Group №4 – oil content from 35.1% to 45%, 6 sites;

Group № 5 – oil content from 45.1% to 55%, 6 sites;

Group № 6 – oil content from 55.1% and more, 6 sites.

The amount of oil in the samples to conduct bioremediation ranged from 7.14% to 80.73%. Reducing the amount of petroleum products after the bioremediation occurred at 56.64+18.82% and ranged from 1.23% to form for 61.42%.

Residues ranged from 1.23% to form for 61.42% and depended mainly on the topography and soils of a particular contaminated site.

Upon further analysis of the results, after division of all sites into groups according to the content of oil products before the bioremediation were obtained similar results, presented on graphs. The percentage of reduction of petroleum products varied only slightly and did not differ significantly among divided groups

(table 1).

CONCLUSION

We evaluated a decrease in the content of oil products when you use the Association of microorganisms isolated from the contaminated soils of the southern part of the Yamal-Nenets Autonomous district. Evaluation of bioremediation of oil-contaminated territories as the basis of a system of measures to improve the environment of human habitation in Northern Siberia. It is shown that reducing the amount of petroleum products after the bioremediation occurred at 56.64+18.82%.

Thus, bioremediation can reduce the oil content in the contaminated areas, and revegetation to increase the indicators of pollutants to background norms. Since the main pollutant in the North of Siberia are hydrocarbons (oil, oil-gas-condensate), reducing their number or their full utilization in the process of bioremediation is the primary indicator of improvement of the human environment.

Problem of cleaning areas, including aquatic environments from wastes seems to be relevant, requiring innovative approaches and solutions, as well as increased attention and control of the administration of the state at all levels. It should be remembered that the efficiency of purification of circulating water to the natural environment directly determines the level of health and life of humans, as well as the quality of the state and the stability of relationships in ecological communities.

Table
Reducing the amount of petroleum products in groups of contaminated sites after the bioremediation

The group	Limits of the oil amount at the group formation	Mean reduction in the amount of oil after bioremediation, %
№1	5-15%	56.97+16.13
№2	15.1-25%	53.57+17.19
№3	25.1-35%	67.39+12.34
№4	35.1-45%	68.64+20.73
№5	45.1-55%	53.92+28,22
№6	>55.1%	44.74+25.29

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Information about authors:

Alekseev Alexander Yurievich, PhD, senior researcher, Federal state budgetary scientific institution "Scientific research Institute of experimental and clinical medicine", 630117, Novosibirsk, Timakov str., 2, tel.: (383) 335-94-05, e-mail: Al-AlexOK@ngs.ru;

Adamenko Lyubov Sergeevna, Junior researcher, Federal state budgetary scientific institution "Scientific research Institute of experimental and clinical medicine", 630117, Novosibirsk, Timakov str., 2, tel.: (383) 335-94-05, e-mail: aminisib@ngs.ru;

Zabelin Vladimir Arkadievich, PhD, General Director, Joint-stock company "Biooil", 630007, Novosibirsk, Oktyabrskaya str., 42, office 611, tel.: (383) 381-45-13, e-mail: biooil2002@mail.ru;

Makarchuk Alexander Leonidovich, PhD, head of Department of ecological safety and environmental protection, Joint-stock company "Gazpromneft-Noyabrskneftegaz", 629807, Tyumen region, YANAO, Noyabrsk, Lenina str., 59/87, tel.: (3496) 377-266, e-mail: makharchuk@mail.ru;

Shestopalov Alexander Mikhailovich, DS, PhD, chief researcher, head of laboratory, Federal state budgetary scientific institution "Scientific research Institute of experimental and clinical medicine", 630117, Novosibirsk, Timakov str., 2, tel.: (383) 335-94-05, e-mail: shestopalov2@ngs.ru.

Ivanov P.M., Abramov A.F., Tomskiy M.I., Makarova N.N., Goldereva A.S., Nikolaeva T.I., Zharnikova T.N., Myreeva S.A., Ivanova F.G., Nikolaev V.M., Kiprijanova N.S.

ENVIRONMENT SITUATION AND MALIGNANT NEOPLASM MORBIDITY IN ARCTIC REGIONS OF YAKUTIA

ABSTRACT

Effect of anthropogenic and technogenic environment influence and social-economic factors on malignant neoplasm among the population living in the severe arctic conditions has been analyzed.

Keywords: the Arctic, neoplasm, environment factors, morbidity.

PREFACE

Medical-demographic data of the population are indicators of life – quality and health not only of a man but also of the whole society defined by social-economic and sanitary-hygienic factors and a way of life. Intensive exploitation of the arctic territories and river basins at the end of 20th c. influenced environment pollution because of mining enterprise activities and consequences of which are observed today.

The arctic zone is a vast coastal and tundra zone including Anabar, Allaekha, Bulun, Nizhnekolym, Olenek, Ust-Yana regions, where average annual winter temperature is 12.6-14.5 degrees below zero, average January temperature is 32-40 degrees below zero, average July is 4-14 degrees above zero. Precipitation is 187.6-256.0 mm., total a daily average temperature is 5 degrees of 557.3 in Bulun to 256.0 mm. in Olenek. Permafrost is more than 500 m. Climatic conditions in Anabar, Bulun, Ust-Yana, Allaekha and Nizhnekolyma regions are absolutely extreme but in Olenek it's the most extreme ones. Severe climatic conditions determine economic activities and have influence on environment situation and population health of the zone.

In the arctic zone traditional economic branches: hunting, reindeer-breeding, fishery are developed. In Anabar, Bulun, Olenek diamond extraction industry, in Ust-Yana gold- and tin-industry are developed.

Research aim. Estimation of anthropogenic and technogenic facts and social-economic life factors influence on the data of malignant neoplasm morbidity of the population living in the severe arctic conditions.

MATERIALS AND METHODS

Reports of YaROD of 1989-2010

and statistic data of TO FSGS of the Republic Sakha (Yakutia) [2] are analyzed. Research results aimed at anthropogenic, technogenic and economic influence in the arctic territories were the basis to estimate influence of regional factors on environment situation. Estimation was carried out according to the method made up by E.I.Burtseva [1]. Statistic data are worked up according to generally accepted method using programme "Statistical".

RESULTS AND DISCUSSION

Anthropogenic effect. In the arctic regions the population increased 3.1 times in comparison with 1950 especially in Ust-Yana 6.8 times which influenced greatly environment situation. By 2012 in connection with mining industry disorganization the population reduced to 7.8 thousands. Now the anthropogenic effect is on the lowest level in all arctic regions (Table 1).

Population and medical-demographic data. In Anabar region the population increased in connection with diamond industry development and new arrival contingent. In 2010 it made up 49.2% [2,11].

In Olenek native people occupy 76.5% of the population, in Bulun-39.0%, the Yakut people occupy in these regions accordingly -21.0 and 23.4%. In connection with mining industry development the population number in Ust-Yana reached its maximum (49.9 thousands) in 1990. About 90.9% were the Russians and other ethnic groups. By 2010 after disorganization of the industry and disintegration of the Soviet Union most of them migrated and the number of living people in the region was 7.8 thousands. In Allaekha and Nizhnekolyma regions, where fishery is developed, proportion of the Russians

and other nationalities is 50%. But since 2010 a quick population increase has been observed owing to migrants from other Russia regions.

The best birthrate was noticed in Olenek region, where the most part of the population is the Yakut people and northern native people, though in the years of perestroika the above mentioned rates had a tendency to come down till a minimum level (Table 2). The birthrate and population increase were the lowest ones in Ust-Yana, Allaekha, Nizhnekolyma regions where the most of the population were the Russian people and other nationalities especially in the years of perestroika.

It's necessary to point out a presence of a strong correlation tie ($r=-0.91$) between the number of new comers living in different regions of the arctic zone and coefficients of birth-rate. Between coefficient of birth-rate and a number of northern native not numerous people a strong direct tie is singled out ($r=0.91$). Analogous situation is observed in correlation analysis of population increase and a portion of new-comers and a native population (accordingly: $r=-0.76$, $r=+0.76$).

The given data might be a consequence of negative influence on the results of medical-demographic situations, environment factors, a way of life, nutrition. Analysis pointed out that a birthrate has an influence on a morbidity level of MN of reproducing woman organs. It can be seen in Table 3 where a birthrate is low, but woman morbidity with MN of reproductive organs is higher in Allaekha, Bulun, Nizhnekolyma, Ust-Yana regions ($r=-0.71$ and -0.68). This fact has been proved by researches [9,10].

Economic and technogenic effect on environment. Agricultural influence on

Table 1

Anthropogenic effect in the arctic regions

Index	Regions					
	Ana-bar	Allae-kha	Bu-lun	Ni-zhne-kolym	Ole-nek	Ust-Yana
Territory, 1000 km ²	55,6	107,3	223,6	97,1	18,1	127,3
Population (n - 1000)						
1959	1,4	2,4	10,0	4,2	3,4	6,0
1990	4,0	5,4	16,9	13,7	4,1	40,9
2012	3,4	2,9	9,4	4,5	4,1	7,8
population density (1prs per 1 km ²)						
1959.	0,025	0,022	0,045	0,048	0,011	0,050
1990	0,072	0,050	0,076	0,157	0,013	0,340
2012	0,061	0,027	0,041	0,057	0,013	0,071
environment effect:						
1959	L	L	L	L	L	L
1990	L	L	L	Rd	L	A
2012	L	L	L	L	L	L

Note: environment effect: L – low, Rd – reduced, A– average

Table 2

Medical demographic data of arctic regions (per1000 people)

Index	years	Regions					
		Ana-bar	Allae-kha	Bu-lun	Ni-zhne-kolym	Ole-nek	Ust-Yana
Child birth rate	1990	29,0	18,7	16,0	15,2	28,1	14,3
	2000	18,7	17,8	14,6	13,3	17,8	10,3
	2005	20,7	17,2	11,0	12,5	13,7	10,2
	2011	19,4	18,0	17,0	14,6	24,8	19,3
Population mortality	1990	9,5	6,1	16,2	3,7	9,0	3,5
	2000	11,3	12,2	14,6	11,9	8,3	10,8
	2005	11,7	13,1	11,9	14,9	12,9	11,3
	2011	10,9	15,7	12,4	15,4	13,2	15,3
Population growth	1990	19,5	12,6	11,4	11,4	19,0	10,9
	2000	7,4	6,8	4,7	1,3	9,5	-0,5
	2005	8,5	4,1	1,8	-2,4	0,7	-1,1

Table 3

Correlation analysis of birthrate and woman MN morbidity of reproductive organs in the arctic regions

Regions	Period	Child birth (‰)	Pe-riod	MN of WRO*/ (‰/0000)	including:			
					Breast	Cervix	Uterus body	Ovule
Anabar	1980-1990	26,8	1989-1998	26,0	10,4	5,2	0,0	10,4
	2000-2010	19,3	2001-2010	25,0	10,0	5,0	5,0	5,0
Allaekha	1980-1990	21,4	1989-1998	30,2	15,1	11,3	0,0	3,8
	2000-2010	14,7	2001-2010	75,0	46,1	17,3	5,8	5,8
Bulun	1980-1990	16,7	1989-1998	49,1	25,7	11,7	4,7	7,0
	2000-2010	14,4	2001-2010	78,8	29,8	27,7	6,4	14,9
Nizhne-kolym	1980-1990	16,2	1989-1998	42,4	26,3	8,8	1,5	5,8
	2000-2010	15,3	2001-2010	50,2	33,5	10,0	6,7	0,0
Olenek	1980-1990	28,5	1989-1998	24,5	14,7	4,9	0,0	4,9
	2000-2010	18,4	2001-2010	29,4	24,5	0,0	4,9	0,0
Ust-Yana	1980-1990	14,6	1989-1998	30,6	20,4	6,1	1,0	3,1
	2000-2010	11,2	2001-2010	56,1	29,1	14,5	0,0	12,5
The correlation between the birth rates of the 1980-1990 biennium. and MN of WRO for 1989-1998				-0,71	-0,83	-0,51	-0,59	0,41
The correlation between the birth rates of the 1980-1990 biennium. and MN of WRO for 2001-2010,				-0,68	-0,47	-0,70	0,24	-0,55

*/ MN of WRO – malignant neoplasms of women reproductive organs

environment is insignificant because only reindeer-breeding is developed in these regions. Reindeer-breeding has a lower influence on environment in Anabar, Ust-Yana, Nizhnekolyma regions, in Olenek and Allaekha it is low (Table 4).

In Table 5 estimations of economic and technogenic influence on environment are given in those regions where there is a different level of technogenic influence: Ust-Yana region has a high influence because of polluting mining mass, polluting substances thrown into the air and sewage. Anabar, Bulun, Allaekha regions have a lower influence on environment, Olenek and Nizhnekolyma regions – a low one.

It's set up that transbordering pollutions from mining enterprises of upper reaches of Yana, Indigirca, Kolyma influence water pollution of lower reaches. If some drastic measures are not taken in Anabar, Olenek, Bulun regions to protect their territories we won't escape the common lot of Ust-Yana.

Estimation of regional influence factors on environment in the arctic regions is based on research results finding out anthropogenic, economic and technogenic effects and the data of E.I Burtseva [1] estimating timber industry influence and vulnerability of nature complex to technogenic factors (Table 6).

Table 4

Reindeer –breeding influence on environment in arctic regions

Re-gions	Period	The deer population	environ-ment effect
Ana-bar	1995	21262	H
	2008	15485	Rd
	(± head)	-5777	
Allae-kha	1995	11961	Hght
	2008	2207	L
	(±head)	-9754	
Bu-lun	1995	19257	H
	2008	15770	Rd
	(±head)	-3487	
Nizh-ne-kolym	1995	20320	H
	2008	16773	Rd
	(±head)	-3547	
Ole-nek	1995	9410	L
	2008	4694	L
	(±head)	-4716	
Ust-Yana	1995	17252	H
	2008	12852	Rd
	(±head)	-4400	

Note: ± head – in 2008 in comparison with 1995. Environment effect: L – low, Rd – reduced, Hght – heightened, H – high.

The given data show that environment situation in the arctic regions under the influence of different factors of stages 1 and 2 can be estimated as follows: Ust-Yana territory is tensed because of the mining industry; Olenek region is relatively good; Bulun region is relatively good; Anabar region is satisfactory; Allaekha region is relatively satisfactory because polluting substances thrown into the air, sewage, water pollution from Ust-Yana mining industry and the river Indigirka; Nizhnekolyma region is relatively satisfactory. Environment is polluted from transbordering sources of Srednekolyma and Verkhnekolyma regions and Magadan region.

Annual MN morbidity of the coastal population in Allaekha region came down to 39.2 men during the analysis period where the population is 100 thousand men with average annual rate of 1.40%. While in other regions of the arctic zone data are higher. (In Anabar-15.4 0\0000, in Bulun-39.5, in Nizhnekolyma-76.00, in Olenek-1.1, Ust-Yana-81 0\0000). Annual average rate is 1.30%, 3.96, 4.85, 0.05, and 8.4%.

Data increase might be the result of environment pollution, some

Table 5

Estimation of economic and technogenic effect on environment in arctic regions

Index	Regions					
	Ana-bar	Allae-kha	Bulun	Nizhne-kolym	Olenek	Ust-Yana
Agricultural effect on E. (2008.)	Lr	L	Lr	Lr	L	Lr
Transport influence on E.	L	L	L	L	L	Lr
Extraction of mining mass from entrails of the Earth till 2002, mln. m ³	13,9	-	0,3	-	-	482,8
effect on E.	L	-	L	-	-	Hght
Average annual polluting substances thrown into the air (1995-2005) (thous. ton)	0,81	0,4	2,1	2,2	0,3	5,9
effect on E.	Lr	L	Lr	Lr	L	-
Sewage throwing (mln. m ³)	2,10	0,30	1,60	1,11	No register	0,90
effect on E. (ha)	A	-	Lr	Lr		L
Injured lands 1990-2001 (ha)	354,0	362,0	383,0	7,0	31,0	4256,0
effect on E.	Lr	Lr	Lr	L	L	Hght

Notes: L- low, Lr.- lower, A- average, Hght- heightened

changes of a way of life and nutrition of the population in the severe arctic conditions. Some differences in the MN morbidity can be explained by peculiarities of each region depending on the regional environment situation.

- In Anabar region morbidity increased in; cancer of liver (annual average rate-8.30%), breathing organs (5.60), lymphatic and blood tissues (19.55). Reduction of data was observed in digestion organs (-0.15), woman reproducing organs (-0.40).

- In Olenek region MN morbidity was observed in dynamics of head, neck, stomach, bowels, breathing organs, reproducing organs of women and men, lymphatic and blood tissues morbidities. Reduction was explained by carcinoma of gullet, bones, soft tissues and urination organs.

- In Bulun region general cancer increase (1.5) was observed in gullet

(1.1), stomach (more than 2), liver (1.8), pancreas (9.6), bowels (2.7), breathing organs etc. It's necessary to note a revealed tendency to reducing MN of man reproducing organs, bones and soft tissues, lymphatic and blood tissues was not so important.

- In Nizhnekolyma region cancer morbidity rose (1.6) in digestion organs (2.1 in annual increase of 7.95%); stomach (7.25%). Liver (6.20), pancreas (25.35), bowels (12.20 and 4.65% of colon and rectum). Average annual rise of MN of breathing organs is 0.30%, reproducing man organs (21.95), woman (1.75), urination organs (25.45), lymphatic and blood tissues (5.35). Reduction of MN was observed in bones and soft tissues (10.0%).

- Among the arctic regions Ust-Yana region is singled out for its highest rise of morbidity (8.45% annually). Thus, general morbidity coefficient of

Table 6

Population morbidity of the arctic regions in the Republic Sakha (Yakutia) and its annual average rate (1989-1998, 2001-2010) per 100 thousand population [4-6]

Localization	Period	Regions					
		Ana-bar	Allaekha	Bu-lun	Nizhnekolymsk	Olenek	Ust-Yana
1	2	3	4	5	6	7	8
Malignant neoplasm total	1989-1998	111,3	293,5	105,0	126,3	177,3	65,3
	2001-2010	126,7	254,3	154,50	202,3	178,4	146,9
	Growth rate	1,30	-1,40	3,96	4,85	0,05	8,45
Head and neck	1989-1998	0,0	3,6	1,4	2,4	0,0	0,8
	2001-2010	1,4	2,0	2,0	6,8	15,5	8,5
	Growth rate	0,0	-5,70	3,30	10,95	0,0	26,65
digestive organs – total	1989-1998	47,9	98,6	42,3	44,0	82,6	20,8
	2001-2010	47,3	119,7	62,5	94,4	70,8	54,0
	Growth rate	-0,15	1,95	4,45	7,95	-1,55	10,00
Esophagus	1989-1998	20,1	27,9	11,9	10,7	32,5	2,9
	2001-2010	2,5	17,5	7,2	11,8	14,7	9,0
	Growth rate	0,05	-4,55	-4,90	1,00	7,65	12,00
Stomach	1989-1998	17,7	35,2	9,4	15,6	20,0	9,7
	2001-2010	9,9	40,9	13,3	33,7	24,4	17,0
	Growth rate	-5,15	1,60	3,45	7,25	2,00	5,80
colon	1989-1998	0,0	3,8	4,6	7,8	5,0	2,2
	2001-2010	7,5	17,5	5,1	27,0	12,2	14,0
	Growth rate	0,0	16,50	1,05	12,20	16,50	20,35
rectum	1989-1998	0,0	7,5	2,9	6,4	5,1	3,2
	2001-2010	0,0	11,7	8,2	10,1	0,0	7,0
	Growth rate	0,0	4,55	10,96	4,65	0,0	8,15
liver	1989-1998	10,1	24,2	9,6	2,8	17,5	1,3
	2001-2010	22,4	29,2	20,5	5,1	17,1	4,0
	Growth rate	8,30	1,90	7,90	6,20	-0,25	11,90
pancreas	1989-1998	0,0	0,0	3,9	0,7	2,5	1,5
	2001-2010	5,0	2,9	8,2	6,7	2,4	3,0
	Growth rate	0,0	0,0	7,75	25,35	-0,40	7,20
Respiratory organs - total	1989-1998	22,5	40,7	20,4	35,4	45,0	13,7
	2001-2010	32,3	70,1	32,7	38,8	46,5	28,0
	Growth rate	5,60	4,85	1,05	0,30	6,70	0,0
larynx	1989-1998	2,5	5,5	1,7	4,2	2,5	1,7
	2001-2010	2,5	2,9	0,0	3,4	4,9	1,0
	Growth rate	0,05	-0,70	0,0	-0,2	1,08	-0,6
Trachea, bronchi, lungs	1989-1998	20,0	33,4	18,1	31,2	40,0	11,1
	2001-2010	29,8	67,2	32,7	35,4	41,6	27,0
	Growth rate	4,05	7,25	6,10	1,3	0,4	9,3
Bone and soft tissue	1989-1998	25,0	41,8	19,8	38,8	47,4	13,8
	2001-2010	0,0	11,7	3,0	3,4	2,4	3,0
	Growth rate	0,00	-10,0	-10,0	-10,0	-10,0	-10,0
Bone	1989-1998	7,5	3,7	1,7	0,7	7,5	0,2
	2001-2010	0,0	2,9	1,0	1,7	0,0	2,0
	Growth rate	0,0	-2,40	-5,20	9,25	0,0	29,15

all MN kinds rose 2.3 times. (of 65.3 to 146.9 0\0000) the reasons of which were a positive rate of head and neck MN (26.65%, gullet (12.00), liver (11.90), pancreas (7.20), bowels (20.35 and 8.15), breathing organs (7.20), reproducing man organs (11.35) and woman (6.25), thyroid gland (9.60), urination organs (19.95). Reduction was observed in lymphatic and blood tissues (-9.30%) .

- In the arctic coastal zone Allaekha region having a leading position in a general level of cancer morbidity, is the only region where at the same time a reduction is observed (of 293.5 0\0000 in 1989-1998 to 254 0\0000 in 2001-2010, annually -1.40%. Meanwhile total data of MN of stomach cancer (1.60), liver (8.30), colon (16.50), rectum (4.55), breathing organs (4.85), reproducing woman organs (9.55) are increasing in dynamic. MN of bones and soft tissues (-10.0%), urination organs (-10.0) , gullet (-4.55) and others reduced showing a general tendency of dynamic.

Among the coastal arctic zone Allaekha region (293.5) is in the first place, Olenek region (177.3)- second, Nizhnekolymsk region (126.3)- third according to the cancer morbidity level. Including gullet morbidity Allaekha (119.7), Nizhnekolymsk (94.4), Olenek (70.8); breathing organs: Allaekha (70.1), Olenek(46.5), Nizhnekolymsk(38.8); reproducing woman organs: Bulun(78.8), Allaekha (75.0), Nizhnekolymsk(50.2); urination organs: Nizhnekolymsk(13.5), Ust-Yana (8.0), Bulun (5.1); Anabar, Nizhnekolymsk, Olenek in cancer morbidity of thyroid gland and haemoblastosis occupy the first three places accordingly.

Results of the research prove that MN is higher in those regions located in the lower reaches of great northern rivers because the upper reaches are influenced by environment pollution of mining industry.

Some researchers [3, 9-12] explain MN morbidity rate as follows: a way of nourishment, especially non-qualitative imported products, lack of vegetable products leading to macro-and-micro-nutrient in a ration, birth-rate reduction, a short period of nurse, environment pollution, smoking, alcoholism, a changed way of life.

CONCLUSION

Thus, the main factor of MN morbidity in Ust-Yana, Allaekha regions is the functioning mining enterprises in the upper reaches. Water territory

Continued table 6

1	2	3	4	5	6	7	8
Soft tissue	1989-1998	1,1	0,0	1,5	2,1	0,0	1,1
	2001-2010	0,0	8,8	2,0	1,7	2,4	1,0
	Growth rate	0,0	0,0	2,90	-2,20	0,0	-0,95
Skin (including melanoma)	1989-1998	2,6	1,8	1,8	2,1	5,1	1,9
	2001-2010	2,5	0,0	3,1	3,4	4,9	10,0
	Growth rate	-0,40	0,0	5,60	4,95	-0,40	18,05
Female reproductive organ in total	1989-1998	26.0	26.0	26.0	26.0	26.0	26.0
	26.0 30.2	30.2	30.2	30.2	30.2	30.2	30.2
	49.1 42.4	49.1	49.1	49.1	49.1	49.1	49.1
	24.5 30.6	42.4	42.4	42.4	42.4	42.4	42.4
		24.5	24.5	24.5	24.5	24.5	24.5
		30.6	30.6	30.6	30.6	30.6	30.6
	2001-2010	25.0	75.0	78.8	50.2	29.4	56.1
Growth rate	-0,40	9,55	5,40	1,75	6,35	6,25	
Breast	1989-1998	10,4	15,1	25,7	26,3	14,7	20,4
	2001-2010	10,0	46,1	29,8	33,5	24,5	29,1
	Growth rate	-0,40	11,85	5,75	2,30	5,20	3,65
Cervix	1989-1998	5,2	11,3	11,7	8,8	4,9	6,1
	2001-2010	5,0	17,3	27,7	10,0	0,0	14,5
	Growth rate	-0,40	3,95	9,00	1,30	0,0	9,10
Uterus body	1989-1998	0,0	0,0	4,7	1,5	0,0	1,0
	2001-2010	5,0	5,8	6,4	6,7	4,9	0,0-
	Growth rate	0,0	0,0	3,15	16,15	0,0	0,0
Ovule	1989-1998	10,4	3,8	7,0	5,8	4,9	3,1
	2001-2010	5,0	5,8	14,9	0,0	0,0	12,5
	Growth rate	-7,05	4,30	7,85	0,0	0,0	14,95
Male genitals-total	1989-1998	0,0	11,1	1,1	1,4	5,1	1,3
	2001-2010	5,0	0,0	0,0	10,2	4,9	3,8
	Growth rate	0,0	0,0	0,0	21,95	-0,40	11,35
Prostate	1989-1998	0,0	11,1	1,1	1,4	5,1	0,4
	2001-2010	0,0	0,0	0,0	10,2	4,9	1,9
	Growth rate	0,0	0,0	0,0	21,95	-0,35	16,85
testicle	1989-1998	0,0	0,0	0,0	0,0	0,0	0,9
	2001-2010	5,0	0,0	0,0	0,0	0,0	1,9
	Growth rate	0,0	0,0	0,0	0,0	0,0	7,80
urinary	1989-1998	0,0	11,1	1,1	1,4	5,1	1,3
	2001-2010	5,0	2,9	5,1	13,5	2,4	8,0
	Growth rate	0,0	-10,0	16,55	25,45	-7,25	19,95
kidney	1989-1998	5,2	-	2,8	3,5	5,0	1,1
	2001-2010	5,0	2,9	5,1	8,4	2,4	7,0
	Growth rate	-0,40	0,0	6,20	9,15	-7,15	20,35
bladder	1989-1998	2,5	0,0	0,6	2,1	0,0	1,5
	2001-2010	0,0	0,0	0,0-	5,1	0,0	1,0
	Growth rate	0,0	0,0	0,0	9,25	0,0	-3,95
CNS	1989-1998	5,1	1,9	2,2	0,7	0,0	1,2
	2001-2010	0,0	0,0	1,0	0,0	2,4	2,0
	Growth rate	0,0	0,0	-7,60	0,0	0,0	5,25
Thyroid	1989-1998	0,0	1,9	0,5	0,0	4,9	1,2
	2001-2010	7,5	2,9	4,1	5,1	4,9	3,0
	Growth rate	0,0	4,30	23,40	0,0	0,00	9,60
hemoblastosis	1989-1998	2,5	5,6	2,3	5,0	5,0	2,8
	2001-2010	14,9	5,8	1,0	8,4	7,3	1,0
	Growth rate	19,55	0,35	-8,00	5,35	3,85	-9,80

of the lower reaches and the rivers Yana, Indigirka, Anabar are polluted by transbordering mining enterprises. Nizhnekolymsk region is polluted by mining enterprises of Srednekolymsk, Verkhnekolymsk and Magadan regions. At the same time a changed way of life, nutrition, lack of vegetable products leading to deficit of important nourishing substances play a great role in cancer morbidity rate data.

