The International Stress and Behavior Society (ISBS)
Institute of Experimental Medicine
Institute of Translational Biomedicine, St. Petersburg State University

Program and Proceedings

28th Multidisciplinary International Neuroscience and Biological Psychiatry Conference

"Stress and Behavior"

Dedicated to the Year of Science and Technologies (2021) in Russia

St. Petersburg, Russia
May 16-18, 2021

CONFERENCE PROGRAM

Day 1. Sun, May 16, 2021

Fireplace Hall (Kaminnyy Hall), Oktiabrskaya Hotel, 10 Ligovsky Prospect, St. Petersburg

09.00-17.00 **REGISTRATION DESK OPEN**

09.30-10.00 **OPENING AND WELCOMING ADDRESSESS**
Prof. AV Kalueff, ISBS President and Conference Chair
Prof. VM Klimenko, Program Committee Chair
Prof. OV Shamova, Deputy Director, Institute of Experimental Medicine

10.00-10.40 **OPENING PLENARY LECTURE:** BEHAVIORAL AND NEUROBIOLOGICAL CONSEQUENCES OF EXCESSIVE CONSUMPTION OF WESTERN DIET: A STUDY ON MICE. T Strekalova, Department of Psychiatry and Neuropsychology, University of Maastricht, Netherland, Sechenov 1st Moscow State Medical University, Moscow, Russia

10.40-15.55 **SYMPOSIUM 1: LAPIN SYMPOSIUM ON PRECLINICAL NEUROSCIENCE**
Chairs: AV Kalueff (China, Russia, USA) and VM Klimenko (Russia)

10.40-10.45 INTRODUCTION: PROFESSOR IZYASLAV LAPIN

10.45-11.05 TRANSGENIC ANIMAL MODELS IN NEUROPHARMACOLOGY. RR Gainetdinov, Institute of Translational Biomedicine, St. Petersburg State University, St. Petersburg, Russia

11.05-11.25 TONIC LOCUS COERULEUS ACTIVITY PLAYS A CAUSAL ROLE IN STRESS-ASSOCIATED INCREASES IN ALCOHOL DRINKING. EA Budygin, Wake Forest School of Medicine, Winston Salem, NC, USA

11.25-11.40 APPROACHES TO PARALLEL MODELING NEUROBIOLOGICAL CONDITIONS IN COMPLEX CELLULAR AND ANIMAL MODELS. EV Petersen, Moscow Institute of Physics and Technology, Moscow, Russia

11.40-11.50 EFFECT OF MELANOCORTIN RECEPTOR AGONISTS ON SEXUAL MOTIVATION IN RATS AFTER CHRONIC SOCIAL ISOLATION, IY Tissen, LA Magarramova, MD Ayzup, AA Lebedev, PD Shabanov, Department of Neuropharmacology, Institute of Experimental Medicine, St. Petersburg, Russia

11.50-12.00 MOLECULAR MECHANISMS OF SUPPRESSION OF THE PROGRESSION OF FUS PROTEINOPATHY IN THE NERVOUS SYSTEM OF TRANSGENIC MICE EXPRESSING C-TERMINALLY TRUNCATED HUMAN FUS, EA Lysikova, S Funikov, AP Rezvykh, KD Chaprov, Institute of Physiologically Active Substances RAS, Chernogolovka, Engelhardt Institute of Molecular Biology RAS, Moscow, Russia

12.00-12.15 ***TECHNICAL BREAK***

12.15-12.30 SEROTONIN METABOLISM IN GENETICALLY DETERMINED DOPAMINE METABOLISM DISORDERS, DS Traktirov, NS Pestereva, ZS Fesenko, IS Ivleva, MN Karpenko, VM Klimenko, Institute of Experimental Medicine, Peter the Great St. Petersburg Polytechnic University, St. Petersburg State University, Institute of Translational Biomedicine, St. Petersburg, Russia

12.30-12.45 ARE PAIN AND ANXIETY INTERCONNECTED SIGNALS OF HUMAN DISEASE? AS Tadevosyan, A Avetisyan, Heratsi Yerevan State Medical University, Yerevan, Armenia

