NEW TECHNOLOGIES FOR WATER DECONTAMINATION FROM RADIONUCLIDES   
AND INCREASING ITS BIOTROPISM

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Under discussion are the results of testing the sorption properties of new filtering materials like CARBOVER (Russian: КАРБОВЕР), which is plasma combination of carbon composite with exfoliated vermiculite surface, and plasma­stimulated carbon material (Russian: ПСУМ), derived from the nanotechnology suggested. The evaluation of sorption properties of the filtering materials has been done for main natural radionuclides of sanitary importance contained in fresh water (226Ra, 210Pb, 210Po, 238U). According to the data of predesigned experiments, the nanotechnology used has been proved effective. The nanotechnology enables plasma stimulation of carbon materials to create sorbents, which are composites with prescribed properties. The key point of the given technology is decomposition of hydrocarbons caused by low­temperature plasma. In the function of low­temperature plasma arc­vacuum discharge plasma is used, with the discharge burning in vapors of graphite cathode. The sorption processes of natural radionuclide 226Ra by these filtering materials are examined in most details. Plasma­stimulated carbon material (in pure form) demonstrates high sorption performance in case of natural radionuclide 226Ra in water. After filtration of distilled water with 226Ra dispersed in it, the specific radioactivity in water has become at least 100 times less. This equally refers to the natural radionuclides 224Ra and 228Ra, which are chemically identical to the 226Ra. The suggested composite filtering material CARBOVER, based on exfoliated vermiculite from the composition of plasma­stimulated carbon material, also has high sorption qualities against the mentioned radionuclides most common in ground waters (with reduction of their specific radioactivity in filtered water of up to 80 %). As well under consideration are topical issues of obtaining biotropic water, which has the ability to strengthen the interfacing between biopolymer macromolecules and water clusters. A number of scientific and technical solutions discussed in the paper have patent protection.

**Keywords:** free radicals, the filter material, sorption activity, sorption capacity, biotropic water

THE IMMUNE STATUS AMONG HEALTH WORKERS OF MEDICAL INSTITUTIONS   
OF THE EUROPEAN NORTH OF RUSSIA (ARKHANGELSK)   
AND THE KOLA NORTH (REVDA)

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The results of the comparative analysis of the condition of immune system of medical workers living and working in different climatic and social conditions in Arkhangelsk and in Revda (Murmansk region) are presented. We have analyzed the results of immunological examination of 107 people working in medical institutions of Arkhangelsk and Revda. We studied the concentration of leukocytes, neutrophils, eosinophils, monocytes, lymphocytes, phagocytic index, the phenotypes of T­ and B­lymphocytes, cytokines, CEA, immunoglobulins. Doctor`s work is associated with activization of the cell­bound and the antibody­producing immune reactions with increase in blood of natural killers and cytotoxic lymphocytes with phenotype CD8+, and also IgA and IgE. This reaction is less expressed among working people in the Polar region and it seems it may be explained by some of inhibiting factors. It is lymphopenia, deficit of mature T­ cells with phenotype CD3+, low concentration of IL­6 and CEA, higher level concentration of IL­10. The features of immune background of health workers from Revda can be caused by climate ­ecological living conditions.

**Keywords:** North, immune system, health workers

INFANTS’ PROVISION WITH VITAMIN D IN ARKHANGELSK REGION

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The problem of provision infants with vitamin D is paid careful attention in modern medicine nowadays. Prevention and correction of vitamin D deficiency are the most important tasks for the pediatric community. Special attention should be paid on providing infants living in the Arctic and Subarctic regions with vitamin D where the risk of vitamin D deficiency is high due to the low insolation level and severe climate conditions. Methods: children under the age of 3 years (n = 214) of both sexes from Arkhangelsk region were examined in spring­autumn period between 2013 and 2014. Blood sample was taken for estimating 25­OH vitamin D concentration. Objective: to estimate provision of infants living in the Arkhangelsk region with vitamin D. Results: vitamin D deficiency (25­OH vitamin D blood plasma concentration lower than 30 ng/ml) is detected in 56 % of children under the age of 3, decline of vitamin D provision has been resisted with age. Conclusion: high incidence of vitamin D deficiency has been detected in young children living in Arkhangelsk region. It requires implementation of preventive programmes.

**Keywords:** vitamin D, vitamin D lack and deficiency, infants

CAPILLARY AND MICROCIRCULATION STRUCTURE OBSERVED IN ABORIGINES   
AND NORTH­BORN CAUCASOIDS RESIDENTS OF RUSSISA’S EXTREME NORTH­EAST

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The results of the comparative analysis of morphofunctional parameters in nail­bed skin fold capillaries in male Aborigines and north­born Caucasoids (residents of Chukotka Autonomous District) examined at rest and rerespiration test are presented in the paper. The intravital study of capillary morphometric structure and erythrocyte motion speed in arterial and venous circulation was carried out using “Capillaroscan­01” complex developed in Skolkovo innovation centre. It was found out that the structure and characteristics of microcirculation in Aborigines differed significantly from those in Europeans North natives in the 1st–2rd generation. Aborigines of Chukotka Autonomous District, as compared to Caucasoids of the same age, demonstrated bigger diameter of the arterial link at higher blood flow speed that set better conditions for erythrocyte laminar motion. Besides, it turned out that, short­term rerespiration test in confined space without carbon­dioxide adsorption, despite the evident hypoxic­hypercapnic effect, did not influence morphofunctional parameters of microcirculation of the surveyed. Apparently, the capillary microcirculation structure specific for Aboriginals provided the body surface temperature maintenance and heat conservation much better than in Caucasoids born in the north and living in the same climatic conditions.