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Authors: Ivanov Petr Mihaylovich - MD, Professor, Head MI Oncology course Ammosov NEFU, Abramov Aleksey Fedorovich - PhD (Biology), Professor, FGBNU YANIISKH RAAS.

Employees of the YSC CMP: Tomskiy Mikhail Innokentievich - MD, Professor, Director; Golderova Ajtalina Semenovna, MD, Head of Dep., Nikolaev Vjacheslav Mihajlovich, PhD

(Biology), senior researcher;

Staff GBU YAROD: Makarova Natalia Nikolaevna - PhD, Senior Scientist, Head of Dep., Nikolaeva Tatyana Ivanovna - PhD, senior researcher, deputyhead physician; Zharnikova Tatyana Nikolaevna - PhD, researcher, head of department; Myreeva Svetlana Anatolievna - PhD, researcher, doctor oncogynecologist, Ivanova Feodosija Gavril'evna - MD, Head of chemotherapy Dep., Kiprijanova Nadezhda Sidorovna - MD, Prof. FPOV MI NEFU.

S. N. Samsonov, A. A. Strekalovskaya, L. A. Malysheva, P. G. Petrova, F. A. Zakharova

RELATIONSHIP OF THE GEOMAGNETIC DISTURBANCE TO THE STATE OF THE CARDIOVASCULAR SYSTEM AT HIGH LATITUDES ON THE GROWTH PHASE OF THE 11-YEAR SOLAR ACTIVITY CYCLE

ABSTRACT

Aim. To determine the dependence of the cardiovascular system's changes on specific physical parameters of space weather.

Materials and methods. The research covered 47 volunteers of different age, gender, and health conditions. The research was conducted at two observing stations: in the city of Yakutsk and the settlement of Tiksi in the Far North. For two months in March and April of 2011, on weekdays, we did ECG of the volunteers with Phasagraph system.

Results. It was revealed that the test people organisms react with changes in the T-wave symmetry on each change in the geomagnetic storminess.

Conclusion. The existence of coincident peaks of ECG data changes with geomagnetic parameters at the two observing stations proves the impact of the changes in geomagnetic storminess on the human cardiovascular system. The contrasting of the research results to the 2009 experiment results assumes that the different reactions of the human cardiovascular system may be related to the different phases of the 11-year Solar cycle.

Keywords: cardiovascular system, electrocardiogram, degree of symmetry, Solar activity, geomagnetic storminess.

The term 'space weather' describes the state of the near-Earth space. The Sun has the main impact on the near-Earth space. Therefore, identifying the link mechanisms between the solar activity and the functioning of various objects of the biosphere, including humans, is one of the fundamental issues of modern science.

The human organism is an open system; thus, changing conditions in the external environment have an impact on human well-being. The cardiovascular system is one of the first to participate in the process of adapting to changing environmental conditions. This is manifested in changes in the circulatory system, in particular, in the vascular tonus and blood rheological properties, as well as a disturbed balance between the coagulation and anticoagulation systems [4]. Cardiovascular diseases rank first in the morbidity and mortality of people; therefore, these diseases are socially signifi-

cant and require more attention [5].

Living organisms on Earth are under the constant influence of environmental factors [1]. They include both widely known meteorological factors (temperature, pressure, wind, and humidity) and less known factors of electromagnetic nature, whose influence is not felt until their intensity reaches a certain level. The factors of electromagnetic nature change primarily under the influence of the Sun on the magnetic field, gaseous mantle and solid crust of the Earth [6]. To date, a large body of scientific information on the matter is accumulated. However, the conclusions of individual authors are contradictory. For example, Yu. I. Gurfinkel et al. [2] claim that the impact of geomagnetic storminess on the cardiovascular system of a patient with coronary artery disease is most pronounced during the first three days after the storm beginning. Meanwhile, E. I. Nesmeyanovich and A. V. Bukalov [3]

conclude that the heart attacks dynamics is not correlated with the dynamics of storminess of the Earth magnetic field; they note that the highest number of heart attacks occur 9-10 days prior a geomagnetic storm.

Thus, the results of individual authors on the reaction of the human body to heliogeophysical disturbances do not always agree with each other.

The aim of the present research was to determine the dependence of the cardiovascular system's changes on specific physical parameters of space weather.

MATERIALS AND METHODS

To address this aim, in the period March-April 2011, we carried out a biomedical monitoring experiment to check the cardiovascular system state of volunteers with Phasagraph express-cardiograph.

At two stations: in the city of Yakutsk - Shafer Institute of Cosmophysical Re-

search and Aeronomy (ICPRA) and the Medical Institute, Ammosov North-Eastern Federal University (MI NEFU); and in the settlement of Tiksi – the ICPRA Observatory, the measurements were taken on a daily basis with the same equipment (Phasagraph system) following the same study protocol in groups of volunteers recruited at each observing station. All measurements were sent to the united database on Geliomed portal, where they were processed by the same method, which excluded the introduction of subjective factors with local processing of the measurement results at the observing stations.

As an experimental material, we used the data of the first electrocardiogram (ECG) leads of the volunteers with subsequent calculation of the T-wave symmetry characterizing the cardiovascular system functional state. Kp-index was used as a measure of geomagnetic activity.

The experiment covered 47 volunteers of different age, gender, and physical conditions. During two months in March and April 2011, on weekdays, we did ECG test on a daily basis using Phasagraph system. The ECG data were recorded under 4 loads: 0 load - measurement of the heart rate at rest, 1 - after an exercise same for all participants of the experiment, 2 - after emotional load, 3 - after a 10 minute rest.

When processing the medical data, we received an individual data range for each patient, for the entire period of the experiment and each load. Then, in order to create a continuous series of the data, we interpolated the parameters of each volunteer. In order to smooth the variations in the geomagnetic storminess index and the T-wave symmetry (TWS), the data were filtered to eliminate oscillation with a period of less than 4 days.

RESULTS AND DISCUSSION

The comparison of TWS temporal variations for each tested person under 4 loads with the temporary variations in the geomagnetic storminess index showed the coincidence of these figures in half of the tested people in the MI and Tiksi groups. However, the ICPRA group demonstrated only a partial coincidence of the experimental data. It was found that the best agreement is observed for 0 and 3 measurement modes, corresponding to the state of rest and the state in 10 minutes of rest after physical activity. This means that the tested people felt changes in geomagnetic storminess more at the state of rest. The average age of the tested people with the

same changes in the MI group was 22 years old. The average age of the participants with overlapping changes in the ICPRA group amounted to 47.8 years. In the Tiksi group, the average age of the participants with the same changes was 39.8 years, and the average age of the participants with overlapping changes was 43.1 years.

In Figure 1, the vertical axis shows the average index of the T-wave symmetry during ECG test under load 0 in relative units (the solid line) and Kp-index of geomagnetic storminess; the horizontal axis indicates the time in days from the beginning of the experiment. The figure shows that almost every change in geomagnetic storminess resulted in similar changes in TWS. The presence of coincident peaks of the medical data changes with geophysical parameters at the two observing stations shows the impact of changes in geomagnetic storminess on the human cardiovascular system.

During a similar comparison of the medical data from Tiksi, MI and ICPRA with Kp-index of geomagnetic storminess in 2009, the following results were obtained: a coincidence was marked in temporary variations of the T-wave symmetry in half of the volunteers at the observing station in Yakutsk (ICPRA and MI groups) with Kp-index, at low levels of geomagnetic storminess. At observing station in Tiksi, the comparison of the medical and geophysical data identified a group of people with TWS changes that coincided with the variations of geomagnetic activity only partially. Such a difference in the results may be due to the fact that the observations were conducted at different years of the solar activity. The year 2009 was considered a year with minimum solar activity, whereas the year 2011 signaled the beginning of solar activity growth.

Conclusion

1. There were revealed coinciding peaks of temporal changes in geomagnetic storminess and TWS in half of the volunteers in the MI group (Yakutsk) and Tiksi, who participated in the experiment. Basing on this, the assumption is made about the dependence of the human cardiovascular system on geomagnetic storminess.

2. The year of solar activity growth showed better tracking of variations in geomagnetic activity in young tested people (MI) and the group of volunteers in the Arctic region (Tiksi). The comparison of the results of this experiment with the experimental results of 2009 suggests that the different reactions of the cardiovascular system may be associ-

ated with a certain phase of the 11-year Solar cycle.

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The authors:

Sergei Nikolaevich SAMSONOV, Candidate of Physical and Mathematical Sciences, Leading Researcher, Shafer Institute of Cosmophysical Research and Aeronomy, Siberian Branch, Russian Academy of Sciences, Yakutsk,

Russia.

Alena Anatolievna STREKALOVSKAYA, Candidate of Medical Sciences, Associate Professor, Medical Institute, Ammosov North-Eastern Federal University, Yakutsk, Russia.

Larisa Afanasievna MALYSHEVA, Candidate of Medical Sciences, Associate Professor, Medical Institute, Ammosov North-Eastern Federal University,

Yakutsk, Russia.

Palmira Georgievna PETROVA, Doctor of Medicine, Professor, Medical Institute, Ammosov North-Eastern Federal University, Yakutsk, Russia.

Fedora Appolonovna ZAKHAROVA, Doctor of Medicine, Professor, Medical Institute, Ammosov North-Eastern Federal University, Yakutsk, Russia.

Bessonov P.P., Bessonova N.G.

PREVALENCE AND RISK FACTORS OF ACID DISEASES IN THE ADULT POPULATION OF THE REPUBLIC SAKHA (YAKUTIA)

ABSTRACT

In order to study the prevalence of risk factors of acid diseases in the adult population according to the residence area in the Republic Sakha (Yakutia), we surveyed men and women aged 45-70 years, living in the Arctic and Central Yakutia. We concluded that prevalence of symptoms of acid disorders was 53%, more often in the living in the Arctic. We revealed the high prevalence of chronic atrophic gastritis, Helicobacter pylori infection and poor dental health. Some risk factors for these disorders are modifiable, allowing to plan in their relation therapeutic and prophylactic measures.

Keywords: acid disorders, gastroesophageal reflux disease, population, prevalence, risk factors.

INTRODUCTION

Acid-related diseases are the cause of diseases of the stomach, duodenum (peptic gastric and duodenal ulcer disease, erosive and ulcerative lesions, chronic gastritis, gastroduodenitis, syndrome of non-ulcer functional dyspepsia), esophagus (gastroesophageal reflux disease -GERD, which occupies one of the first places). The true prevalence of GERD is poorly studied. This statement is connected with a great variability of clinical manifestations - from occasionally arising heartburns at which patients rarely go to the doctor, to the bright signs of complications of reflux esophagitis [1, 5].

In recent years, there is a clear downward trend in the number of patients with peptic ulcer disease on the background of increased number of patients suffering from GERD, which gave reason to declare this pathology a disease of the 21st century at the VI united Gastroenterological Week held in Birmingham in 1997. The term "reflux disease" was proposed in the mid 60s of the 20th century and involves a combination of the clinical picture of the disease and its associated morphological changes - reflux esophagitis, which has occurred as a result of continuous flow back in the esophagus of gastric or intestinal content, bile and pancreatic juice. GERD as an independent nosological unit officially was recognized in 1997 in the Belgian town of Genval at

a conference devoted to the diagnosis of the disease [3, 5]. In accordance with the WHO classification of GERD - it is a chronic relapsing disease caused by a violation of the motor-evacuation function of the gastroesophageal zone and characterized by spontaneous and (or) regularly repeated throwing up into the esophagus gastric or duodenal content, resulting in damage to its distal department.

As for dyspepsia it is a syndrome, including pain or burning in the pit of the stomach, heaviness and fullness in the epigastrium after eating, early satiety, bloating, nausea, and vomiting, belching and some other symptoms. In Western Europe, functional dyspepsia is found in 30-40% of the population, it is the cause of 4-5% of all visits to the doctor. In the USA and UK dyspeptic symptoms bother respectively 26 and 41% of the population.

Heartburn and acid regurgitation are the main symptoms of acid disorders. The prevalence of heartburn in the USA, the UK and Finland amounted to 24-36%, when it concerned of heartburn in general, and 10-21% of the population had heartburn weekly [5].

The foreign and domestic statistical studies report, that almost every tenth citizen of the European countries, the USA and Russia suffers from peptic ulcer disease (GU) of the stomach and duodenum, and the prevalence of GERD in adults is about 40% and 30% in Yakutia [1, 3, 5].

Here is some information about geographical position of the Republic Sakha (Yakutia). It occupies a vast territory, more than 40% of it lies above the Arctic Circle. Central Yakutia area includes Yakutsk and its suburbs, as well as the areas located in the basins of the Lena river flow, Viluy, Lena-Amga interfluve. Anabar, Nizhnekolymsky, Allaikhovskiy, Bulunsky and Ust-Jansky areas, situated along the shores of the Arctic Ocean, refer to the number of Arctic regions. In the Arctic low temperature is accompanied by strong winds. In the period from November to January polar night falls over a large territory. According to the complex of natural factors that affect the human body, this region is very harsh to live.

The aim of this study was to investigate the prevalence of acid diseases and risk factors among the population of Yakutia living in the various climate areas.

MATERIALS AND METHODS

We studied 2 groups of population - those, living in Central Yakutia and in the Arctic. In Central Yakutia survey was carried out among the indigenous population of two villages, in total 133 people (63 men and 70 women) aged 45-70. In Arctic villages we surveyed 131 people (31 and 100), aged 45-70 years. To identify the symptoms of the disease we used gastroenterological questionnaire, there was also conducted blood sampling and 40 people underwent endoscopy. Infection with Helicobacter pylori (Hp) we assessed using a test

system for the detection of cytotoxic (expressing CagA - protein) Hp strains. Each respondent signed the informed consent form to participate in the study. Statistical processing was carried out using SPSS 9.0 program. The criterion for statistical significance was a level of $p = 0.05$.

RESULTS AND DISCUSSION

Prevalence of symptoms of acid diseases accounted 51% in the inhabitants of Central Yakutia and 56% in the inhabitants of the Arctic zone (Table 1).

We compared age groups (45-60 and 61-70 years) and found out that the frequency of acid disease symptoms did not differ between these groups. There was no age difference in the incidence of individual symptoms. As it can be seen from Table 2, the prevalence of symptoms of acid diseases more often is observed among residents of a northern zone of Yakutia. It is well known that the nature and climate of Yakutia, being not major etiological factors of disease, nevertheless play a role in the pathogenesis of various diseases as predisposing factors that determine the regional peculiarity of disease course.

Increase of intra-abdominal and/or intra-gastric pressure in combination with the failure of the lower esophageal sphincter is considered to be factor, associated with GERD. Obesity, wearing a tight belt, stretching stomach with abundant food or slowing of gastric emptying leads to the increase of intra-abdominal and/or intra-gastric pressure; the failure of the lower esophageal sphincter is provoked by smoking, alcohol intake, certain medications (nitrates, calcium channel blockers), increased level of estrogen and progesterone during pregnancy [3, 5].

According to our data, the vast majority of the surveyed diet themselves (Tab. 3); eat 4 times a day, the main meal at lunch time, rarely hasty meals and dry rations food and no big break between meals. Thus, we revealed no association of acid diseases with eating disorders, except in individuals taking the main meal in the evening ($p = 0.02$). We often revealed the poor condition of the teeth (dental caries, missing teeth) in the adult population.

In accordance with our data, in the both surveyed populations there was revealed high prevalence of Hp infection - 87.8%. In the rural residents pepsinogen level 1 (PG1) was significantly lower than that of the urban population. Thus, the rate of atrophy of the gastric mucosa is observed in rural residents more often than in urban ones. Normal indicators of PG1 and gastrin - 17 (G-17), indicating a lack of atrophic changes in the gastric mucosa, were revealed in only 43% of the inhabitants of Yakutia, compared with 69% of residents of Novosibirsk [6]. These differences are probably not linked to genetic factors, but rather with the peculiarities of diet and lifestyle. In rural areas, there is deficiency in fresh foods: vegetables, fruits, berries, dairy products, meat, assortment of which is very limited in the cold period, continuing most of the year. The lack of fresh products and the use of canned and salt food are known as one of factors of atrophic gastritis and gastric cancer. The study of food of indigenous people reveals that nutrition is unbalanced and suggests a lack of basic micronutrients, minerals and vitamins in the diet [4].

It is known that the long persistence of Hp in gastroduodenal zone is accompanied by a general, systemic exposure to the human body, a

plurality of loop-related biologically active substances (toxins, cytokines, leukotrienes, prostaglandins, etc.), and with the possible development of autoimmune reactions. Noteworthy are and materials on the participation of Hp in the etiology of chronic pancreatitis. Such a connection is theoretically possible, as Hp, as already mentioned, changes the function of the stomach and duodenum, and the pancreas has a close anatomical and physiological relationship with these bodies. Thus, Hp inhibits the synthesis and expression of somatostatin with the stomach D-cells, which is accompanied by a reduction of antral density of these cells, while the density of G - cells and synthesis of gastrin increase significantly with the subsequent development of the hypersecretion of hydrochloric acid, and the acidification of the duodenum can stimulate the secretion of pancreatic through the allocation of secretin [8]. In addition, gastrin expresses a weak like cholecystokinin effect on pancreatic secretion [9]. Recently it has been shown that in the H-positive person inter-digestive secretion of pancreatic amylase, lipase and chymotrypsin was significantly higher, but post-prandial secretion of enzymes tended to increase. So, in individuals infected with Hp, even in asymptomatic carrier, functional disorders not only of the stomach but also of pancreatic gland are marked [7]. Diseases' interference significantly changes clinical symptoms and course of disease, the nature and severity of complications, impairs the quality of life of the patient and complicates diagnostic and therapeutic effect [2].

Pursuant to our study, marital status and employment characteristics of the surveyed had no significant effect on the frequency of symptoms. Helicobacter infection in populations was revealed in the most studied, in this regard we did not find connection of the infection with symptoms, in contrast to other studies. The prevalence of Hp infection is very high, that perhaps, determines the absence of association with symptoms and individual nosological units, since the vast majority of the population is infected.

CONCLUSION

Symptoms of acid disorders have been reported in 53% of the adult population, more frequently in the residents of the northern Yakutia regions. Risk factors of acid diseases are associated with the diet violation and food consumption in the evening. We revealed a high prevalence of chronic atrophic gastritis, Helicobacter pylori infection and poor dental health. Socio-demographic characteristics, alcohol, intake of NSAIDs did not affect the frequency of detection of symptoms. Some risk factors for these disorders are modifiable, allowing to plan in relation

Table 1

Prevalence of symptoms of acid diseases among residents of Central Yakutia, %

Symptom	Less than 1 time per month	Once a month	Once a week	Several times a week	Daily
Heartburn	27	14	4	5	1
Sour belching	10	16	4	5	2

Table 2

Prevalence of symptoms of acid diseases among residents of the Arctic, %

Symptom	Less than 1 time per month	Once a month	Once a week	Several times a week	Daily
Heartburn	24	20	7	4	1
Sour belching	11	16	5	2	0

Table 3

Risk factors of the acid diseases in the population, depending on the area of residence

Risk factor	Diet	Central Yakutia	The Arctic	p
Eating regime	Regular	98	87	-
The number of meals per day	3 and more than 3 times a day	36 68	37 66	- -
Dry rations food	Sometimes	29	26	-
The main meal in the evening	Sometimes often	21 13	20 12	0.02
Big interval between meals	Yes	11	12	-
Quick and hasty food	Yes	39	20	-

to them therapeutic and prophylactic measures.

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Information about the authors:

Bessonov Prokopij Prokop'evich - PhD, Associate Professor, Department of Hospital Therapy, Occupational Diseases and Clinical Pharmacology, Medical Institute FGFOU VPO Ammosov NEFU, Yakutsk, Russia, e-mail: bessonovproc@mail.ru;

Bessonova Natalia Georgievna - PhD, Associate Professor, Department of Hospital Therapy, Occupational Diseases and Clinical Pharmacology, Medical Institute FGFOU VPO Ammosov NEFU, Yakutsk, Russia, e-mail: bessonovang@yandex.ru.

A.V. Efremova, G.E. Mironova, L.I. Konstantinova ACTUAL NUTRITION INDEXES OF THE INDIGENOUS RURAL POPULATION OF YAKUTIA

ABSTRACT

We researched the actual nutrition among persons of the indigenous nationality of Yakutia. By our study we proved imbalance of the actual nutrition by macro - and micronutrients. Besides we revealed increase in a share of fats (10%) and carbohydrates (12%) in a daily diet.

Keywords: indigenous population, the actual nutrition, traditional nutrition, obesity.

INTRODUCTION

Food of indigenous peoples of the North developed protractedly, under the influence of regional features and social and economic conditions. The state of health of aboriginals of Yakutia substantially is defined by their features which have developed in the course of centuries-old selection in extreme conditions of Far North. The traditional way of life and type of food developed

during many millennia don't contribute to development of much known "diseases of a civilization". At the same time, the separation of inhabitants of a radical nationality from a native habitat, a traditional way of life and a food allowance is caused at them by growth of diseases of the blood circulatory system and digestion.

Research objective: to estimate actual food of radical villagers taking into

account a floor and nature of activity.

MATERIAL AND METHODS

During our study 307 representatives of adult population are examined (the 239 woman and 68 men aged from 30 till 50 years). The actual food of surveyed was studied by means of a method of daily reproduction of food [2], receiving data on food eaten within the last days by poll with use of an album of foodstuff and dishes [1]. On the basis

of the obtained data with the help of the tables "Chemical Composition of the Russian Foodstuff" defined a chemical composition of a daily diet [3]. Balance of a diet was estimated in sizes of consumption of the main nutrients, energy and compared to MP 2.3.1. 2432 – 08 "Norms of physiological needs for feedstuffs and energy for various groups of the population of the Russian Federation" [4]. For an assessment of the food status used a body weight index (IMT = the body weight, kg/height, m²). The IMT normal value - 18,5 to 25 kg/m².

RESULTS AND DISCUSSION

The main reasons leading to obesity are the excess quantity, and high caloric content of the consumed food in a combination to decrease in energy consumption. The excess mass (25,0 – 29,99 kg/m²) of a body is revealed at 32% of men and 37% of women, obesity (IMT of 30 kg/m² and more) it is noted at 22% of men and 20% of women.

All examined persons treated working-age and lived in rural areas. Physical activity surveyed generally was formed of agricultural work, truck farming, care of house conditions, gathering wild berries, hunting and fishing.

Most of the examined persons have been busy with easy physical work (group I, 40,5%) (fig. 1), mainly were engaged in brainwork 27% (group II), work of average weight – 28% (group III), 5% treated the IV group, that is did hard manual work. In this regard patients have been divided according to weight of work. Indicators of the actual food of men depending on physical activity are given in table 1.

The obtained data confirm discrepancy of the actual food of the examined men to the norms developed by scientific research institute of food of the Russian Academy of Medical Science (table 1). At the persons occupied mainly with brainwork excess body weight prevailed. Consumption of almost all main components exceeded the recommended norms: consumption of protein was above the recommended norm for 28%, fats – for 19%, carbohydrates – for 20%. The power value of a daily diet exceeded the recommended size for 21%.

The IMT average value was in the second group on the upper bound of norm that testifies to imbalance of all components of food. The amount of the consumed protein among men of this group exceeded the recommended norm for 18%, consumption of fats met standard, and the amount of the

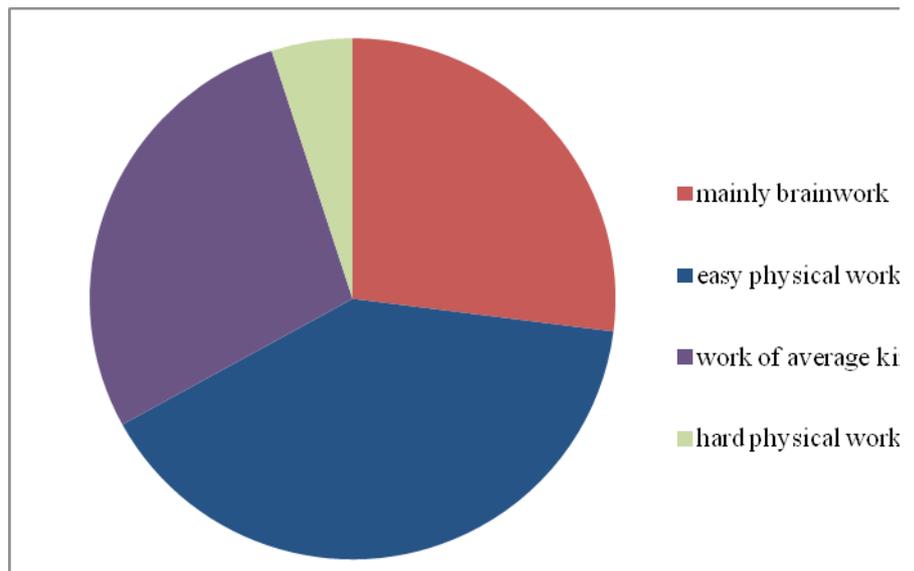


Fig. 1. Distribution of the examined aboriginals of Yakutia on nature of kind of work

consumed carbohydrates were slightly lower than norm (for 10%). Caloric content of a diet of the men occupied with easy work met the recommended standard.

The indicator of IMT of the patients occupied with work of average weight was on the upper bound of norm. Consumption of protein was 36% lower than norm, consumption of fats met standard, the amount of carbohydrates was below the recommended size for 18%. Caloric content of a diet of men of this group of employment was below the recommended norm for 7%. The power value of a diet of the men occupied with hard physical work was 16% lower than the recommended norm as consumption of protein was 14% lower than norm,

consumption of fats – for 14%, the content of carbohydrates in a daily diet was lower than the sizes of norm for 24%. All examined men in this group had normal body weight.

Among the women occupied with an intellectual kind of activity, average daily consumption of proteins and fats exceeded the recommended norms for 17% and 15% respectively (tab. 2), and the amount of the consumed carbohydrates was above norm for 12%. Respectively and the caloric content of a diet of the examined women was 13% higher than the recommended norm. The average value of IMT of women of this group was also above norm $\geq 25,0$.

