COMPARATIVE INDICATORS OF IRON AND MANGANESE CONTENT   
IN THE HAIR OF WOMEN LIVING IN THE NORTHERN REGION   
WITH DIFFERENT TREATMENT OF DRINKING WATER

T. Ya. Korchina, L. A. Minyailo, O. A. Safarova, V. I. Korchin

Khanty­Mansiysk State Medical Academy, Khanty­Mansiysk, Russian

*Aim*: to study the concentration of Fe and Mn in the hair of women living in the cities of Khanty­Mansiysk Autonomous Region (KHMAO) with different treatment of drinking water. *Methods*. The ultimate composition of hair of 106 women (average age 38,9±11,3 g) ­ residents of the Northern region, not employed in the manufacturing sector was studied. 50 of them lived in the cities of Nefteyugansk and Nyagan and 56 ­ in the cities of Surgut and Khanty­Mansiysk. In the cities of Surgut and Khanty­Mansiysk underground water undergoes non chemical treatment, iron removal by the method of deep aeration and decontamination on UV irradiation installations. In the cities of Nefteyugansk and Nyagan water from artesian wells is decontaminated only by baclor. *Results*. The women living in the cities of Nefteyugansk and Nyagan had significantly higher (p < 0,001) and higher than reference values of Fe (82,3 ± 11,4 mkg/g ­ the norm 7­40) and Mn (11,3 ± 1,9 mkg/g ­ the norm 0,15­2,0) concentrations in the hair compared to women living in cities with high­quality purification of drinking water: Fe (23,6 ± 2,2 mkg/g) и Mn (3,1 ± 0,2 mkg/g). Iron, getting in to the organism with other pollutants (dietary Fe excess is not negative) also shows the properties of the immunosuppressant. Manganese is considered to be vital and at the same time a toxic element with mutagenic activity and tendency for accumulation. We can assume the best resistance to the adverse effects of oxidative stress in women­residents of KHMAO cities with optimal treatment of drinking water. *Conclusions*: To correct the microelement status of the Northern region population it is necessary to carry out more research of the environmental objects (in particular water) on the content of heavy metals, pay special attention to quality control of drinking water, and to use the method of microelement status determination of the hair chemical composition as an additional method of assessment of the internal body environment.

**Keywords:** Northern region, drinking water, iron, manganese

ASSESSMENT OF ENVIRONMENTAL RISKS OF THE POPULATION HEALTH   
IN AREAS RANKED BY THE DEGREE OF TECHNOGENIC POLLUTION

E. V. Geger, \*G. P. Zolotnikova

Bryansk Clinical Diagnostic Centre, Bryansk; \*I. G. Petrovsky Bryansk State University, Ministry of Education and Science of the Russian Federation, Bryansk, Russia

The *aim* of this article is identification of environmental risks to the public health from polluted areas. *Methods*. Ranking of all districts of the Bryansk region according to the degree of radiation­chemical pollution of environment (E) for 8 environmental groups was made to analyze cause­and­effect relationships in the system “environmental factors ­ health status of the population”, according to the environmental condition of the region and annual statistical reporting. Ecological groups were used to study the dependence of hematological parameters in patients with allergopathology from the degree of the territories contamination. To estimate the impact of E factors on the health status of the population the analysis of variance (fixed effects model) and a nonparametric analysis of variance using non­parametric rank criterion of Kruskal and Wallis was applied. 403 adolescents aged 15­17 years were examined. Functional indicators of the cardiovascular system with the calculation of the adaptive capacity of circulation, the content of immunoglobulin classes M, G and A were studied. *As a result* a statistically significant sensitivity of eosinophilic (Fcalc = 3,46 at Ftabl = 3,05) and platelet reactions (Fcalc = 6,19 at Ftabl = 3,05) to the degree of technogenic pollution of E was established. Statistically significant sensitivity of the hemoglobin, leucocytes and thrombocytes was stated (Ncalc = 9,68; 9,83 and 9,48 at Ntabl = 9,49) to the degree of environmental technogenic pollution. *Conclusions.* The factor analysis affecting the surveyed organisms discovered the role of increased technogenic loads, each of radiation and chemical nature as health risk. Students living in conditions of combined radiation­chemical and radiation pollution of the E, discovered increased levels of immunoglobulin classes M, G and A. The analysis allowed to identify early signs of eco­dependent pathology risks with the aim to work out measures for the prevention of such diseases development.

