ASSESSMENT OF THE RISK MORTALITY FROM THERMAL WAVES   
IN KRASNOYARSK CITY

1,2D. A. Chernykh, 1,3O. V. Taseiko

1Institute of Computational Technologies of the Siberian of the Russian Academy of Sciences, Krasnoyarsk; 2Siberian Federal University, Krasnoyarsk; 3Reshetnev Siberian State University of Science and Technology, Krasnoyarsk, Russia

*Objective*. The main goal of this article is to estimate an influence of thermal wave on population mortality of Krasnoyarsk city. *Methods*. The temperature waves’ identification was carried out by method of long­term classification of mean daily temperature. To define relative mortality increase during thermal wave over background mortality a relative risk (RR) was revealed and calculated as maximum of RR values in different lags from 0 to maximal acceptable lags. *Results*. Daily mortality of Krasnoyarsk population has been studied for 10 years. The indices were divided into four age groups (0­17, 18­29, 30­64 and 65 years and older). Three groups that caused mortality have been marked: circulatory diseases, diseases of respiratory system and external causes. To assess the proportion of the population exposed to the influence of temperature waves a relative risk (RR or RR) was calculated. To compare the population mortality risk from thermal waves with other risks expectance of thermal waves’ rising, death expectance during the thermal waves and the risk of mortality increase from thermal waves were calculated. *Conclusions*. The study results allow to state that the thermal waves (both heat and cold) have a greater negative effect on death from circulatory diseases in the age group 65+, with the risk magnitude from heat waves 4,4·10­3 and from cold ­ 4,81·10­3.

**Keywords:** heat wave, cold wave, relative risk of mortality, threshold temperature

THE RELATIONSHIP BETWEEN GLOBAL ENVIRONMENTAL PROBLEMS,   
POPULATION HEALTH, AND DEVELOPMENT OF NUCLEAR POWER INDUSTRY

Vladimir Grachev

A. N. Frumkin Institute of Physical Chemistry and Electrochemistry of the Russian Academy of Sciences,   
Moscow, Russia

The article describes the relationship of global environmental problems and population health with development of nuclear power industry. Atomic energy industry does not consume oxygen and emit greenhouse gases. European countries with a highly developed atomic energy industry are recognized as ecologically clean regions of Europe. World nuclear industry reduces the worldwide coal combustion by 440 million tons. In Russia, the occupational diseases are not as frequently encountered in the cities with nuclear facilities as in Russia as a whole in spite of the fact that in these cities the surveys are conducted more often and cover a greater amount of people. The exposure due to exploitation of man­made radiation sources is 0.14 %, and from nuclear power plants ­ 0.01 % of the total radiation dose, which is 100 times lower than the norm ­ 1 mSv/year. The authors have studied the influence of nuclear power industry on human health and have proved that the fears associated with risks are exaggerated. The risk­based approach speaks volumes for the nuclear power industry’s advantages and safety for population health. According to sociologists, the support for atomic energy industry is constantly growing.

**Keywords:** global environmental problems, risk­based approach to nuclear power industry, influence of nuclear power industry on population health

ECOLOGICAL SAFETY IN PLANT INTRODUCTION IN URBAN LANDSCAPE  
OF THE EUROPEAN NORTH

1A. N. Nikanov, 2V. K. Zhirov, 2A. N. Kizeev, 1N. M. Frolova, 3O. N. Popova, 4N. V. Sturlis

1Northwest Public Health Research Center, Saint­Petersburg; 2Polar­Alpine Botanical Garden and Institute   
named after N. A. Avrorin, the Kola Science Centre of the Russian Academy of Sciences, Apatity;   
3Northern State Medical University, Arkhangelsk;   
4Northern (Arctic) Federal University named after M. V. Lomonosov, Arkhangelsk, Russia

The problem of ecological safety of exploitation of the territories exposed to anthropogenic influence can be considered within the framework of reclamation of the disturbed vegetative cover, and subsequent use of the greening material for nutrition and pharmacological purposes. To date, for the northern regions that are part of the federal property, in accordance with the federal laws and standards. With further expansion of this assortment, it is necessary to take into account not only the presence of new plant species in local conditions, but also their synthesis of nutrient and pharmacologically valuable compounds. These include, in particular, polyunsaturated fatty acids (PUFA), which are anti­sclerotic and are involved in the mechanism of regulation of cholesterol level in the blood. In this work Euonymus Europaea L. is for the first time considered from this point of view. The results of analysis of the content of high fatty acids in the pericarp of its fruits at different stages of maturation are shown. It is found out that PUFA content of the lipid fraction of the total lipid fraction is significantly higher than that of saturated fatty acids. The distribution of fatty acids by groups is shown depending on the content of double bounds in their molecules. The results obtained are evidence of the expedience of analyzing the lipid acid contents of plant fruits. As an environmentally safe and pharmacologically valuable object from this point of view, European sprouts Euonymus Europaea L. can be recommended for cultivation on anthropogenically contaminated territories of the European North.