In the second group all main indicators met standard, except for protein content

Table 1

The main indicators of the actual food of men depending on kind of work

Indicator	Kind of work			
	Group I, n = 15	Group II, n = 17	Group III, n = 21	Group IV, n = 15
IMT, kg/m ²	27,18±1,22	25,75±0,87	25,79±0,68	23,92±0,97
Proteins, gr	106,52±11,31 76,47*	104,06±7,79 85,67*	135,75±8,94 99,47*	132,94±14,37 113,85*
Fats, gr	104,06±9,79 84,52*	93,82±10,01 98,62*	115,15±9,01 116,72*	115,71±9,97 133,97*
Carbohydrates, gr	457,09±58,94 366,85*	383,14±28,31 423,97*	419,72±30,41 514,05*	447,28±35,59 590,52*
Energet. value, kcal	3220,62±334,49 2530*	2797,85±196,26 2961,25*	3262,89±189,50 3507,50*	3367,91±167,62 4025*

Note: * Norms of physiological needs for energy and feedstuffs for various groups of the population of the Russian Federation (Methodical recommendations 2.3.1.2432-08).

Table 2

The main indicators of the actual food of women depending on kind of work

Indicator	Kind of work			
	Group I, n = 65	Group II, n = 91	Group III, n = 52	Group IV, n = 15
IMT, kg/m ²	26,09±0,7	25,28±0,45	24,44±0,46	24,55±1,54
Proteins, gr	81,07±3,85 67,27*	84,13±3,12 73,60*	88,21±4,41 83,95*	115,01±12,23 95,45*
Fats, gr	83,61±4,57 70,72*	80,67±3,57 81,65*	85,62±4,68 96,60*	103,82±8,34 110,97*
Carbohydrates, gr	345,29±15,20 305,53*	343,6±12,49 354,20*	382,32±24,14 424,35*	485,76±40,55 488,17*
Power value, kcal	2448,56±103,85 2127,50*	2438,39±80,89 2443,75*	2658,70±142,49 2903,75*	3342,72±309,04 3335*

Note: * Norms of physiological needs for energy and feedstuffs for various groups of the population of the Russian Federation (Methodical recommendations 2.3.1.2432-08).

(norms for 13% are higher).

Caloric content of a diet of the women occupied with work of average weight was below norm for 9% as average daily consumption of fats and carbohydrates was below norm for 11% and for 10%

respectively, and intake of protein met standard.

In group of the women occupied with hard physical work the increased protein consumption (for 17%) is revealed whereas intake of fats with a diet was

below the recommended size for 7%, and consumption of carbohydrates met standard. Among women of this group of excess body weight it isn't revealed.

Thus, the analysis of average daily diets, depending on nature of work, has revealed that with power consumption increase the index of body weight of the examined patients corresponds to normal values.

Average daily consumption of proteins, among all examined persons has made 91,90 ± 2,13 g/days, fats – 87,66 ± 2,15 g/days, carbohydrates – 371,35 ± 8,37 g/days. The power contribution of the main components to diet power value, among all examined persons, has made: proteins – 14,0%, fats – 30,0%, carbohydrates – 56,0%.

The comparative analysis of the actual food depending on a floor has shown that men consume slightly more proteins and fats, and women – carbohydrates (tab. 3). Caloric content of a daily diet as among women (12%), and among men (13%) was below the recommended norms developed by scientific research Institute of food of the Russian Academy of Medical Science. Average daily intake of protein with a diet of men exceeded the recommended size for 22%. The protein contribution to diet power value, both among men, and among women exceeded norm. Consumption of fats corresponded to norm indicators, and consumption of carbohydrates was slightly lower than the recommended sizes. The insufficient use in food of vegetables and fruit leads to the low level of receipt in an organism of cellulose and can be the cause of

Table 3

Indicators of the actual food of aboriginals of Yakutia depending on depending gender distinctions (man, woman)

Indicators	Man, n = 66	Recommended norms for men *	Woman, n = 210	Recommended norms for women *
Proteins, gr	117,48±5,26	96,61-102,35	85,35±2,07	82,80-85,17
Fats, gr	104,00±5,00	112,73-120,75	83,40±2,30	95,45-97,75
Carbohydrates, gr	416,18±17,96	496,83-531,34	358,83±9,28	420,96-427,80
Power value, kcal	3053,53±113,39	2700,45-3622,54	2541,44±58,41	2875,00-2932,57
Proteins, %	15,38	11,31-12,03	13,43	11,52-11,61
Fats, %	30,64	29,89-29,98	29,54	29,88-30,00
Carbohydrates, %	54,51	58,58-58,66	56,48	58,56-58,35
Ratio of proteins: fats: carbohydrates	1:0,88:3,55	1:1,17:5,16	1:0,98:4,22	1:1,15:5,05

Note: * Norms of physiological needs for energy and feedstuffs for various groups of the population of the Russian Federation (Methodical recommendations 2.3.1.2432-08).

development of diseases of a digestive tract. We have revealed deviations in intake of food fibers with a daily diet. So, men consumed $19,48 \pm 1,07$ g/days. food fibers, and the woman – $14,93 \pm 0,50$ g/days at norm of 20 g/days.

CONCLUSION

We revealed that the actual food of indigenous people of Yakutia is characterized by imbalance of a diet on macro - and to micronutrients. Increase in a share of fats and carbohydrates (for 10% and 12% respectively) in a daily diet testifies to a carbohydrate and lipidic orientation of modern food of indigenous country people of Yakutia.

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Information about authors:

Efremova Agrafena Vladimirovna – candidate of biological science, the senior research associate of Department of studying of mechanisms of adaptation of YSC CMP, Yakutsk, Russia, E-mail: a.efremova@mail.ru;

Mironova Galina Egorovna – doctor of biological science, professor of department of biochemistry and biotechnology of M. K. Ammosov NEFU Yakutsk, Russia;

Konstantinova Lena Ivanovna – researcher of YSC CMP Yakutsk, Russia.

M.M. Tyaptirgyanov, V.M. Tyaptirgyanova, A.V. Chernyh

EVALUATION OF THE WATER QUALITY IN THE KOLYMA RIVER ON AN AQUATIC BIOTA

The article reports an analysis of hydro-chemical parameters of water in comparison to the MPC for fishery and drinking water use. Due to a comprehensive assessment in 2010 the water quality of river Kolyma was characterized as the 3rd class category «A» «polluted». Typical contaminants were phenols, copper and zinc compounds.

Keywords: salinity, cationic composition, gas mode, biogenic element, the maximum permissible concentration.

INTRODUCTION

The Kolyma River, that has a length of 2129 km, is formed by the confluence of Kullu and Ayan-Yuryakh, originating in Cherskiy mountain range and flows into the East Siberian Sea. Delta length is 110 km, an area - 3000 km². Mixed supply: snow (47%), rain (42%) and underground (11%). Flood: from mid-May to September. Swipe level fluctuations up to 14 m. The annual flow at the mouth - 123 km³ (3,900 m³ / s). The average annual sediment load - 5.5 mln tons. It freezes in mid-October, rarely - at the end of September. Before freezing – ice-drift and slush lasting from 2 days to a month, ice dams. In winter, frazil - river-bed and extensive ground. Ice reveals in the second half of May and early June. Debaile lasts from 2 to 18 days. Area of lake fisheries fund - 12716 km² [13, 9].

The purpose and objectives of the research: the study of the contemporary composition of the major chemical ele-

ments and their impact on aquatic biota structure in the formation of modern hydrochemical regime of the Kolyma River.

Research objectives included the determination of salinity, anionic and cationic composition, total hardness, pH, dissolved oxygen, carbon dioxide, nutrients and conclusions about the sanitary condition of the pond for drinking water and fishery use.

MATERIALS AND METHODS

Chemical analysis of the water was carried out according to generally accepted in hydrochemistry freshwater techniques [1].

RESULTS AND DISCUSSION

We investigated the Kolyma River area within Srednekolymsk and Nizhny Kolymsky areas. These areas are replete with lakes, interconnected river and canals, dominated by sand and mud and silt. The average flow rate - 0.4-0.5 m / s, in the delta - 0.2-0.3 m / sec, acquires the reverse direction at the time

of the tides.

The Kolyma River is ice-free from 125 to 157 days, the mode level of the Kolyma river is most dependent on the discharge of the Kolyma hydroelectric power station, located in the Magadan region, and therefore characterized by high spring and august floods. Most of the flow is noted from June to August. In general, during the warm season (May-October) is held up to 90-95% of annual runoff. A. Novikov [3] noted that the minimum winter water discharges, before the construction of HPP cascade Kolyma, in the middle and lower reaches could drop to 30-50 m³ / sec.

The temperature regime of the Kolyma River is quite hard. In Srednekolymsk surface water temperature in summer is above 10 ° C and keeps 2-2.5 months, and in some years the water temperature reaches 10 ° C.

According to Anadyr-Kolyma Water Association, in 1990 into the Kolyma

River basin and its main tributaries were dropped 32.93 million. m³ of runoff. The sources of water pollution, according to Severovostokupravleniye are mining, industrial, transport enterprises, towns and farms.

The chemical composition of water of the river Kolyma at the inspected site belongs to "very mild" and "soft" type [1]. Annual minimum salinity (according to our data for 2004-2006 and YAUGKS-data) falls on the spring flood, the maximum - on the winter.

The main source of river water supplies are being formed directly on the surface of the catchment. On the whole, over the period of mineralization value was close and ranged, in 2004 - 60,2-109,3 mg / dm³, 2005 - 61,2-102 mg / dm³, in 2006 - 62.7 -108 mg / dm³, while the average for the year - 84.2 - 91.6 mg / dm³. Average annual rate of mineralization - 87.5 mg / dm³. The most minimal mineralization observed in the summer of 2004 and was 60.2 mg / dm³, the maximum winter 2004 - 109.3 mg / dm³.

Bicarbonates in the ionic composition of the water in the subject area in 2004-2006 are predominant; on average - 31.1 years - 33.4% eq. Calcium ions also are the predominant ions and make up an average of 21.1 years - 24.2% eq.

Chloride content is relatively small, but fluctuations are significant (0.3 - 7.0 mg / dm³), it seems, it can be explained by tidal phenomena in the delta.

The total hardness of the water has changed from 0.50 to 1.15 mmol / dm³ and the average annual rate was 0.91 mmol / dm³. The lowest (0.5 mmol / dm³) was observed in 2006, and the maximum (1.15 mmol / dm³) in April 2004.

The great importance in the evaluation of the quality of natural water has a pH value. At a pH value of the surveyed area has fluctuated slightly, from 6.37 to 7.3, which is well within the maximum permissible limits (6.5-8.5). The lowest rates are slightly shifted to the acid side, were observed in the spring and summer of 2006 (6.4) and the highest (7.3) in the winter of 2004. This is due to the fact that while the spring tide, when there is a flush catchments wetland rich in humic substances, the water becomes acidic in nature, whereas it is neutral in the winter.

The oxygen content in the water of the river Kolyma at the period 2004-2006 varied within relatively narrow limits (from 7.6 to 10.3 mg / dm³), reaching 120% of saturation. Seasonal dynamics are well pronounced. The highest rates of dissolved oxygen were observed in autumn and winter (9,5-10,3 mg / dm³) and

minimal (7,6-8,2 mg / dm³) in the spring and summer.

In general, the gas mode of the river Kolyma in the open period is quite favorable for the development of biological life.

Elevated levels of ammonia nitrogen indicate the improvement of the sanitary condition of the water body. MACs for ammonium ion (fishery) is 0.39 mg / dm³, for drinking purposes - 2 mg / dm³. Increasing of the concentration of ammonium ions is observed during the extinction of aquatic organisms. A significant number of them fed by surface runoff and atmospheric deposition. A natural source of ammonia nitrogen are also lifetime allocation of aquatic organisms, particularly invertebrates [8]. In addition to ammonium nitrogen it is formed as a result of anaerobic processes reduction of nitrates and nitrites.

In the surveyed area of ammonia nitrogen content is ambiguous: from 0.08 to 0.66 mg N / dm³ and the average was 0.24 mg N / dm³.

The concentration of nitrite in the surveyed area of the river Kolyma changed from "not detected" to 0.012 mg N / dm³. And no more than any one season or MAC for drinking water (3 mg N / dm³), nor for the fishery (0.08 mg N / dm³) water. It is known that small amounts of nitrite can be present even in uncontaminated saturated oxygen reservoirs. In Sec. Males were stable during the years 2004-2006. and were <0.007 mg N / dm³.

Nitrate does not go beyond the admissible limits (9.0 mg N / dm³) and changed from 0.10 to 0.205 mg N / dm³. The highest rates were recorded in the winter period (March-April) of 2004 and the lowest - in the autumn of 2005. The low nitrate content indicators, apparently, can be explained by the fact that the samples were taken during the growing season, when the content of nitrate nitrogen is minimal.

Maximum values of total phosphorus were observed in the autumn-winter period in 2004. Note, however, that such laws were found in 2005-2006., When maximum rates were summer (0,202-0,208 mg P / dm³), and minimum values (0.041 mg P / dm³) in April 2004-2005. The average phosphorus content in 2006 was 0.1 mg P / dm³, t. E. Even minimal phosphates figures were about the same MAC (0.040 mg P / dm³).

The processes of weathering of rocks lead to the accumulation in the surface waters of iron compounds. In addition, admission is possible with underground, industrial and agricultural effluents. The

river waters are rarely iron content greater than 1 mg Fe / dm³. Elevated concentrations significantly impair the organoleptic properties of water. MPC of iron in drinking water is 0.3 mg Fe / dm³ for water fishery is much stricter - 0.1 mg Fe / dm³. In the surveyed areas p. Kolyma iron content varied from 0.67 to 1.24 mg Fe / dm³.

Maximum iron indices (1,02-1,24 mg Fe / dm³) were observed in all years of observations in the summer-autumn period, which is ten times higher than the MPC for drinking as well as for fishery water.

The concentration of silicon in the surveyed area of r. Kolyma varied from 0.1 to 4.0 mg Si / dm³ and did not exceed the accepted limit (10 mg Si / dm³).

The study of organic matter in the water associated with the solution of a number of practical issues in the field of water supply and fisheries. Its content in surface waters is determined by a set of processes occurring in the reservoir, and the posthumous life aquatic discharge, precipitation, surface, industrial and utility fluids. Organic substances are dissolved in water, and a colloidal suspension. They can move from one form to another under the influence of physical, chemical and biological conditions continuously.

The estimated total amount of organic matter produced as a result of dichromate oxidation (COD). It is known that the northern and southern taiga are increased oxidation zone [11]. COD water, certain dichromate method can be considered as an approximate measure. Surveys conducted in 2004-2006. in the lower reaches of the river Kolyma at p. Males showed that COD is not unique.

Quantitative indicators COD varied from 6.9 to 24.8 mg O / dm³ and averaged 16.3 mg O / dm³. The highest rates were observed in summer and autumn (21,0-24,8 mg O / dm³), and the lowest (6.9) in the winter, when the oxidative processes are slowed down due to low temperatures.

COD figures are in good agreement with the chrominance values. It varied from 22 to 203 and an average of 47.8 ° in 2004-2006., Exceeding the accepted limit.

Long-term observations of claim. Males showed a distinct seasonal trend. If the spring-summer period of 2005, the COD value is ranged from 90 ° to 152 °, then in the fall and winter - from 20 ° to 22 °, and the average for the year was 55 °, exceeding the permissible limits. A similar pattern was observed in 2004 - in the spring and summer - 80 ° -138 °,

in the autumn-winter period - 12 ° -21 °, and the average was 51 °.

Biochemical Oxygen Demand (BOD) is determined according to the standard after five days of incubation, or complete. The results allow to assess water quality. The observations were made in the paragraph from p. End of the Line for 2004-2006., BOD value is ranged from 2.7 to 3.3 mg O / dm³. And the highest rates (about 3.3 mg / dm³) was in October, when there is a death of aquatic organisms, and consequently, a large consumption of oxygen affects the decomposition of organic substances.

On average, during the years of BOD observations was about 2.9 mg / dm³ and fit into the accepted limit (about 3 mg / dm³). In general, the water quality on this indicator can be considered quite satisfactory for drinking water and fisheries.

Maximum allowable concentration of oil in the fresh water is 0.1 mg / dm³ for drinking water, and 0.05 mg / dm³ for the fishery. Leaking water bodies in the processes of biochemical and chemical oxidation, reducing the concentration of oil in the water of the northern water sources are poorly understood.

It is believed that a high degree of intoxication oil is the cause of the pathology of the internal organs of fish, leading to deformity and destruction, disruption of the structure of the population and ultimately - depletion of the fish population [12, 10].

It is known that the main pollutant of oil products in the rivers are navigable transport [2]. Distribution of oil products is difficult and unstable, usually are the most polluted coastal zones. With this in mind, sampling for the study of water on the oil content in the surveyed area were carried out in the surface horizons.

The concentration of petroleum products, observed for a few years (2004-2006 gg.) In the lower reaches of the river Kolyma, has shown that it does not exceed the permissible norms (0.005 mg / dm³), ranging from 0.02 to 0.06 mg / dm³. Can any patterns not found in the seasonal dynamics of the concentration of oil. Maximum values were observed at all times of the year (0.06 mg / dm³).

In general, the concentration of oil products in the surveyed area does not exceed the MPC, but in practice and was not below the MRL. Thus, this site can be considered with caution to clean water and fishery is quite favorable for domestic and drinking purposes.

In low contaminated surface water surfactants concentration range usually within thousandths and hundredths

of mg / dm³. In areas of pollution, it increases up to several tenths of a milligram, and can reach close to sources of pollution a few milligrams.

The main factors reducing the concentration of water entering the surfactants are the processes of biochemical oxidation. Their speed is dependent on the water temperature, pH and suspended solids t. D.

The content of surfactants in the district Kolyma does not exceed the maximum permissible concentration for drinking purposes (0.01 mg / dm³) and exceeds for fishery water (0.5 mg / dm³). It detected in all seasons and ranges from 0.017 to 0.028 mg / dm³. The highest rates are found in winter (0.028 mg / dm³), t. E. Higher than the MPC for fish farming. The relatively high (0.02 mg / dm³) was the figure in spring flood by runoff from the catchments area.

Pollution of r. Kolyma at the level reached in 1992 the average annual Concentrations of phenols 3 MPC, copper compounds - 2 MAC, zinc - 1.6 MAC, oil products - at the level of the MPC. In the lower reaches of the river Kolyma water is dirty: in comparison with the 1992 level of phenols exceeded MPC 7, petroleum products - more than 3 MPC, copper - 2 MACs, iron - within 2 MPC [4].

In 2003, the characteristic was water pollution by phenols and iron compounds at 1.6 MAC, the highest concentration reached 10 at the MPC, the MPC Srednekolymsk and 7.5 at p. Cherskii respectively. Water pollution of light and difficult-substances (BOD₅ and COD) from zero to 9.9 MAC at the city Srednekolymsk. Average annual concentrations of other pollutants were below or at the level of the MPC. The oxygen regime - satisfactory [5].

Water Quality of r. Kolyma in 2006 decreased to discharge "a" Class 4 ("dirty"). According to a comprehensive assessment of water pollution in the river iron compounds defined as critical, the average concentration in comparison with the previous year increased to 1,3-3,4 MPC, the maximum determined in the range of 5-11 MAC. The average concentration of copper compounds decreased slightly compared to 2005, and changed from 4 to 6 MAC, the maximum values reached respectively 14 and 24 MPC MPC. In 2006, was typical level of water pollution with phenols to an average of 2-3 MAC, the maximum concentrations reached 6-8 MAC, as well as manganese compounds in 1.3 times. The maximum concentration of manganese was 15 MAC. A critical indicator of water pollution are mercury compounds,

respectively, the average concentration reached 1-3 MPC [6].

In 2010, a comprehensive assessment of the water quality of river. Kolyma in Srednekolymsk near testified that the water in all cross-sections of the river characterized by the 3rd class "A" category (as "polluted"), but below, the Srednekolymsk 1 km was a class of water quality change for the worse. The most typical contaminants of water throughout the river were phenols, average concentrations are almost unchanged compared to the previous year (an average of 1.8 MAC), and the maximum value reached 5-7 MAC. Contamination of the water connections of the river downstream of copper ranged from stable low level (2.4 MAC) to an unstable intermediate level (up to 9.3 MAC), and their average annual concentrations do not exceed the allowable criteria. The maximum concentration of zinc compounds in the control section has reached the level (12 MPC); average, in general, under the item does not exceed the permitted limit, the critical indicators of water pollution, as well as in 2009, were absent [7].

CONCLUSIONS

Development of mineral resources in the region and the development of fields in the north-east Yakutia led to intensive anthropogenic influence. These rivers are used for timber floating in the interests of Fisheries (Fisheries) and recreation. It is known that sewage plants processing alter the physico-chemical parameters of water bodies and create a new quality - the toxicity of the environment. Smoke emissions of tin ore enterprises, gold industries pollute the water catchment areas of the rivers organic and inorganic salts and heavy metals that enter the river with melt water and rainfall.

The results showed that the discharge of saline water from the temporary storage and drainage of polygons has a definite influence on the formation of the hydrochemical regime of reservoirs studied. Domestic sewage from the cities and towns, as well as farm animals (fox, fox, nutria, cattle and sheep, and others.) bring nutrients and contribute to the eutrophication of the north water bodies. The chemical composition of water is under the direct influence of highly discharges. As a result, the chemical composition of the water has changed from bicarbonate-calcium to sodium-chloride. Changing of abiotic parameter of sub-Arctic waters, with a different focus and degree of manifestation, resulted in a change of aquatic communities. In general, the structural changes in the com-

munities of aquatic invertebrates with anthropogenic pressure are reduced to the loss from the list of species previously existing typical fauna of northern waters, or their complete replacement, such as brackish organisms.

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Authors:

Matvey Tyaptirgyanov - PhD, associate professor of Institute of Natural Sciences NEFU, E-mail: matyap@mail.ru, Yakutsk, Russia;

Victoria Tyaptirgyanova - MD, deputy chief medical officer, FBHF "Center of Hygiene and Epidemiology in the Republic of Sakha (Yakutia) » Yakutsk, Russia, E-mail: vtyap@mail.ru;

Alexandr Chernykh - engineer hydrochemist, Nizhnekolymskiy district Inspection of the Ministry of Nature Protection in Republic of Sakha (Yakutia), tel. (41157) 2-20-92.

«THE YAKUT MEDICAL JOURNAL» ISSUE MATERIALS

ORIGINAL RESEARCHES

S.A. Chugunova, T.Ya. Nikolaeva, T.S. Egorova

FEATURES OF ANTICOAGULATION-ASSOCIATED INTRACEREBRAL HEMATOMAS

ABSTRACT

Anticoagulant-associated intracerebral hemorrhage is characterized by the clinical severity and an increased risk of death. Previously published data on the anticoagulation-associated hematoma's localization are controversial. This study was provided to characterize the localization of intracerebral hematomas, associated with anticoagulant therapy, in patients with warfarin-associated and spontaneous hypertensive intracerebral hematomas.

It is found that warfarin-associated hematoma characterized by a common site in the cerebellum compared with hypertensive intracerebral hematomas.

Keywords: hemorrhagic stroke, intracerebral hematoma, anticoagulation therapy, warfarin.

INTRODUCTION

In recent years, the antithrombotic-associated hemorrhagic stroke (HS) due to changes in blood coagulation is very actual problem. It is because of the growing number of patients who are appointed by the anticoagulant and antiplatelet therapy for prevention of the thromboembolism. The anticoagulant therapy increases the risk of HS [2, 21, 22]. The anticoagulant-associated intracerebral hemorrhages (ICH) consist up to 20% of all cases of HS [10, 11, 25]. This ICH has a higher risk of hematoma expansion, subsequent clinical deterioration and death [11]. Predictors of hemorrhagic complications of anticoagulant therapy include the previous ischemic stroke history, arterial hypertension, leukoaraiosis, the initiation period of anticoagulant therapy, excessive anticoagulation, elderly age, and the concomitant use of antiplatelet agents [11, 18]. Reported data about the localization features of anticoagulant-associated ICH are controversial [5, 17, 27]. In Yakutia, studies on the clinical features of anticoagulant-associated HS have not been carried out.

Aim of the study. To characterize the localization of intracerebral hematomas associated with anticoagulant therapy.

METHODS

The retrospective study was performed in the group of HS patients consecutively admitted to the Regional Vascular Center (Yakutsk) in 2012-2014.

Criteria for inclusion in the study group:

1) patients with ICH in acute stage due to anticoagulation background (warfarin-associated ICH, valCH) with international normalized ratio (INR) > 3.0 (first group) and 2) patients with primary hypertensive spontaneous ICH (the second group). Exclusion criteria: patients with ICH due to rupture of cerebral vascular anomalies (arterial aneurysms, arteriovenous malformations, cavernous angiomas); traumatic hemorrhage; tumor hemorrhage; HS due to liver disease, blood disease, using of the antiplatelet therapy, "new anticoagulants", heparin, thrombolytic therapy. The diagnosis was confirmed by the neurological examination data, anamnesis, neuroimaging (cerebral computer tomography (CT) and / or magnetic resonance imaging of the brain (MRI)) in 100% of cases. Status of blood coagulation was estimated at INR indicator. The demographic data, INR indicators, ICH localization according to neuroimaging were analyzed in both groups. Localization of hematoma was distributed as follows: 1) supratentorial hematoma includes lateral, medial, lobar, and mixed localization; 2) cerebellar hematoma; 3) stem hematoma. The anticoagulant dosage at the ICH onset; the risk factors of thromboembolic events according CHADS₂ scale; risk factors of hemorrhagic complications of anticoagulant therapy according HAS-BLED scale were analyzed in the first group.

Statistical analysis was performed

using software packages STATISTICA 8. Quantitative characteristics described medians (Me) and quartile [Q1; Q3]. The comparison of the group's central parameters was performed using U-Mann-Whitney nonparametric method. Study of the interrelationship between the pairs of discrete qualitative characteristics was performed using the paired analysis of conjugation tables. In addition to Fisher's exact test, associations strength was analyzed with relative risk values (OR) and 95% confidence intervals (CI).

RESULTS

It was randomized 492 acute ICH patients, including 14 patients with valCH (first group, 2.8%) and 478 patients with spontaneous hypertensive ICH (second group, 97.2%). Demographic and clinical characteristics of both groups are presented in Table 1.

The average age of first group patients was 61.5 [57; 67] years (min – 42, max – 75). Male patients amounted 57.1% (n = 8). In the second group, the patients mean age was 59 [51; 66] years (min – 16, max – 89). The proportion of male patients was 58.2% (n = 278). The average age of the patients had no significant difference between groups ($p = 0,305$).