**Key words:** technogenic pollution, environment, radiation and chemical pollution, ecological­hygienic ranking, ecodependant pathology

COMPARATIVE STUDY of AIRbornE fungi at Arctic stationS NEAR   
WATER AREA OF THE NORTHERN Sea Route

1I. Yu. Kirtsideli, 1,2D. Yu. Vlasov, 2V. A. Krylenkov, 3N. N. Rolle,   
4E. P. Barantsevich, 5V. T. Sokolov

1Komarov Botanical Institute of the Russian Academy of Sciences (BIN RAS), Saint Petersburg, Russia; 2Saint­Petersburg State University, Saint Petersburg, Russia; 3Peter the Great State Saint Petersburg Polytechnic University, Saint Petersburg, Russia; 4Almazov National Medical Research Centre, Russian Federation Ministry of Health, Saint Petersburg; Russia; 5Arctic and Antarctic Research Institute, Saint Petersburg, Russia

*Аim.* Main goal is the study of the microscopic fungi composition in the air of Arctic stations located along the Northern Sea Route. *Methods.* The study of aeromycota was carried out at 30 Arctic polar stations. The state of the Arctic territories was assessed in accordance with the methodology approved by the Ministry of Natural Resources of the Russian Federation. Air sampling in living and working zones was carried out with a PU­1B aspirator. Microorganisms were precipitated from air (volume of 250­1 000 l) on agar medium. The identification of micromycetes was carried out on the basis of cultural and morphological features as well as using molecular methods. The isolates of the dominant species were tested for their ability to grow at a temperature of 37 °C (potential virulence). *Results.* In total, 40 species of micromycetes were found in the air environment of the Arctic stations. Most of them belonged to anamorphic fungi of ascomycete affinity. A significant part of the identified fungi (65%) are the human pathogens (group IV pathogenicity in SP 1.3.2322­08). The highest diversity of fungi (20 species) was noted in the aeromycota of Tiksi. The number of microscopic fungi in the air of all the investigated Arctic stations was moderate and varied from several colony forming units (CFU) to 254 CFU per 1 m3 of air. The largest number of micromycetes in the air of living spaces (more than 200 CFU per 1 m3 of air) was recorded on the islands of Vize and Troynoy (the archipelago of Izvestia CIK). The minimum number of micromycetes was in the air of small (both island and continental) polar stations, regardless of their location. *Conclusion.* The composition of the aeromycota of Arctic polar stations was characterized by the dominance of fungi associated with anthropogenic habitats. The obtained data indicate the need to control the number of potential human pathogens and allergenic fungi found in the areas of Arctic settlements.

**Key words:** Arctic, polar ecosystems, anthropogenic impact, airborne microscopic fungi, allergens, potential human pathogens

biofeedback CORRECTION FOR OPTIMIZATION OF functional state   
of human ORGANISM DURING high­altitude climbing

A. V. Latanov, \*N. B. Pankova

Department of Higher Nervous Activity, Biological Faculty, M. V. Lomonosov Moscow State University, Moscow; \*Laboratory of Physical, Chemical and Ecological Pathophysiology, Research Institute of General Pathology   
and Pathophysiology, Moscow, Russia

The *aim* of the work was the approbation of a method for correcting the functional state of participants in a high­altitude expedition using biofeedback (BF) technologies. *Methods*. A study of the dynamics of heart rate (HR) variability during the sessions of biofeedback training in the highlands (F. F. Konyuhov Everest expedition) was carried out. The sessions were held before the mountain climbing (session 1) and during the acclimatization at 6 400 m (session 2) and 5 300 m (session 3) above sea level. Two climbers close in age, physique and athletic skills participated in the experiment. Each session of BF training included several computer game trials. The purpose of trial was to decelerate the HR. The trial continued for 80­105 seconds. All sessions were held in the late evening between 22.00 and 24.00. *Results*. Both participants achieved effective the HR fall during all sessions of BF training and demonstrated certain dynamics of HR variability in each session. Based on the revealed dynamics we assumed that before climbing the HR fall was achieved by an increase in sympathetic activity (increase in LF/HF ratio) with a decrease in the overall level of autonomic activity (total power spectrum, TP). As BF training (with consolidation of a new skill) for the session 3 deceleration the HR in both participants was accompanied by an increase in the overall level of autonomic activity (TP) and a decrease in the stress index. The changes in autonomic balance sheet (the LF/HF ratio) during session 3 were oppositely directed. *Conclusion*. The data received suggest that the achievement of the final goal in the sessions of BF correction (deceleration of the HR) in two participants of the experiment was accompanied by shifts in the level of activity of autonomic regulation systems. In this case, the direction of the shifts depended on the stage of formation of the skill and was specific for each subject.

