HUMAN WORKING CAPACITY IN PERIODIC STAY IN HYPOXIC AIR ENVIRONMENTS, REDUCING THE FIRE HAZARD OF SEALED OBJECTS

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*The aim* ­ assessment of the impact on human working capacity of prolonged (up to 60 days) periodic (4 hours per day) stay in normobaric hypoxic air environments (NHAE) ([O2] = 16­17 % vol., [CO2] up to 0.8 % vol., nitrogen ­ the rest) reducing the fire hazard of sealed inhabited objects (SIO). *Methods*. The type of the research: prospective cohort. As the main group of volunteers, 6 men aged 21­25 years were examined, as a control group ­ 20 men of the same age. Volunteers of the main group stayed in a sealed room daily for 60 days 4 hours per day with the specified NHAE and performed the working program simulating the activity of the SIO personnel. Persons of the control group, also stayed in a deemed sealed room daily for 60 days 4 hours per day with the normal external conditions and performed work of a similar nature and duration. With a frequency of one times in 2 weeks the physical (test PWC170) and mental (test “Route”) working capacity of volunteers was assessed. *Results*. It was shown that stay in the specified NHAE was followed by a decline in physical and mental working capacity of the test persons. However, the level of these changes was low, not exceeding 6.5­6.2 % of baseline. In the process of testing adaptive reactions formed in the body of volunteers, which allowed to increase significantly the resistance of the body to hypoxia and ensure the maintenance of a normal level of performance during the entire period of testing. After the end of the experiment, the working capacity indicators of the main group exceeded both the initial values and similar indicators in the control group. *Conclusion*. The data obtained justify the admissibility of the formation of such NHAE on SIO to improve their fire safety. Whereby no significant changes were revealed in the functional state and different activity in the subjects of the main group.

**Key words:** fire safety of sealed objects, hypoxic air environments, physical and mental working capacity

SOME ASPECTS OF SYNERGISTIC ACTION OF ALUMINUM AND FLUORINE  
ON HUMAN BODY (LITERATURE REVIEW)

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This review reflects some aspects related to synergistic effect of aluminum and fluorine on a human body. The fluorine and aluminum ­ highly­reactive elements are widely used in nature and belong to the 2nd and 3d class of hazard. Both elements are actively used by people in different spheres of economic activity. At present, a lot of researches have been devoted to the influence of aluminum and fluorine on a human body. However, often the studies did not take into account the synergetic effect of these elements, so the detected effects could be mistakenly assigned to one of them. Often, such a joint impact of aluminum and fluoride on the organism has a synergistic character. The antagonism between fluorine and aluminum is essential in the toxicokinetics and the substances’ distribution in the organism. Whereby, the mutual influence of the elements is not definite and depends on many factors. One of the mechanisms of synergetic action of aluminum and fluorine can be caused by the formation of fluorine­aluminum compounds that function in the body in a manner similar to phosphate groups. The complexity and ambiguity of the joint effect of aluminum and fluorine on a human body, as well as the interaction of both elements, necessitate further study of this issue.

**Key words:** aluminum, fluorine, synergetic effect, toxic effect

SCHOOLCHILDREN’S FUNCTIONAL STATE UNDER INTENSIVE INFORMATION LOAD AT THE INITIAL ADAPTATION PERIOD TO EDUCATIONAL ENVIRONMENT

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*Aim*. The research aim is to identify peculiarities of first forms schoolchildren’s functional state (FS) under intensive information load during different phases of adaptation to educational environment. *Methods*. Schoolchildren’s FS research was carried out at comfort and at test information load during the 2nd­3rd, 6­7th and 15­16th educational weeks at school. The complex of indices suitable for schoolchildren’s FS mark was used. *Results*. The obtained results give the evidence that at the beginning of systematic education at school the additional information loads performed with comfort and with maximal speed cause the significant (p < 0.05­0.001) rise of common CNS activation level among 6­7 aged children, tension of mechanisms of FS regulation, shift of autonomic balance to the side of ANS sympathetic part activity predominance, central regulatory influences strengthening to heart rhythm, systematic hemodynamics stimulation, as well as anxiety level rise. It has been stated that in different phases of children’s adaptation to education at school the additional information loads cause, in whole, similar changes of used indices among the children. Their shifts during test tasks performance had the same focus both at 2nd­3rd, 6­7th and at 15­16th weeks of education at school, thereat, the most expressed change of FS values fell on the first weeks of systematic education (p < 0.05­0.001). *Conclusions*. With the development of adaptation process to educational environment among the children in the conditions of test load the tendency of less significant changes of FS indices has been observed on the background of activity effectiveness rise.

