HEAVY METALS POLLUTION ASSESMENT OF UNDERPOPULATED REGIONS   
USING THE EXAMPLE OF THE NORTH­WESTERN REGION OF RUSSIA

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Two following factors determine the topicality of the preset study: increasing role of recreation branch in the modern Russian economy and necessity to search for unpolluted, “control” territories as a precondition of efficient environmental monitoring. *The goal* of the present paper is to assess the heavy metals (HM) pollution of unpopulated territory using a combined approach. *Methods*. The assessment of HM pollution was made in the part of Volga­Baltic canal and adjacent north ­ western territory of Vologodskaya oblast. The study region is a sparsely populated territory situated far from industrial centers. The samples sediments, fish and mosses were subjected to the “wet” combustion with HNO3 H2O2 mixture. The concentrations of chalcophylic (Cd, Cu, Ni, Pb, Zn) and rear earth elements in these samples (the core sample of bottom sediments, fish muscles caught in Lake Vozhe, Belousovskoye and Vytegorskoye reservoirs and in bog mosses) were determined using ICP­MS DRC­e mass spectrometer. *Results*. The study revealed that increase of Zn and Pb concentrations in the bottom sediments related to its deposition with atmospheric fallout. At the same time, low contents of Ni, Cu, Zn, Cd and Pb in the moss *Sphagnum magellanicu*m may indicate inconsiderable level of atmospheric pollution in previous years. The levels of concentration of these elements in the fish muscles were within the limits legislated by sanitary norms (SanPiN). *Conclusions*. The present study based on the combined approach including analysis of bottom sediment cores, moss and fish tissues allows to make a conclusion that studied unpopulated region of Russia (northwestern part of Vologodskaya oblast) is environmentally clean in respect to heavy metals. Hence, this region may be used for recreation and environmental monitoring.

**Key words:** heavy metals, bottom sediments, bioaccumulation, mosses, fish muscles, ICP­MS DRC­e

INFLUENCE of AIR ENVIRONMENT chemical IMPUTITIES   
ON EXPRESSION OF Toll­like receptors and cytokine levels   
oF adolescents

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Emissions from oil refining, chemical industry, heat power industry, which are located in the Irkutsk region, cause a high level of air pollution in these areas. Personalized approach to assessing the risk of health disorders allows to set taxis to external influence. *The aim* of this study was to assess the level of expression of toll­like receptors (TLR) and cytokine content in adolescents with different risk of formation of the immune system disorders caused by the individual inhalant chemical load. *Methods*. The calculation of the individual chemical load, hazard quotient (HQ) of pollutants and hazard indexes (HI) and dysimmunity for 244 adolescents was carried out based on the data on air pollution and indoor air pollution, the organization of educational process and leisure time, anthropometric and spirometric indices. The content of interleukins­2 and ­10, alpha and gamma interferons in the serum of adolescents was studied by the method of enzyme immunoassay. The level of expression of TLR­2 and TLR­4 was assessed by polymeric chain reaction. *Results*. Persons with an increased risk of developing the immune system pathology were identified as a result of calculating the individual chemical load. It has been stated that the risk of immunity disorders in adolescents living in industrial cities of the Irkutsk region was due to the presence of formaldehyde, nitrogen and sulfur dioxide in the air. While assessing the role of atmospheric and indoor air pollution level in the formation of HQ it was detected that indoor air pollution with formaldehyde was of primary importance. An increase in interleukin­2 and gamma­interferon concentration and decrease in the interleukin­10 concentration was stated with an increase of the air pollution level by chemical impurities that affect the immune system. *Conclusion*. Thus, the presence of relationships between the indicators of the immune system and increase of their expression with an increase of HI indicates mechanisms contingency of pro­ and anti­inflammatory process in the development of adaptive reactions in adolescents under the influence of chemical air pollutants.