In the first group (n = 14) before the ICH onset, the anticoagulation therapy for the thromboembolism prevention has been appointed in 10 patients with atrial fibrillation (71.4%), with the operated

Demographic and clinical characteristics of the anticoagulant-associated intracerebral hematomas and spontaneous hypertensive intracerebral hematomas

	First group	Second group	<i>p</i> *, OR (95 % CI)
n	14	478	
Male gender, n (%)	8 (57,1)	278 (58,2)	
Age, years	61,5 [57; 67]	59 [51; 66]	<i>p</i> = 0,305
INR > 3, n (%)	14 (100)	-	
CHADS ₂ and > points, n (%)	14 (100)	-	
HAS-BLED 3 and > points, n (%)	10 (71,4)	-	
Localization of hematoma:			
Supratentorial, n (%)	9 (64,3)	407 (85,1)	<i>p</i> = 0,05; OR = 0,314; 95 % CI: 0,093 – 1,113
Cerebellar, n (%)	4 (28,6)	33 (6,9)	<i>p</i> = 0,017; OR = 15,39; 95 % CI: 1,398 – 20,144
Stem, n (%)	1 (7,1)	38 (7,9)	<i>p</i> = 1,00; OR = 0,89; 95 % CI: 0,042 – 6,826
Hematoma volume	25,5 [6,0; 45,0]	22,3 [8,0; 80,0]	<i>p</i> = 0,857
Breakthrough blood brain ventricles, n (%)	7 (50)	150 (31,4)	<i>p</i> = 0,153

*Two-tailed Fisher Exact Test

heart valves – 3 patients (21.4%), with a combination of atrial fibrillation and operated heart valve – 1 patient (7.1%). The heart failure was diagnosed in 12 patients (85.7%), arterial hypertension – 14 patients (100%), diabetes mellitus – 3 patients (21.4%). There were no patients aged > 75 years in the first group. Patients with previous stroke or transient ischemic attack history (TIA) consist 10 cases (71.4%). Thus, CHADS₂ scale score 2 and > was established in 100% cases among atrial fibrillation patients (n = 10).

In the first group, the following anticoagulant therapy's hemorrhagic complications factors were diagnosed: arterial hypertension – 100% (n = 14); acute cerebrovascular accident in history – 71.4% (n = 10); anticoagulant receiving without laboratory monitoring of INR – 42.8% (n = 6); age > 65 years – 35.7% (n = 5); concomitant use of drugs (antiplatelet agents, non-specific anti-inflammatory drugs) – 21.4% (n = 3); alcohol abuse – 14.3% (n = 2); bleeding history – 7.1% (n = 1); abnormal liver function – 7.1% (n = 1); abnormal renal function – 7.1% (n = 1). Thus, the risk of hemorrhagic complications of anticoagulant therapy according to scale HAS-BLED with 3 and > points was established in 71.4% (n = 10).

In the first group, ICH occurred due to warfarin using in 100% cases (n = 14). Patients admitted with INR > 3.0 in 14 cases (100%), including: INR from 3.0 to 5.0 – in 8 cases (57.1 %), INR > 5.0 – 6 cases (42.8%). Minimum INR rate was 3.18; maximum – 12.54. On the valCH onset warfarin dose was 5 mg and < in 13 patients (92.9%); > 5.0 mg – 1 patient (7.1%). In the second group, the INR rate was estimated < 3.0 in 100% cases (n = 478). In 2 cases (14.8%), HS combined with extracranial hemorrhages, including hematuria in 7.1% (n = 1), gastric bleeding – in 7.1 % (n = 1). In 85.7% (n = 12) only cerebral hemorrhage occurred.

In the first group, the ICH localization was as follows: supratentorial hematoma diagnosed in 9 patients (64.3%), cerebellar hematoma – in 4 cases (28.6%), stem hematoma – 1 case (7.1%). In the second group, supratentorial hematoma diagnosed in 407 cases (85.1%), cerebellar hematoma – in 33 cases (6.9%), stem – in 38 cases (7.9%). Comparative analysis of the hematoma locations frequencies between groups shows that the cerebellum hematoma has higher frequency in the first group (28.6% vs. 7.1%) (*p* = 0,017; OR = 15.39; 95% CI: 1.398 – 20.144). The stem hematomas frequency had no significant differences between groups (7.1% vs. 7.7

% (*p* = 1.00; OR = 0.89; 95% CI: 0.042 – 6.826)), as well as the supratentorial hematomas frequency (64.3% vs. 85.1% (*p* = 0.05; OR = 0,314; 95% CI: 0.093 – 1.113)).

The mean hematoma volume was 25.5 cm³ [6.0; 45.0] (min – 1.8; max – 150.0) in the first group. In the second group, the mean hematoma volume was 22.3 cm³ [8.0; 80.0] (min – 1.0; max – 196.0). No significant differences in the hematoma's volume was found (*p* = 0.857). It was diagnosed 7 cases of the blood breakthrough into the brain ventricular system in the first group (50 %), and 150 cases in the second group (31.4%). No significant difference was established between groups (*p* = 0.153).

DISCUSSION

This study is performed in the actual field of intracerebral hemorrhages due to the anticoagulant therapy. We conducted a study of the ICH localization in patients receiving anticoagulant therapy, as compared with spontaneous hypertensive ICH which is the most common type of HS. The share of primary spontaneous intracerebral hemorrhage accounts vast majority (88%) of the intracerebral hemorrhages [3, 20, 23]. Primary ICH include hematomas, which occur due to rupture of small blood vessels damaged by chronic hypertension or amyloid angiopathy.

In recent years, the antithrombotic-associated hemorrhagic stroke due to changes in blood coagulation is very actual problem. It is because of the growing number of patients who are appointed by the anticoagulant and antiplatelet therapy for prevention of the thromboembolism. Many studies have demonstrated the benefit of anticoagulation therapy compared with other methods of prevention of these complications. Thus, the effectiveness of anticoagulants for stroke prevention in patients with atrial fibrillation is much higher than the effectiveness of antiplatelet therapy (risk reduction by 64% and 22%, respectively) [14]. However, effectively reducing the risk of ischemic stroke associated with atrial fibrillation, warfarin anticoagulation increases the risk of major bleeding. Particularly, actual problem is the anticoagulation-associated hemorrhagic stroke. Using the vitamin K antagonist warfarin increases the HS risk estimated 5-10 times [22]. In study [21] investigated the HS risk factors in a group of 597 patients. It was found that warfarin is a risk factor for HS (OR = 4.63; CI 95 %: 3.17 – 6.76; *p* < 0.001). Thus, using warfarin is a risk factor for both lobar (OR

= 5.23; CI 95%: 2.88 – 9.50; $p < 0.001$), and nonlobar ICH (OR=4.24; CI 95%: 2.6–6.94; $p < 0.001$). Using “new” anticoagulants (dabigatran and apixaban), has lower bleeding complication’s frequency compare warfarin [6, 8, 9, 15].

Predictors of hemorrhagic complications of anticoagulant therapy include previous ischemic stroke history, arterial hypertension, leukoaraiosis, the initiation period of anticoagulant therapy, excessive anticoagulation, elderly age, and the concomitant use of antiplatelet agents [11, 18]. In addition, carriers of some variants of *CYP2C9* gene and *VKORC1* gene have increased sensitivity to warfarin [18]. In study [1], conducted in stroke patients in Yakutia, has been shown that carriers of *CYP2C9* and *VKORC1* genotypes, determining the increased sensitivity to warfarin, accounted for 40% of the patients. Elderly age increases the risk of bleeding, particularly the risk of HS [4]. In our study, the mean age of the patients of the first group was higher (61.5 years) compare to the patients of the second group (59 years), but these differences were not significant ($p = 0.305$).

According to our data, the anticoagulation administration in first group patients was expedient because of the fact that warfarin was administered to patients with operated heart valves and atrial fibrillation, and CHADS₂ scale score equal to 2 and >points estimated in 100% cases. On the other hand, the risk of bleeding complications according to HAS-BLED scale with 3 points and >was in 71.4%. This indicates that it was performed no control of modifiable hemorrhagic complication’s risk factors in the first group. Thus, according to the our data, 42.8% of patients did not conducted laboratory INR monitoring; in 21.4% had the concomitant use of warfarin and antiplatelet or non-specific anti-inflammatory drugs, in 14.3% cases had alcohol abuse. The INR monitoring absence is the anticoagulant-associated ICH risk factor [11].

Anticoagulant-associated intracerebral hemorrhage constitutes up to 20% of all cases of hemorrhagic stroke [10, 11, 25]. The vaICH’s small proportion in our study (2.8%), compared to other studies data, is probably due to the fact that number of patients constantly receiving anticoagulant therapy for prevention thromboembolism currently is not large in Yakutia. Another possible explanation for this phenomenon is that the INR rate has not reached the “therapeutic” level in the majority cases. Thus,

it is necessary to continue to examine the association between the receiving anticoagulant therapy and hemorrhagic intracranial complications rates and cardioembolic stroke rates. The proportion of patients receiving warfarin and have recommended INR levels is not quite high according to study [19]. Thus, according to the study [19] conducted in the United States population, among 5210 patients with atrial fibrillation treated with warfarin only 59% had an INR rate between from 2.0 to 3.0, while the share of those who have this rate above were 17%, below – 10%.

Currently, only few research data on the clinical features of the anticoagulation-associated ICH have been published. Compared with other types of HS, it is characterized by an increased risk of hematoma expansion, as well as a greater risk of the subsequent clinical deterioration and death [11, 12]. Data on the anticoagulation-associated ICH’s localization features are controversial. According to different authors, the anticoagulation due to anticoagulant therapy promotes stem, cerebellar, lobar, thalamic localization of hematomas [5, 17, 27]. According to study [15] conducted in a cohort of 18,113 patients with atrial fibrillation, there were 154 intracerebral hemorrhages for 2 years, including 46% of intracerebral hemorrhage, 45% of subdural hematoma and 8% of subarachnoid hemorrhage. In the study [5] the risk factors of cerebellar hemorrhage were analyzed. This hematoma localization was diagnosed in 38 cases (12%) in the group of consecutively admitted 327 patients. In 75% cases the cerebellar hematoma occurred in patients with INR rate > 2.5 ($p < 0.0001$). Using warfarin with an INR rate > 2.5 and an increase in blood glucose levels at admission were independently associated with cerebellar hematoma localization, in comparison with the hematomas at other sites. In addition, ischemic stroke history ($p = 0.002$) and heart disease ($p = 0.018$) were more common in patients with cerebellar hematomas as compared with patients with hematomas at other sites. The authors concluded that warfarin therapy with an INR > 2.5 is associated with the cerebellar hematoma localization.

In study [27] was the group of 404 consecutively hospitalized ICH patients, including 69 patients with warfarin. Patients receiving warfarin had a large hematoma volume (median 23.9 vs. 14.2 mL, $p = 0.046$). In the cases with an INR ratio > 3.0 the stem hematomas frequen-

cy was higher in compare to cases with INR ratio within the therapeutic range (6.1% vs. 24.0%; $p = 0.005$). Thus, it was concluded that the patients with warfarin-associated ICH have tend to localize stem hematoma. 484 acute intracerebral hemorrhage cases admitted within 7 days after stroke onset analyzed in a study [17]. Among them, there were 116 patients receiving the antithrombotic therapy before onset, including 38 patients with warfarin, 70 patients – antiplatelet therapy, 8 patients – both drugs simultaneously. Antithrombotic therapy was an independent risk factor for cerebellar hemorrhage (OR = 3.66, 95% CI: 1.31 – 10.18), lobar hemorrhage (OR = 2.27, 95% CI: 1.12 – 4.57), and thalamic hemorrhage (OR = 2.20, 95% CI: 1.06 – 4.54) compared to putamenal hemorrhage.

In our study, we divided the ICH into three subgroups: supratentorial hematomas, which included the medial, lateral, lobar and mixed hematomas localized in the cerebral hemispheres; stem hematoma and bruising of the cerebellum. The vaICH localization frequency was compared with the most common HS form – spontaneous intracerebral hematomas. Most of primary spontaneous ICH localized in the basal ganglia and the thalamus (70%), 13% – in the stem, 10% – in different brain lobes, 9% – in the cerebellum [24]. In our study, the incidence of cerebellar hematoma was significantly higher in patients receiving warfarin compared to patients with hypertensive hematomas ($p = 0.017$; OR = 15.39; 95% CI: 1.398 – 20.144). These findings are consistent with those in study [5], in which it was found that the warfarin-associated hematomas occur in cerebellum more often than compare to another ICH. In addition, this trend has also been established in patients with hypocoagulation as in our study.

Our study has limitations. In the studied group, there are a few cases of warfarin-associated ICH ($n = 14$), what is probably due to the small proportion of this ICH in the HS structure in Yakutia. In addition, the study doesn’t include ICH associated with other anticoagulant therapy. Further studies on the anticoagulant-associated ICH are needed. Finding features of vaVICH localization are interesting due to the fact that high frequency of cerebellar hematomas due to hypocoagulation is likely to be caused by poorly understood pathophysiological mechanisms of hemorrhagic stroke.

CONCLUSION

Thus, our data suggest that intra-

cerebral hematomas caused by anticoagulant therapy, are characterized by a common site in the cerebellum, in comparison with hypertensive hematomas ($p = 0.017$; OR = 15.39; 95% CI: 1.398 – 20.144). In the group of anticoagulant receiving patients, the hemorrhagic stroke occurred in cases with high risk of hemorrhagic complications of anticoagulant therapy according HAS-BLED scale with score 3 and >in 71.4% cases. Further study on the associations between the using of various types of antithrombotic therapy and hemorrhagic stroke risk is needed in Yakutia.

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The authors:

1. Chugunova Sargylana A. – PhD, docent of Department of Neurology and Psychiatry, North-Eastern Federal university named after M.K. Ammosov, Yakutsk;

Address: 93 A, Petr Alekseev street, Yakutsk, 677005, Russia, Phone/fax: +7(4112) 43-27-40

E-mail: sargyc@mail.ru;

2. Nikolayeva Tatiana Ya. – MD, professor, Head of Department of Neurology and Psychiatry, North-Eastern Federal University named after M.K. Ammosov, Yakutsk

Address: 36, Kulakovsky street,
Yakutsk, 677007, Russia, Phone/fax:
+7(4112) 49-67-00

E-mail: tyanic@mail.ru;

3. Egorova Tuyara S. -

neurologist, ordinator of Department of
internal medicine and general practice
(family medicine), North-Eastern Federal
University named after M.K. Ammosov,
Yakutsk, Address: 36, Kulakovsky street,

Yakutsk, 677007, Russia, Phone/fax:
+7(4112) 49-67-00

E-mail: labyrinth_of_december@mail.ru.

D.V. Kroshka, A.A. Dolgalev, E.A. Bragin

TIME AND GRAPHIC PARAMETERS OF MASTICATORY MOVEMENTS OF SUBJECTS WITH TEMPOROMANDIBULAR JOINT AND MASTICATORY MUSCLES DYSFUNCTION

ABSTRACT

Chewing is the one of the most important functions of the human stomatognathic system. We have done the research of the volunteers with in the period from 2014 till 2015 years with an aim of receiving information about the parameters of chewing with signs of pathological changes in the temporomandibular joint (TMJ), which are characterized for patients with TMJ and masticatory muscles disfunction syndrome. Registration of the chewing moves on the habitual and non-habitual sides of chewing was made by using electronic gnathograph Jaw tracker 3D (BioResearch, USA) and software BioPAK 7.2. by the standard method as recommended by the equipment manufacturer. As a result of this work was identified time and graphical parameters of chewing moves, which are characterized for subjects with pathological changes in the TMJ. Comparative analysis of the time parameters of chewing moves on the habitual and non-habitual sides of chewing with using Wilcoxon signed rank criterions allowed to determine: the absence of significant differences in the average duration of the opening mouth phase ($Z = -1,6$; $p = 0,11$), an average duration of the occlusion phase of dentition ($Z = -1,5$; $p = 0,139$), average duration of the closing mouth phase ($Z = -1,4$; $p = 0,173$), average duration of the one masticatory cycle ($Z = -1,7$; $p = 0,086$), variability of the duration of the opening mouth phase ($Z = -1,4$; $p = 0,155$), variability of the average duration of the occlusion phase of dentition ($Z = -0,9$; $p = 0,342$), variability of the duration of the closing mouth phase ($Z = -1,4$; $p = 0,155$), variability of the duration of the one masticatory cycle ($Z = -0,5$; $p = 0,635$). When the patient chewing on the habitual and non-habitual sides of chewing, there were found the absence of significant differences between variability of the duration of the opening mouth phase and the variability of the duration of the closing mouth phase ($Z = -1,4$; $p = 0,155$ for the habitual side, $Z = -1,8$; $p = 0,086$ for non-habitual side), the variability of the duration of the closing mouth phase and variability of the duration of the occlusion phase of dentition ($Z = -0,3$; $p = 0,767$ for the habitual side, $Z = -1$; $p = 0,314$ for non-habitual side).

Keywords: temporomandibular joint disfunction syndrome, masticaciography, electronic gnathography, masticatory cycle.

INTRODUCTION

The role of chewing in the process of digestion determines the value of this function for the existence of the body [1]. The researching of this function received considerable attention of the foreign researchers [5, 10]. There are some different ways of chewing researching. They are: the analysis of parameters of moves of the lower jaw [2], the analysis of the bio potentials of chewing muscles [4], chewing tests, connected with the measuring of the chewed particles of food [11].

In many sources the great attention devoted to the analysis of parameters of moves of the lower jaw in the process of chewing [6, 7, 8]. According to the opinion of the specialists using of such method of researching allows to receive information about the functional condition of the chewing muscles, occlusion and the articulation of the dentition, the TMJ [12].

The analysis of the parameters of chewing of the patients with temporomandibular joint and the chewing

muscles dysfunction syndrome (TMD syndrome) represents a great science interest. This occurs because the information, received in a result of using this method of searching, can allow to detect the level of severity formed pathological and functional changes in the masticatory organ, and also determine the degree of involvement of the main elements of system in a disease pathogenesis [9].

An aim of our researching was receiving information about the parameters of chewing, which is characterized to the patients with TMD.

Objectives of the study:

1. To determine the time and graphic parameters of the masticatory movements of the subjects with TMD.

2. To determine the influence of the side of chewing to the time and graphic parameters of chewing moves of subjects with TMD.

MATERIALS AND METHODS

In the period from 2014 to 2015 was done the survey of 52 volunteers aged from 18 to 46 years old. The criteria for participation in the researching were:

age from 18 years old, a wish to participate in a research and informed consent to participate in it. The criteria for non-participation in the researching was: age till 18 years old, the presence of large extent defects on the dentition or total loss of teeth of a volunteer at the treatment time, bone defects of the upper and / or lower jaw, exacerbation of existing chronic somatic diseases, mental or other disorder determining the incapacity of a volunteer, finding a volunteer at the time of treatment in the active phase of orthodontic treatment, treatment due to the presence of tumors, post-myocardial infarction or cerebral stroke in the history of treatment in the previous half of year, carrying out surgery on the TMJ in the anamnesis, unwillingness of a volunteer to take part in the researching and the absence of informed consent to participate in the researching.

On the basis of the survey (by the "Hamburg" reducing scheme) and collection information to the anamnesis, 45 volunteers were included in the researching. Among included people were

30 men and 15 women. Registration of the chewing moves was made by the using electronic gnatograph Jaw tracker 3D (Bioresearch, USA) and software BioPAK 7.2.

Registration of the chewing moves was made by the standard method as recommended by the equipment manufacturer. Recording was carried out in a sitting position. It is defined by the fact that this position is typical for a patient in the implementation of the act of chewing. At least 10 masticatory cycles were subjected to recordings on the habitual chewing side and on the opposite side. As a bolus (piece of food) was used soft chewing gum in the form of plates. In the interface of the computer program was done processing of received information: selection of the cycles for the analysis, determination of the time characteristics of masticatory cycles, were defined the types of patterns (stereotypes) of the chewing movements.

The information, which was received in the process of the survey, was subjected to the statistical analysis using IBM SPSS Statistics 21 software.

RESULTS AND DISCUSSION

The analysis of graphical parameters of chewing moves of the volunteers let us to know the following: in the process of chewing on the habitual side the first type of front projection of chewing movements of the pattern detected in 66.7% of cases, the second - in 22.2%, the third - in 11.1%. The first type of sagittal projection of chewing movements of the pattern detected in 77.8% of cases, the second - in 22.2%. The first type of the horizontal projection of chewing movement of the pattern was detected in 100% of cases. The first type of the opening speed of the pattern detected in 22.2% of cases, the second - in 11.1%, the third - in 66.7%. The first type of the closing speed of the pattern was detected in 100% of cases.

In the process of chewing on the non-habitual side of the volunteers the first type of the front projection of chewing movements of the pattern detected in 44.4% of cases, the second - in 44.4%, the fourth - in 11.1%. The first type of the sagittal projection of chewing movements of the pattern detected in 88.9% of cases, the second - in 11.1%. The first type of the horizontal projection of chewing movement of the pattern was detected in 77.8% of cases, the second - in 22.2%. The first type of the opening speed of the pattern was detected in 22.2% of cases, the third - in 77.8%. The first type of the closing speed of the pattern was detected in 88.9% of cases, the

Table 1
The parameters of the distribution of temporal characteristics of masticatory cycles on the habitual side of chewing the subjects having symptoms of TMJ pathology and masticatory muscles (mc, n = 45)

The time parameter	Average	Standard deviation	The standard error of the average
An average duration of the mouth opening phase	339	47	15,7
The variability of duration of the mouth opening phase	72,7	38,6	12,9
An average duration of the occlusion phase of dentition	177,4	30,3	10,1
The variability of duration of the occlusion phase of dentition	54	47,6	15,9
An average duration of the closing mouth phase	324,8	42,7	14,2
The variability of duration of the closing mouth phase	49,2	16,4	5,5
An average duration of the one masticatory cycle	841,1	105	35
The variability of duration of the one masticatory cycle	126,3	52,7	17,6

Table 2
The parameters of the distribution of temporal characteristics of masticatory cycles on the non-habitual side of chewing the subjects having symptoms of TMJ pathology and masticatory muscles (mc, n = 45)

The time parameter	Average	Standard deviation	The standard error of the average
An average duration of the mouth opening phase	354,3	71,4	23,8
The variability of duration of the mouth opening phase	96,7	45,9	15,3
An average duration of the occlusion phase of dentition	207,6	76,7	25,6
The variability of duration of the occlusion phase of dentition	70,4	40,1	13,4
An average duration of the closing mouth phase	350,8	102,4	34,1
The variability of duration of the closing mouth phase	55,7	16,4	5,5
An average duration of the one masticatory cycle	912,8	196,8	65,6
The variability of duration of the one masticatory cycle	142,0	78,6	26,2

second - 11.1%.

The time characteristics of masticatory cycles of the volunteers are shown in the Table 1,2.

The comparative analysis of the time parameters of chewing movements

on habitual and non-habitual sides of chewing of the volunteers has allowed to reveal the following (using Wilcoxon signed rank criterions for data processing). There are no significant differences in the average phase of the mouth

opening ($Z = -1,6$; $p = 0,11$), the average duration of the occlusion phase of the dentition ($Z = -1,5$; $p = 0,139$), the average duration of the mouth closing phase ($Z = -1,4$; $p = 0,173$), the average duration of the one masticatory cycle ($Z = -1,7$; $p = 0,086$), the variation of duration of mouth opening phase ($Z = -1,4$; $p = 0,155$), the variability of the average duration of the occlusion phase of dentition ($Z = -0,9$; $p = 0,342$), the variability of duration of the mouth closing phase ($Z = -1,4$; $p = 0,155$), the variability of the duration of one cycle of chewing ($Z = -0,5$; $p = 0,635$). Perhaps the available functionally and morphological disorders in the TMJ and in the masticatory muscles of the volunteers in this group are not formed in isolation on the one of the sides but determined symmetrical bilaterally lesion of the complex of the masticatory muscles of the TMJ. The result of this is a comparable change in the time characteristics of phases of masticatory cycles on habitual and non-habitual sides of chewing.

It is important to said that during chewing as on the habitual, as on non-habitual sides of chewing there are no significant differences between the variation of duration of mouth opening phase and the variability of duration of the occlusion phase of dentition ($Z = -1,4$; $p = 0,155$ for the habitual side, $Z = -1,8$; $p = 0,086$ for non-habitual side), the variability of the duration of the phase of closing of the mouth and the variability of the occlusion phase of dentition ($Z = -0,3$; $p = 0,767$ for the habitual side, $Z = -1$; $p = 0,314$ for the non-habitual side).

The differences between the variability of the duration of the mouth opening phase and the variability of duration of the mouth closing phase on the habitual side also are not important ($Z = -1,8$; $p = 0,086$). In our opinion, the lack of significant differences for these parameters defined by the central regulation of masticatory cycles and the possible influence is equivalent to changing in the process of mastication of the characteristics of bolus. It is important to note that the identified differences between the variability of the duration of the of mouth opening phase and the variability of duration of mouth closing phase on the non-habitual side of chewing was important ($Z = -2,5$; $p = 0,012$). This is probably related to the presence of obstacles for excursions to the TMJ elements in the form of dislocated meniscus.

The significant differences in the graphical parameters of chewing movements for the volunteers on habitual and non-habitual sides of chewing were ab-

sent (using Wilcoxon signed rank criteria for data processing). For the front projection of the pattern chewing movements $Z = -1,1$; $p = 0,257$, sagittal - $Z = -0,6$; $p = 0,564$, horizontal - $Z = -1,4$; $p = 0,157$. For the pattern of the mouth opening speed $Z = -0,4$; $p = 0,705$, closing - $Z = -1$; $p = 0,317$.

CONCLUSIONS

1. The subjects who have symptoms of TMJ and masticatory muscles pathology, chewing side has no effect on the duration of the phases of masticatory cycles.

2. The subjects who have symptoms of the TMJ and masticatory muscles pathology, the chewing side does not affect to the graphical parameters of the chewing movements.

3. The subjects with symptoms of the TMJ and masticatory muscles pathology, the chewing side has no effect on the variability of the masticatory cycle phases.

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The authors:

1. Kroschka Dmitry Vladimirovich. SBEI Stavropol State Medical University Ministry of Health of Russian Federation, Department of Prosthetic Dentistry, intramural post-graduate student. Postal Address: Stavropol Territory, Stavropol, Mira st. 280/4, apt. 3. Telephone +79187646606. E-mail get_on_top@inbox.ru

2. Dolgalev Aleksandr Anatolyevich. SBEI Stavropol State Medical University Ministry of Health of Russian Federation, Department of Prosthetic Dentistry, professor, MD, professor of the Department. Postal Address: Stavropol Territory, Stavropol, Mikhail Morozov st. 6. Telephone +79624035869. E-mail dolgalev1@mail.ru

3. Bragin Evgeny Alexandrovich. SBEI Stavropol State Medical University Ministry of Health of Russian Federation, Department of Prosthetic Dentistry, professor, MD, Head of Department. Postal Address: Stavropol Territory, Stavropol, Mikhail Morozov st. 6. Telephone +79280095097. E-mail professor_bragin@mail.ru

V. N. Kazanov, D. K. Garmayeva, R. M. Khairullin

TOPO- AND MORPHOMETRICAL CHARACTERISTIC OF THE BREAST ASYMMETRY IN WOMEN OF YAKUTIA IN AGE 20-40

ABSTRACT

The article presents the results of morpho- and organometry of mammary glands in the indigenous and non-indigenous women of Yakutia in age from 20 to 40 years. The study defined that topo- and organometric breast indices revealed bilateral asymmetry of nipple-areola complex, the size of the base of the breast, skin and glandular fold along breast poles. We established asymmetry of mammary glands forms in women of indigenous and non-indigenous nationality at different age periods. We also revealed the highest frequency of the asymmetric structure of the chest carcass and level asymmetry of submammary fold in the indigenous women. These topometric breast indicators in indigenous and non-indigenous women may be used as quantitative age morphological markers to choose breast implant and tactics of surgical correction.

