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**MATERIALS OF THE III RUSSIAN CONGRESS ON
CHRONOBIOLOGY AND CHRONOMEDICINE WITH
INTERNATIONAL PARTICIPATION**

**CHRONOBIOLOGICAL ASPECTS OF STUDENTS EXAMINATION
STRESS PREDICTION**

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Key words. Chronobiology. Examination stress. Biological rhythm. Students.

Annotation. The article presents the results of the influence of examination stress on the state of biological rhythms and changes in neurovegetative status of students. Analysis of the results revealed that it was in the evening hours marked the maximum efficiency of the prevailing number of students. During the days of stress load there were changes in the basic physiological parameters of heart rate, SBP, DBP, respiration rate, which were manifested in increasing the average daily values, acrophase displacement and amplitude reduction. These changes may indicate the functional stress of the body systems as a whole.

**INFLUENCE OF THE RHYTHM OF TRAINING ON THE
EFFECTIVENESS OF TECHNICAL TRAINING IN FOOTBALL
(ON THE EXAMPLE OF THE CROATIAN CLUB)**

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Key words: biological rhythm, the technique of sports exercises, motor skills, football, young athlete.

Annotation. Conducting trainings at one time throughout the week leads to an increase in the effectiveness of training complex motor skills and the development of special physical qualities. Lack of stability in the rhythm of classes, reduces the quality of training. Efficiency in teaching is expressed in decreasing the running time of test tasks for speed and endurance, range of jumps and throwing, increasing the angle of rotation in jumps in test tasks of general and specific direction and accuracy of the punches of young players.

GENDER DIFFERENCES OF ULTRADIAN RHYTHMS OF SPECTRAL ESTIMATION OF HARMONIC POWER WITH THE ACCOUNT OF AGGRESSION LEVEL IN SPORTSHIP PARTICIPANTS IN SPORTS OF HIGHER ACHIEVEMENTS

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Key words: gender, ultradian rhythms, spectral estimation, level of aggression, sport of higher achievements

Annotation. In the article, gender differences in the ultradian rhythms of the spectral estimation of harmonic power are considered, taking into account the level of aggression as the properties of HNA by the example of sportsmen-paratroopers in the sport of higher achievements. It was revealed that in athletes of both men and women with a high level of aggression, synchronization of regulation of heart rhythm regulation is performed by oscillating high frequency LF waves, but having a different physiological mechanism. This phenomenon should be considered as internal dyschronism, associated in men and women athletes parachutists with the impact of a complex of stress factors of different nature.

THE IMPORTANCE OF MONTHLY BIORITHM RESEARCH FOR PREDICTION AND PREVENTION OF THROMBOTIC COMPLICATIONS

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Key words: monthly biorhythms, fibrinolysis, the prevention of thrombotic complications, antioxidants, natural plant anticoagulants.

Annotation. Studies monthly biorhythms patients using new moon calendar can detect two-week period with reduced activity of fibrinolysis, in which an increased risk of complications due to uncontrolled thrombosis. The definition of these periods (second phase monthly biorhythms) facilitates timely appointment in the outpatient setting soft anticoagulant therapy consisting of antioxidants (vitamins E and C) and natural plant anticoagulants (ginseng and garlic). It is also advisable to conduct these periods diet modification with the exception of products that activate lipid peroxidation, production of thromboxanes and thereby increase the risk of hypercoagulability.

**SPECIFIC FEATURES OF 24-HOUR PROFILE OF BLOOD PRESSURE
AND CARDIAC RHYTHM UNDER MOFELING BRIGHT LIGHT
THERAPY IN SPONTANEOUSLY HYPERTENSIVE RATS**

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Key words: bright light therapy, blood pressure, heart rate, hypertension, biological rhythms.

Annotation. Bright light therapy is coming into increasingly wide use in contemporary medicine. In particular, it is applied to the correction of disorders observed in case of seasonal and non-seasonal depressions, sleep disorders etc. In the meantime for today there is almost no data for the impact of its exposure on the chronostructure of the cardio-vascular system. In the present work we performed experiments on Wister and SHR rats to evaluate the effect of bright light therapy on the 24-hour profile of blood pressure and cardiac rhythm in case of normal blood pressure and under primary (genetically determined) hypertension. As a research method we used telemetric monitoring of blood pressure and biopotentials of the heart (ECG). It was found that one hour session of bright light exposure (10 000 lux) caused a significant increase in blood pressure during the daytime period under hypertension as well as some changes in the structure of its circadian and ultradian rhythms. At night blood pressure returned to the initial level. In normotensive Wistar rats bright light therapy did not induce any significant changes in either blood pressure or heart rate.