12.45-13.00 ISBS AND BIOLOGICAL PSYCHIATRY OF STRESS TODAY, IN THE YEAR OF SCIENCE. AV Kalueff, Southwest University, Chongqing, China

13.00-13.15 UNDERSTANDING TRANSLATIONAL AND EVOLUTIONALLY CONSERVATIVE MOLECULAR BIOMARKERS OF AFFECTIVE DISORDERS IN THE ZEBRAFISH, RAT AND HUMAN, KA Demin, AV Kalueff, Institute of Translational Biomedicine, St. Petersburg State University, Institute of Experimental Medicine, Almazov National

Medical Research Centre, Ministry of Healthcare of Russian Federation, St. Petersburg, Neuroscience Program, Sirius University, Sochi, Russia; Southwest University, Chongqing, China

13.15-13.30 THE ROLE OF SYNUCLEINS IN BEHAVIORAL IMPAIRMENT MEDIATED BY COMPROMISED DOPAMINE TRANSMISSION, KD Chaprov, IuS Sukhanova, Institute of Physiologically Active Compounds RAS, Chernogolovka, Russia

13.30-13.40 MATERNAL HYPERHOMOCYSTEINEMIA LEADS TO NEUROINFLAMATORY PROCESSES IN RAT HIPPOCAMPUS DURING THE FIRST MONTH AFTER BIRTH, INDUCING MEMORY DEFICIT IN ADULTS, DS Vasilev, NL Tumanova, AD Shcherbitskaia, DS Kalinina, NM Dubrovskaya, Sechenov Institute of Evolutionary Physiology and Biochemistry RAS, St. Petersburg, Russia

13.40-13.50 REFERENCE GENE VALIDATION WITHIN THE RAT BRAIN UNDER MILD KETOSIS, AP Schwarz, AS Shcherbakova, VA Nikitina, DU Krytskaya, AN Trofimov, VM Klimenko Institute of Experimental Medicine, Sechenov Institute of Evolutionary Physiology and Biochemistry RAS, St. Petersburg, Russia

13.50-14.05 DELAYED EFFECTS OF CHRONIC SLEEP RESTRICTION ON MEMORY AND EMOTIONALITY IN RATS, MV Chernyshev, MA Guzeev, VD Borschenko, IV Ekimova, Sechenov Institute of Evolutionary Physiology and Biochemistry RAS, St. Petersburg, Russia

14.05-14.20 TEMPORAL ANALYSES OF DRUG-INDUCED LOCOMOTOR ACTIVITY IN ZEBRAFISH BASED ON NEURAL NETWORK PREDICTIONS, DV Bozhko, GK Galumov, AI Polovjan, SM Kolchanova, VO Myrov, AV Kalueff, ZebraML, St. Petersburg, Russia; Neuroscience Center, Helsinki Institute of Life Science, University of Helsinki, Helsinki, Department of Neuroscience and Biomedical Engineering, Aalto University, Helsinki, Finland; School of Pharmacy, Southwest University, Chongqing, China

14.20-15.30 ***TECHNICAL BREAK***

15.30-15.50 **CONFERENCE PRESENTATION:** SOCIABILITY TEST IN MICE USING LABORAS AND SONOTRACK SYSTEM, L Bachdasarian, R Bulthuis, Metris BV, Hoofddorp, Netherlands

15.50-17.10 **ISBS SYMPOSIUM 2: ZUKOWSKA STRESS NEUROSCIENCE SYMPOSIUM**
Chairs: VM Klimenko (Russia)

15.50-16.00 INTRODUCTION: PROFESSOR ZOFIA ZUKOWSKA

16.00-16.10 MOTOR ACTIVITY DURING SWIMMING AND WALKING IN THE TAAR5 KNOCKOUT MICE, AV Goriainova, DS Kalinina, RR Gainetdinov, PE Musienko, Institute of Translational Biomedicine, St. Petersburg State University, Sechenov Institute of Evolutionary Physiology and Biochemistry RAS, Pavlov Institute of Physiology RAS, St. Petersburg, Sirius National Technical University, Neuroscience Program, Sochi, Russia

