**THE ELECTROMAGNETIC FIELDS EFFECT ON CHAOTIC DYNAMICS**

**OF CARDIOVASCULAR SYSTEM PARAMETERS OF WORKERS OF OIL**

**AND GAS INDUSTRY**

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The motion of state vector of cardiovascular system in females working on Surgut condensate stabilization plant was studied in five­dimensional phase space of states. The parameters xi of cardiovascular system in four groups of women varied within the range of VG – bounding volumes of the phase space of states, which was defined as quasi­attractor. The volumes VG were measured and compared in women of different age, affected and not affected by human­made electromagnetic fields of industrial frequency, which allowed establishing the principal differences in the dynamics of VG. In particular, women, both younger and older age groups underwent stress effect of electromagnetic fields of industrial frequency. This led to breakdown in volume of quasi­attractors in phase plane of vector (x1, x2) T where x1 ­ duration of cardiointervals, and x2 = dx1/dt ­ rate of change of x1. In fact, electromagnetic fields became stress agents for human’s cardiovascular system in the North of Russian. This is shown in the framework of quasi­attractors for cardio of two groups of women. Comparison of these four groups according to the parameters of quasi­attractors showed differences though statistical differences were not significant on a number of xi parameters of whole the body state vector x (f) of person’s organism living in the special northern conditions.

**Keywords:** electromagnetic field, cardiovascular system, functional system of the organism, theory of chaos and self­organization

**ASSESSMENT OF ELECTROMAGNETIC FIELD EFFECT ON HEALTH OF OPERATING PERSONNEL WORKING ON THE DIGITAL ELECTRICAL SUBSTATIONS**

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The development of solid­state electronics technology has led to the technically advanced electrical installation emergence, in particular Digital transformer substations (DTS) 10 (20)/0,4 kV. However, due to the uniqueness and novelty of the development the adverse health effects of the digital transformer substation are currently absent. The article presents the theoretical studies results of negative effects of the industrial frequency of electromagnetic fields (EMF) on personnel health operating the high­voltage equipment DTS. EMF performance evaluation (intensity of electric and magnetic fields, body current capacitor) during DTS operation in various installed capacity 10/0.4 kV and 20/0.4 kV has been done. The obtained results are compared to EMF level being created by high­voltage equipment of existing transformer substations and checked for compliance with current health standards. The characteristic curve of intensity of electric and magnetic fields, body current capacitor at nominal rating power, voltage and DTS electrical equipment are presented. It is shown that use of DTS in distribution networks scarcely has negative effect on the operating personnel health.

**Keywords:** electromagnetic field, capacitive current, operating personnel, digital transformer substation

**STOCHASTIC AND CHAOTIC ASSESSMENT OF HUMAN’S NEUROMUSCULAR SYSTEM IN CONDITIONS OF COLD EXPOSURE**

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The paper presents the study results of thermometry indices in boys and girls aged 20-28 years old living in the North more than 15 years and having different background of conditioning. Average age of surveyed was 22.8 years. The thermometer readings were register before and after local cooling. Traditional statistical ratios were calculated. They demonstrated Eskov­Zinchenko effect for tremor and quasiattractors areas, thermogramm pairwise comparison matrixes of three groups of surveyed before and after cooling from the perspective of self­organization. Quasiattractors showed the most diversity in comparison with stochastics and the thermogramm pairwise comparison matrixes in trained persons scarcely changed before and after cooling which was high adaptation parameter to cooling. This points significant differences in organism reactions in all the surveyed groups (untrained, poorly trained and strongly trained). Worked out methods to assess changes in the characteristics of quasiattractors can be used individually (for each test person) to assess your personal training level (in the repetition of measurements), and for group studies.

**Keywords:** tremor, entropy, quasiattractors, biosystem state vector

**Heart rate and hemodynamic changes at orthostatic test   
demonstrated by Extreme North Aborigines and Europeans (Caucasians) having different types of autonomic regulation**

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The examinees were 102 male habitants of Anadyr and Chukotsky Autonomous District, 17­19 aged, Europeans (Caucasians) and Aborigines. Functional reserves of autonomic regulation were studied and influence of its changes on cardiohemodynamics at active orthostatic test in different ethnic groups with similar types of original autonomic nervous system. The findings testified that, irrespective of ethnic origin or autonomic tonus similar responses to active orthostatic test were observed focused on weakening parasympathetic section of autonomic nervous system and strengthening sympathetic one. However, fundamental difference was registered in normotonic subjects and occurred in low frequency component of the heart rate power (LF). Cardiac hemodynamic analysis showed that, Europeans (Caucasians) and Aborigines who had different types of autonomic regulation, however, demonstrated their functional indices to largely coincide with each others at either baseline or at active orthostatic test. Some revealed differences were caused by types of autonomic regulation rather than by ethnic origin.

**Keywords:** young males, type of autonomic regulation, heart rate variability indices, cardiac hemodynamic indices, active orthostatic test

**COMBINED INFLUENCE OF HYPO AND HYPERMICROELEMENTOSIS ON FUNCTIONING OF CARDIOVASCULAR AND ENDOCRINE SYSTEMS AND ANXIETY LEVEL OF ADOLESCENTS**