**Key words:** risk, adolescents, air pollution, immune system, toll­like receptors, cytokine

ENVIRONMENTAL HEAVY METALS POLLUTION EFFECT   
ON PRESCHOOL CHILDREN’S HEALTH

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The environment is polluted by chemical elements including heavy metals. Heavy metals accumulate in the human’s body and adversely affect the organism, especially child’s body. *The purpose* of this study was to assess the impact of excessive amount of elements on the child’s body. *Method*: The levels of lead (Pb), cadmium (Cd) and strontium (Sr) were determined in urine and hair of 50 children (5­7 years old) by atomic absorption spectrometry in order to study the content of heavy metals in the body. *Results*: It was found that more than 60 % of the children had higher levels of Cd and Pb in the urine. Cd and Pb median in children’s urine in the group with higher content of heavy metals were 0.15 and 1.28 µ/l respectively and in the group within normal range of heavy metals ­ 0.07 and 0.34 µ/l, respectively. In order to assess the impact of excessive amounts of heavy metals on the body the analysis of morbidity was done. Consequently, significant correlation has been established between the level of heavy metals in children’s organism and incidence of upper respiratory tract infections, gastrointestinal tract disorders, anemia and changes in urine. *Conclusion*: Environmental pollution is a strong factor affecting human health and disease development. The impact of the environment on the children’s body in large industrial cities is of particular interest for the development of preventive services and health care.

**Key words***:* environmental pollution, heavy metals, disease, children

HYGIENICAL ASSESSMENT OF FACTORS OF EDUCATIONAL AND PRODUCTION ENVIRONMENT OF CADETS OF HIGHER MARINE EDUCATIONAL INSTITUTION

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The results of factors evaluation of educational and production environment of cadets training at higher marine educational institutions are presented in the paper. It was determined that in the process of professional assimilation of the marine specialties the combination of training and production environment factors affected the cadets organisms, which required considerable stress of adaptation mechanisms of body balance control and could influence the morbidity of this cohort. The complex of leading factors that determined the health state of students of higher marine educational institutions included: microclimate, artificial lighting, noise, vibration, harmful chemical substances in the air of working zones, an increased level of mental stress. The students of all faculties are characterized by a high level of mental stress, which indicates the negative transformation of their emotional and autonomic processes that complicate adaptation to the training environment of marine profession. It is shown that microclimate instability and jet lag when vessels passing to the different climatic areas of the World Ocean exacerbate negative effect of marine environment factors on students health. In the structure of General morbidity of cadets diseases of the respiratory system (62 %); traumas, intoxication and some other consequences of external causes (18.4 %); the nervous system diseases (7.5 %) are dominated. Factors analysis of educational and production environment shows that the cadets health is an indicator of the synergistic negative factors of the training environment that are to be considered while organizing educational and production process and carrying out of preventive measures.

**Key words:** marine cadets, health state, environment, labor conditions

THE IMPACT OF WORKING CONDITIONS ON INDICATORS OF CARDIORESPIRATORY SYSTEM AND BLOOD IN ELECTRIC WELDERS WITH DIFFERENT LENGH OF WORK

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Production environment as part of the individual’s environment consists of the natural­climatic factors and the conditions related to professional activities, which under certain conditions can be harmful. The purpose of the study was to investigate the impact of harmful workplace factors on the organism of a welder. Methods. The characteristic of the sanitary and hygienic working conditions of the welders was given. Parameters of welders’ external respiration were identified using a complex of monitoring cardio­respiratory system and tissues hydration. The indices of peripheral blood (erythrocytes number, hemoglobin content, erythrocyte sedimentation rate, functional state of the cardiovascular system (electrocardiogram, the values of systolic and diastolic blood pressure) and the state of bronchopulmanory ways (according to spirographic and x­ray surveys) were studied. Changes of physiological parameters in workers exposed to health hazards, depending on their length of service and age were indicated. Results. The study results revealed that with increase in work experience of welders, number of people suffering from respiratory diseases, diseases of the musculoskeletal system and myocardial dystrophy also increased. Welding aerosol with high content of manganese and iron is the cause of professional pathologies development such as pneumoconiosis and dust bronchitis. The analysis of welders’ working conditions revealed that the main harmful production factor was the welding aerosol. The workers had an increase in the erythrocyte sedimentation rate, reduction of red blood cells quantity and hemoglobin, neutrocytosis, which might indicate the reduced resistance of the organism and the development of the inflammatory process. Myocardiodystrophy was detected which is characterized by increased blood pressure, complaints of heart stabbing and aching pain, asthenia, fatigability. Conclusion. The results indicate the necessity to carry out routine health screening of the welders at least once a year, as well as preventive and curative interventions aimed at health improvement.