**PSYCHOPHYSIOLOGICAL FEATURES AND ACADEMIC
PERFORMANCE IN CONTEMPORARY STUDENTS WITH
DIFFERENT CHRONOTYPE**

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Key words: circadian rhythms, heart rate variability, students, academic performance

Annotation. The purpose of this study was to evaluate if chronotype could influence autonomic cardiac control, executive function and academic achievement in medical students. 280 females and 119 males 4-6th year students underwent psychophysiological testing ('Valeoscan 2'). Autonomic state was assessed using heart rate variability in time and frequency domains.

Morning-type females during morning hours (9.30 – 11.00 a.m.) present a significantly higher sympathetic tone than Evening-types, but males show opposite pattern. Mean academic achievement score during 6 year of education both in females and males Morning-types was higher than in Evening-types. This fact is confirmed by better different cognitive tests' results performed in the morning in Morning-types both females and males.

INTERRELATION OF BIORTIMMOLOGICAL AND PSYCHOSOMATIC CONDITION IN WOMEN WITH ARTERIAL HYPERTENSION IN POSTMANOPOAUSE

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Key words: arterial hypertension, postmenopausal women, climacteric syndrome, desynchronosis.

Annotation. The purpose this paper was to analyze the prevalence of climacteric syndrome (CS) in individuals with different desynchronosis and to identify a possible relationship between violations of the temporal organization of physiological functions and the presence of CS. It was found that in patients with physiological desynchronosis of mild and moderate severity CS occurs in 37 patients with hypertension, and in the control group – in 4 healthy women; among patients with pathological desynchronosis – in 5 of the control group and in 23 women with postmenopausal hypertension. Among patients, the proportion of persons with II and III levels of health, with manifestations of desynchronosis: physiological and pathological, and the proportion of persons with successful adaptation (I level of health) is reduced by half.

HYPERCAPNIC STIMULATION AND ITS EFFECT ON THE CYCLICAL DYNAMICS OF THE FUNCTIONAL STATE

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Key words: female athletes, menstrual cycle, functional state, individual reactions, breathing simulator.

Annotation. Female athletes engaged in fitness aerobics, studied the individual characteristics of the change in the functional state (FS) during the ovarian-menstrual cycle. FS were characterized by cardiovascular system (CS) status indicators according to cardiorrhography and respiration data. Registration of the cardiorhythmogram was performed with the help of the mobile complex "Clue Medical" (Austria), breathing parameters with the help of the "Diamant" complex (Russia). The directions of changes in heart rate, blood pressure and the ratio of autonomic nervous system departments are revealed. In the second part of the study, the possibility of influencing these parameters with the help of the respiratory simulator "Samozdrav" was evaluated. Its application has led to an increase in the capacity of the respiratory system and the growth of hypoxic resistance. As a result, undesirable changes in the state of the CS regulator were reduced.

CHRONOMEDICAL TECHNOLOGIES IN PERSONALIZED PREVENTION OF CARDIOVASCULAR DISEASE

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Key words: temporal organization of physiological functions, biorhythms, genetic polymorphism, thrombogenic risk, hemostasis system, arterial hypertension.

Annotation. The article presents the possibilities of determining the prognostic significance of the combination of temporal organization of cardiovascular system functions, the peculiarities of genetic polymorphism in the pathogenesis of thrombotic disorders in the cardiovascular system. Chronoanalysis of rhythms was conducted in 45 medical students and 20 patients with arterial hypertension; in persons with high hereditary risks, the frequency of mutant alleles was revealed, were shown the possible mechanisms for the implementation of desynchronoses in the presence of factors of thrombogenic risk, prospects for using chronomedical methods in the prevention of diseases of the cardiovascular system.

METHODS AND DEVICES FOR CHRONODIAGNOSTIC AND BIOCONTROL CHRONOPHYSIOTHERAPY

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Key words: chronodiagnostic, biorhythms, breathing and heartbeat sensors, physical therapy, biofeedback, rhythms of blood microcirculation, rhythms of the central blood flow.

Annotation. In paper describes the methods and medical diagnostic devices that allow you to monitor and predict the functional status and dynamics of the diseases a patient to diagnose diseases in early preclinical stages. They allow you to correct violations of the rhythms of vegetative status, normalize cellular immunity, restore range of rhythms of blood microcirculation in the field of pathology. Increase the integral wholeness of the body without side effects and overdose is provided by sync physiotherapy impacts with the rhythms of the central blood flow signals from sensors pulse and breathing of the patient.