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Purpose of investigation: to reveal the combined influence of hypo (Zn, Fe) and hyper (Cd, Pb) microelementosis on functional status of the cardiovascular, endocrine systems and anxiety level of adolescents (13 years of age) living in a chemically contaminated area in Stavropol region. The level of microelements (Cd, Pb, Fe, Zn, Cu) in hair and nails was determined by atomic absorption spectrophotometry method, cortisol in saliva ­ by ELISA method. The state of the cardiovascular system and its regulatory mechanisms was determined by indicators of variational pulsometry. To assess anxiety level of adolescents test method "Anxiety scale" was used. The analysis of microelement composition of hair and nails in adolescents, living in conditions of chemical environmental pollution with Cd and Pb subliminal doses, revealed the presence of hypo­ (Zn, Fe) and hyper­ (Cd, Pb) microelementosis. At the same time, increased levels of cortisol in saliva more evident in boys, increased heart rate and mode amplitude, peassure of the central mechanisms of the heart function regulation have been discovered. Change of anxiety level was stated. It has been proved that the determination of the microelement composition of hair and nails can serve as a marker of environmental contamination and complex negative changes, including the imbalance of microelements in hair and nails, functional changes in leading adaptive systems ­ the hypothalamic­pituitary­adrenocortical axis, cardio­vascular, changes of anxiety level can be used as a marker of dysaptation and predictor of psychosomatic problems.

**Keywords:** hypo­ and hypermicroelementosis, hair and nails, cortisol (C), anxiety, adolescents

**CHRONIC OCCLUSIVE DISEASES OF LOWER LIMB ARTERIES IN THE NORTH   
(Literature Review)**

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Chronic occlusive disease of lower limb arteries is a widespread disease of the blood vessels, where due to arteriostenosis there appears arterial misperfusion in the limb. According to the data, nowadays from 2 to 15 % of the adult population suffer from this disease. The literature review shows the relevance of studying the problem of peripheral arteries occlusive diseases (PAD) in the extreme environmental conditions of the Northern latitudes. The analysis conducted by scientists of Surgut city showed that the most important etiological factors resulting in PAD are atherosclerosis (54.5 %) and occlusive tromboangitis (45.3%). Occlusive diseases of the vascular system have multisegmental nature and appear at a young age and often have malignancy flow. The development of atherosclerotic process in its classic version starts at the age of 40­50 years, more often with sectoral lesions in the iliac segment. Occlusive process, once appeared, has no tendency to reverse development, and the outcome of this process (40 % of patients with PAD) is a disability or limb amputation. The study results showed that in young people living in KHMAO­Yugra, endothelial function was characterized by more evident disorders compared to normal rates; the severity of dysfunction was higher than in healthy individuals with risk factors for cardiovascular diseases. The biological age of the subjects met people over 40, and in men, the processes of biological aging was characterized by greater severity.

**Keywords:** ecology, the North, chronic occlusive diseases of lower limb arteries

**PATIENTS’ ASSESSMENT OF IN­PATIENT MEDICAL CARE QUALITY IN KAZAKHSTAN**

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In this cross­sectional study we assessed self­perceived quality of inpatient healthcare in three Kazakhstani cities. Altogether, 923 patients admitted to the city hospitals in Almaty, Aktobe and Semey filled out an anonymous questionnaire. 63 % of them were emergency patients. Binary logistic regression and principal component analysis (PCA) were used. Adjustments for social and demographic patients’ characteristics were made. Altogether, 82.9 % (95 % CI 80.3­85.2) of patients rated the quality of healthcare as good or excellent. Among emergency patients, the key factors for being unsatisfied by the quality of services were insufficient quality of hospital food (OR 4.2; 95 % CI 1.70, 10.4), poor communication between doctors and nurses (OR 6.3; 95 % CI 2.3; 17.3) and the lack of adequate explanations regarding procedures and medication (OR 3.8; 95 % CI 1.5, 9.6). Among non­emergency patients, the key factors for being unsatisfied by the quality of services were insufficient quality of hospital food (OR 2.3; 95 % CI 1.2, 4.6), poor communication between doctors and nurses (OR 6.3; 95 % CI 2.9, 13.5), situation if the physician did not pay attention to whether a patient understood information about his/her condition or treatment (OR 2.4; 95 % CI 1.0, 5.2), when the patient has not had the opportunity to discuss his/her condition with medical staff (OR 2.7; 95 % CI 1.2, 5.8), if the patient's relatives was not given a possibility to communicate with a doctor (OR 4.3; 95 % CI 1.7, 11.0), or such this possibility was limited (OR 4.8; 95 % CI 1.9; 12.2).

**Keywords:** quality of medical care, hospital, cross­sectional study, Kazakhstan

**THE USE OF MELATONIN IN THE TREATMENT OF DUODENAL ULCER**

**IN THE EUROPEAN NORTH**

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Objective: to study changes in the course of the duodenal ulcer in patients residing in the European North, using melatonin as an addition to standard antiulcer therapy. Materials and methods: the study involved 80 patients with uncomplicated active duodenal ulcer. Patients were divided into 2 groups: Group I (test, 40 patients), received a triple regimen (omeprazole, clarithromycin, amoxicillin) and melatonin as an addition; Group II (control, 40 patients) received only a triple regimen. Taking into account the peculiarities of photoperiodism in the region subgroups A and B were marked in the 1st Group, subgroups C and D ­ in the 2nd group (A and C­ received treatment from March to August; and B and D­from September to February). Results: Before treatment in all groups and subgroups patients complained of epigastric burning, ulcerative pain and sleep disturbance. Complaints disappeared faster in the test group than in the control; in the subgroup A and B compared to subgroups C and D respectively. Study of time limits of patients’ physical status recovery did not reveal statistically significant differences between test and control groups, however, faster recovery was observed in subgroup A compared to sub­group C. Cicatrization according EGD on the 14 day of the therapy took place in 100 % cases in the study group and the subgroups A and B, whereas in the control group and in the sub­groups C and D ­ 60, 80 and 40 %, respectively. Conclusions: antiulcer therapy in combination with melatonin is more effective, especially when administered in a period of growth and maximum day light duration.

**Keywords:** duodenal ulcer, melatonin, north, photoperiodism