**Key words:** electric welder, cardiovascular system, blood, respiratory system, welding aerosol, myocardiodystrophy

FUNCTIONAL ACTIVITY OF THE ANTIOXIDANT SYSTEM   
OF A PERSON LIVING IN THE NORTH DURING THE YEAR

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*The purpose* is to study the annual dynamics of activity of antioxidant enzymes superoxide dismutase (SOD), glutathione peroxidase (GP), glutathione reductase (GR) of erythrocytes, the content of selenium in blood serum, provision with vitamins A (tocopherol) and E (retinol) in young men (18­22 years), residents of the North (62° northern latitude) and involved in manual work in the open air by trade. *Methods*. The cohort study was carried out. The SOD activity was estimated by quantity of nitro­formazan. GP was estimated by the loss of reduced glutathione at its oxidation with a tret­butil hydroperoxide. GR was estimated by oxidation rate of NADPH. The concentration of retinol and tocopherol was determined on the intensity of lipid extract fluorescence of blood serum. The concentration of selenium in plasma was identified by a fluorimetric method with 2,3 diamino­naphthalene. *Results*. Data analysis showed decrease of SOD activity up to 45.17 ± 0.34 (Òß½.Ññ/ml erythrocytes) during the cold period of the year (November­March) and increase up to 71.09 ± 0.53 (Òß½.Ññ/ml erythrocytes) during the warm period of the year (June ­ August), whereas the activity of GP and GR, selenium level in blood serum increased during the cold period of year and decreased during the warm period of the year. For example, activity of GP was 112.35 ± 6.29 (micron/min./гHb) in November and 35.87 ± 2.47 (micron/min/гHb) in July. The level of tocopherol in the blood serum varied from 2.39 to 6.53 mcg/ml during the year and it was considerably lower than middle­latitude norm (8­15 mcg/ml). The minimum level of tocopherol was in August, September, October, January and maximum in November and March. Dynamics of the content of retinol in the blood serum was similar within a year. Level of retinol had the annual dynamics similar to tocopherol and was at the lower limit of normal (30­80 mcg/ml). *Conclusion*. Seasonal fluctuations of SOD and GP of erythrocytes activity, vitamins’ contents, selenium in blood serum can be treated as adaptation processes of the organism to natural and climatic factors.

**Key words**: antioxidant system, man, North

FACTOR ANALYSIS OF HEMODYNAMICS DAILY PARAMETERS   
IN STUDENTS OF THE NORTHERN MEDICAL UNIVERSITY

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*The purpose* was to find out the hidden common factors characterizing the relationship between the parameters of daily hemodynamics in students of the northern medical university. *Methods*. A factor analysis of hemodynamics data obtained during the daily monitoring of arterial pressure and heart rate in students of Khanty­Mansiysk State Medical Academy (35 boys and 61 girls) was carried out. *Results*. The analysis revealed two factors in groups. According to the first factor, the mesor factor loading of the index of functional changes (r = 0,833) and the daytime values of the IFI (r = 0,923) and the IAD DB (r = 0,708) achieved significant values in the young men. In the girls: SAD (r = 0,862), DBP (r = 0,767) and IFI (r = 0,919), daily SBP values (r = 0,889), DBP (r = 0,867), IFI (r = 0,942), IV DBP (r = 0,713) (total dispersions are 34,37 % and 39,05 %). The second factor included night hemodynamic parameters in both groups. The young men had : IFI night (r = 0,808), SAD night. (r = 0,813), DBP overnight. (r = 0,892), IV SBP overnight. (r = 0,766), IV DBP at night. (r = 0,778), night decrease of SBP (r = –0,822) and DBP (r = –0,806), in girls: SAD night. (r = 0,776), DBP overnight. (r = 0,836), IV DBP of night. (r = 0,740), SB SBP (r = –0,797) and NS DBP (r = –0,865) (the total variance is 23,04 % and 17,68 %). *Conclusion*. Differences were found in the structure of the relationship of hemodynamic indices associated with gender. The first factor was formed by daily and average daily hemodynamic indices; in girls its composition is determined by a large number of variables 7 against 3 in boys. The second factor was formed by the night values of hemodynamic indices in both groups. Day and night indices of hemodynamics did not correlate.