THE PHOTOPERIOD AS MAIN TIME INTEGRATOR OF PHYSIOLOGICAL SYSTEMS

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Key words: photoperiod, photoperiodism, Zeitgeber, chronoperiodic system.

Annotation. The photoperiod as the basic temporary integrator of functional systems of all alive organisms, including man, was considered in this review. The concept about chronoperiodic and photoperiodic systems as the functional systems of an human organism was offered. Chronoperiodic and photoperiodic systems allows to synchronize the chronorhythms of different somatic and visceral functions and also realize the coordination and the modulation of adaptation mechanisms to the stressors influence.

BIOLOGICAL RHYTHMS AND MINERAL WATERS

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Key words: chronobiology, biological rhythms, mineral water, adaptation.

Annotation. The disease begins with a violation of the harmony between the rhythms of the inner and outer environment of man. Natural mineral waters increase the adaptive reserve of the body not only through direct and reflex action on metabolic and regulatory processes, but also through the harmonization of their biorhythms. A certain contribution to this effect can be made by some micro- or macroelements, especially lithium.

CONTENTS OF CORTYCOSTERON AND SEROTONIN IN THE SERUM OF RAT BLOOD IN CONDITIONS OF DESINHRONOSIS AND PHYSICAL OVERFATIGUE IN DIFFERENT SEASONS OF A YEAR

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Key words: corticosterone, serotonin, blood serum, seasonal rhythms, desynchronization, physical overfatigue .

Annotation. The purpose of this study was to study the annual dynamics of the content of corticosterone and serotonin in the blood serum of rats after exercise in conditions of light desynchronization.

It was found that after the dark deprivation and physical overfatigue annual dynamics of serum corticosterone content did not change significantly, while annual dynamics of serotonin was significantly optimized and the acrophase preceded the acrophase of the corticosterone rhythm. After light deprivation and physical overfatigue annual dynamics of serotonin content was also optimized, but to a lesser extent than after dark deprivation, and the annual dynamics of the corticosterone level was converted in circumannual one with acrophase following serotonin. Obviously, dark deprivation contributed to the synchronization of the two systems of a body and light deprivation, on the contrary to desynchronization.

CONTRIBUTION OF THE GENETIC COMPONENT TO THE PHENOTYPIC DISPERSION OF CIRCADIAN RHYTHMS IN NORM, SPORT AND WITH HYPERTENSION DISEASE

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Key words: circadian rhythms, genetic component, twins method.

Annotation. The aim paper: twins and biorhythmological investigations for determination of mechanisms in base of circadian rhythms formation in norm, sport and arterial hypertension.

Results: There were presented materials of twins and biorhythmological investigations in groups of teenagers, sportsmens and patients with hypertonic disease (HD) , stage 1. Circadian rhythms of electromechanical and hemodynamical functions in conditions of plate, middle- and high- mountains

hypoxia were determined. Desynchronization of these rhythms in mountains were established. In patients with HD stage 1 circadian rhythmicity of hemodynamics and catecholamines excretion were disturbed. The main role of genetic component was put up in circadian rhythms of hemodynamical function, same parameters of electromechanical heart functions and noradrenalin excretion.

CHRONOBIOLOGY OF CERVICAL MICROBIOT IN THE PERIOD OF GESTATION

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Key words: microbiom, microbiot of the cervical canal, timing of gestation, circannual rhythm, new moon, full moon, gravitational pacemaker, apogee, perigee.

Annotation. High-tech methods for studying human microbiom provided an exhaustive «census» of the automicroflora of key locations, including the cervical canal. But routine microbiological tools are more adequate for monitoring the long-term dynamics of the microbial landscape of specific locations. There is no data in the literature on the regularities of the variability of the cervical microbiot during gestation in the context of circannual and «lunar» rhythms. On the basis of the data base for 1531 women, observed at small gestational age, collected by us in 1998-1999, the required regularities are established. For many of the 16 strains of the cervical canal microbiot studied, the maxima and minima of the circannual rhythm of the detection frequency index fall in February and August. And for *E. coli* - on lunar syzygy, and more pronounced - in the days of apogee and perigee.

THE ROLE OF NEW MEDICAL TECHNOLOGIES IN OBSTETRICS AND GYNECOLOGY

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Key words: ozone therapy, obstetric and gynecological pathology of pelvic organs, pathological desynchronosis.