Keywords: morphometry, mammary asymmetry, indigenous and non-indigenous, the Republic Sakha (Yakutia).

MATERIALS AND METHODS

Morphometry of the breast was performed for 169 women aged 20 to 40, who attended a private clinic "Victory Clinic" (Yakutsk) for correcting mamoplasty with the principles of voluntariness, individual rights and freedoms guaranteed by Article 21 and 22 of the Constitution. Among them, 91 (53,8%) women were members of the indigenous (the Yakut, Even, Evenki) and 78 (46,1%) non-indigenous nationalities (Russians, Ukrainians, Belarusians). The examinees were divided into the following age groups: I group from 20 to 25 years, II group – from 26-30 years, III group – from 31-35 years, IV group – from 36-40 years. (tabl.1)

The studied group included persons with no subjective complaints on the state of the reproductive system, with no medical history of menstrual dysfunction and with no concomitant pathology of reproductive system. Measuring was carried out on the "Body Logic" (Mentor Medical Systems B. V. – USA), developed by Professor Dr. Dennis Hammond for the company "Mentor". This system was first presented by Dr. Dennis Hammond and called "Body Introducing Logic: A New Method of Sizing" in the Symposium "Breast & Facial Aesthetics" October 8, 2006.

Statistical analysis of results been performed using SPSS STATISTICS 17.0 with the creation of a database and analysis package "MICROSPFTEXCEL 2008" program products "spreadsheet". The significance of differences of mean values of the independent-dependent samples was assessed using Student's criterion. In all procedures of statistical analysis, the significance of differences was considered and established at $p < 0.05$. Assessment of correlation was performed on the correlation coefficient (R).

When $g < 0,30$ were considered weak correlation, if $g = 0,31-0,70$ - average, $g = 0,71-0,99$ - strong [3].

RESULTS AND DISCUSSION

Topometric characteristic of the breast showed that the absolute average distance from the jugular fossa to the nipples was $17,5 \pm 1,4$ cm (right), $17,6 \pm 1,4$ cm (left) to the indigenous women aged 20-25 years. In the age group of 26-30 years: $18,0 \pm 1,4$ and $18,1 \pm 1,5$ respectively, in the age group (31-35 years): $18,6 \pm 0,7$ cm and $18,4 \pm 0,8$ cm, respectively, in the age group (36-40 years): $20,1 \pm 1,7$ cm, and $20,0 \pm 1,5$ cm, respectively (Fig.1). The analysis of the distance from the jugular fossa to the nipples showed us a tendency to increase this indicator to 36-40 years and the maximum asymmetry parameters in the age group of 31-35 y. group of indigenous women. The absolute average of the distance from the jugular fossa to the nipples of the women of foreign nationality in the age group of 20-25 years: to the right of $18,3 \pm 0,8$ cm, left - of $18,3 \pm 0,8$ cm, in the second group it is $18,9 \pm 1,3$ cm and $18,7 \pm 1,1$ cm respectively. In the group of 31-35 years: $19,6 \pm 1,3$ cm, and $19,8 \pm 1,5$ cm, respectively. In the age group 36-40 years, the distance from the jugular fossa to the nipples was $20,3 \pm 2,2$ cm on the right and $20,3 \pm 2,4$ cm on the left.

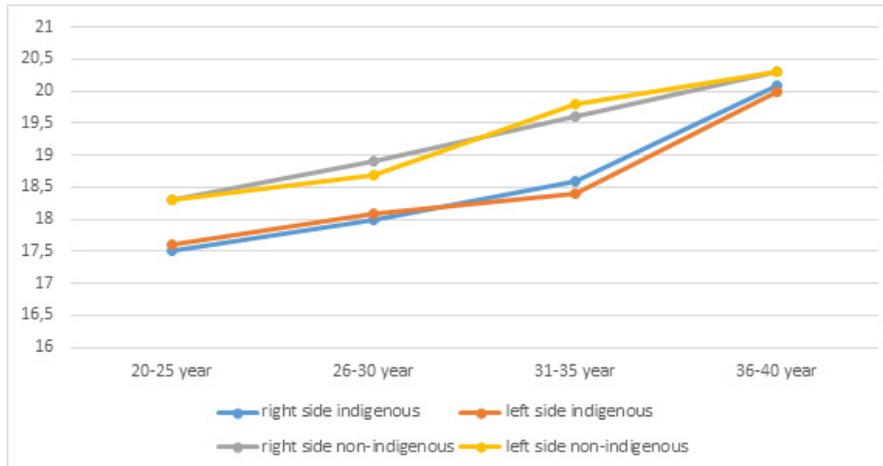
The maximum asymmetry observed in the age groups 26-30 and 31-35 years - 0,2 cm, revealed no significant difference in this indicator between the right and left breasts in ethnic groups. Analysis of the distance from the level of mid-clavicle to nipple in women of both ethnic groups tends to increase to 36-40 years. In this case, this figure increased largely to the indigenous women, than for women of non-indigenous ethnic groups. So, in the 20-25 age group, the

figure was right - a $15,6 \pm 1,9$ cm., left to $15,8 \pm 1,7$ cm. In the group of 26-30 years the distance was $16,4 \pm 1,5$ cm and $16,9 \pm 1,5$ cm, respectively. In the group of 31-35 years $17,1 \pm 0,9$ cm. to the right and $17,0 \pm 1,1$ cm on the left, and in the group of 36-40 years $18,7 \pm 1,6$ cm to the right and $18,8 \pm 1,6$ cm on the left. The same in women of non-indigenous nationality in the age group is 20-25 years was $16,6 \pm 1,1$ to the right and $16,8 \pm 1,1$ cm to the left, 26-30 years – of $17,4 \pm 1,5$ and $17,3 \pm 1,4$ cm. respectively, 31-35 years – $18,4 \pm 1,6$ cm and $18,7 \pm 1,7$ cm, respectively, 36-40 years – $18,9 \pm 1,9$ cm and $18,9 \pm 2,1$ cm. respectively. The analysis showed that the maximum asymmetry of the indigenous women occurs in the age of 26-30 years and is 0,5 cm, and in women non-indigenous ethnic group is observed in the age group of 31-35 years and is 0,3 cm. This distance is more predominantly on the left side, regardless of ethnicity. While at the indigenous women the figure is less than in all age groups, expressed in women of the first and second age groups (less than 1,0 cm).

Organometric characteristics of the breast: analysis of the absolute average cross-sectional dimension of the base of breast showed no significant difference in women of indigenous and non-indigenous ethnic groups in all age groups. The average cross-sectional dimension of the base of the breast of the indigenous women is 20-25 years and $12,3 \pm 0,7$ cm on the right and $12,2 \pm 0,7$ cm on the left, 26-30 years and $12,3 \pm 0,7$ cm on the right and $12,3 \pm 0,7$ cm on the left, 31-35 years and $12,7 \pm 0,8$ cm on the right and $12,8 \pm 0,8$ cm on the left, 36-40 years- $13,0 \pm 0,8$ cm on the right and $13,1 \pm 0,9$ cm. on the left. The maximum asymmetry is 0,1 cm in the age groups 20-25 years old, 31-35 and 36-40 years.

The number of women depending on age and ethnicity

Groups	20-25 year	26-30 year	31-35 year	36-40 year	total
Indigenous	14 (8,2%)	29 (17,1%)	25 (14,7%)	23 (13,6%)	91 (53,8%)
Non-indigenous	10 (5,9%)	18 (10,6%)	23 (13,6%)	27 (15,9%)	78 (46,1%)
total	24 (14,2%)	47 (27,8%)	48 (28,4%)	50 (29,5%)	169 (100%)



The distance from the jugular fossa to the nipples of the breast in women of indigenous and non-indigenous ethnic groups

A measure of the transverse dimension of the base of the breast increases with age in women indigenous to the right by 0,7 cm and 0,9 cm on the left of the transverse dimension of the base of the breast in women of foreign descent is: 20-25 years -12,4±0,6 cm on the right and 12,5±0,6 cm on the left, 26-30 years-of 12,6±0,5 cm and 12,7±0,5 cm, respectively, 31-35 years-12,8±0,5 cm on the right and 12,8±0,6 cm on the left, 36-40 years-13,1±1,2 cm and 13,1±1,2 cm, respectively. The maximum asymmetry is 0,1 cm in the age groups 20-25 and 26-30 years. A measure of the transverse dimension of the base of the breast is increased in women of non-indigenous nationality with age by 0,7 and 0,6 see right, see left. As the research showed, revealed a more pronounced increase in the width of the base of the left breast of the indigenous women.

A study of the vertical size of the base of mg showed us no significant increase of this indicator from the indigenous women, while women non-indigenous nationalities been recorded an increase of 0,7 cm on the right and 0,5 cm on the left to 36-40 years. Thus, the vertical dimension of the base of the breast of the indigenous women is 20-25 years is 11,9±1,0 cm on the right and 11,6±1,1 cm to the left, 36-40 years old is 11,9±0,7 cm and 12,0±0,9 cm., respectively. The maximum asymmetry observed in the

age group of 20-25 years and is 0,3 cm. The indicator right breast with age does not change, and the left increases by 0,4 cm to 36-40 years. Indicators the vertical size of the base of the breast in women of non-indigenous descent are: 20-25 years is 11,6±0,8 cm on the right and 11,7±0,8 cm on the left, 26-30 years-11,6±1,0 cm and 11,4±1,0 cm, respectively, 31 to 35 years-11,9±0,5 cm on the right and 11,9±0,5 cm on the left, 36-40 years and 12,3±1,0 cm and 12,2±1,1 cm respectively. The maximum asymmetry is observed in the group of 26-30 years and is 0,2 cm, and a more pronounced asymmetry is observed in the indigenous women aged 20-25 years.

Inframammary fold (IMF) as the anatomical structure is a key that defines the aesthetics breast augmentation and mastopexy, this structure is the foundation on which is based the construction of mammoplasty. Analysis of the distance from the nipple to infra mammary fold alone revealed a trend towards a gradual increase of values in both groups, from 5,6 ± 1,1 cm to 6,3 ± 0,8 cm in women indigenous (0,7 cm), and from 6,0 ± 0,8 cm to 6,6 ± 1,4 cm in women of non-indigenous descent (0,6 cm). When comparing the distance from nipple to IMF, the indigenous women have low values in all age groups. The most pronounced asymmetries in this

indicator is observed at the age of 31-35 years, women of non-indigenous descent (0,3 cm), whereas, in the aged 20-25 asymmetry have been reported. Meanwhile, the indigenous women noted the asymmetry of this index in all age groups, and more pronounced at the age of 31-40 years (to 0,2 cm). The asymmetry of the level IMF is more common in the indigenous women in all age groups and more pronounced in the age of 31-35 years (7,1 %). To a lesser extent the asymmetry of the level of IMF were detected in women of non-indigenous in all age groups and is more common in the group of 31-35 years (4,7%).

Research of the values of the distance from nipple to IMF in tension also showed a tendency to increase to 36-40 years in both ethnic groups, and more pronounced among the indigenous women (0,4 to 0,7 cm), while women of foreign descent parameter increases to a lesser extent (0,2-0,3 cm). In both ethnic groups expressed asymmetry of this indicator is not revealed.

We analyzed the vertical and horizontal dimensions areolar complex comparative with the right and left breasts. A pronounced asymmetry of this parameter in all investigated groups was observed. Age dynamics of value, the horizontal size of areola in the indigenous women also increased to a greater extent (0,9 to 0,8 cm) than that of women of foreign descent (0,3-0,2 cm.). Expressed Asymmetry of the horizontal size of the areola (0,2 cm) was observed in women of non-indigenous nationality in the age of 26-35 years. Vertical and horizontal dimensions of the areola of the indigenous women have smaller values in all age groups, especially in the age of 20-25 years. So, the vertical and horizontal dimensions of the breast areola of the indigenous women have high variability, compared with women non-indigenous group, however at the age of 36-40 years. In women of indigenous groups the indicators of asymmetry ANC expressed identically in the age of 31-35 and 36-40 years old (7,1% and 7,1%).

To determine the thickness of skin-glandular folds in the medial pole of the breast in women of this nationality are less pronounced than in women of foreign descent. The difference is 0,5 cm in the age group of 20-25 years: 2,7±0,5 cm on the right and 2,7±0,6 cm left of the indigenous women and 3,2±0,5 cm on the right and 3,2±0,6 cm in the left in women of foreign descent. In both ethnic groups there is a tendency to increase this parameter with age, and in the group 36-40 years, these figures

are equal, amounting to $3,3\pm 0,7$ cm on the right and $3,3\pm 0,6$ cm left of the indigenous women and $3,3\pm 0,8$ cm on the right and $3,4\pm 0,9$ cm to the left in women of foreign descent. The maximum asymmetry (0,3 cm) was observed in women of non-indigenous nationality in the age of 31-35 years, with a predominance of the size of skin-glandular folds of the left breast.

Measure the thickness of skin-glandular folds in the lateral pole showed a tendency to decrease this parameter by the age of 26-30 years of age in both ethnic groups and the growth parameter to 36-40 years, more pronounced among the indigenous women. Low thickness of skin and glandular folds in the lateral pole of the breast was marked of the indigenous women in all age groups. The asymmetry is more pronounce in the age group of 31-35 years women non-indigenous groups, and was 0,2 cm, with a predominance of the size of your left breast.

The analysis of thickness of skin-glandular folds in the upper pole of the breast showed the absence of pronounce difference and asymmetry between the right and left breasts in both ethnic groups. Asymmetry indices-thickness skin-glandular folds in the upper pole between the right and left breasts are more noticeable in women of the indigenous group 26 to 30 years old, and aged 31-35 years women non-indigenous groups, 0,2 cm, with predominance of the thickness of the folds of the left breast in both ethnic groups.

We're analyzed the external forms of the breast for presence of asymmetry on the basis of size indicators, of the distances from the jugular fossa to the nipple, the level of mid-clavicle to nipple distance and the level of inframammary fold to the nipple between the right and left breasts. Asymmetry of breast shape is most common in women of both ethnic groups aged 31-35 years, but is more common in the indigenous women (7,6% of the total number surveyed). When we were examining women, we paid atten-

tion also to the frame of the chest wall that defines the position of the base of the breast. The presence of asymmetry in the form of congenital and posttraumatic deformities, scoliosis, rachitic deformation of the chest affect the shape and position of the breast relatively between the right and left sides. Asymmetry of the thoracic skeleton is more common in the indigenous women for all age groups, but more often in the group of 26-30 years (8,8 %). Women of non-indigenous group had maximum amount of asymmetry of the thoracic skeleton had been found in the age of 31-35 years (8,2 %).

CONCLUSION

Thus, we carried out a comparative topo- and morphometrical analysis of breast in women of indigenous and non-indigenous nationality living in Republic of Sakha (Yakutia) in the age 20 to 40. We have found a topo-graphic asymmetry in women aged 30-35 years, from now both of the required groups, with asymmetry of breast shape and nipple-areola complex is prevalent among women of foreign descent. When analyzing the distance from the level of mid-clavicle to nipple, transverse and vertical base size of the breast, the thickness of skin-glandular folds, the distance from nipple to inframammary folds at rest and under tension prevails mainly in the left mammary gland, more pronounced in women is not an indigenous group. Asymmetry of breast shape is most common in women of both ethnic groups aged 31-35 years, but is more common in the indigenous women (7,6 %). Asymmetry of the thoracic skeleton is more common in women of an indigenous nation in all age groups, but more often in the group of 26-30 years (8,8 %). Women of foreign descent maximum amount of asymmetry of the thoracic skeleton are found in the age of 31-35 years (8,2%).

The results of morphometric features of the shape of the breast can be useful for precise planning of breast surgical correction and selection of implants with consideration of the peculiarities topom-

etry and organometry of women breast.

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AUTHORS:

1. Vladislav Kazanov, plastic and aesthetic surgeon. Victory Clinic, Prospect Lenina (corpus 1), Yakutsk, 677000. Cell-phone: +7 914 272 81 37, e-mail: kazavlad@gmail.com;
2. Darima Garmaeva, Doctor of Medicine Sciences, Professor of Department of human anat-omy North – Eastern Federal University, 34 Kulakovskovo Street, Yakutsk, 677016. Tel.(8-4112) 35-63-02
3. Radik Hairullin, Doctor of Medical Sciences, Professor, 432017, Russia, Ulyanovsk, 42 Leo Tolstoy street, Ulyanovsk state University, Head of the Department of Human Anatomy, Cell-phone.:+7 842 232 65 65 e-mail: prof.khayrullin@gmail.com.

METHODS OF DIAGNOSIS AND TREATMENT

Pakharukova M.Yu., Dushkin A.V., Mordvinov V.A.

**COMPARISON OF ANTI-
OPISTHORCHIASIS EFFECT OF
PRAZIQUANTEL AND COMPLEXES
OF ALBENDAZOLE WITH
ARABINOGALACTAN****ABSTRACT**

Opisthorchiasis is a helminthiasis affecting mainly the hepatobiliary system and pancreas; its most dramatic complication is malignization of the organs infected by the parasites. The causative agents of opisthorchiasis are two species of liver flukes, the trematodes belonging to the family Opisthorchiidae - *Opisthorchis felineus* and *O. viverrini*. The Chinese liver fluke, *Clonorchis sinensis*, also member of the family Opisthorchiidae, causes clonorchiasis, a disease very close in symptomatology.

Two thirds of world area of opisthorchiasis is located in the territory of Russia. The hyper-endemic region is world's largest opisthorchiasis foci in the Ob-Irtysh river basin. Incidence of opisthorchiasis in different localities of this region exceeds the all-Russian from 3 to 28 times.

The main drug for specific therapy of opisthorchiasis is praziquantel. This drug exhibited positive effects upon treatment of acute opisthorchiasis, though it was not sufficiently effective in cases of most widely spread chronic opisthorchiasis. Previously, we showed that the complexes of albendazole, the anthelmintic of a broad spectrum of activities, and arabinogalactan possess anti-opisthorchiasis effect.

Aim of this study is the comparative assessment of efficiency of praziquantel and complexes of albendazole with arabinogalactan on *O. felineus* on model of experimental opisthorchiasis.

The experiments were carried out on five groups of golden hamsters *Mesocricetus auratus* infected with *O. felineus* and receiving various doses of praziquantel and complexes of albendazole with arabinogalactan. The group of the animals infected with *O. felineus* who weren't receiving anthelmintics has been used as control. The obtained data indicate that efficiency of complexes of albendazole with arabinogalactan on model of experimental opisthorchiasis on golden hamsters is similar to therapeutic efficiency of praziquantel.

Thus, results of this study confirm a possibility of the development of drugs for treatment of opisthorchiasis on the basis of intermolecular complexes of albendazole with arabinogalactan. Besides, as praziquantel and albendazole possess different mechanisms of action on helminths, it is possible to assume that combinatory action of a praziquantel and complexes of albendazole with arabinogalactan can be more effective on *O. felineus* than individual effects of these drugs.

Keywords: opisthorchiasis, *Opisthorchis felineus*, praziquantel, albendazole, intermolecular complexes of albendazole with arabinogalactan.

INTRODUCTION

Opisthorchiasis is a helminthiasis affecting mainly the hepatobiliary system and pancreas. Infection occurs when eating raw river fish infested with helminth larvae. Specific of the human disease is a long duration, frequent exacerbations, and possible induction of the primary liver and pancreatic cancers [1, 13]. The causative agents of opisthorchiasis are two species of liver flukes, the trematodes belonging to the family Opisthorchiidae - *Opisthorchis felineus* and *O. viverrini*. The Chinese liver fluke, *Clonorchis sinensis*, also member of the family Opisthorchiidae, causes clonorchiasis, a disease very close in symptomatology [6].

Opisthorchiasis and clonorchiasis are food borne trematodiasis the natural foci of which cover a considerable part of Europe and Asia. However, these parasitoses can be currently only arbitrarily attributed to natural focal diseases. Many emigrants from Asia live in the areas non-endemic for opisthorchiasis and clonorchiasis, and the tourist exchange between various countries is ever increasing. Consequently, the patients suffering

from liver fluke infection can be recorded far from the corresponding endemic regions [14].

According to different estimations, up to 40 million people are currently infected with the liver flukes belonging to the family Opisthorchiidae (*O. felineus*, *O. viverrini*, and *C. sinensis*) and up to 600–750 million people in Eurasian countries constitute the risk group [5, 7].

Two thirds of world area of opisthorchiasis is located in the territory of Russia. According to the state reports of 2007 and 2008 year "About a sanitary and epidemiologic situation in the Russian Federation" in the country about 40 thousand patients annually are registered. The hyper-endemic region is world's largest opisthorchiasis foci in the Ob-Irtysh river basin. Incidence of opisthorchiasis in different localities of this region exceeds the all-Russian from 3 to 28 times. According to the results of researches which are carried out by different groups of the Russian scientists, the prevalence of opisthorchiasis amongst rural population in endemic regions fluctuates from 10% and to 45%, which exceeds data of official statistics significantly [1-3]. Thus, causative agent

of opisthorchiasis, *O. felineus*, can be counted as an adverse factor influencing a state of health of the population in subarctic regions of Siberia.

Taking into account a high abundance of opisthorchiasis in Russian Federation, developing of adequate therapeutic and prevention methods for this pathology is a topical problem. Since any vaccines for prevention of parasitoses are yet unavailable, chemotherapy plays the main role in treatment of invasions. The selection of pharmacological preparations for chemotherapy is determined by a number of characteristics, including a wide range of action, high efficiency and selectivity of the drug towards the parasite in combination with a low toxicity, and a minimum of side effects towards the final host, first and foremost, human. The first preparation maximally meeting these requirements was praziquantel. Today, it is the drug of choice and is widely used in the therapy of trematodiasis of various etiologies, in particular, opisthorchiasis, clonorchiasis, and schistosomiasis [8].

Praziquantel is not a perfect drug in every respect, because it (1) is inefficient towards the eggs and immature

worms;(2) is not free from side effects; (3) is able to induce resistance development; (4) fails to prevent reinfection; and (5) is administered as a race mate rather than as a pure active enantiomer, which lessens its pharmacological characteristics. Besides, we have shown that efficiency of praziquantel for therapy of experimental *O. felinus* opisthorchiasis is not more than 80% [12].

Therefore, the development of novel anti-opisthorchiasis agents and/or increase in efficiency of the existing anthelmintics is considered to be a challenging problem of modern medicine and pharmacology.

Albendazole is anthelmintic with broad spectrum of activity. This drug is efficient against many species of helminths, however its action on *O. felinus* is not so efficient than praziquantel action. Earlier we have carried out comparative assessment of anti-opisthorchiasis effect of official albendazole and supramolecular complexes of albendazole and polysaccharide arabinogalactan isolated from the wood of larches *Larix sibirica* and *Larix gmelinii* (ABZ-AG). It has been shown that at equal dosages anthelmintic activity of the ABZ-AG complexes is significantly higher, than activity of official albendazole [4].

Aim of this study is the comparative assessment of efficiency of praziquantel and complexes of albendazole with arabinogalactan on *O. felinus* on model of experimental opisthorchiasis.

MATERIALS AND METHODS

O. felinus metacercariae were collected from naturally infected fish (*Leuciscus idus*) caught in the Ob River near the city of Novosibirsk. The fish meat was digested by pepsin – HCl overnight at 37°C, metacercariae were washed and counted [1]. Golden hamsters (*Mesocricetus auratus*) were purchased from the stock of the Puschino Animal Facility (Russia). The animals were kept and treated according to protocols approved by the Committee on the Ethics of Animal Experiments of the Institute of Cytology and Genetics (Permit Number: 7 of 19.12.2011). Hamsters were infected per os with 50 viable active metacercariae two months before the experiment.

Praziquantel was used as the suspension in 7% Tween-80 and 3% Ethanol, ABZ-AG complexes were used as water suspensions. ABZ-AG complexes were synthesized in the Institute of Solid State Chemistry and

Mechanochemistry of Siberian Branch of Russian Academy of Sciences. The studied compositions were administered to the animals per os. The hamsters were treated either once or daily for several days, depending on the experimental scheme used. The experimental groups contained 7 – 22 animals. The control group was formed of the hamsters who weren't receiving anthelmintics. Animals were euthanized in 21 days after the anthelmintics treatments. Adult worms of *O. felinus* were obtained from bile ducts of euthanized hamsters.

Two doses of praziquantel were used in the study: 75 mg/kg and 400 mg/kg of weight of an animal. The first dose (75 mg/kg) and a way of administration (3 times in 4-6 hours on 25 mg/kg) is taken from recommendations for opisthorchiasis therapy. The second dose (400 mg/kg, single administration) is chosen for an assessment of efficiency of praziquantel high dose, essential exceeding the recommended doses for therapy of opisthorchiasis.

For comparison of efficiency of praziquantel and the ABZ-AG complexes, we used the compositions of albendazole and arabinogalactan prepared in the ratio 1:10 [10]. It has been found in preliminary experiments, that arabinogalactan doesn't possess anthelmintic activity, therefore, when testing activity of composition of albendazole and arabinogalactan, only the mass of albendazole were considered. ABZ-AG complexes were used in doses 75 mg/kg, 150 mg/kg and 300 mg/kg. We have chosen these doses of albendazole in combination with arabinogalactan, since they have relatively high anthelmintic efficiency and do not have toxic effect on liver tissues of golden hamsters [5]. To reach dose 75 mg/kg, animals received 25 mg/kg within three days once a day. To reach doses 150 mg/kg and 300 mg/kg, animals received 50 mg/kg once a day until achievement of a final dose. The obtained results are presented in table 1.

RESULTS AND DISCUSSION

The data obtained in this study indicate that efficiency of ABZ-AG complexes on model of an experimental opisthorchiasis on golden hamsters is similar to therapeutic efficiency of praziquantel. So, efficiency of the maximum dose of ABZ-AG (300 mg/kg) above efficiency of the maximum dose of praziquantel (400 mg/kg). However efficiency of praziquantel dose 75 mg/kg, which is recommended for therapy of opisthorchiasis, surpasses efficiency

of ABZ-AG doses 75 mg/kg and 150 mg/kg, which are similar to albendazole doses used in clinical and laboratory practice (table).

Application of albendazole against tissue parasites is limited by its extremely low water solubility and, respectively, low absorption and bioavailability (<5%). Earlier we have shown that inclusion of albendazole in complexes with arabinogalactan allows increasing repeatedly its water solubility [10]. It is also important to note that the ABZ-AG complexes possess smaller toxicity, than albendazole and praziquantel [4]. Obtained results confirm a possibility of the development of drugs for treatment of opisthorchiasis on the basis of intermolecular complexes of albendazole with arabinogalactan.