**Keywords:** the European North, introduction of plants, resistance, European spindle Euonymus Europaea L., fruits, polyunsaturated fatty acids

**Библиографическая ссылка:**

*Никанов А. Н., Жиров В. К., Кизеев А. Н., Фролова Н. М., Попова О. Н. , Стурлис Н. В.* Экологическая безопасность при интродукции растений в городские ландшафты Европейского Севера // Экология человека. 2018. № 2. С. 16–20.

Nikanov A. N., Zhirov V. K., Kizeev A. N., Frolova N. M., Popova O. N., Sturlis N. V. Ecological Safety in Plant Introduction in Urban Landscape of the European North. *Ekologiya cheloveka* [Human Ecology]. 2018, 2, pp. 16­20.

PRODUCTION AND IN VIVO TOXICITY TESTING   
OF MICROCRYSTALLINE CELLULOSE DERIVED FROM BACTERIAL CELLULOSE

1К. S. Bolotova, 2O. V. Buyuklinskaya, 2А. S. Chistyakova, 3О. V. Travina, 1D. G. Chukhchin

1 Northern (Arctic) Federal University, Arkhangelsk; 2 Northern State Medical University, Arkhangelsk;   
3Federal Center for Integrated Arctic Research of Russian Academy of Sciences, Arkhangelsk, Russia

The aim of the present research is production of microcrystalline cellulose (MCC) derived from bacterial cellulose and estimation of MCC micromorphological and toxicological characteristics. The microcrystalline cellulose was derived from bacterial cellulose using acid hydrolysis. Shape and size of the MCC microcrystallites were studied using scanning electron microscopy. Preclinical toxicity testing of the MCC preparations included acute and subacute toxicity experiments. The micromorphological characteristics of fibrillar structure of bacterial cellulose and MCC microcrystallites derived from bacterial cellulose were visualized as a study result. It has been stated that microcrystallites of bacterial MCC had a prolate form in comparison with plant (cotton) MCC. Short fusiform shape of microcrystallites is shown for the plant MCC. The diameter of the microcrystallites derived from bacterial cellulose reduced after hydrolysis without shortening in microcrystallites length. Consequently, the amorphous parts are located substantially on the surface of the fusiform body. The analysis of the study results of acute and subacute toxicity has shown that intragastric MCC administration by fixed dose 4,9 ­ 43,4 ­ 434,8 mg/kg to the experimental animals (white non­pedigree rats) did not kill them or deviate from normal physical state. It was found that bacterial MCC may be classified in accordance with State standard GOST 121007­76 (State standard on harmful substance) as IV hazard class “low­hazard substance”.

**Keywords:** bacterial cellulose, microcrystalline cellulose, microcrystallite, acute toxicity, subacute toxicity

BIOLOGICAL AGE OF MEN ­ ROTATION WORKERS OF ARCTIC, RESIDENTS   
OF THE SOUTHERN PART OF TYUMEN REGION ­ A COMPARATIVE STUDY

1,2A. М. Durov, 2D. G. Gubin, 1N. Ya. Prokopiev, 3V. P. Zuevsky, 2S. V. Solovieva

1Tyumen State University, Tyumen; 2Tyumen State Medical University, Tyumen;   
3Khanty­Mansiysk State Medical Academy, Khanty­Mansiysk, Russia

*Objective*. To study circadian rhythms of the cardiovascular and respiratory system variables and to evaluate biological age in people of adult men, involved in Arctic Sojourn vs. residents of the of the Tyumen region South. *Methods*. Functional indices of the cardiovascular system and external respiration were studied four times a day at 8, 12, 16 and 20 hours in 34 men (mean age 30.1 ± 0.8 years), long time working in the village of Kharasavey (The Arctic group), and 30 men aged 37.0 ± 1.0 years living and working in the South of the Tyumen region (Tyumen Control group). Biological age was estimated in the both groups on the basis of chronobiological approach. *Results*. Circadian rhythms of the cardiovascular and respiratory system indices in men in the Control group were more robust than that of the Arctic group. This was manifested in higher values of amplitudes and more stable acrophases. Diurnal rhythm amplitudes of the number of variables (systolic blood pressure, pulse pressure, vital capacity of lungs) of the Control group were significantly higher than those of the Arctic group. *Conclusions*. The structure of biological rhythms of physiological parameters (especially amplitude) is a sensitive indicator of the functional state of humans and can be successfully used to assess biological age. The biological age of the Arctic group men more profoundly exceeded chronological age compared to men working in the South region.