Annotation. Objective: to systematize and analyze the published data of scientific literature on the therapeutic effectiveness of ozone therapy in obstetrics and gynecology. Materials and methods: Search for information published in the PubMed and Cochranne Library database, inclusive 2017. The works containing information on methods and criteria of diagnosis of obstetric and gynecological

diseases and pathological desynchronization, treatment of patients with the use of ozone therapy were selected for the analysis. Results: in the process of systematization of published scientific data, 811 sources presented by articles and systematic reviews were found. Conclusion: the analytical processing of the results of studies of domestic and foreign authors revealed the high therapeutic effectiveness of ozone therapy technology in the prevention and treatment of obstetric and gynecological pathology and the preservation of maternal and fetal health.

INFLUENCE OF THE DAY OF STAY IN THE MIDDLE-ALTITUDE FOR DESINCHRONIZATION AND RESINCHRONIZATION OF ATHLETES BIOLOGICAL RHYTHMS

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Key words: biological rhythms, athletes, adaptation, desynchronization.

Annotation. The purpose of the research was to identify the features of resynchronization and synchronization of biological rhythms of athletes at different stages of adaptation to special environmental conditions. The conducted researches of circadian rhythms of sportsmen of different sports on different days of stay (adaptation) to middle mountains have shown presence of expressed circadian rhythm of heart rate in all groups and consequently, absence of desynchronization. Apparently, based on the data of previous studies, an intensive physical load is a significant synchronizer of the biological rhythms of athletes in this case.

THE ROLE OF EPIPHYSIS IN THE DAILY VIBRATIONS OF PATIENT SENSITIVITY AND HEMATOLOGICAL INDICES IN RATS WITH ADJUVANT ARTHRITIS

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Key words: chronopharmacology, epiphysis, melatonin, rheumatoid arthritis.

Annotation. The contribution of the epiphysis brain gland and its main melatonin hormone to the organization of diurnal fluctuations of the inflammatory process in rheumatoid arthritis in the experiment was assessed in the article. It is shown that adjuvant arthritis leads to a decrease in the threshold of sensitivity to pain

and to a shift in the peak of pain and hematological markers of inflammation in the morning. The removal of the epiphysis led to a decrease in the threshold of pain sensitivity. At the same time, the smallest threshold was registered in the morning. In addition, epiphysectomy led to a change in the daily profile of hematological indices of rat blood. Melatonin caused a decrease in pain sensitivity and neutralized manifestations of a systemic inflammatory reaction in rats with adjuvant arthritis.

ADAPTATION OF THE ORGANISM OF ADOLESCENTS 12-13 YEARS FOR SEVEN LEGAL PHYSICAL LOADS BY INDICATORS OF CIRCADIAN RHYTHM OF TEMPERATURE

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Key words: physical load, circadian rhythm of temperature, teenagers.

Annotation. The results of the study of the process of thermoadaptation of the organism of adolescents aged 12-13 years to physical loads during a seven-day trek to the Caucasus Mountains are presented. Each of the 10 adolescents, each day, was assigned a circadian temperature rhythm (CRT) of the skin using the «Thermochron iButton» method in terms of mesor and amplitude. It was revealed that the seven-day dynamics of the mesor is similar to the dynamics of the amplitude. The greatest values of both chrono-indicators were found on the second and fifth days of the trip, when there was the greatest physical load (according to subjective estimates). The results of this work show that the physical loads of the seven-day campaign in the mountains of adolescents 12-13 years have a significant impact on architectonics and the parameters of the CRT.

DEVELOPMENT OF A BIOTECHNICAL SYSTEM BASED ON THE FUNCTIONING OF NEURAL NETWORKS FOR SOLVING THE PROBLEM OF THE SCATTERGRAMS ANALYSIS

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Key words: translational approach, neural network, biotechnical system, modular type, pulse sensor, scattergram, algorithm, classification, clusterization, categorization, atrial fibrillation.

Annotation. In the article, based on the translational approach, a neural network biotechnical system of a modular type is considered. The biotechnical system realizes the construction of autoregressive clouds (ARC), or scattergrams. Microstructural patterns of inter-pulse intervals are obtained from patients in on-line

mode using a pulse sensor. Neural network algorithms provide the solution of the following tasks: clustering autoregressive clouds, based on a learning strategy without a teacher; classification of scattergrams into five classes, including a learning strategy with the teacher; categorization of scattergrams with preliminary training and with the identification of three categories in the form of monomodal, polymodal and amodal autoregressive clouds, or scattergrams. Clinical studies have shown high efficiency of neuronet algorithms for differential diagnosis of the degree of activity of the autonomic nervous system in healthy and classification of scattergrams in patients with atrial fibrillation syndrome.