It is important to note that praziquantel and albendazole possess different mechanisms of action on helminths and damage different molecular targets. Praziquantel increases permeability of cell membranes for Ca²⁺ that leads to the generalized reduction of muscles passing into persistent paralysis which consequence is a death of helminths [9,12]. Besides, praziquantel causes a vacuolization and damage of an epithelium that significantly decreases efficiency of helminth protection from host immune system and increases helminth vulnerability by digestive enzymes.

The mechanism of albendazole action is connected with suppression of polymerization of β -tubulin and destruction of cytoplasmatic microtubules of helminths intestinal cells. In addition, albendazole impairs glucose utilization, suppresses ATP synthesis, blocks transportation of secretory granules and other organelles in muscle cells of helminths.

Thus, it is possible to assume that combinatory action of praziquantel and albendazole can be more effective than individual effects of these drugs. Testing of combinatory effect of praziquantel and the ABZ-AG complexes is perspective research in the context of development of novel anthelmintic drugs possessing increased efficiency and safety.

CONCLUSION

Therapeutic efficiency of complexes of albendazole with arabinogalactan on model of experimental opisthorchiasis on golden hamsters is similar to therapeutic efficiency of praziquantel. Thus, results of this study confirm a possibility of the development of drugs for treatment of opisthorchiasis on the basis of intermolecular complexes of albendazole

Comparison of anti-opisthorchiasis effect of praziquantel and the ABZ-AG complexes various doses

Anthelmintic drugs	Dose per animal (mg/kg)	Number of animals	Number of <i>O. felineus</i> adults per animal, \pm SD	Mortality of <i>O. felineus</i> adults, %
Praziquantel	75	17	10 \pm 4	70
Praziquantel	400	7	6 \pm 4	81
ABZ-AG	75*	19	14 \pm 5	60
ABZ-AG	150*	20	12 \pm 5	64
ABZ-AG	300*	20	2 \pm 2	94
-	0	22	34 \pm 12	0

* dose of albendazole

with arabinogalactan. Besides, as praziquantel and albendazole possess different mechanisms of action on helminths, it is possible to assume that combinatory action of a praziquantel and complexes of albendazole with arabinogalactan can be more effective than individual effects of these drugs.

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The authors:

Mariya Y. Pakharukova, PhD, senior researcher, Federal State Budget Scientific Organization the Institute of Molecular Biology and Biophysics, 630117, Russia, Novosibirsk, Timakov Str, 2/12; The Federal Research Center Institute of Cytology and Genetics, Siberian Branch of the Russian Academy of Sciences, Russia, 630090, Novosibirsk, Ac. Lavtrentiev Per, 10; e-mail: pmaria@yandex.ru;

Alexander V. Dushkin, PhD, Leading Researcher, Institute of Solid State Chemistry and Mechanochemistry of Siberian Branch of Russian Academy of Sciences, 630128, Russia, Novosibirsk, Kutateladze Str, 18, e-mail: dushkin@solid.nsk.su.

Viatcheslav A. Mordvinov, PhD, Acting Director Federal State Budget Scientific Organization the Institute of Molecular Biology and Biophysics, 630117, Russia, Novosibirsk, Timakov Str, 2/12; Science Deputy Director, The Federal Research Center Institute of Cytology and Genetics, Siberian Branch of the Russian Academy of Sciences, Russia, 630090, Novosibirsk, Ac. Lavtrentiev Per, 10; e-mail: mordvin@bionet.nsc.ru.

I.S. Pinelis, Yu.I. Pinelis, I.D. Ushnitsky

THE TREATMENT OF KELOID SCARS OF AURICLES

ABSTRACT

Nowadays despite of broad studying, the problem of treatment of the keloid scars is not solved. In this regard continuous search of the methods and means increasing efficiency of treatment is carried out. Our work presents treatment results of the keloid scars appeared after the trauma and operations of auricles where dynamic care has been made within 2-5 years. Thus authors offered the complex program of therapy of the keloid scars taking into account the sizes and duration of their existence with an individual approach for each case. Preoperative local medication preparation of abnormal site growth of cicatricial tissue in the auricles and anti-relapsing treatment in the postoperative period was carried out for this purpose. Preoperative preparation includes infiltration of 2,0-4,0 ml of 0,5% lidocaine in tissues around the keloid and through one puncture injection by a syringe of 10-40 mg/ml of «Kenalog» (Diprosan) where the preparation dose always depended on the size of the keloid scar. If noticeable regress of the keloid (scar has decreased in sizes, color and scar consistence has changed, the itch, etc. has stopped) after injection of the preparation was noted, procedure was repeated in 3-4 weeks. The quantity of injections reached 5 times depending on efficiency of influence of these medications. The following stage when the keloid didn't decrease any more after the corticosteroids influence – surgical excision of scar was planned. In the postoperative period, since 10th day (the end of wound epithelialization) the anti-relapsing treatment has been continued including 10-15 times of phonophoresis in the postoperative scar area with the use of Contractubex ointment or 3000 ME gel of « Longidaza». Such tactics of treating patients with pathogenetic reasonable methods of treatment had positive effect on quality of complex therapy and increased efficiency. Thus important value had a time factor which testifies that it was more successful to begin treatment of young keloids earlier. Patients after treatment of auricle keloid remained happy with the results of treatment that in the clinical plan was characterized by lack of its recurrence and favorable esthetic type of the scar. These recommendations and assessment of efficiency of complex treatment and anti-relapsing actions of the keloid scars of auricles can be applied in medicine as alternative methods of patients' treatment.

Keywords: keloid scar, auricle, complex treatment.

INTRODUCTION

The keloid scar represents the excess, dense growth of connecting tissue of skin reminding a tumor [3]. The cause of the keloid scars in the auricle area is not definitely specified today. They arise after surgical operations, burns and wounds repairing, piercing lobes of ears, etc. [1, 4, 5]. Quite often they develop due to general and local immunity decrease [8]. The keloid depending on degree of vascularization has bright pink, pale, cyanotic or red color, elastic consistence, rough and slightly wrinkled surface. Its feature is the continuous pulsing growth, quite often goes beyond the wound, doesn't regress spontaneously and may be recurring after resection. Appearance of keloids has a great influence on esthetic assessment of operation results, becomes frequent cause of psycho-emotional discomfort, development of psychosocial disadaptation and quality of life loss of the patient.

Nowadays there are no ideal methods of treatment of keloids that is caused by features of anatomic shape of auricles, difficult blood circulatory system, close arrangement of nerves, etc. [2]. Moreover, there is no accurate concept of prevention and treatment of the keloid scars of the face and neck, indications and contraindications to conservative therapy and also terms of surgical intervention aren't defined. [3, 7, 8]. All mentioned before defines the relevance of this problem. In this regard our research aim was the development and assessment of efficiency of the complex program of treatment of the keloid scars of auricles.

MATERIALS AND METHODS

There were 16 patients with keloid scars of the auricle area which arose after the trauma (4 people), cosmetic operations (5 people), and a puncture of lobes of ears for earrings (7 people). Duration of their existence fluctuated from 9 months to 2 years. The size of keloids varied from 0.9 to 2.5 cm. They were painless, cyanotic or brown-red color, elastic consistence, with rough and slightly wrinkled surface. Patients noted their continuous pulsing growth without regression signs. Recurrence has been noted in 11 patients after keloplasty.

On the basis of the literature data analysis and our control we offered the complex program of treatment of the keloid scars. At the beginning, irrespective of the term of keloid formation, tissue around was infiltrated with 2,0-4,0 ml of 0,5% lidocaine and one puncture 10-40 mg/ml Kenalog was injected (Diprosan). The preparation dose depended on the size of keloid scar. If after preparation injection we noted noticeable regress of the keloid (scar has decreased in sizes, color and consistence of scar has changed, the itch, etc. has stopped) procedure was repeated in 3-4 weeks. Depending on efficiency of influence of these preparations the quantity of injections reached 5 times. At the following stage when under the influence of corticosteroids the keloid didn't decrease any more – surgical dissection of the scar was planned. However before operation there were some events to prevent further development of recurrence of the keloid. The patient was appointed a course of treatment by Thymalinum 10

mg 10 days and 10 sessions of electrophoresis of 5000 U of heparin in 10-15 days before surgical operation. The surgical stage consisted of radical keloplasty, and the formed defect of the auricle was closed by local tissues plastic. In the postoperative period, since 10th day (end of wound epithelialization) anti-relapsing treatment was continued. In the area of postoperative scar 10-15 sessions of phonophoresis with Contractubex ointment or 3000 ME Longidaza gel were carried out. Besides, immunotherapy course with Thymalinum was repeated. The diagnosis "Keloid scar of the auricle" in all cases was confirmed with morphological researches.

The lack of recurrence and favorable esthetic type of the scar testified about efficiency of the carried complex treatment of the auricle keloid. The remote supervision carried out within 2-5 years.

RESULTS

Keloplasty has recurrence in 45-100% cases. The obtained data testified that "young" keloids (existence period till 12 months) in 7 patients had almost completely the return development under the influence of corticosteroids and physiotherapeutic actions. They formed soft, painless, whitish and little sinking down scar on the place of keloid. In these cases there were no indications to surgical treatment.

The regress of "old" keloids reached 60-75% in other patients under the influence of corticosteroids and immunotherapy. They became considerably less, softer consistence, but color didn't significantly change. No recurrence of the keloid was observed after preoperative

preparation, excision and postoperative therapy, and the postoperative scar was conformed to cosmetic requirements.

We'll present a case report.

Patient B., 16 years, consulted to the clinic of Chita State Academy of Medicine in December, 2014 concerning the psycho-emotional discomfort caused by a big keloid scar in the upper part of the right auricle. Anamnesis has established that the diagnosis "Congenital deformation of the right auricle (the sticking-out ears)" was 11 months ago in Ulan-Ude and cosmetic corrective operation has been performed. The postoperative period was complicated by inflammatory process, and healing of the wound finished with formation of the keloid scar. The objective research has noted painless cyanotic-brown color, dense consistence, 2.5x2.0 cm in size in the area of the upper part of right helix. Under its weight the upper part of right auricle was sunken and deformed. Diagnosis was "Keloid scar of the right auricle".

20 mg of Kenalog was injected in the keloid to the patient under infiltration anesthesia of 2.0 ml of 2% of Lidocaine solution. In 3 weeks the patient had partial softening of scar. The drug was injected 4 times with interval of 3-4 weeks (last injection was in May, 2015). As a result of the carried-out treatment the keloid became soft and elastic consistence and decreased in sizes (2.0 x 1.0 cm). As there was no regress of formation, the patient was carried out preoperative preparation with the subsequent excision of keloid scar. After its removal in the upper part of the auricle defect of soft tissues of 2.7 x 1.5 cm which was eliminated with local tissues according to Shymanovsky's plastic was formed. The postoperative period proceeded without complications. After removal of sutures, the patient was administered 10 sessions of phonophoresis with Contractubex ointment. Thin, soft whitish scar of 3 cm long is visible on the right auricle in

9 months after the carried-out complex treatment, the auricle form was reconstructed completely, and the patient has been satisfied with esthetic result.

CONCLUSION

The obtained data testified that therapy of the keloid scars, with a variety of methods of treatment, demanded an integrated and at the same time individual approach taking into account the sizes and duration of their existence. Moreover, the presented results showed that the most effective is the integrated approach consisting of pathogenetic reasonable methods of therapy and also once again confirmed opinion that the earlier treatment of young keloids was more successful.

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The authors:

1. Pinelis Iosif Semenovitch, PhD, professor, head of the department of surgical dentistry, Federal State-Funded Educational Institution of Higher Professional Education "Chita State Academy of Medicine", Chita, Russia, tel (83022) 315-918, E-mail: pinelis1@mail.ru;

2. Pinelis Yury Josephovitch, PhD, professor of department of surgical dentistry Federal State-Funded Educational Institution of Higher Professional Education "Chita State Academy of Medicine", Chita, Russia: tel (83022) 315-918, E-mail: pinelism@mail.ru;

3. Ushnitsky I.D. MD, professor of department of therapeutic, surgical, orthopedic dentistry and dentistry of children's age of medical institute of the North-Eastern federal university named after M. K. Ammosov, Yakutsk, Russia, tel: 89241708940, E-mail: incadim@mail.ru.

E.V. Bashirov, N.I. Duglas

LAPAROSCOPIC UTERINE ARTERY OCCLUSION AS A STAGE OF EFFECTIVE UTERINE FIBROIDS TREATMENT TECHNOLOGY

ABSTRACT

Compared to separate laparoscopic myomectomy, its combination with uterine arteries (UA) occlusion reduces the duration of the intervention, intraoperative blood loss and adverse clinical symptoms among 93.7% of women. It also has low myoma growth recurrence rate (during 12 months' observation period – just 3.0%).

High therapeutic effectiveness of UA laparoscopic occlusion consists of good knowledge of the basics of angiology, having manipulative skills, adequate perioperative management and complex rehabilitation after surgery.

Keywords: uterine fibroids, laparoscopic occlusion of uterine arteries.

INTRODUCTION

Deterioration of women's reproductive health, risk of fertility loss among the nulliparous connected with the presence of uterus benign tumors, the cases of uterine fibroids recurrence after organ interventions – these are some aspects drawing attention to the urgency of dealing with this disease, which is a heavy burden not only for women, but also for the society as a whole.

Due to the significant breakthrough in uterine fibroids (UF) treatment technology, the priority of radical hysterectomy with an insolvent slogan “no uterus - no problem” was replaced by the introduction of organ-saving endoscopic and endovascular interventions. Nevertheless, data on the benefits of each of the above-mentioned methods still remain controversial.

Problems of modern reproductive surgery lie in the absence of clear ideas about expedient selection criteria, indications and contraindications, long-term results to justify choosing of a certain treatment technology for women with UF. Data on fertility after myomectomy, frequency of complications and relapses prove to be too variable.

Laparoscopic access, despite its undoubted advantages, remains a modern challenge for surgeons – in terms of the need to improve reconstructive and plastic surgery techniques and limitations of intraoperative blood loss. With laparoscopic myomectomy (LM), a serious and frequent complication is uncontrolled bleeding, ways to overcome it being studied. Blood loss reduction is extremely important to minimize negative thermal effects on the myometrium, especially for patients who are interested in preserving their reproductive function.

However, temporary ligation or clipping of internal iliac and uterine arteries (UA), followed by the removal of “stricture” involve a number of drawbacks: these methods are long, technically complex and may lead to massive intra-abdominal bleeding. Need for surgery in the ureters projection increases the risk of injury to the ureter with related complications.

UAE and LUAO are reported to reduce menstrual bleeding and the volume of uterine fibroids in general. The data on comparability of the results of both methods require additional studies owing to small sample of patients. Temporary occlusion of uterine vessels, which effectively reduces the risk of blood loss, is considered to be a perspective way of UF treatment without any systemic side effects. However, the existence of

other, less favorable long-term results after LUAO proves the need for further studies to introduce alternative methods of UF treatment.

The objective of the study: to compare the effectiveness of separate laparoscopic myomectomy and with the stage of occlusion of the ascending UA branches among patients of reproductive age with UF.

MATERIALS AND METHODS

To achieve the above-mentioned objectives a prospective study was conducted, including 40 women with UF who were examined on clinical bases of the Department of Obstetrics, Gynecology and Perinatology, Kuban State Medical University in 2014-2015 and provided with high-tech medical care.

Depending on the UF technology treatment women were divided into two groups: group I included patients with LM (n = 20), group II – with a combination of LM and LUAO (n = 20) for reducing intraoperative blood loss.

LM was held traditionally, involving the following steps: serosa and myometrium cutting above the node in its outermost part and as distantly as possible from appendages and vascular bundles; myoma node husking without a pseudocapsule by rigid fixation and unit traction with ten-millimeter volsella and gradual myometrium removal from the node. It was followed by bleeding vessels spot coagulation with the help of bipolar coagulation, postoperative defect suturing with individual sero-muscular sutures gripping the bottom of the wound for the prevention of myometrium hematomas and the formation of a well-fixed scar, with extracorporeal node tying, and removing the remote myoma node from the abdomen by morcellation in an airtight container.

Occlusion of the ascending UA branches on both sides was carried out by forming a «window» in the avascular zone of broad ligament 1-1.5. This procedure can reduce, but not completely restrict the blood flow to the body of the uterus, which was proved during the ultrasound with color Doppler in postoperative period. The advantages of this method include simplicity, rapidity (occlusion of the ascending UA branches on both sides takes 3-5 minutes), and safety.

The age of patients ranged from 25 to 40 years old. All women were examined in connection with infertility during different periods in accordance with generally accepted standards; significant deviations from the standard indicators haven't been identified.

The study inclusion criteria: the presence of single subserous interstitial fibroids sized from 5 to 7 cm.

The following procedures were performed intraoperatively before myomectomy: adhesiolysis, salpingostomy, destruction of endometrioid heterotopias in the pelvic peritoneum and ovaries, checking tubal patency, mobilization and restoration of pelvic organs normal anatomy.

Patients' follow-up after the surgery was 12 months.

Statistical processing of the results was performed using the statistical software package Statistica v.6.0. The level of statistical significance was adopted $p < 0.05$.

RESULTS AND DISCUSSION

While carrying out the comparative analysis of LM and its combination with LUAO the duration of the operation and the amount of intraoperative blood loss were taken into consideration. The duration of the operation includes the time spent directly on myomectomy.

The main criteria for the effectiveness of organ-saving surgical treatment were the following: the elimination of clinical symptoms (poly- and dysmenorrhea), the reduction in the uterus volume based on gynecological examinations and a transvaginal ultrasound scan. Two treatment groups under the study corresponded to each other in age, time of uterine fibroids having and structure of clinical symptoms. The average age of women in group I was $35,6 \pm 1,8$ years, in group II - $33,8 \pm 1,4$ years, with no significant age differences between groups ($p > 0,05$). The number of women with node size up to 5 cm (32% and 40%) and larger (5-7 cm) (78% and 60%) wasn't significantly variable in these groups.

Myomectomy duration in group I ranged from 30 to 85 min., on average – 55 min., in group II – from 30 to 65 min., on average - 45 min. The longer surgery duration in group I can be explained by the need to achieve hemostasis by additional coagulation and additional sutures, especially on larger sites.

The average amount of intraoperative blood loss in LUAO was significantly less than among women in the group with separate LM ($79,5 \pm 17,8$ and $120,5 \pm 26,7$ ml, respectively) – by half. The essential difference of the studied parameters in these two groups indicated that LUAO can effectively reduce blood loss during the surgery.

In neither case intraoperative injuries of vessels, nerves or ureters occurred, so laparotomy and blood transfusions weren't needed. It is the technical skill of

the surgeon that is known to determine the duration of the operation, and it can differ significantly among doctors-beginners and experts. Running a successful UA laparoscopic occlusion requires basic knowledge of angiology and manual skills of proper occlusion and blood vessels clipping, so operations of this kind are the prerogative of institutions with qualified specialists in this sphere.

The postoperative period was uneventful; therefore all women were discharged after sutures removal in satisfactory condition five days later.

The study of early and late results of UF endosurgical treatment showed a decrease in the volume of menstrual blood loss, severe pain syndrome in the abdomen and in the lumbar area among patients of both groups.

Menstrual blood loss reduction and therapeutic effectiveness against menometrorrhagias were observed among 91.8% of women after LM and 93.7% - after LUAO. The relief of UF symptoms and a satisfactory feeling after the intervention were noticed among all patients within 9 months' observation.

The frequency of UF recurrence after LM and its combination with LUAO was 4.7% and 3.0% respectively during the observation period.

CONCLUSIONS

The prospects of using laparoscopic occlusion of ascending UA branches

as a step prior to myomectomy, aimed at reducing intraoperative blood loss and being an effective alternative to hysterectomy for symptomatic UF treatment are obvious. Performed technically proper, this manipulation is safe, allows better visualization, minimizes the negative thermal effect on the myometrium, thereby increases the probability of well-fixed uterine scar formation, which is important for patients with infertility and those being interested in women's reproductive function implementation. The above-discussed technique reduces the duration of the operation, diminishes the possibility of intraoperative and postoperative complications, therefore leads to hospital stay reduction, decreases medical support (including anesthetic) and the rehabilitation period.

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The authors:

Bashirov Eduard Vladimirovich – MD, Fundamental obstetric-gynecological clinic of Kuban state medical university of Russian federation healthcare department, Russia, 350072, Krasnodar, Zhipovskaya street 4/1; Tel. 8(988)2425536, факс 8(861)2570509, edikbashirov@rambler.ru;

Duglas Natalia Ivanovna – obstetrician-gynecologist, MD, Head of the Department of Obstetric and Gynecology Faculty of Postgraduate Training for Medical Institute Doctors « M.K. Ammosov North- Eastern Federal University, 8924662 67 22, E-mail: nduglas@yandex.ru.

HEALTHCARE, MEDICAL SCIENCE AND EDUCATION ORGANIZATION

L.F. Timofeev

PRIMARY MORBIDITY OF THE REPUBLIC SAKHA (YAKUTIA) IN 2013-2014

ABSTRACT

The paper reports the analysis of the primary morbidity of the population of the Republic Sakha (Yakutia) in 2013-14 on the basis of Russian Ministry of Health statistical reports. High levels of primary morbidity in 2013-2014 were observed in such class of diseases as diseases of the nervous system, the eye and adnexa, respiratory and digestive system, skin and subcutaneous tissue; diseases of the blood and blood-forming organs, musculoskeletal system and connective tissue of the urogenital system were above average level. It also turns out that from the 113 species of the considered pathologies high and higher than average incidence rates in the country are found in 69 species, low and below average levels – in 19.

Keywords: primary morbidity, the incidence of diseases by classes, an incidence of certain types of pathologies.

INTRODUCTION

It is known that the disease is one of the criteria of public health, and morbidity data are the basis for planning in health care. On the basis of these data, it is planned volume of necessary medical assistance to the population, number of beds, staff and other resources for health. Incidence – is the prevalence of disease in the population or its individual groups is determined by identifying and recording the number of

cases of the disease when treatment in medical institutions (or dispensary and preventive examinations) during the year. Primary morbidity registered in establishing the diagnosis, the patient for the first time in my life.

MATERIAL AND METHODS

We analyzed the primary morbidity of the population of the Republic of Sakha (Yakutia) in 2013-14 on the basis of statistical reports of the Russian Federation Ministry of Health [1].

For the analysis of morbidity data used percentile (centile) method, according to which the subjects of the federation with the performance to the 10 th percentile is the territory with a low level of an indicator, from 10 to 25 th percentile – a level lower than the average, from 75 to 90 th – over and above the average 90th percentile – high level. Obviously, the indicators lie in the range from 25 to 75 th percentile (or the other - 25 and 75 quartiles (Q25-Q75) distribution),

the territory belonged to the group with average values.

Data were subjected to analysis of primary disease:

1) presented on 18 classes of diseases (no statistics on certain conditions originating in the perinatal period, external causes of morbidity and mortality, and factors influencing health status and contact with health services);

2) 113 nosology forms of diseases, except for the following types of pathologies disease classes: tumors; mental and behavioral disorders; pregnancy, childbirth and the postpartum period; symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified; injury, poisoning and certain other consequences of external causes.

At the same time the number of diseases for classes according to the International Classification of Diseases and Related Health, X-th revision (ICD-X) as follows (Table 1)

RESULTS AND DISCUSSION

By classes of diseases. Hereinafter, the results will be presented only the data that are different from the average – morbidity levels high and low, above and below the average.

In the Republic of Sakha (Yakutia), the level of primary morbidity was high in 2013 (110,701.4 per 100 000 population against 79941.1 in Russia, or 1.4 times higher), and above the average in 2014 (109,694.1; 78615.7 and 1.4 respectively).

The high level of the primary disease in 2013, and in 2014 it was observed in this class of diseases as diseases of the nervous system, the eye and adnexa, respiratory and digestive system, skin and subcutaneous tissue; above average – disease of the blood and blood-forming organs, musculoskeletal system and connective tissue, genitourinary system (Table 2). The incidence of endocrine diseases was high in 2013, and higher than the average – in 2014. Diseases of the circulatory system were above the average in 2013

As can be seen from Table 2, only 6 classes republican indicators of diseases were among the averages, and 11 classes of 18 – high and / or above average. It was only the class "Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified" level of Sakha (Yakutia) was lower than the average in 2013, and data and does not register in 2014.

For certain diseases. The primary morbidity on groups of diseases and

Table 1

Quantitative distribution of certain types of diseases

Classes diseases	Types of diseases	Number
Class I	Certain infectious and parasitic diseases	2
Class III	Diseases of the blood-forming organs and certain disorders involving the immune mechanism	4
Class IV	Endocrine, nutritional and metabolic diseases	13
Class VI	Diseases of the nervous system	10
Class VII	Diseases of the eye and adnexa	8
Class VIII	Diseases of the ear and mastoid process	13
Class IX	Diseases of the circulatory system	23
Class X	Respiratory diseases	8
Class XI	Diseases of the digestive system	7
Class XII	Diseases of the skin and subcutaneous tissue	6
Chapter XIII	Diseases of the musculoskeletal system and connective tissue	6
Class XIV	Diseases of the genitourinary system	6
Chapter XVII	Congenital anomalies (malformations), deformations and chromosomal abnormalities	7
Total		113

Table 2

Primary morbidity by disease classes, per 100 000 population

Classes disease	2013		2014	
	RS (Y)	RF	RS (Y)	RF
The incidence of total population	110701,4	79941,1	109694,1	78615,7
Certain infectious and parasitic diseases	3465,3	3089,8	3255,6	3079,4
Neoplasm's	1206,3	1135,0	1104,5	1157,5
Diseases of the blood-forming organs and certain disorders involving the immune mechanism	612,8*	465,6	556,6	470,5
Endocrine, nutritional and metabolic disorders	2030,3*	1063,9	1567,0*	1118,4
Mental and behavioral disorders	506,3	520,6	514,0	501,7
Diseases of the nervous system	3672,8*	1647,6	3657,2*	1620,2
Diseases of the eye and adnexa	5016,3*	3642,0	5280,6*	3575,2
Diseases of the ear and mastoid	2488,8	2796,9	2671,8	2768,8
Diseases of the circulatory system	3760,0	2985,8	3318,5	2874,9
Respiratory diseases	49056,1*	33843,9	49333,7*	33300,6
Digestive diseases	9587,8*	3522,7	9431,1*	3652,4
Diseases of the skin and subcutaneous tissue	6392,7*	4696,6	6209,3*	4626,7
Diseases of the musculoskeletal system and connective tissue	4090,6	3228,9	3862,2	3177,1
Diseases of the genitourinary system	5935,0	4980,3	5892,1	4897,9
Pregnancy, childbirth and the postpartum period **	5565,8	7102,1	6235,3	7145,3
Congenital anomalies (malformations), deformations and chromosomal abnormalities	308,5*	207,9	297,2*	209,9
Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	209,0	631,5	-	359,0
Injury, poisoning and certain other consequences of external causes	10308,4	9257,6	10485,8	9012,8

* Obtained figures exceeding 30% and a similar performance in the Russian Federation;

** Index calculated on the female population (10-49 years)

certain types of diseases also consider, depending on the class of diseases. Those whose incidence was high and / or above average in 2013 and in 2014 year (the Table 3) will be indicated.