**Keywords**: Arctic, chronobiology, biological age, circadian rhythms, adult men

Seasonal changes in indicators of the immune   
and endocrine systems of athletes in the natural   
and climatic conditions of the Middle Ob region

A. E. Gubina, An. P. Koynosov

Khanty­Mansiysk State Medical Academy, Khanty­Mansiysk, Russia

The article presents the study results of some indicators of the immune and endocrine systems of young men and women with high physical activity during the year periods with the minimum and maximum duration of daylight. The study involved 60 sportsmen of high qualification (40 women and 20 men). The amount of physical activity of the surveyed ranged from 18 to 32 hours a week. Type of the research is observational (longitudinal). The method of sampling is non­randomized. The following parameters were studied: immunoglobulins A, M, G, free triiodothyronine and thyroxine, thyroid­stimulating hormone, cortisol, total testosterone, dehydroepiandrosterone sulfate. The study revealed that young men and women with high physical activity had a statistically significant seasonal changes in blood levels of immunoglobulin M and G, thyroid hormones, correlations between north and sports experience and investigated blood parameters. A statistically significant trend has been revealed, which indicated an increase in the functional activity of steroid hormones during the maximum duration of daylight. The obtained results testify to the optimal adaptation of the immune and endocrine systems of athletes to specific climatic and geophysical conditions of the North and intensive physical loads, which consists in changing the reactivity of the humoral link of immunity, thyroid hormone activity, adrenal cortex and gonads. The individual values of the studied indicators did not exceed the limits of physiological standards.

**Keywords:** athlete, adaptation, immunoglobulins, thyroid hormones, thyroid stimulating hormone, cortisol, testosterone, dehydroepiandrosterone sulfate

PSYCHOPHYSIOLOGICAL CHARACTERISTICS OF CHILDREN   
WITH AGGRESSIVE BEHAVIOR

M. N. Pankov, I. S. Kozhevnikova, E. Yu. Sidorova, A. V. Gribanov, L. F. Startseva

Northern Arctic University named after M. V. Lomonosov, Arkhangelsk, Russia

The article presents a review of research on the problem of aggressive forms of behavior in children. Scholarly knowledge of definitions "aggression" and "aggressiveness" has being deepened and discovered. An available data analysis on dependence of the aggressiveness level on the features of the central nervous system functioning, psychological and social attitude of the individual has been carried out. The concepts of positive and negative aggression were indicated. A psychophysiological approach to aggressiveness has been considered, based on the study of the activity of various parts of the brain and characteristics of its functional status in children with aggressive behavior. Electroencephalographic markers in children with aggressive forms of behavior are appearance of cortical asymmetry associated with a slow­wave activity increase. Changes in indices of event­related potentials allow to suggest that aggressive individuals have certain cognitive impairments, in particular, problems with memory. According to the level registration of the brain constant potential, aggressive behavior leads to a significant increase in energy costs of the right hemisphere. Children with aggressive behavior are characterized by a disruption in the processing of incoming information, a hyperactive behavioral activation system and underactive behavioral inhibition system. An integrated approach in assessing the aggressiveness of children is based on interaction peculiarities of biological, psychophysiological and psychosocial factors, taking into account possibility of comorbid conditions development.

**Key words:** aggression, children, psychophysiological characteristics

PROFESSIONAL BURNOUT AND TIME PERCEPTION   
IN POSTTRAUMATIC STRESS DISORDER

V. Yu. Slabinsky, \*N. M. Voishcheva, E. I. Chekhlatyi, S. A. Podsadnyi

Saint Petersburg State University, Saint Petersburg; \*Scientific and Technical Center of innovative technologies, Saint Petersburg, Russia

The professional burnout and its prevention is one of the central issues in clinical psychology and organizational psychology. Despite a big array of this subject publications, the study of professional burnout predictors and search for the tools providing its effective prevention continues. *Objective:* studying of individual psychological characteristics of persons with PTSD within the framework of professional burnout and proactive coping. Type of the study: analytic, prospective. Sampling: 148 people who sought psychotherapy, of which Group 1 is comprised of people with PTSD ­ 65 people, and Group 2 is comprised of people without PTSD ­ 83 people. *Methods of research* ­ psychological tests: “Zimbardo Time Perspective Inventory» (ZTPI), “Maslach Burnout Inventory” (MBI), “Proactive Coping Inventory” (PCI), “BAK­conflict”. *Results*: According to the MBI questionnaire, 75 % of the people examined in Group 1 and 28 % those in Group 2 had high and extremely high rates of professional burnout; differences on the scales of the ZTPI questionnaire are “negative past” and “fatalistic present”. According to the “BAK­conflict” questionnaire, the following indicators were detected in Group 1: low self­esteem, poor quality of relationships in a dyad (the “You sphere”) and relationships in a team (the “Us sphere”); disorders of perception of time parameters (the “Grand­Us sphere”); as well as the risk factors of psychosomatic diseases ­ an excess in the corporeality sphere, a deficit in the spheres of sociability and spirituality. According to the PCI questionnaire in Group 1, the subjects used "proactive overcoming", “reflexive overcoming”, “preventive overcoming”, and the "search for emotional support”. *Conclusions*: Due to the changes in perception of time (the predominance of negative past and fatalistic present) patients with PTSD undergo a deformation of the personality relations system of attitudes and a reduction of proactive coping, which may be a cause of relations development. For the prevention of relationships in individuals with PTSD during the psychotherapeutic intervention it is necessary to take into account the "traumatic experience", to form a strong "Me­concept" of the personality based on the adequate development of the perception of time, harmonious You­relations, relying on the experience of ancestors (Grand­Us) that allows to reduce the importance of the “negative past” and the "fatalistic present," and to build a long­term perspective of the future.