**Key words:** high altitude, heart rate variability, biofeedback

parameter evaluation of cardiovascular system in schoolchildren under the conditions of latitudinal displacement

D. Yu. Filatova, Yu. V. Bashkatova, \*M.A. Filatov, \*L.K. Ilyashenko

Department of Biophysics and Neurocybernetics, Institute of Natural and Technical Sciences, Surgut State University, Surgut; \*Federal State Budget Educational Institution of Higher Education «Industrial University   
of Tyumen», Surgut Branc, Surgut, Russia

In the conditions of Russian North recreation activity is usually carried out by means of latitudinal displacement from North to South and realization of health­related activity. Herein a regular question about of their effectiveness arises. Tradition statistic methods of parameter evaluation of the cardiovascular system (CVS) homeostasis of a person, in this case, show poor efficiency; often they do not show differences between the organism’s state before and after the treatment. *The aim* of the research was to study the effect of latitudinal movements on the process of functional systems changes of children’s organisms. Information on the indices state of cardiovascular system of schoolchildren was acquired by the method of pulseintervalography on the basis of the pulse oximeter “ELOKS­01”. The CVS parameters of schoolchildren were analyzed in the process of latitudinal displacement (from north to south of the Russian Federation and vice versa**).** *The result* of the study showed that a two weeks’ vacation in the south reduced the quasi­attractors’ size of the vector state of children’s organisms in the six­dimensional phase space of states (*m* = 6) and partially normalized the indices of their cardiorespiratory system. The volume of quasi­attractors (*m* = 6) after returning to Surgut decreased 2,3 times in boys and 4,7 times in girls in comparison with the state before leaving to the south. However, the reaction in girls was more expressed and persistent than in boys, who showed a partial return to their original state (before departure) after their return from the south. In fact, girls show an exponential decrease of quasi­attractors volumes, and boys ­ a parabolic type depending on *VG* from the type of stay (registration). Similar dynamics was observed in age­related changes of quasi­attractors volumes of cardiointervals of Khanty women (decrease in volumes with age) and newcomers (they had a parabola for quasi­attractors of cardiointervals). *Conclusion:* calculation of the parameters of CVS quasi­attractors shows a significant difference in all diagnostic parameters from the results of statistical processing of primary data.

**Key words:** chaos, self­organization, cardiorespiratory system

POLYMORPHISM ­786T>C ENDOTHELIAL NO­SYNTHASE AS A RISK FACTOR   
OF ARTERIAL HYPERTENSION

N. A. Bebyakova, O. M. Feliksova, A. V. Khromova, I. A. Shabalina

Northern State Medical University, Arkhangelsk, Russia

A variety of studies demonstrates the association between the ­786T>C polymorphism of eNOS, nitric oxide (NO) level and different parameters of cardiovascular system (CVS). The majority of these studies includes middle­aged and elderly individuals with cardiovascular disorders (CVD), so it is difficult to evaluate the role of genotypes of ­786T>C polymorphism of eNOS in arterial hypertension (AH). *The aim* of this study is to determine the association between ­786T>C polymorphism of eNOS and hemodynamic and vascular risk factors of AH in young healthy adults from European North. *Metods*. 286 healthy young men and women constantly living in Arctic region were examined in this cross­sectional study. Genotyping of ­786T>C polymorphism of eNOS, hemodynamic parameters before and after physical probe (peripheral resistance, arterial pressure, heart rate, pulse pressure etc.), NO and endothelin­1 (ET­1) plasma level, index NO/ET­1 were determined in this study. Statistical methods include Pearson χ2 test. *Results*. The imbalance of vasoactive endothelial factors (which lead to vasoconstriction) and higher incidence of hemodynamic risk factors were revealed in young men with CC genotype. There is no association between CC genotype and NO, ET­1 level and hemodynamics in the group of young women. *Conclusion*. Genotype CC of ­786T>C polymorphism of eNOS can be genetic predictor of AH for young men from European North but not for young women from European North.

**Key words:** ­786T>C polymorphism of eNOS gene, endothelin­1, nitric oxide, arterial hypertension

COMPONENT CHARACTERISTICS OF THE POSTURAL CONTROL IN WOMEN   
55­64 YEARS OLD WITH THE RISK DEVELOPMENT OF THE GERIATRIC SYNDROME   
OF FALLS

© 2018 1А. V. Dyomin, 1,2А. B. Gudkov, 1A. V. Gribanov, 2V. P. Pashchenko, 2O. N. Popova

1Institute of Medical­Biological Research, Northern (Arctic) Federal University, Arkhangelsk;   
2Northern State Medical University, Arkhangelsk, Russia