Noteworthy is the fact that on 6 pathologies occur in diseases of the circulatory system and the digestive system, 5 – on diseases of the nervous system, 4 – to diseases of the blood and blood-forming organs, the endocrine system, the eye and the ear, respiratory and musculoskeletal systems .

In addition, a number of specific diseases had relatively high rates: in 2013 – viral hepatitis, diabetes mellitus type I and II, inflammatory and central nervous system demyelinating disease, multiple sclerosis, transient cerebral ischemic attacks, diseases of the inner ear, Meniere's disease, thromboangiitis and endarteritis obliterans, phlebitis and thrombophlebitis, varicose veins, localized scleroderma, congenital malformations of the circulatory system, Down's syndrome; 2014 – contact dermatitis, reactive arthropathy. Four of these pathologies are diseases of the nervous system, 3 – to diseases of the circulatory system.

Thus, it turns out that of the 113 species considered pathologies and higher than average incidence rates in the country are found in 69 (61.1%) of these, low levels and below average – in 19 (16.8%). If we consider that adrenal disorders and blindness in both eyes had a relatively low incidence and high levels in 2013 and 2014, respectively, only 23 species have average values (20.5%).

CONCLUSION

Earlier, we noted that in 2012-2013, high and / or above-average rates of primary morbidity were identified as 11 classes of diseases according to ICD-X, which is more than half of the class [2]. And only for diseases of the circulatory system we are seeing a positive trend: in 2014, the incidence in the Sakha Republic (Yakutia) – in the range of average values.

Among these classes of diseases and certain diseases of the respiratory disease, chronic otitis media, chronic rheumatic heart disease, arthropathy, systemic connective tissue disorders, and others were also at high and higher than average incidence of the level at the beginning of the XX century – in 2001. Presumably, they are largely a consequence of the population living in extremely unfavorable climatic conditions of the North.

Table 1

Groups of diseases, some diseases with high and above-average incidence in 2013-2014.

Class disease	Groups of diseases, some diseases
Diseases of the blood-forming organs and certain disorders involving the immune mechanism	Anemia Coagulation defects, purpura and other haemorrhagic conditions ** Disseminated intravascular coagulation (defibrination syndrome) ** Certain disorders involving the immune mechanism *
Endocrine, nutritional and metabolic disorders	Thyrotoxicosis (hyperthyroidism) * Thyroid disease * Diabetes insipidus ** Diabetes *
Diseases of the nervous system	Epilepsy, status epilepticus ** Systemic atrophies primarily affecting the central nervous system ** Extrapyramidal and movement disorders ** Episodic and paroxysmal disorders * Cerebral palsy and other paralytic syndromes
Diseases of the eye and adnexa	Myopia* Glaucoma* Diseases of the eye muscles, disorders of binocular movement, accommodation and refraction * Astigmatism*
Diseases of the ear and mastoid	Chronic otitis media ** Conductive and sensorineural hearing loss ** Conductive hearing loss, bilateral ** Sensorineural hearing loss, bilateral
Diseases of the circulatory system	Acute rheumatic fever Chronic rheumatic heart disease ** Essential hypertension ** Acute and subacute endocarditis * Cardiomyopathy * Diseases characterized by high blood pressure
Respiratory diseases	Acute laryngitis and tracheitis ** Chronic disease of tonsils and adenoids, peritonsillar abscess ** Asthma, asthmatic status * Interstitial, suppurative lung disease, other diseases of the pleura
Digestive diseases	Gastritis and duodenitis ** Non-infectious enteritis and colitis ** Diseases of the gallbladder and biliary tract ** Diseases of the pancreas ** Diseases of the liver **, Of these: fibrosis and cirrhosis of the liver **
Diseases of the skin and subcutaneous tissue	Atopic dermatitis** Other dermatitis * Psoriasis
Diseases of the musculoskeletal system and connective tissue	Systemic connective tissue disorders ** Arthropathy Rheumatoid arthritis (seropositive and seronegative) ** Spondylopathy **
Diseases of the genitourinary system	Glomerular, tubulointerstitial kidney disease, and other disorders of kidney and ureter * Renal impairment ** Other diseases of the urinary system
Congenital anomalies (malformations), deformations and chromosomal abnormalities	Congenital malformations of the nervous system * Congenital ichthyosis * Neurofibromatosis **

* Diseases exponents in 1.5-1.9 times higher than in Russia

** Diseases exponents of 2 or more times higher than those in the Russian Federation

However, the relatively high rates of primary morbidity in such classes as a disease of the blood and blood-forming organs, endocrine system diseases, congenital anomalies (birth defects) can not always be explained by the extreme conditions of the North. Researchers health in regions belonging to the areas of industrial development, a reasonable question arises: perhaps due to adverse environmental changes we are now seeing a picture of the disease? Answers to these and other issues relating to the Republic of Sakha health (Yakutia), can be obtained only as a result of comprehensive research in the areas of mining. Unfortunately, such studies as part of contractual works, made between

large companies and medical scientific and educational institutions, almost non-existent today.

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About the author

Leonid Fedorovich Timofeev – MD, professor of public health and health care, general hygiene and bioethics NEFU Medical Institute named M.K. Ammosov,

Mailing address: 677000, Yakutsk, Oyunskiy st., 27. Tel.: 8-914-225-88-45.

E-mail: lfnauka@mail.ru.

S.M. Tarabukina, Z.A. Boyarova

MINIMUM RANGE OF MEDICINES COMPLIANCE IN THE PHARMACEUTICAL INSTITUTIONS OF THE REPUBLIC SAKHA (YAKUTIA)

ABSTRACT

One of the questions of present interest in the area of medicinal product is the formation of rational policy, as contributing to full satisfaction of needs of population in medical care and efficient financial performance of pharmaceutical organizations.

An analysis of inspection reports for the years 2012-2014 revealed the lack of certain medications, included in the list of mandatory minimum range, in the pharmaceutical entities.

Objective: to develop the methodology of nomenclature classification of mandatory minimum assortment. To achieve the goal the following tasks were solved: the study of violations of licensing requirements in terms of compliance with the minimum range of medicines for medical care, analysis of the missing items from the list of the minimum range, the determination of the degree of demand and velocity on the basis of expert assessment.

Based on the questionnaire of pharmaceutical experts the classification of drugs in the level of demand and the velocity of circulation was done. The proposed method of determining the level of demand and the velocity of circulation, with obligatory taking into account available balances by pharmaceutical experts, working directly with visitors, will contribute to the continuous maintenance and determining the optimal amount of the prescribed minimum assortment of medicines in the pharmacy organizations.

Keywords: medicinal product, minimum assortment, pharmaceutical experts.

INTRODUCTION

In accordance with paragraph 6 of article 55 of the Federal law dated 12 April 2010 No. 61 –FL «On Medicine Circulation» pharmacy organizations, individual entrepreneurs licensed for pharmaceutical activity, are obliged to ensure approved by the Government of the Russian Federation and formed in accordance with the established procedure the minimum assortment of medicinal preparations necessary for rendering medical assistance. [3]

The minimum assortment of medicinal preparations necessary for rendering medical aid approved by the Decree of the RF Government dated 30 December 2014 No. 2782-R. the Lack of in pharmacies drugs that are included in the list of mandatory minimum range, is

a gross violation of the licensed activity for which administrative responsibility.

The pharmaceutical activity with rough violation of license requirements entail the responsibility established by the legislation of the Russian Federation [1].

On a reported basis of Department of licensing of medical and pharmaceutical activity of the Ministry of health of the Republic of Sakha (Yakutia) for 2012-2014 the same type of violations of license requirements and conditions in pharmacy institutions of the Republic are: - compliance with the established limits retail markups to the actual selling prices of producers on the medicines included in the list of vital and essential medicinal products; violation of rules of storage of medicines for medical use,

failure to comply with the minimum range of medicines.

In this regard, one of the topical issues in the field of medicines in the Republic is the observance of prescribed minimum range of medicines for the medical care. Data analysis of available literature showed that studies of violations in-compliance with the minimum assortment in the pharmacy organizations of different ownership forms in the Republic of Sakha (Yakutia) was carried out. This determined the aim and objectives of the study.

The purpose of the study: development of a methodology for the classification of the item mandatory minimum range. To achieve the goal following problems were solved: the study of violations of licensing requirements in terms of compliance

with the minimum range of medicines for medical assistance, analysis of missing items from the list of the minimum range, to determine the degree of demand and speed of treatment on the basis of expert evaluation.

MATERIALS AND METHODS

The study of violations of licensing requirements by ensuring that the minimum range of medicines in pharmacies carried out on the basis of the 16 pharmacies of different ownership forms for 2012-2014. In the analysis were used 16 audit reports on pharmaceutical institutions of Sakha (Yakutia) of different ownership forms for 2012 - 2014, 12 of them from the city of Yakutsk, 1 - Mirny district, Udachnyj, 1 - Lensky district, Lensk, 1 - Neryungri, 1 - Megino-Kangalassky district, Maya village, questionnaires for pharmaceutical professionals - 20. On the basis of expert evaluation of pharmaceutical professionals conducted an analysis

of the content of the minimum range of medicines in pharmacy institutions, classified drugs according to the degree of demand and speed of treatment.

RESULTS AND DISCUSSION

The current minimum assortment of medicinal preparations in pharmacies are regulated by the Decree of the RF Government dated 30 December 2014 No. 2782-R [2]. During the study period was the Ministry of health of the Russian Federation No. 805n of 15 September 2010, so the analysis of the content of the minimum of the range drawn according to this order. A list of the minimum assortment of medicinal preparations necessary for rendering medical aid is divided into two sections:

- section I - pharmacy (dosage forms, manufacturing, production with the right production of aseptic medicinal preparations);
- section II - pharmacies, branch pharmacies and individual entrepreneurs

licensed for pharmaceutical activity.

From trusted pharmacy organizations to the first section we took the following pharmacy organizations in the form of ownership and organizational structure: the municipal unitary enterprise, limited liability company, production cooperative.

As can be seen in Figure from the list of minimum range, mandatory for pharmacies finished dosage forms, manufacturing, production with the right production of aseptic medicinal products consisting of 57 items average no 4 drug product (7%).

The second section related pharmacy organizations, individual entrepreneurs.

As can be seen in Figure from the list of the minimum range for pharmacies, individual entrepreneurs, consisting of 27 items, in average no 2 drug product.

To conduct to determine the extent of demand and the speed of circulation of medicines from the list of minimum range, also the assessment of reasons leading to violations of licensing requirements pharmacy organizations, was selected sociological method aimed at gathering opinions of specialists with pharmaceutical education, especially those who directly communicate with the visitors of drugstores.

To resolve these goals, we compiled a questionnaire of 15 questions, grouped in 4 blocks:

- demographic profile of respondents (gender, age, location pharmacy organizations);
- the professional status of the respondents (education, work experience, position);
- assessment of the level of demand and speed of medicines from the list of mandatory minimum range;
- the proposals of the experts to improve the situation.

All the questionnaires were subjected to 20 respondents, all female (100%). According to the survey the average age of pharmaceutical professionals working on the trading floor, was 37 years. Education at secondary 15 respondents (75%), 5 respondents highest (25%). Work experience in the position on average is 15 years.

Previously we have proposed a classification of medicines from the minimum of the range in 4 categories:

Category 1 – drugs that have the highest demand or having a fast access (more than 10 packages per day);

Category 2 – drugs that enjoy stable demand or stable with treatment (from 5 to 10 packages per day);

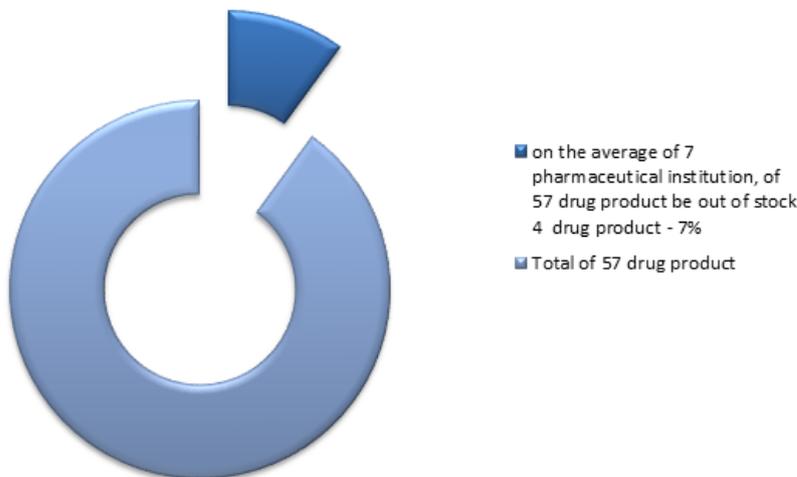


Fig.(a). Pharmacy organizations in the form of CBM, PCs, LLC (7 pharmacies)

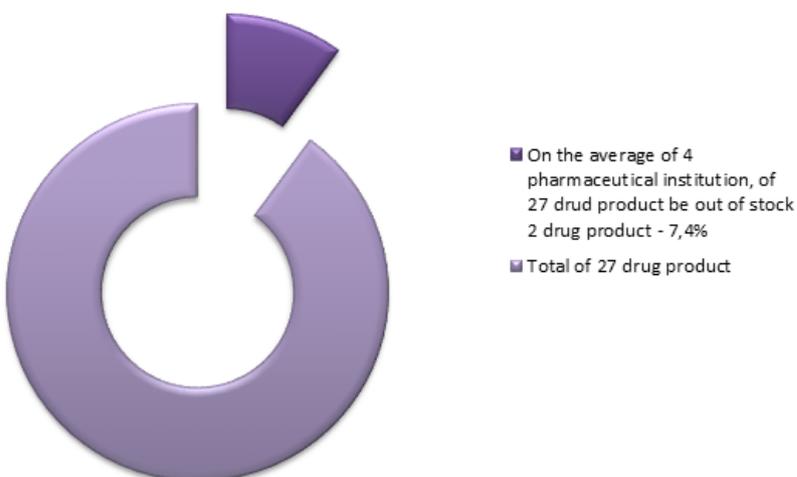


Fig.(a). Pharmacy organizations in the form of CBM, PCs, LLC (7 pharmacies)

Category 3 – drugs, using the least demand or having a delayed treatment (1 to 5 packs per day);

Category 4 – medicinal products are not in demand.

As a result of the study revealed the extent of the demand and speed of medicines.

On the first section of the minimum range, mandatory for pharmacies finished dosage forms, manufacturing, production with the right production of aseptic medicinal products, of the 57 items of the first category of drugs 20 - 35,09 %, to 2 category included 24 drug – 42,11%, to 3 category 11 drug – 19,3%, 4 to a category 2 drug product is -3.5%.

In the second section, the minimum of the range mandatory for pharmacy points, kiosks and individual entrepreneurs, of the 27 items of the first category included 13 drug – 48,15%, to 2 category 12 drug – 44%, 3 to a category 2 drug product is 7.4%.

Tested in pharmacies were no drugs as the highest demand and lowest demand or having delayed treatment. In order to maintain the presence of the minimum assortment of medicinal preparations in accordance with the standards requires continuous monitoring of the movement of drugs from the list. To determine the

optimal stock of item minimum list of drugs in quantitative terms, it is advisable to consider the velocity or quantity of a drug sold during a certain period. These criteria are directly dependent on the location, profile and format of the pharmacy, and must be set taking into account the actual pattern of sales.

CONCLUSION

In the result of the study drugs were classified according to their degree of demand and the rate of circulation of medicinal products. Thus, in the category of drugs which are not marketable on the first section of the minimum range 2 drugs referred, that is 3.5% of the whole item. From the second section to this category 2 drugs referred, which is 7.4% of the entire item.

Wherein in pharmacy organizations at the time of the inspection drugs in this category, but also those in greatest demand and sustainable, were not available. Due to the fact that the absence of drugs, which are included in the list of mandatory minimum range required for the provision of medical care, is a gross violation of the licensed activity, the leaders of pharmacy organizations need to continuously monitor for the presence of these drugs.

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The authors:

Tarabukina Sardana Makarovna – candidate of pharmaceutical Sciences, associate Professor of medical Institute of North Eastern Federal University, first Deputy General Director of the open joint-stock company «Sakhafarmacy», tcmx@mail.ru;

Boyarova Zinaida Alekseevna – student of the 5th course of medical Institute of North Eastern Federal University, Zinaidaboyarova@mail.ru.

NUTRITION IN THE NORTH

Abramov A.F., Sleptsova T.V., Efimova A.A., Vasilieva V.T.

THE BIOLOGICAL VALUE OF THE YAKUT CARP'S PROTEINS BY AGE

ABSTRACT

The article presents the results of studies of the biological value of Yakut carp's proteins by age of Lake Nigili in the Kobyaisky District of the Republic Sakha (Yakutia). It is concluded that the meat of carp under the age of 5 by the protein content significantly inferior to the meat of adult carp. Yet carps in the age of 5 have a high biological value - the amount of the amino-acid score is higher than standard (more than 100%).

Keywords: Yakut carp, meat, amino-acids, amino-acid score.

Introduction

Yakut Carp (*Carassius carassius jacuticus*, Kirillov) is the most common commercial species of fish in the lakes of Yakutia. Due to low demands for oxygen it occurs in almost all the lakes in Yakutia, including the northern lakes to 70° 30' N latitude. In this regard, commercial stocks of carp can reach very large volumes [5]. The main commercial stocks available in 20 districts of Yakutia: in the northern, central, western and southern areas. In these areas, the proportion of carp in the annual fish catch is 60-70% [6]. The increases in carp catch are due to the increase in its demand, and most importantly with favorable

ecological conditions of reservoirs for natural reproduction of carp. Over the last decade throughout the water level rises in the lake waters, this is conducive to the further intensification of the growth and development of the food carp.

According to Kirillov A.F. (2002), the largest Yakut carp exceeds by weight 2-3 kg. However, the majority are small carps of 100-200 grams. Carps reach puberty by the age of 3-5 years, the individual fertility is high - 118.5 thousand eggs. They belong to the fish of portion spawning and spawn during the summer 2-3 times, from June until autumn. For one spawning female lays about 40 thousand eggs that stick to the

stems of aquatic plants. The eggs which fell to the bottom die. The larvae from the eggs begin to hatch within a week. At the age of 10 days, the larvae begin to make small swimming movements, and on the 13th day they become active at all. Their length by that time is 12 mm, the larvae begin to feed actively.

Since ancient times, the Yakut carp is almost the most popular product among the population of Yakutia, and remains so today, as it is a valuable source of protein with easily digestible fatty acid fractions, vitamins and mineral elements. Eating fish, including carp, our ancestors have maintained youth and health for a long time.

Large stocks of carp are in the lakes of Kobyaisky District [4, 9]. However, up to date there are very few studies on the nutritional value of carp.

With this in mind, it was set a goal to explore the biological value of Yakut carp's meat proteins on content of essential amino-acids by ages.

MATERIALS AND METHODS

Yakut carps (*Carassius carassius* ja-cuticus Kirillov) were sampled in the field conditions in Kobyaisky District in Lake Nigili. The selection of product samples was carried out directly on the place of catches by sampling from each batch of specific instances in accordance with GOST 7631-2008. [2] The samples obtained from all parts of the fish were combined in homogeneous parties and led to an average sample of each type according to GOST 31339-2006 [3].

Whole carcasses of frozen fish prethawed at room temperature, were purified from scales and entrails, surface of carcasses were wiped with gauze from top to bottom. Bones and cartilages were removed from the selected samples. Muscle tissue from the dorsal and ventral parts of the 6 fish was taken for the study.

Determination of the chemical composition of fish and fish products was determined by infrared spectroscopy on infrared analyzer SpectraStar model 2200 of Unity Scientific USA Company, calibrated on the basis of generally accepted standard chemical methods in the laboratory of biochemistry and mass analysis of Federal State Budgetary Institution "Yakut Scientific Research Institute of Agriculture".

Food and biological value of meat and fish belly were determined on the basis of the biochemical composition study [8].

Amino-acid (AA) score was calculated by the formula: (mg AA per 1 g of protein test) / (mg AA per 1 g of ideal protein x 100) [7], biological effectiveness was defined ratio of unsaturated fatty acids to saturated [1].

The obtained data were processed biometrically using a personal computer (Microsoft Excel 2003, Microsoft Windows XP).

THE RESULTS OF THE STUDY

The data presented in the table shows that the meat of Yakut carp under the age of 5 years on the protein content significantly inferior to older carp. Thus, the protein content in the meat of carp over the age of 7 years is 16.59±1.917 g/100 g, from 5 to 7 years – 17.12±1.596, under the age of 5 years – 11.20±0.32 g/100 g.

Meat proteins of carp under the age of

Table 1

The biological value of Yakut carp's fillet proteins from Yakutian Lake Nigili by age

Amino-acids	Yakut carp			Ideal amino-acid (FAO/WHO), g/100 g
	large (over 7 years)	average (5-7 years)	small (under 7 years)	
Proteins, g/100 g	16.59±1.917	17.12±1.596	11.20±0.320	
Valine, g/kg fillet	11.30±0.460	11.43±0.387	10.01±0.075	
g/100 g protein	6.8	6.7	8.9	5.0
score, %	136	132	178	
Isoleucine, g/kg fillet	10.95±0.691	11.14±0.574	9.01±0.114	
g/100 g protein	6.6	6.5	8.04	4.0
score, %	165	162.5	201	
Leucine, g/kg fillet	13.72±0.841	13.95±0.703	11.35±0.139	
g/100 g protein	8.2	8.1	10.1	7.0
score, %	117.1	115.7	144.2	
Lysine, g/kg fillet	17.67±1.535	18.09±1.278	13.36±0.256	
g/100 g protein	10.6	11.0	11.9	5.5
score, %	192.7	200	216.3	
Threonine, g/kg fillet	9.18±0.535	9.33±0.447	6.58±0.121	
g/100 g protein	5.5	5.4	5.8	4.0
score, %	137.5	135	145	
Tryptophan, g/kg fillet	2.27±0.153	2.31±0.129	9.01±0.114	
g/100 g protein	1.3	1.3	8.04	1.0
score, %	130	130	804	
Phenylalanine, g/kg fillet	9.22±0.841	9.47±0.703	11.35±0.139	
g/100 g protein	5.5	5.5	10.1	3.0
score, %	183.3	183.3	336.6	
Phenylalanine + tyrosine, g/kg fillet	12.67±1.535	13.08±1.278	13.36±0.256	
g/100 g protein	7.6	7.6	11.9	6.0
score, %	126.6	126.6	198.3	

5 years compared with an ideal protein of chicken eggs are high in essential amino-acids (valine, isoleucine, leucine, lysine, threonine, tryptophan and phenylalanine), an amino-acid score of which is much higher than score of ideal protein amino-acids. Score of these amino-acids in the meat of carp under the age of 5 years is from 144.2 to 804 per cent. The content of the phenylalanine amino-acid + tyrosine in carp's meat over 7 years old and at the age of 5-7 years is the same, and in the meat of carp under the age of 5 years contained 11.9 g/100 g.

CONCLUSIONS

The following conclusions can be drawn from these data:

- Meat of carp under the age of 5 years is significantly inferior to the meat of adult carp on the protein content;
- Carps under the age of 5 years have a high biological value - the amount of the amino-acid score is higher than standard (more than 100%).

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A note about the authors:

Abramov Alexei Fyodorovich – doctor of biological Sciences, Professor. Yakut Scientific Research Institute of Agriculture after M. G. Safronov (677001, Russia, Yakutsk, Bestuzheva-marlinskogo, D. 23/1, ANEESH, tel: 8(4112)214574, e-mail: yniicx@mail.ru.

Sleptsova Tatyana Vasilevna – researcher of the laboratory of agricultural products processing and biochemical analyses. Yakut Scientific Research Institute of Agriculture after M. G. Safronov (677001, Russia, Yakutsk, Bestuzheva-marlinskogo, D. 23/1, ANEESH, tel: 8(4112)214574, e-mail: yniicx@mail.ru).

Efimova Aleksandra Arkadyevna,

candidate of agricultural Sciences, leading researcher of the laboratory of agricultural products processing and biochemical analyses. Yakut Scientific Research Institute of Agriculture after M. G. Safronov (677001, Russia, Yakutsk, Bestuzheva-marlinskogo, D. 23/1, ANEESH, tel: 8(4112)214574, e-mail: alekefim@mail.ru).

Vasilyeva Valentina Tikhonovna – candidate of biological Sciences, senior researcher of the laboratory of agricultural products processing and biochemical analyses. Yakut Scientific Research Institute of Agriculture after M. G. Safronov (677001, Russia, Yakutsk, Bestuzheva-marlinskogo, D. 23/1, ANEESH, tel: 8(4112)214574, e-mail: vasvalt@mail.ru).

SCIENTIFIC REVIEWS AND LECTURES SCIENTIFIC REVIEWS AND LECTURES

M.M. Vinokurov, V.V. Savelyev, T.V. Yalynskaya

THE USE OF «DNA-COMET» METHOD FOR THE DETECTION AND ASSESSMENT OF DAMAGE TO THE BLOOD MONONUCLEAR CELLS INDUCED BY ENDOGENOUS INTOXICATION AT THE ACUTE DESTRUCTIVE PANCREATITIS

ABSTRACT

The method of analysis of DNA damage («DNA comet», DNA-comet assay, method of gel electrophoresis of individual cells DNA) found its application in clinical practice as a method of monitoring the effectiveness of treatment and the severity of genotoxicologic effect in the development of endogenous intoxication. The literature review data suggest a possible clinical application of the method in determining the level of endogenous intoxication in patients with acute destructive pancreatitis.

Keywords: DNA damage, mutations, repair, apoptosis, genotoxicity.

Most researchers dealing with human adaptation in the Far North have noted that for the majority of the inhabitants of the Republic Sakha (Yakutia) the reduction or distortion of most of biochemical processes and the violation of homeostasis of the body are indicative, which are expressed by changes in carbohydrate, protein and lipid metabolism, immunological reactivity [1, 2, 3, 4, 5], balance of prooxidant and antioxidant systems, the activity of enzymes involved in detoxification and protective processes of the body [1,3, 4, 7].

There is no doubt that all these pathological changes affect the

homeostasis for any disease and require accounting and analysis for decision-making of their correction in a comprehensive program of treatment [2, 5, 10, 11]. It should be noted that these body systems are the most important in the pathogenesis of inflammation and also play a significant role in the development and progression of various complications [5,10]. For this reason, research aimed at studying the pathogenesis of significant violations homeostasis, their dynamics in order to control the efficiency and timely correction of the complex therapeutic measures have significant value.

The impact of adverse factors on

any biological system (including the human body) is accompanied by the accumulation of DNA damage and repair systems activity change that may cause mutations, lesions and body cells. The review assessed the effectiveness of the method of «comet assay» to detect DNA damage caused by endogenous intoxication (including that causes , and acute destructive pancreatitis), which was the reason for choosing this method.