16.10-16.20 EXPLORING THE CONSEQUENCES OF A SINGLE SOCIAL DEFEAT STRESS ON ACCUMBAL DOPAMINE IN MALE AND FEMALE RATS, VV Nemets, VA Zavyalov, PA Chepik, RR Gainetdinov, EA Budygin, St. Petersburg State University, Institute of Translational Biomedicine, St. Petersburg, Russia; Wake Forest School of Medicine, Department of Neurobiology and Anatomy, Winston-Salem, NC, USA

16.20-16.30 FEATURES OF AUTONOMOUS REGULATION OF THE CARDIOVASCULAR SYSTEM IN ELDERLY UNDER STRESS, VP Nesterov, AI Burdygin, KB Ivanov, SV Nesterov, Sechenov Institute of Evolutionary Physiology and Biochemistry RAS, St. Petersburg, Russia

16.30-16.40 EFFECTS OF GLIBENCLAMIDE ADMINISTRATION ON COGNITIVE FUNCTIONS OF RATS IN NORMOGLYCEMIA, AS Zubov, TV Tiutiunnik, MN Karpenko, VM Klimenko, Institute of Experimental Medicine, St. Petersburg State University, St. Petersburg, Russia

MOTOR ACTIVITY DURING SWIMMING AND WALKING IN THE TAAR5 KNOCKOUT MICE, AV Goriainova, DS Kalinina, RR Gainetdinov, PE Musienko, Institute of Translational Biomedicine, St. Petersburg State University, Sechenov Institute of Evolutionary Physiology and Biochemistry RAS, Pavlov Institute of Physiology RAS, St. Petersburg, Sirius National Technical University, Neuroscience Program, Sochi, Russia

INTRODUCTION: Trace amines (TA) are biogenic substances, which structurally and metabolically are similar to classical monoamines, but their concentration is about 100 ng/g of tissue. Nevertheless, TA and their receptors called trace amine associated receptors (TAARs) may modulate different functions of nervous systems. Particular interest to them in recent years is due to their ability not only modulate the action of monoamines and can be expressed together with their transporters and receptors. Today 15 types of trace amine associated receptors have been identified, but their role in sensorimotor functions is not fully understood [1]. This study investigates the role of the type 5 receptor (TAAR5) in motor control in various types of locomotion. METHODS: The work was carried out on mice with a knockout gene (TAAR 5 KO) encoding the expression of this receptor (n = 7) and WT mice (n = 6). Behavioral tests were performed after implantation of recording electrodes into m. tibialis anterior (L_TA) of the left hind limb and recovery period. Locomotion was assessed during walking on a flat surface, on a regular horizontal ladder (1 cm between rungs) and under conditions of water immersion (swimming). In all tests we used the same parameters of installations - 50 cm long and 10 cm wide. The swimming installation was filled water of a temperature of 37 °C and was 25 cm deep. We analyzed the locomotor parameters as the duration of the phases of the gait cycles (swing, stance), the duration of retraction (extension) and protraction (flexion) during swimming, and the duration of intra- and inter- burst interval of L_TA. RESULTS AND DISCUSSION: It was found that the duration of L_TA bursts was shorter ($p < 0.05$) in knockout mice relative to wild-type, while the intervals between bursts did not differ in both groups. At the same time, we observed a decrease in the duration of the retraction phase ($p < 0.05$) in TAAR5-KO mice under water immersion conditions, although during walking on a flat surface the phases of the cycle did not differ in both groups. The results of the horizontal ladder did not show significant differences. Based on the data obtained, it can be assumed that TAAR5 can specifically affect muscle activity and the characteristics of the locomotor cycle under various conditions of locomotion, especially it may depend on of the gravity. RESEARCH SUPPORT: This work was performed within project ID: 73025317 of the St. Petersburg State University, St. Petersburg, Russia.