**Key words:** information load, functional state, adaptation to school, children

INDICATORS OF DEVELOPMENT IN THE PRESHOOL PERIODAS A WAY   
TO PREDICT SCHOOL ADAPTATION of first­year primary school students

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The article is devoted to the analysis of the long­term consequences of the influence of unfavorable facts and situations in the preschool period on the success of the child’s adaptation to school. *The aim of the work* was to study the relationship between the indicators of the preschool development period and the characteristics of the cognitive, emotional, behavioral components of the first­formers school adaptation. *Methods*. To identify the developmental features before the school and the characteristics of school adaptation 193 first­formers in Arkhangelsk were examined. *Results*. It is shown that as the child grows, the interrelation between the developmental features of the child and the components of school adaptation increases: if the indicators of the infant period are associated with the emotional component and the characteristics of the early childhood period (1­3 years) are associated with the emotional and behavioral characteristics, the characteristics of the pre­school development period (3­7 years) have high correlation with the cognitive, emotional and behavioral components of school adaptation. *Conclusions*. The findings suggest that the developmental features of a child aged 3 to 7 years, more than other previous stages of ontogeny, affect the ability of a first­year student to adapt to systematic learning activity. The construction of regression models revealed the key interrelationships between the investigated indicators of the child’s preschool development and the components of school adaptation. The authors emphasize that the analysis of the child’s developmental features before school makes it possible to get an idea of presence of dysontogenesis risk factors and to determine the focus in the corrective­developing work taking into account individual characteristics.

**Key words:** ontogeny, dysontogenesis risk factors, first­formers, school adaptation, disadaptation.

THYROID HORMONES AND ANTIBODY LEVEL IN HEALTHY RESIDENTS   
OF THE ARKHANGELSK REGION

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*The aim* of the study was to compare ratios of total and free fractions of iodothyronines (T3/T4, fT3/fT4) and integral thyroid index ((fT3 + fT4)/TSH) in euthyroid subjects that had negative of antibodies values and euthyroid subjects that had positive antibodies (antibodies to thyroid peroxidase ­ AntiTPO and / or antibodies to thyroglobulin ­ AntiTG). *Methods*. A total of 95 apparently healthy people were enrolled in this study and classified into two groups. Group A (n = 72) had normal values of thyroid hormones and negative values of antibodies, i. e. AntiTPO < 50 IU/ml and/or AntiTG < 100 IU/ml. Group B (n = 23) had normal values of thyroid hormones and positive antibodies, i.e. AntiTPO > 50 IU/ml and/or AntiTG > 100 IU/ml. Serum thyroid hormones and antibodies concentration was measured by enzyme immunoassay. *Results.* Euthyroid subjects with positive thyroid antibodies have less values of (T3 + T4)/TSH (Me = 12,9 vs. 15.7, p = 0.01), T3/T4 (Me = 0.015 vs. 0.017, p = 0.02) and fT3/fT4 (Me = 0,24 vs. 0.27, p = 0.03) ratios than subjects with negative antibodies, as well as value of free triiodothyronine (Me = 3.9 vs. 4.7 pmol/l, p = 0.02). In the group of individuals with positive antibodies AntTPO significantly correlated with thyroid­stimulating hormone (r = 0.45; p = 0.02) and T3/T4 ratio (r = ­0.43; p = 0.03). *Conclusion.* This finding may point to a decreased ability of tissues thyroxine deiodination in individuals with elevated thyroid antibodies levels.

**Key words:** thyroid peroxidase antibodies, thyroglobulin antibodies, thyroid hormones, triiodthyronine to thyroxine ratio, integral thyroid index

THE INFLUENCE OF LOCAL COLD EFFECTS ON ELECTROMYGRAM PARAMETERS   
IN WOMEN

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The problem of studying the effects of climatic­ecological factors of territories to the formation of specific conditions of the human environment and human health in general is very relevant. The study of influence of such factors on the functional state of the body, it is expedient to study within the framework of the new theory of chaos­self­organization (there are a number of fundamental differences from the tacit stochastic approach). In this regard, we set *the aim*: consider and forecast in individual and groups the characteristics of the state of the neuromuscular system of a person living in the territory of the Khanty­Mansiysk Autonomous Okrug ­ Yugra from the standpoint of chaotic dynamics of electromyograms parameters. New *methods* of data visualization were used (obtaining phase portraits EMG in coordinates *x(t)* ­ muscle biopotentials, and *x2 = dx1/dt* ­ the rate of their change) recorded using an electromyograph, a time scan of the signal was constructed, which was converted by sampling the signal into some numerical series and for them the parameters of quasi­tractors were calculated. *Results*. In the work, multiple measurements of the parameters of the bioelectrical activity of the muscle were analyzed from the position of the Eskova­Zinchenko effect, i. e. with repeated (identical) experiments before and after a local cold exposure in a group of girls. Analysis of the obtained time series showed that the signal is always unique for each recording interval for each subject. Cooling of the limb leads to an increase in the size of quasi­tractors, which is difficult to document in the framework of statistics (there is a continuous statistical change in electromyograms). *Conclusions*. The practical possibility of applying the method of multidimensional phase spaces (calculation of quasi­tractors parameters) for identifying real changes in the parameters of the human neuromuscular system in conditions of cold stress is proved. Calculation of the parameters of quasi­tractors is necessary as a quantitative measure of the reaction of the organism to external influences.