*The aim* was to define the quality peculiarities of the equilibrium function, the strategy of the body position maintenance and the sensory organization of postural control in women 55­64 years with the risk of geriatric syndrome of falls (GF) development. *Methods*. 88 women aged 55­64 years (mean age 60.2 ± 3.2 years) were examined. The first group, the study group (SG), included 44 women who reported that experienced two or more falls in the last 8 months, which should be considered as having a risk of GF developing. The second group, the comparison group, randomly included 44 women of the same age who had not experienced a single fall in the last 12 months (postural stability). To assess the components of postural control, the Sensory Organization Test (SOT) of the computer dynamic posturographic complex «Smart Equitest Balance Manager» was conducted. *Results*. When analyzing SOT parameters, it was found that women in the SG had a quality decrease of the equilibrium function and the strategy of maintaining the body position in all functional tests, as well as their final grade of the entire test, the participation degree of somatosensorial, visual and vestibular information in the balance monitoring. The most important changes in the SOT parameters that affect the majority of the surveyed women in the SG are reflected in a significant decrease in the quality of the equilibrium function in functional tests 3, 5, 6, and in the final grade of the quality of the equilibrium function in SOT, as well as in the degree of involvement of vestibular information in the balance monitoring, what allows to consider these changes as primary predictors of the development of GF in women aged 55­64 years. *Conclusion*. The significant decrease of the SOT indicators in women aged 55­64 years with the risk of development of GF was detected. It allows to calculate the regulatory parameters of SOT in order to improve the quality of diagnosis of postural changes and the risk of falls.

**Key words:** women 55­64 years old, computer posturography, geriatric syndrome of falls, sensory organization test, postural control, postural balance, postural instability

RETINOL CONTENT AND REPRODUCTIVE DISORDERS IN RESIDENTS   
OF EASTERN SIBERIA (Literature Review)

A. V. Labygina, L. I. Kolesnikova, L. A. Grebenkina, M. A. Darenskaya,   
N. A. Kurashova, M. I. Dolgih, N. V. Semenova, L. V. Natyaganova, \*E. B. Druzhinina

Scientific Сentre for Family Health and Human Reproduction Problems, Irkutsk, Russia;   
\*Irkutsk State Medical Academy of Continuing Education, Irkutsk, Russia

The article presents a literature review on the role of retinol as a component of the systemic metabolism affecting the reproductive system functioning and the consequences of its deficit. The paper presents the analysis of research works of FSBSI “Scientific Center of Family Health Problems and Human Reproduction” on studying reproductive health of the citizens of Eastern Siberia for the last 20 years as well as present knowledge on the relationship of low retinol level and reproductive disorders. Diagnostic results of 2 600 patients, including 2 200 with infertility and more than 400 teenagers from Russian and Buryat ethnic groups from rural areas and cities of Eastern Siberia, as well as the small peoples of the North: the Evenks and the Tofalars were analyzed. The authors found a decrease in the retinol concentration in blood serum of women and men with infertility as well as the growth of combined hormone­dependent diseases associated with a low content of this vitamin in women. The relationship between the content of retinol, α­tocopherol, thyroid hormones and some blood bioelements in women with infertility was detected. The article also presents data on the ethnic features of the metabolic status typical for the indigenous population ­ the Buryats and Tofalars. Retinol decrease in boys ­ Caucasians with hormonal disorders, residing in the industrial city was stated.

**Key words:** reproductive disorders, infertility, retinol deficit, Eastern Siberia

THE USE OF PATIENT­SPECIFIC REGIMENTS IN OBESITY TREATMENT   
AND PREVENTION BASED ON DATA FROM INDIRECT CALORIMETRY

O. V. Sazonova, Yu. V. Myakisheva, L. M. Borodina, M. Yu. Gavryushin, D. O. Gorbachev

Samara State Medical University, Samara, Russia

Excessive intake of nutrient materials combined with low physical activity in modern conditions has led to a high prevalence of obesity among the population. One of the conditions for obesity treatment and prevention is the use of diets based on different diagnostic methods, the effectiveness of some of which remains understudied. *The aim* of this study is efficacy evaluation of personified diets in obesity treatment and prevention on the basis of indirect respiratory calorimetry. *Methods*. The analysis of indicator changes of bioimpedansometry (BIA) in 112 patients with obesity II and III degree during the three­month use of diet therapy based on anthropometric, anamnestic data and BIA results (group 1) as well as respiratory indirect calorimetry (group 2 experienced) was carried out. To conduct the BIA the device ABC­01 MEDASS (Russia), indirect calorimetry ­ CCM Express (Medical Graphics, USA) was used. Data collection was performed in Microsoft Excel 2011, statistical data processing ­ using the computer program Statistica 13.1. *Results*. Analysis of changes of BIA data among patients of the experimental group revealed statistically significant (p = 0.048) differences of average values of parameters obtained before and after therapy. Thus, the reduction in fat mass made up 14.2 %, BMI ­ 9.7 %, and the specific change grew to 3.3 %, which is almost twice the rate of the relevant indicators among the patients in the control group. *Conclusion*. Appliance of the indirect calorimetry method in patients with obesity II and III degree allows to carry out more efficient diet therapy under the control of the objective results except for the subjective factor. The data obtained allows to judge more precisely about susceptibility of a concrete person to the appointed diet, which eventually gives the most adequate result in comparison to the standard practice of destination therapy.

**Key words:** nutrition, nutritional status, obesity, diet, indirect respiratory calorimetry