EXPLORING THE CONSEQUENCES OF A SINGLE SOCIAL DEFEAT STRESS ON ACCUMBAL DOPAMINE IN MALE AND FEMALE RATS. VV Nemets, VA Zavyalov, PA Chepik, RR Gainetdinov, EA Budygin, St. Petersburg State University, Institute of Translational Biomedicine, St. Petersburg, Russia; Wake Forest School of Medicine, Department of Neurobiology and Anatomy, Winston-Salem, NC, USA

FEATURES OF AUTONOMOUS REGULATION OF THE CARDIOVASCULAR SYSTEM IN ELDERLY UNDER STRESS. VP Nesterov, AI Burdygin, KB Ivanov, SV Nesterov, Sechenov Institute of Evolutionary Physiology and Biochemistry RAS, St. Petersburg, Russia

INTRODUCTION: The use of the piezopulsometric method developed by us (RF Patent for invention, 2020) for a non-invasive study of the functional state of the cardiovascular system (CVS) in an elderly man after physical trauma made it possible to reveal signs of a negative stress response of muscle effectors (ME) CVS to this impact. The combined carrying out of contour and spectral analyzes of variable parameters of pulse arterial pressure (PAP = PP) of blood expanded the range of assessment of cardiohemodynamic parameters (CGD) and made it possible to identify the physiological mechanisms underlying the changes in these parameters. In this work, we used an individual approach to the analysis of CHD parameters and their variability in a particular patient, which is recognized as relevant in our time. METHOD: The basis of the applied method is a computer complex, which includes synchronously functioning piezoelectric sensors and an interface converter. Local changes in PP are visualized on the monitor in the form of graphs of the dependence of the rate of change in the VPP value on time (t), which makes it possible to analyze with high accuracy the dynamics of changes in the amplitude-time parameters of such graphs based on calculated points. A feature of our development is the use of point B - an absolute positive extremum, which non-invasively assesses the contractility of the left ventricular myocardium (LVM) and on which the reflected pulse wave RW (reflected wave) is never superimposed, which significantly increases the accuracy of assessing the CHG indicators, compared with other methods. The parameters VmaxPP [mm Hg / s], SAP [mm Hg] and TNN [ms] were used as parameters for the non-invasive assessment of the effectiveness of the systems of autonomic regulation of ME CVS. RESULTS AND DISCUSSION: It has been shown that the impact of acute post-traumatic pain on the first day of observation causes a negative stress reaction in the ME CVS, provoking an abnormal increase in the contractility of the LV myocardium (the maximum rate of increase in pulse blood pressure - VmaxPP: before injury - 643 ± 71 mm Hg / s, after injury - 2117 ± 173 mm Hg / s). An even greater

increase was revealed when comparing the values of the dicrotic index (DIx): before the injury - 36 ± 9%, after - 375 ± 11% (an increase of 10 times!). The reason for this growth may be the excessively high total accumulation of mediators of sympathoadrenal regulation from the activated neurohumoral system, near the adrenergic receptors of the sarcolemma of cardiomyocytes (CM). This may result from a rapid release of norepinephrine from sympathetic efferents in addition to the increased release of humoral catecholamines from the adrenal cortex, which is common in the elderly. This conclusion follows from the redistribution of HA and ACh activities revealed during the examination. It was shown that the variability of all the main studied parameters of CGD, caused by GC exposure before injury in the ULF range, significantly decreased as a result of trauma, and this decrease was accompanied by an increase in the regulatory activity (variability of parameters) of parasympathetic efferents in the HF range. The released mediator of the autonomic nervous system (ANS), acetylcholine (ACh), plays an important cardioprotective role, inhibiting the contractile function of BM and thereby reducing the load on the heart.