**Key words:** electromyogram, quasiattractor, local cold exposure, Eskov­Zinchenko effect

COMPARATIVE ANALYSIS OF DIFFERENT OBESITY DIAGNOSTIC METHODS: ANTROPOMETRY AND BODY IMPEDANCE

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*The Aim* ­ to study the fat content in the body of girls with different weight and height. *Methods*. We estimated the weight and height correlation by means of the body mass index or the Quetelet­II index. The component body composition was evaluated with the help of a bioimpedansometry device АВС­01 “Medass”. *Results*. A cross­sectional study of 111 student girls at the age of 17­20 years was carried out. About 50 % of the testees had normal weight and height correlation. In 15 % and 18 % of the examined girls BMI was higher or lower the average levels. In 8 % of the testees BMI was lower than 10 centile, while in 9 % it was higher than 90­centile. The use of the overweight and obesity classification according to the body fat content showed that 7 % of the girls had a low fat content, 19 % had a normal fat content, and 42 % had an excessive fat content, while 32 % were characterized as suffering from obesity. The majority of the testees (63 %) with the body mass deficit (less than 10 centile) had a low body fat content, while the rest (37 %) had the normal level. The group of the individuals with weight and height correlation below the average included the testees with a normal (48 %) as well as with a low (21 %) and a high (31 %) fat content. In the group of the individuals with the normal weight and height correlation (BMI within the range of 25­75 centile), 24 % had a normal fat content, 11 % had a low fat content, while 45 % had a high fat content; 20 % of the testees had obesity. We revealed that in the group of the individuals with BMI above the average level (75­90 centile), 5 % (one person) had a normal fat content, 40 % had a high fat content and 55 % had obesity. One person had a high fat content, whereas the rest had obesity in the test group with BMI > 90 centile. *Conclusions*. The use of BMI in the obesity diagnostics and in other disorders of trophic status had a low diagnostic sensitivity. The bioimpedanceometry method should be used to diagnose the trophic status. This method allows to divide the body mass into the main tissue components: fat, muscular and bone.

**Key words:** body mass index, bioimpedansometry, obesity, girls

NEUROEPIGENETICS OF BIPOLAR DIATHESIS: FROM THE SYNDROME OF MENTAL IMMUNE PROFICIENCY TO THE SYNDROME OF MENTAL IMMUNE DEFICIENCY

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The aim of the article is the conceptual and methodological substantiation of epigenetic dysfunctions of mental immunity in the development of bipolar diathesis, represented by pre­nosological states and syndromes of mental immune proficiency (SMIP) and deficiency (SMID). In the onset of bipolar disorder (BD), these syndromes evolve into the manic phase (MPh) and/or depressive phase (DPh) of the disease. The allocated syndromes transgenerationally accumulate epigenetic labels of future possible BD and other mental diseases. Their pre­nosological functional diagnostics allows for screening and early prevention of mental disorders. These syndromes are the initial dysfunctional link in the development of the mental epidemiological cascade: mental epidemics ­ destructive mental epidemics ­ the pandemic of mental immune deficiency. Pandemic of mental immune deficiency is manifested by an increase in the prevalence of all mental and psychosomatic disorders, requiring a shift in the focus of preventive­corrective efforts to early pre­nosological fractals of the disease development. The clinical model of BD shows the pathoplastics and pathokinetics of mental immunity dysfunctions in the development of the disease. Mental immunity as an identity matrix predetermines the lateral mental constitution of the personality and the resources of its mental resilience. It is suggested to consider the clinic of mixed forms of BD as a manifestation of the ambidextral mental constitution. In the development of the BD, three pre­nosological fractals are distinguished: 1) predisposition ­ a bipolar family; 2) latent ­ bipolar diathesis (SMIP/SMID); 3) initial ­ the onset of the BD; and three nosological: 4) the full­scale clinical picture of BD (MPh and/or DPh); 5) chronization ­ the types and forms of the course; 6) outcome ­ somatopsychic and socio­moral complications.

**Key words:** bipolar diathesis, syndrome of mental immune proficiency, pandemic of mental immune deficiency, lateral mental constitution, dysfunctions of mental immunity

DESCRIPTIVE STATISTICS USING R

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The article presents basic algorithms of R software using for calculating descriptive statistics of biomedical data including the use specialized packages. Detailed examples of the use of R functions for description and visualization of quantitative and categorical data are given.

**Key words:** descriptive statistics, continuous data, categorical data, visualization, R