**Keywords:** professional burnout, PTSD, stress, proactive coping, locus of time, psychology of relationships

PROVIDING A COMFORTABLE LIFE ACTIVITY IN THE ARCTIC:   
PROBLEMS AND CHALLENGES

V. I. Pavlenko, \*S. Yu. Kutsenko

Institute of Geology of Ore Deposits, Petrography, Mineralogy and Geochemistry Russian Academy of Sciences, Moscow; \*Federal Center for Integrated Arctic Research of the Russian Academy of Sciences, Arkhangelsk, Russia

The article contains reasoned proposals on solving the most important problems of perspective development of the Arctic zone territories of the Russian Federation (Russian Arctic) ­ the consolidation of the population as the main productive force for implementation of the objectives of the state policy of the Russian Federation in the Arctic and the Strategy for socio­economic development of the Russian Arctic and ensuring national security up to 2020. Above mentioned documents as well as the State program of socio­economic development of the Russian Arctic up to 2020 are aimed at achieving a high indicators of a macroregion development, including science and technology development, improvement of the effectiveness of resources utilization of the Arctic zone and continental shelf of the Russian Federation in the Arctic and efficiency improvement of the state management of socio­economic development of the Arctic zone and the quality of life of the population of the Arctic zone. The implementation of the state program should create conditions for accelerated socio­economic development of the Arctic zone, the achievement of the strategic interests and national security of Russia in the Arctic. Among the main tools of its implementation is the creation of economic growth points ­ index zones. It is obvious that to achieve ambitious aims in production sphere it is necessary to relay on the labour resources of appropriate magnitude and professional training. However, the statistical information analysis on dynamics and factors changes in the population base of subjects of federation and the Arctic municipal formations allowed to detect a systematic outflow of labour resources of the macroregion during the last 10 years. Only in 2015 it amounted 22 835 people of working age. Sociological surveys allowed to discover the main reasons for sustainable migration from the Russian Arctic areas. They are: reduction of labor application area and extreme dissatisfaction with the living conditions (quality of housing and lack of opportunities to improve housing conditions, low level of social sphere development). The criteria for "comfortable living", is at a forefront of the population migration from even large settlements – index zones of the Arctic development.

**Keywords:** Arctic zone of the Russian Federation, social policy, life activity, support mechanisms, infrastructure

IS IT POSSIBLE TO SLOW DOWN COGNITIVE AGING OR BENEFITS   
OF EDUCATION IN MIDDLE AND LATE ADULTHOOD

1E. V. Belovol, 2Z. V. Boyko, 2I. V. Radysh, 3E.Yu. Shurupova, 2V. I. Torshyn, 2B. B. Radysh

1Moscow State Pedagogical University, developmental psychology chair, Moscow;

2Peoples’ Friendship University of Russia, Nursing Management Chair, Moskow;

3Centre for psychological support of children and adolescents, Moskow, Russia

The results of longitudinal study on influence of education in middle and late adulthood on cognitive processing are analyzed in the article. The research has been conducted since the October 2014 and 21 persons aged 51­63 participate in it. All participants are the students of the program for professional retraining in “Practical Psychology”. The duration of the program is 2.5 years. All participants are pensioners university­educated in different spheres (engineering, economy, teaching etc.) and did not work at the beginning of the program. Learning psychology was a new sphere for all of them and this was a key point for the research. Characteristics of cognitive processes were measured every two months along with person’s psychological status and the level of psychological comfort. The study has found that the education in middle and late adulthood led to positive changing in cognitive sphere and increase in subjective well­being indices. Statistically significant changes were observed since the second term of learning. The participants re­imagined their own cognitive functioning; they considered that their memory, attention, efficiency and cognitive awareness became more effective while objective data did not confirm the latter. Substantial improvement in cognitive functioning became observable only at the end of the second term after half ­ year training. So, the study demonstrated possibility to change psychological status and cognitive functioning of middle aged and elderly people during acquirement.

**Keywords:** brain aging, reduction in effectiveness of cognitive processes, education of elderly, subjective well­being