EFFECTS OF GLIBENCLAMIDE ADMINISTRATION ON COGNITIVE FUNCTIONS OF RATS IN NORMOGLYCEMIA. AS Zubov, TV Tiutiunnik, MN Karpenko, VM Klimenko, Institute of Experimental Medicine, St. Petersburg State University, St. Petersburg, Russia

INTRODUCTION: Glibenclamide (GD) is a sulphonylurea-based blood glucose-lowering drug used as a treatment for type 2 diabetes worldwide. However, the effect of GD on CNS and in particular on cognitive function is still poorly understood. MATERIALS AND METHODS: The experiments were carried out on 20 male Wistar rats. At the age of 4 months the cognitive functions were tested with Morris water maze and Y-maze. At 7 months of age, the rats were divided into two groups - Group 1 (daily intraperitoneal (i.p.) administration of GD at a dose of 50 μg/kg for 30 days, n=10) and Group 2 (daily i.p. administration of sodium chloride at a dose of 1 ml/rat for 30 days). At the age of 8 months, the maintenance of cognitive function was also checked using the Morris water maze and the Y-maze. Data are presented as Me (qn; qc), and Wilcoxon or Kruskal-Wallis test followed by Newman-Keuls rank test were used. RESULTS: The residence time in the Morris water maze was found to be statistically insignificant, p = 0.09, in rats aged 4 months (41.7 (31.4; 45.9) seconds) and in the same rats aged 8 months (37.9 (26.7; 41.3) seconds). The administration of GD according to the chosen scheme led to an increase in the residence time in the platform area (45.1 (38.9; 53.3) seconds) in the Morris water maze compared to the control (37.85 (26.72; 41.29) seconds), p = 0.014. When tested in the Y-maze, there was a reduction in the % alternation of burrows at 8 months of age (51.1 (37.6; 70.7)) compared to the same rats at 4 months of age (66.03 (65.0; 72.7)), p = 0.0001. Also, administration of GD increased the % alternation of burrows (74.8 (58.5; 86.1)) compared to control animals at young and older ages, p = 0.0001, p = 0.004 respectively. Thus, the introduction of GD leads to improved spatial learning and memory.CONCLUSIONS: Intraperitoneal administration of GD at a dose of 50 μg/kg for 30 days resulted in improvement of cognitive functions in 8-month-old rats. RESEARCH SUPPORT: The reported study was funded by RFBR, project number 20-015-00168.

THERAPEUTIC EFFECT OF HESPERIDIN ON THE INFLAMMATORY RESPONSE AND OXIDATIVE STRESS INDUCED BY A TRAUMATIC BRAIN INJURY IN RATS, YL Yang, MA Tikhonova, TG Amstislavskaya, KT Lu, Novosibirsk State University, Novosibirsk, Russia, National Chia-Yi University, Chia-Yi, National Taiwan Normal University, Taipei, Taiwan

INTRODUCTION: Traumatic brain injury (TBI) is one of the most prevalent causes of morbidity and mortality all over the world. However, there are no effective pharmacological approaches aimed at neuroprotection in brain injury, correction of the effects of trauma and restoration of lost nerve cells (neuroregeneration). Hence, the search for drugs of neuroprotective action and drugs-inducers / modulators of neurogenesis that would be beneficial at TBI is an urgent task. Hesperidin (C28H34O15) is known as a flavanone glycoside, richly found in the citrus fruits. It possesses the anti-oxidant, anti-inflammatory, and anti-carcinogenic activities. Moreover, herperidin elicits neuroprotective effect through attenuating the free radicals formation, modulating neurotransmitter systems and various inflammatory cytokines, it significantly reduces the capillary permeability which is critical to brain edema formation. Here we studied the effects of hesperidin on a model of a closed neurotrauma in rats. METHODS: A conventional weight drop device was used to induce focal impact in a rat for inducing TBI. Hesperidin was administered at doses of 25, 50, or 100 mg/kg immediately after TBI. Three days after TBI, rats were sacrificed and brain samples were taken for subsequent determination of the levels of inflammatory markers and oxidative stress. To assess the content of HO-1, COX-2, and iNOS in hippocampal homogenates, we used standard methods for total protein isolation and Western blotting with specific antibodies. In addition, the levels of lipid peroxidation in the frontal cortex and hippocampus were determined according to the content of malondialdehyde (MDA) using ELISA. RESULTS AND DISCUSSION: On the third day after the trauma, the expression of inflammatory markers (HO-1 (Heme Oxygenase-1), COX-2 (Cyclooxygenase 2), iNOS (inducible nitric oxide synthase)) was prominent. All doses of hesperidin used in the experiment significantly reduced the neuroinflammatory response to the