**Keywords:** North, Aborigines, Caucasoids, microcirculation, capillaroscopy, rerespiration

CORRELATION OF THE SHEDDING OF LYMPHOCYTES RECEPTORS WITH PARAMETERS OF IMMUNOLOGIC REACTIVITY IN RESIDENTS OF THE NORTH

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The study retrospectively investigated correlation characteristics of membrane and soluble forms of lymphocyte receptors in 78 healthy people living in the city of Arkhangelsk. The results of a statistical analysis allowed to evaluate the relationship of dynamic indices of shedding lymphocyte receptors CD23 and CD80 to the immunological reactivity indices. It was found that the receptors’ shedding was not associated with the processes of proliferation and activation of immune cells, and the receptors abscission occurred by postmitotic mature cells. A high ratio reflecting the relationship of shedding activity of membrane forms of lymphocyte with cytokine IL­1 and IL­10 in the extracellular medium was a reflection of the biological processes regulating the in the form of feedback: increasing of receptor concentration in the extracellular medium by means of cytokine blocked cell receptor expression. Low values of the analyzed indices for CD95 receptor indicated that the cells got free from unnecessary receptor substances in the course of performing its function did not undergo apoptosis. Accumulation of receptors extracellular pool was provided by phagocytosis deficiency. Increase of phagocytosis intensity at a maximum concentration of free receptors was due to the necessity of urgent prevention of unwanted substances accumulation in the blood serum.

**Keywords:** shedding of lymphocyte receptors, CD23, CD80, cytokine, phagocytic activity

AGE CHARACTERISTICS OF POSTURAL CONTROL COMPONENTS   
IN WOMEN 55­64 YEARS OLD

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The purpose of the study was to reveal age characteristics of the components of postural control in women 55­64 years old. Computer dynamic stabilometrical complex «Smart Equitest Balance Manager» was used for the comprehensive evaluation of the equilibrium function in elderly women. The following tests were used: Sensory Organization Test (SOT), Motor Control Test (MCT), Rhythmic Weight Shift (RWS). On the basis of the analysis of postural control parameters and according to the SOT data, we have found a quality decrease of the equilibrium function in the functional tests 1­4, as well as reduction in the degree of involvement of the somatosensory information in the balance control in women after 59 years. In addition, comparative analysis also revealed a weakening of postural strategy in all six functional tests SOT. However, no age­related changes have been found in the quality of the equilibrium function (functional tests 5 and 6), being the result of SOT assessment, as well as the degree of involvement of visual and vestibular information in the balance control. The analysis of the MCT test has shown deceleration of coordinated motor reactions. RWS test analysis has shown that women from 59 years had a quality deterioration of gravity control center while moving in the frontal and sagittal directions, as well as speed reduction of the gravity center movements in the sagittal direction.

**Keywords:** computer posturography, postural control, elderly women, geriatric fallers

ASSESSMENT OF THE ROLE OF SELECTED COMORBIDITIES ON OVERALL ­   
AND CARDIOVASCULAR MORTALITY IN SOUTHERN KAZAKHSTAN:   
A 12­YEARS FOLLOW­UP STUDY

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The aim of the study was to assess survival of patients with isolated and combined disorders of circulatory system and diabetes mellitus in Turkestan region, Southern Kazakhstan. Altogether, 1 143 randomly selected individuals comprised a cohort, which was followed up from 2003 through 2015. Data on diagnosis, age, gender, body mass index, smoking and alcohol consumption were collected by trained medical interviewers. Bivariate comparisons of survival between groups with no cardiovascular diseases and groups with isolated and combined disorders were performed using Kaplan­Meier analysis. Independent associations between the studied factors and overall mortality as well as mortality from cardiovascular causes were assessed using Cox regression. Crude and adjusted hazard ratios (HR) were calculated with 95 % confidence intervals (CI). The overall mortality in the cohort was 145 per 1 000 with cardiovascular causes accounting for 49 % of deaths during the study period. The risk of death from any cause was increased for individuals who had arterial hypertension and diabetes mellitus (HR = 4.6, 95 % CI: 1.4­15.3) and combined arterial hypertension, cardiac ischemia and diabetes mellitus (HR = 7.0, 95 % CI: 2.1­26.1) in fully adjusted Cox regression model. The risk of cardiovascular death was increased among patients with isolated cardiac ischemia (HR = 2.7, 95 % CI: 1.1­6.8) and among those with combined arterial hypertension and diabetes mellitus (HR = 8.7, 95 % CI: 2.5­30.4) adjusted for gender, age, smoke, alcohol consumption and body mass index. Combined disorders of circulatory system and diabetes mellitus considerably increase the risk of death in Turkestan region, Southern Kazakhstan warranting urgent need for evidence­based treatment of comorbidities and development of preventive programs.

**Keywords:** comorbidity, arterial hypertension, diabetes mellitus, cardiac ischemia, mortality, hazard ratio, survival analysis

EXPERIMENTAL STUDIES IN MEDICINE AND PUBLIC HEALTH:   
PLANNING, DATA ANALYSIS, INTERPRETATION OF RESULTS

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In this paper we present the basics of planning, carrying out and statistical analysis of experimental studies. We describe the most common types of experimental studies, interpretation of results as well as the main advantages and disadvantages of these studies. Practical examples of experimental studies with step­by­step algorithms of sample size calculation and statistical data analysis using formulas and free software are presented. Moreover, we present a few international and local examples of experimental studies in the fields of clinical medicine and public health.

**Key words:** experimental study, clinical trial, randomization, blinding, placebo

**STATE POLICY ON HEALTH PROMOTION OF THE RUSSIAN NATION**

**Onishchenko G. G.**