TEMPESES OF AGING OF THE ORGANISM WITH ACCOUNTING CHRONOTYOLOGICAL CHARACTERISTICS OF MAN

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Key words: passport age, biological age, chronotype, aging, aging rate.

Annotation. In this article, the aging rates of the age group 18-21 (juvenile age), the age group 22-35 years (the first adult age) are considered. The study involved 80 people. It was determined that the passport age corresponds to the biological age of 48% of the respondents. Most people with accelerated rates of aging are 55%. The difference between biological and calendar age in 33% of participants was more than 15 years in the direction of increasing biological age. The ratio of biological age to chronotype showed that the "larks" were the slowest in aging. Accelerated rates of aging characterized "owls". The most common causes that accelerate aging are: meteorological dependence, dizziness, memory loss, headaches, vision impairment, pain in the joints, pain in the lumbar spine.

INVESTIGATION OF THE BEHAVIOR OF RATS WHEN ADMINISTERED INTRANASALLY RECEPTOR OF KISSPEPTIN ANTAGONIST P-234

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Key words: suprachiasmatic nucleus of hypothalamus, biological rhythms, antagonist of kisspeptin receptors p-234, behavior, labyrinth of Barnes.

Annotation. The suprachiasmatic nucleus of the hypothalamus serves as the main regulator of sleep and wakefulness, and also plays a role in the regulation of metabolism and behavior. An important neurochemical regulator of the biological clock function is cisspeptin, which is responsible for the processes of puberty, as well as behavior and locomotor activity. However, the effect of blockade of specific receptor receptors on aspects of behavior in the field of biological rhythms has not been studied to date. In the present work, the influence of the antagonist of cispeptin receptors p-234 on the biological rhythms in Wistar male rats in the behavioral setting «Barnes labyrinth» is studied.

CHRONOPHARMACOLOGY IN MODERN MEDICINE

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Key words: chronopharmacology, chronotherapy, circadian temporal system, mathematical statistics, daily monitoring.

Annotation. At present, «Omics» technologies are being introduced to chronopharmacology and chronotherapy. Pharmacodynamic and pharmacokinetic parameters are analyzed depending on the time factor. The common goal of these technologies is to analyze the whole set of processes occurring in the cell or the whole living organism. The result of using such technologies is a large array of numerical data, usually requiring automated computer analysis. Examples of such technologies are the determination of amino acid and nucleotide sequences of biopolymers and quantitative analysis of gene expression.

The emergence of "omics" technologies can be of great importance for the molecular understanding of the circadian temporal system and its connection with diseases and treatment, as well as for the full perception of personalized chronotherapy in clinics. Recent in vitro and in vivo studies have provided an understanding of tissue-specific diurnal organization through transcriptome, proteomic and metabolic circadian datasets.

SEASONAL FEATURES OF THE PROFILE OF FUNCTIONAL ASYMMETRY AMONG MEMBERS OF DIFFERENT BIORHYTHMIC STEREOTYPES

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Annotation. The aim of the study was to investigate functional brain asymmetry in youths and girls depending on the biorhythmological stereotype in different seasons of the year. Differences are established in the degree of activation of the cerebral hemispheres of the brain depending on gender, season of the year, biorhythmic patterns. In the winter season, in groups of students identified a large activation of the right hemisphere. In young woman, the predominance of right hemisphere activity was more pronounced in the arrhythmic chronotype. In the spring season, young men with arrhythmic chronotype showed signs of activation of the left hemisphere, the «owls» was symmetrical profile. In young women in the spring observed increased activation of the right hemisphere, less pronounced in «pigeons».

Key words: functional asymmetry, students, chronotype.

FEATURES OF THE RHYTHM ORGANIZATION ANNUAL DYNAMICS OF RESTORATIVE PROCESSES IN THE LIVER OF THE RATS IN A REMOTE PERIOD AFTER INTOXICATION TETRACHLORMETHANE

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Key words: carbon tetrachloride, liver, seasonal and annual rhythms, rats.

Annotation. The purpose of this study was to investigate the rhythmic organization of the annual dynamics of the functional state of rat liver with experimental toxic hepatitis in a late period of intoxication.

Results of investigations. The study of the functional state of rat liver on the 44th day after the last injection of carbon tetrachloride in comparison with one on the

4th day, when active experimental hepatitis developed, indicated the formation of a spontaneous restorative process in the liver, which proceeds at different rates for different functions. First of all, the average annual quantitative indicators and acrophases of the dominant annual harmonics of the blood levels of malondialdehyde, thymol and total bilirubin, and only then - aminotransferases were restored.