The method has a sensitivity required for registration of DNA damage at the level of individual cells, and can be used to evaluate the integrity of the integrated genome. Application method «comet assay»: any biological system [9].

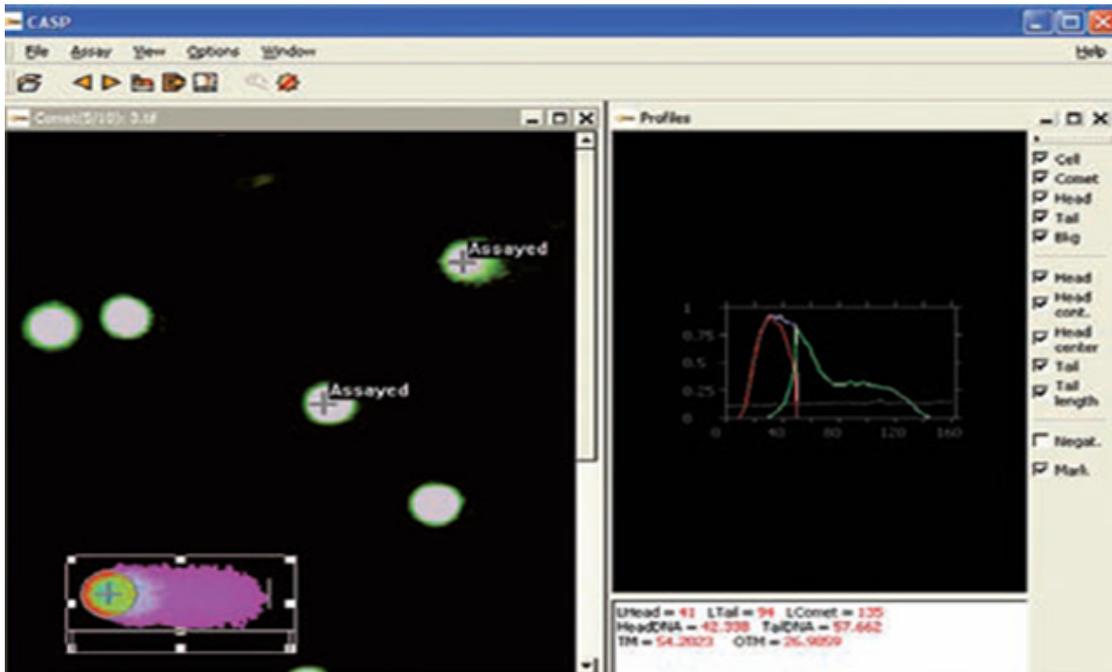


Figure 1. Analysis of DNA comets digital images in a software environment CASP 2.2.1. (CaspLab, USA).

The principle of the method - based on the registration of varying speed of movement in a constant electric field is intact and fragmented DNA isolated cells enclosed in an agarose gel. Isolated DNA molecules of the entire compact cells moving in the electric field. In the presence of impaired DNA structure, the speed of advance in the electric field will be different from the speed of unmodified DNA molecule. Structure «comet tail DNA» due to the natural processes of DNA replication and transcription associated with cell division and protein synthesis processes [8,12].

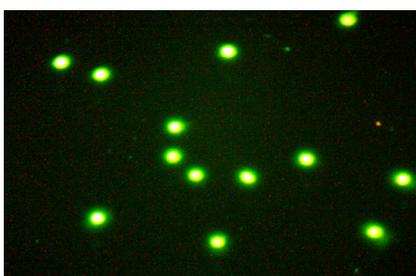
Proceedings determination: Blood samples (2 ml) was mixed with an equal volume of RPMI- 1640 medium containing 10 % dimethyl sulfoxide and frozen and stored until analysis at -20°C . Then, for analysis of blood samples in a volume of 50 μL were added to tubes containing 500 μL of 1 % agarose solution , resuspended and loaded onto agarose precoated slides . After hardening of the agarose slides are lysed with cold buffer(10 mMTrisHCl [pH 10], 2,5 MNaCl, 100 mMEDTA-Na₂,1% Triton X-100, 10% DMSO) at least 1 hour. After the end the slides were incubated

in lysis buffer for electrophoresis (300 mM NaOH, 1 mM EDTA-Na₂, pH>13) for 20 minutes for the implementation of an alkaline alkali-labile sites and denaturation of DNA. Electrophoresis was performed for 20 minutes at a field strength 1/V and a current intensity of from to - 300 mA. After electrophoresis, the slides were fixed in 70 % ethanol solution, dried and stored until analysis at room temperature [5, 8].

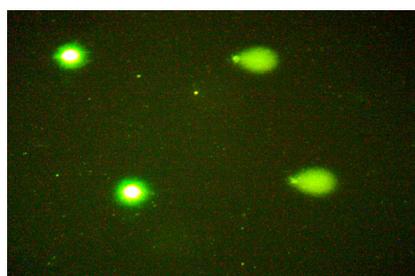
Immediately prior to microscopy slides were stained with appropriate fluorescent dye SYBR Green I (1: 10000) for 30 minutes in TE- buffer). The analysis was performed on the epi-fluorescence microscope Mikmed 2-12T («LOMO», Russia), combined with a high-resolution digital camera (the VEC - 335,»EMU», Russia), with an increase of x400. The resulting image from micropreparations «comet assay» was analyzed using CASP 2.2.1 software. (CaspLab, USA) (Picture 1).

Hardware-software complex consists of a coincident with a microscope a highly sensitive CCD- camera and specialized software that enables digital recording and processing parameters of «DNA - comets », characterizing the integrity of the structure of DNA: the length of the «comet assay», tail length, head diameter, DNA content percentage in the head or the tail (% DNA) etc. (Figure 2).

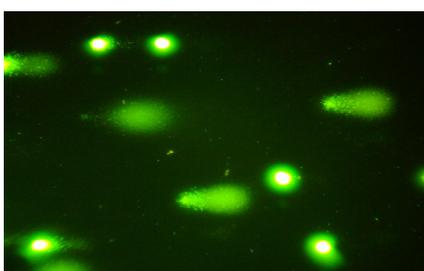
As an indicator of the damaged DNA is most often used of the tail length , percentage of DNA content in the tail or their work - so-called « tail moment » (tail moment) [13,14].Apoptotic DNA



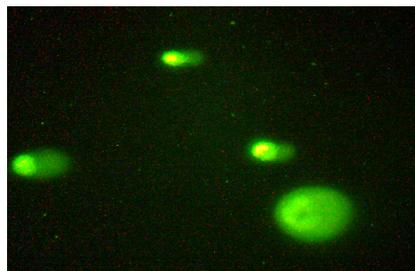
a. Mononuclear cells from a normal donor



b. DNA-comets ghost cells



c. DNA-comets apoptotic cells



d. DNA-comets necrotic cells

Figure 2. DNA-comets cells with varying degrees of damaged DNA.

comet was identified as specific DNA «DNA-comets» diffuse «tail» and is practically absent «head» as well as the extensive necrotic - diffuse «DNA-comets» of irregular shape (Picture 2 c, d). The identification of such abnormal DNA comets can be seen as an indirect indicator, respectively, apoptotic or necrotic cell death. The DNA comet micropreparations often show atypical (cytotoxic) DNA comet, with absent or virtually absent head and broad diffuse tail, known as ghost cells or hedgehogs [9], they singled out and treated separately. Since such DNA comet tail is represented in the form of short discrete fragments (Picture 2b), it is assumed that these DNA comets can form apoptotic cells are on chromatin fragmentation stage [9].

«Comet assay» method has a number of significant advantages over other methods of assessing the damaged DNA. This - high sensitivity, possibility of detecting DNA damage in the cells of any tissue in vivo, a minimum required amount of experimental material, relatively low cost, high «ductility», allowing for minor modifications of the method used for selective recording various categories of DNA damage and related events. It attracts speed of the experiments and the relative simplicity of the laboratory protocol. Today there is a consensus on the need to include the method of «comet assay» as a tracer test in expert assessment of genotoxicity in vitro and in vivo. In Russia, this method became a part of a series of guidelines and instructions [9.12].

Further, it should point to the prospect of applying the method of «comet assay» as a tracer test in epidemiological, different kind of experimental and clinical studies, the study etiopathogenic role of primary DNA damage, as well as to assess the «quality of life» of biological systems in different environmental conditions habitat.

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Authors:

Vinokurov Mikhail Mikhajlovich, doctor of medical sciences, professor of department of faculty surgery of medical institute of NEFU. 677000, Street of Dzerjinskogo 26 flat 41. Office telephone (43-20-91), home telephone (45-25-30),

Yakutsk, Russia. E - Mail: mmv mi@rambler.ru;

Savelev Vyacheslav Vasilievich, candidate of medical sciences, associate professor of department of faculty surgery of medical institute of NEFU. 677000 street of Krupskoj 37 flat 58. Mobile telephone 89241706330. Yakutsk, Russia. E - Mail: vvsaveliev@

mail.ru;

Yalinskaya Tatyana Vadimovna, student of the 5th course of medical institute of NEFU. 677009 street of Dzerjinskogo 45/2 flat 70. Mobile telephone 89143033999. Yakutsk, Russia. barbuzyaka@mail.ru.

CLINICAL CASE

A.A. Tappakhov, T.Ya. Nikolaeva, A.D. Alexeeva,
L.T. Okoneshnikova, L.A. Klarov, T.K. Davydova

DIFFERENTIAL DIAGNOSIS OF MULTIPLE SYSTEM ATROPHY AND ESSENTIAL TREMOR WITH PARKINSON'S DISEASE (CLINICAL CASES)

ABSTRACT

Differential diagnosis of Parkinson's disease is a difficult task especially at the level of primary medical care. It is one of the reasons for late diagnosis of some neurodegenerative diseases.

The article attracted the attention of doctors to clinical features of diseases similar with Parkinson's disease for early diagnosis and adequate treatment. We provide our own clinical cases of patients with neurodegenerative diseases (multiple system atrophy, essential tremor) who in the debut were diagnosed with Parkinson's disease.

Thus, there is hyperdiagnostics of Parkinson's disease, not only under diagnostics. Some neurodegenerative diseases such as multiple system atrophy, are accompanied by the development of parkinsonism, but they have a number of clinical features that contribute to choosing the right tactics and timely diagnosis. In the differential diagnosis of multiple system atrophy apart from typical clinical picture magnetic resonance imaging is important. Differential diagnosis of tremor form Parkinson's disease and essential tremor is often difficult, especially in the early stages of the disease, when there is no clinically severe rigidity. Timely clinical diagnosis involves the use of optimal methods of treatment based on evidence-based medicine, the identification of reliable epidemiological indicators and, consequently, appropriate use of health care resources.

Keywords: diagnostics, multiple system atrophy, essential tremor, parkinsonism, Parkinson's disease, MRI.

INTRODUCTION

Parkinson's disease (PD) is the most common cause of parkinsonism. Parkinsonism is a clinical syndrome characterized by hypokinesia with rest tremor, muscular rigidity and/or postural instability [1, 4, 5]. If at a later stage of PD patients have stereotypes clinical picture, then at an early stage even skilled experts have difficulty in diagnosis [1]. Therefore, PD should be differentiated with essential and dystonic tremor and other disorders that are accompanied by the development of Parkinsonism. For example, symptomatic parkinsonism may develop as a consequence of stroke or chronic vascular diseases of the brain, and traumatic brain injuries. Parkinsonism may accompany neurodegenerative diseases such as multiple system atrophy (MSA), progressive supranuclear palsy (PSP), and dementia with Lewy bodies (DLB) [1, 10].

Differential diagnosis of Parkinson's

disease is a difficult task especially at the level of primary medical care. This is evidenced, for example, by the existing shortage of primary diagnosis of PD, which is associated with both underdiagnosed Parkinsonism and reducing the available symptoms to the natural aging, and insufficient information and late negotiability of the population for health care [3].

Each nosology accompanied by the development of parkinsonism has several distinctive clinical features. Vascular parkinsonism is characterized by a temporary connection with cerebrovascular disease, lesions mainly the lower half of the body, early onset of gait disturbances, symmetrically symptoms and the low efficiency of levodopa [2]. The diagnosis of PSP is considered in cases of early postural instability with falls, early cognitive dysfunction, slowing of vertical saccades, and supranuclear vertical gaze palsy [7]. Various combination of progressive

autonomic failure, parkinsonism with the low efficiency of levodopa, cerebellar ataxia, urinary urgency and pyramidal syndrome most often occurs in MSA [8].

Essential tremor (ET) is characterized by slowly progressive isolated tremor without muscular rigidity and hypokinesia, in the most cases patients have family history of disease and the positive effect of alcohol [6, 9].

Aim of study: To focus doctors on clinical features of diseases similar with Parkinson's disease for early diagnosis and adequate treatment. In this article, we present our own clinical cases of patients with neurodegenerative diseases (multiple system atrophy, essential tremor), who in the debut were diagnosed with Parkinson's disease.

RESULTS OF STUDY

Clinical case 1. A 66-year-old man admitted to the neurological department of the Republican Hospital №2 – The Center emergency medical care (Yakutsk city) in August 2015 with

complaints of rigidity, slowness and depletion movements; weakness in the right extremities; intermittent tremor of the hands, especially in the performance of any purposeful movements; unsteadiness of gait; slurring of speech; frequent urination in small portions; fluctuations of blood pressure from 90/... to 160/... mm Hg with syncope.

Medical history: the first symptoms of the disease appeared in 2009 as frequent urination and recurrent syncope when changing position of the body and physical activity. In 2010, the patient noticed a weakness in the right extremities, changes in speech, and slowness of movement. The diagnosis of Parkinson's disease was made. Appointment of levodopa/carbidopa 750/75 mg per day was characterized by positive dynamics in the form of reduced stiffness and increased amplitude of movements. In 2012, the patient reported a progressive unsteadiness of gait and periodic tremors of the hands. Then he began to walk on a walker. Since 2014 patient is taking levopoda/carbidopa 750/75 mg per day and piribedil 150 mg per day.

The patient denies head injury and acute cerebrovascular accident. Heredity on the nervous system disease is not burdened, brother and sister are healthy. Bad habits: smoking for about 50 years.

Neurological status. Clear consciousness. Hypoosmia, lack of response to convergence, hypomimia,

easy right-sided central prosoparesis, elements of pseudobulbar syndrome (dysarthria, oral automatism reflexes). Moderate right-sided hemiparesis. Muscle tone is increased in the right extremities on mixed type (the phenomenon of «jackknife» and «cogwheel»), in the left - «lead tube» type. Anisoreflexia, D>S. Babinski symptom positive on both sides. Severe hypokinesia. Left-side hemiataxia. Small-amplitude postural and kinetic tremor of the hands. Walking on the walker on a broad basis. Autonomic failure: arterial hypotension (blood pressure = 100/60 mm Hg) with episodes of syncope, frequent urination, and constipation. MMSE – 27/30.

Blood and urine tests are not significantly disturbed.

MRI of the brain: atrophy of the cerebellum and all of its legs with expansion of the 4th ventricle; atrophy of the pons with expansion tank front axle and the brain cerebellopontine cisterns. Determined pathological signal cross the bridge fibers and fibers forming the seam region of the nuclei, which together form a figure «cross», cross the bridge, in the form of increased signal. Conclusion: MR-signs of multisystem atrophy of the brain (Fig. 1-3).

[Fig. 1]

MRI study of patient B., 67 years old, in the axial projection in T1-weighted images (A), T2* (hemo) (B) and TIRM (C). White arrows - pathological signal

of transversal fibers of pons and fibers forming region of nuclei raphes, which forms together cross-figure. Black arrows - atrophy of the cerebellum with the expansion of subarachnoid spaces between its leaves, and the expansion of the 4th ventricle.

[Fig. 2]

MRI study of patient B., 67 years in the median sagittal projection in T1-weighted images. White arrow - flattening the front surface of the pons.

[Fig. 3]

MRI study of patient B., 67 years old in the axial projection in T2-weighted images.

The overall size of the lateral ventricles at 4.4cm, width of 3rd ventricle - 1.3 cm. 4th ventricle has a typical shape and dimensions. Convexital subarachnoid space to the frontal brain and basal cisterns expanded.

Routine EEG: moderate diffuse changes of cortical rhythms with abnormal activation of stem-diencephalic structures.

Daily monitoring of blood pressure: according to the monitoring of blood pressure recorded systolic-diastolic hypertension 1 degree. Maximum blood pressure 160/93 mm Hg, minimum BP – 90/63 mm Hg.

Clinoothostatic test: blood pressure (lying) = 140/90 mm Hg, heart rate (lying) = 66 minutes; blood pressure (standing)

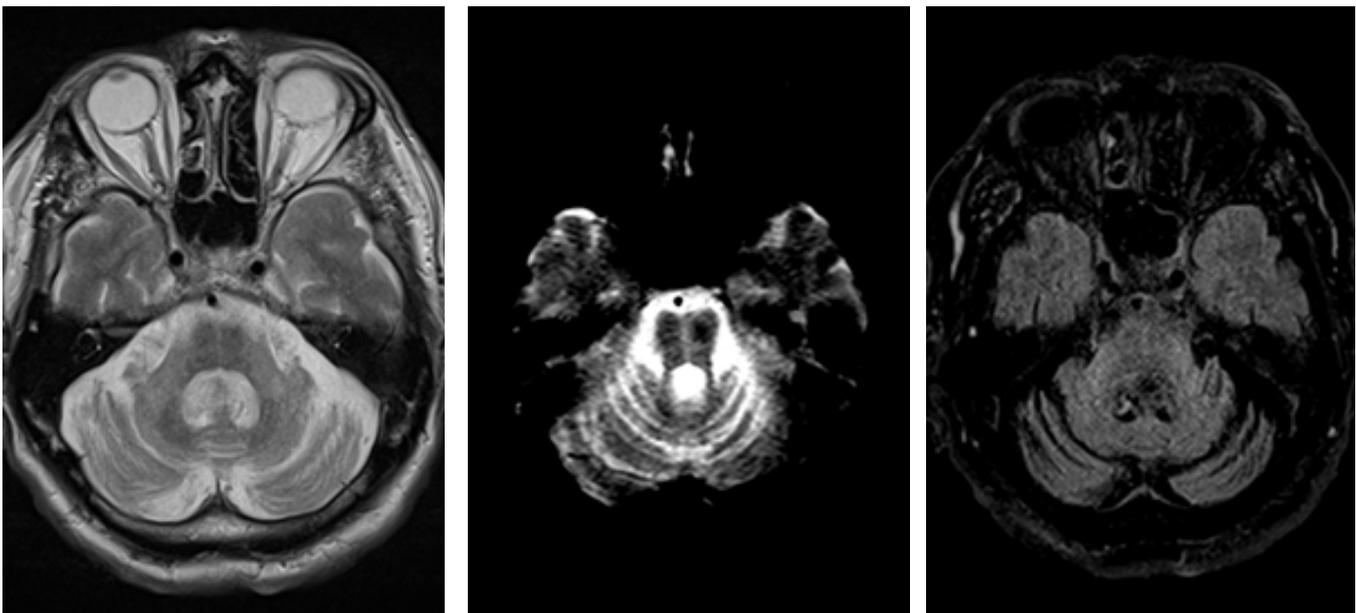


Fig. 1

MRI study of patient B., 67 years old, in the axial projection in T1-weighted images (A), T2* (hemo) (B) and TIRM (C). White arrows - pathological signal of transversal fibers of pons and fibers forming region of nuclei raphes, which forms together cross-figure. Black arrows - atrophy of the cerebellum with the expansion of subarachnoid spaces between its leaves, and the expansion of the 4th ventricle.

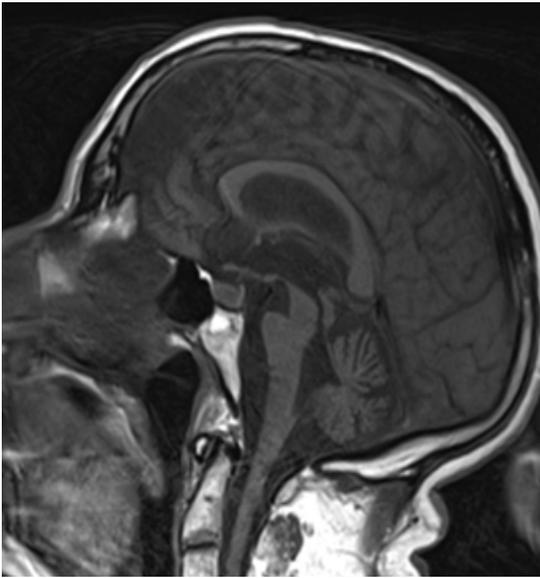


Fig. 2

MRI study of patient B., 67 years in the median sagittal projection in T1-weighted images. White arrow - flattening the front surface of the pons.

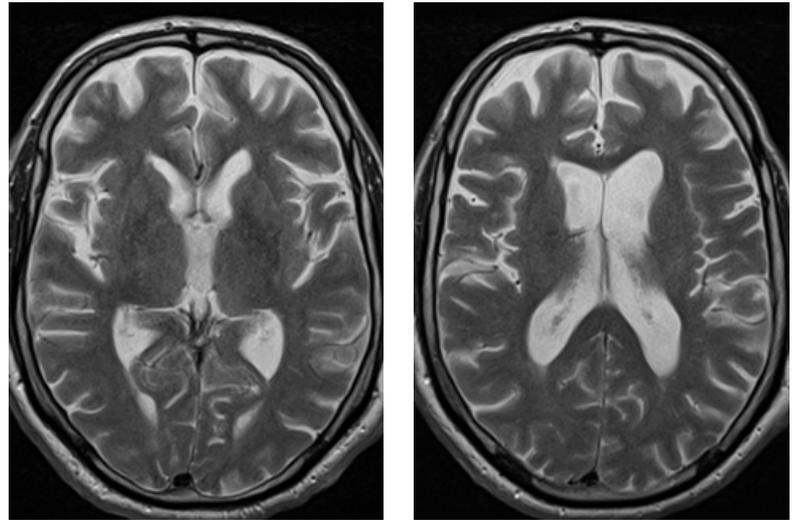


Fig. 3

MRI study of patient B., 67 years old in the axial projection in T2-weighted images.

The overall size of the lateral ventricles at 4.4cm, width of 3rd ventricle - 1.3 cm. 4th ventricle has a typical shape and dimensions. Convexital subarachnoid space to the frontal brain and basal cisterns expanded.

= 115/80 mm Hg, heart rate (standing) = 68 min.

Duplex ultrasound examination of the brachiocephalic artery: ultrasonographic signs of brachiocephalic atherosclerosis without stenosis.

On the basis of medical history and clinical data (onset after 50 years, progressive duration, the lack of family history, a combination of ataxia, pyramidal and pseudobulbar syndromes, parkinsonism, signs of autonomic failure) clinical diagnosis was established: Multiple system atrophy, nigrostriatal form, parkinsonism-plus, mild right-sided hemiparesis, left-sided hemiataxia, autonomic failure in the form of arterial hypotension, bladder dysfunction and constipation.

Symptomatic treatment of the patient includes continue receiving levodopa with possible daily dose titrated up to 1000 mg in 4-6 doses. To prevent attacks of syncope is recommended to increase the intake of salt, frequent small feedings, tight bandaging of the lower extremities.

Clinical case 2 demonstrates essential tremor. Patient C., 45 - yrs old woman, asked for a consultation at the Clinic of Medical Institute NEFU in September 2015 with complaints of constant tremor of the head, voice, both hands and the right leg, with increasing excitement, stress. Alcohol leads to a significant reduction in symptoms.

Medical history: The first symptoms appeared in 2007 in the form of periodic small tremor of the head and right

hand, especially when the excitement, experience. Since 2009, the tremor was virtually constant spread on the right foot, in 2013 - all the limbs, greatly increased in amplitude. MRI brain without pathology. Parkinsonism was established. The patient took Pronoran without clinical effect.

The patient noted that the father and aunt have Parkinson's disease. Father 76 year-old-man, was diagnosed in 50-year-old, currently he has tremor of the head and limbs, but maintains motor activity. Siblings do not have movement disorders.

Neurological status: Muscle hypotonia. Anisoreflexia, S>D. No paresis. No hypokinesia. Low-amplitude tremor of the head of the type «no-no», «yes-yes», the vocal cords. Mid-amplitude postural and kinetic tremor of both hands, D>S. Mid-amplitude tremor of right leg. Gait is normal.

On the basis of typical complaints, positive reactions to alcohol, slowly progressive duration, no change at neuroimaging, positive family history, neurological status diagnosed was made: Essential tremor, family form, with mixed tremor of the head of the type «no-no», «yes-yes», vocal cords, and postural and kinetic tremor of both hands, right leg.

Titration of beta-blocker propranolol up to 120 mg / day is recommended with blood pressure and pulse control.

We have also examined the patient's father, who was diagnosed essential tremor too.

Both patients were observed for a long time with Parkinson's disease. Diagnosis upon further examination has not received confirmation, and thorough analysis of complaints, medical history and neurological status allowed exposing other neurodegenerative diseases.

In re-examination in 1.5 months while taking propranolol 60 mg / day is noted positive effect of the disappearance of the tremor of the right leg and the vocal cords, reducing the severity of head tremor.

CONCLUSION

Differential diagnosis of Parkinson's disease with other neurodegenerative diseases, especially with multiple system atrophy and essential tremor, is a difficult and important task. Essential in the differential diagnosis is a neurovisualization's picture, particularly, magnetic resonance imaging, which can explain to some extent symptoms. Timely clinical diagnosis involves the use of optimal methods of treatment based on evidence-based medicine, the identification of reliable epidemiological indicators and, consequently, appropriate use of health care resources.

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Information about authors

Tappahov Alexei Alexeevich-intramural graduate student of department of neurology and psychiatry Medical Institute NEFU; neurologist MI Clinic NEFU and Neurology Dep. RBN#2 TSEMP

Address: 677000, Yakutsk, ul. Kulakovskogo, 36; tel. 8 (4112) 496700

E-mail: tappakhov@gmail.com;

aa.tappakhov@s-vfu.ru

Nikolaeva Tatiana Yakovlevna - PhD, Head of Department of Neurology and Psychiatry Institute of Medicine NEFU

Address: 677000, Yakutsk, ul. Oiunsky 27; tel. 8 (4112) 363046;

E-mail: tyanic@mail.ru

Alekseeva Alena Danilovna - neurologist Neurology Dep. RBN#2-TSEMP

Address: 677005, Yakutsk, ul. P. Alekseeva, 83A; tel. 8 (4112) 432294

E-mail: alyona83@list.ru

Okoneshnikova Lyudmila Timofeevna – Head of neurological department RBN#2-TSEMP

Address: 677005, Yakutsk, ul. P. Alekseeva, 83A; tel. 8 (4112) 432294

E-mail: okoneshnikovalt@rambler.ru

Clarov Leonid Alexandrovich – head of the MRI radiodiagnostics department RBN#2-TSEMP

Address: 677005, Yakutsk, ul. P. Alekseeva, 83A; tel. 8 (4112) 432953

E-mail: pdygygn@mail.ru.