**Key words:** students, hemodynamics, daily monitoring, factor analysis

Interrelations of somatometric characteristics, hemodynamic   
and capillary blood flow INDICES in young males of THE Magadan region

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*Goals.* Revealing of physiological interrelations of the indicators of anthropometry, microhemocirculation, cardic hemo dynamic and physical development in young men­ natives of the North. *Methods.* 160 young men aged 17­21, natives of the Magadan region in 1­2 generations took part in the study. Using a method of computer capillaroscopy morphometric structure of capillary and erythrocyte velocity at the nailfold capillaries was studied. The main somatometric indices, as well as, cardiovascular indices and integral rheography were measured. *Results*. Subjects’ typing into groups was made according to capillary blood flow velocity. Interrelation was found between the variability of somatometric characteristics and the body functional state with capillary blood flow velocity. The analysis of the main cardiogeodynamic characteristics showed that in the group with a high capillary blood flow velocity the systolic and diastolic blood pressure values were significantly higher than in the group with a low velocity and consequently were significantly beyond the limits of normal for this age group in accordance to the recommendations of the All­Russian Scientific Society of Cardiology. *Conclusions.* The obtained results allow to put off capillary blood flow velocity as the informative typifying marker in cardiohemodynamics estimation. The efficiency of systemic blood circulation in subjects with higher capillary blood flow velocity is higher than in other groups. At the same time none of the groups had an optimal level of hemodynamics, which is due to adaptive physiological alternation of natives­Caucasoids of the Far North in comparison with higher blood pressure indices of their peers ­ inhabitants of the regions with more favorable climatic conditions.

**Key words**: north, young males, somatometry, central hemodynamics, microcirculation, typification

ALCOHOL CONTRIBUTION TO MORTALITY FROM EXTERNAL REASONS

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*The aim* of the study is to compare the visibility and, possibly, the objectivity of various mathematical techniques to identify the connection between mortality and certain external causes with the previous alcohol consumption. *Methods*. A frequency analysis was carried out on the basis of 4,768 acts of forensic, forensic histologic and forensic and chemical examination of dead bodies, residents of Cheboksary and Novocheboksarsk cities copied out in the Republican Office of the Chief Medical Examiner (Ministry of Health of Chuvashia) for the period 1997­2002 with confirmed posthumous presence or absence of alcohol in the blood. The dead bodies were classified by sex, age, ethanol concentration in the blood, forensic medical diagnoses (ciphers ICD10: T58, T68, T15­T19, T66­T78, S00­S09, I250, I200­I209, I241­I249, I252­I259, T00­T07, S00­S39). The data obtained were investigated by the methods of correlation analysis (Spirman), Kolmogorov­Smirnov with Lillieforce correction, xi­square (χ2). *Results*. The alcohol intake immediately before the event increased the risk of death from hypothermia (the proportion of people died with alcohol in the blood 2.10 ‰ ­ 74.07 %), by drowning (2.69 ‰ ­ 73.08 %) and asphyxia of upper airway (2.57 ‰ ­ 73.68 %), but did not affect death frequency from head trauma, sudden cardiac death, pedestrian accidents and murders. Of all the investigated death causes the maximum was in the range of posthumous alcohol content in the blood 1­3.9 ‰. The most effective method of connection detection between alcohol consumption and the risk of death from any causes was calculation of rank correlation between birth cohorts divided into two subgroups based on the principle of presence or absence of alcohol in the blood of postmortem. In addition, to determine the alcohol effect on mortality increase from any causes, it is necessary to compare the sex­disaggregated samples of individuals whose blood was found posthumously and those without alcohol in the blood. *Conclusion*. Standardization of methods of statistical analysis of alcohol consumption with any death cause is necessary.

**Key words:** аlcohol, mortality from external causes, grouping by gender and birth cohorts

AVASCULAR NECROSIS OF THE FEMORAL HEAD (Literature Review)

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The problem of diagnostics and treatment of avascular necrosis of the femoral head is relevant at the present stage. Late diagnostics of this disease leads to a radical operation of hip arthroplasty, which does not always favorably affect the quality of life of young and mature patients, when the primary intervention is not final and the revision arthroplasty is required in the dynamics. Information on modern diagnostic capabilities and a differentiated approach to the choice of treatment methods depending on the stage of avascular necrosis of the femoral head is the purpose of this review. 55 national and international sources have been analyzed in this paper. Data on the etiology and pathogenesis of the disease, classifications, possible variants of clinical manifestations of the process, detailed results of additional survey methods in a comparative perspective, including early stages of the disease and possible methods of conservative and operative treatment depending on the stage of the disease are presented in this review. The introduction into practice of decompression surgical methods of treatment, the use of biocomposite materials, vascularized bone grafts to fill the bone cavity allows us to look optimistically at the prospects of methods development for treating this pathology.

**Key words:** aseptic, avascular necrosis of the femoral head