COBRAIN Scientific-Educational Center for Fundamental Brain Research
Yerevan State Medical University named after Mkhitar Heratsi
International Stress and Behavior Society (ISBS)
Orbeli Institute of Physiology

NEUROSCIENCE WEEK
MAY 16-19, 2023

Final Program Part 1

EU HORIZON 2020 COBRAIN Project Closing Conference (May 16-17, 2023)

Buniatyan Lectures Series in Biochemistry of the Nervous System (May 17, 2023)

The 29th International Annual ISBS "Stress and Behavior" Neuroscience and Biological Psychiatry Conference (May 18-19, 2023)

Orbeli Institute of Physiology "Psychophysiology Symposium" (May 19, 2023)

May 16-19, 2023, Yerevan, Armenia

NEUROSCIENCE WEEK VENUES

May 16-18, 2023	COBRAIN Center, Yerevan State Medical University after Mkhitar Heratsi, 1 Heratsi Str., Yerevan 0025, Armenia
May 19, 2023	L.A. Orbeli Institute of Physiology of Armenian National Academy of Sciences, 22 Orbeli Brothers Str., Yerevan 0028, Armenia
Secretariat:	COBRAIN Center, Yerevan State Medical University, 0025, Yerevan, Armenia
Tel/Fax:	+374 (10) 301014
Web site:	www.cobrainarmenia.org
E-mail:	cobrainarmenia@gmail.com

May 16, 2023 COBRAIN Project Closing Conference
Venue: Nelly Khostikyan Auditorium (Blue Hall), YSMU

10.30-17.00 Registration open

11.00-11.30 **WELCOMING ADDRESSES:**
A. Muradyan, Rector, Yerevan State Medical University
Zh. Andreasyan, Minister of Education, Science, Culture and Sport of RA
A. Wiktorin, Ambassador of the European Union to Armenia
V. Richter, Ambassador Extraordinary and Plenipotentiary of Germany
P. Svensson, Ambassador Extraordinary and Plenipotentiary of Sweden
S. Hayotsyan, Chairman of the State Committee for Science of Armenia

WELCOMING REMARKS: EXTERNAL ADVISORY BOARD MEMBERS

11.30-12.00 **OUTCOMES OF COBRAIN PROJECT AND THEIR EXPECTED IMPACT ON RESEARCH, SOCIETY AND INDUSTRY.** Speaker: K. Yenkoyan, COBRAIN Project Coordinator, COBRAIN Center Scientist-in-Chief, Yerevan State Medical University, Armenia
Co-speakers: L. Danielyan, Head of Laboratory of Cellular/Molecular Pharmacology at the Department of Clinical Pharmacology, Eberhard Karls University Tübingen, Germany, H. Nguyen, Head of Department of Human Genetics, Ruhr-University Bochum, Germany

12.00-12.30 **GUIDED TOUR OF THE COBRAIN CENTER (by invitation only)**

12.00-13.00 **LUNCH BREAK**

13.00-13.20 **SHARING EARLY-STAGE RESEARCHERS' LONG-TERM TRAINING EXPERIENCE** K. Fereshetyan, Department of Biochemistry, COBRAIN Center, Yerevan State Medical University, Armenia, Co-speakers: E. Sahakyan, Department of Pharmacy, COBRAIN Center, G. Karapetyan COBRAIN Center, A. Khamperyan, COBRAIN Center, M. Mirumyan, Department of Biochemistry, COBRAIN Center, Yerevan State Medical University, Armenia

13.20 -13.30 **ESTABLISHMENT OF KNOWLEDGE AND TECHNOLOGY TRANSFER OFFICE** M. Movsisyan, Department of Clinical Immunology and Allergology, COBRAIN Center, Yerevan State Medical University, Armenia

13.30-13.50 **SCIENTIFIC DIRECTIONS OF COBRAIN CENTER** K. Yenkoyan, COBRAIN Project Coordinator, COBRAIN Center Scientist-in-Chief, Yerevan State Medical University, Armenia

13.50-14.10 **THE SYNERGY OF B-AMYLOID 1-42 AND OXIDATIVE STRESS IN THE DEVELOPMENT OF ALZHEIMER'S DISEASE-LIKE NEURODEGENERATION OF HIPPOCAMPAL CELLS** H. Harutyunyan, Neuroscience Laboratory of COBRAIN Center, Yerevan State Medical University, Armenia

14.10-14.30 **PERINATAL EXPOSURE TO VALPROATE IN RODENTS AND AUTISM SPECTRUM DISORDER** K. Fereshetyan, Department of Biochemistry, Neuroscience Laboratory of COBRAIN Center, Yerevan State Medical University, Armenia

14.30-14.50 **DEVELOPING EXPERIMENTAL MODELS OF M-TOROPATHIES: TRANSLATIONAL INSIGHTS FROM ZEBRAFISH.** A. Grigoryan, Pathophysiology Department, Neuroscience Laboratory of COBRAIN Center, Yerevan State Medical University, Yerevan, Armenia

14.50-15.10 **COFFEE BREAK**

15.10-15.30 **RISK FACTORS OF AUTISM SPECTRUM DISORDER** M. Mkhitaryan, Department of Human Anatomy, Neuroscience Laboratory of COBRAIN Center, Yerevan State Medical University, Yerevan, Armenia

15.30-15.50 **KINETICS OF ANTI-SARS-COV2 ANTIBODY RESPONSE IN COVID-19 CONVALESCENT PATIENTS** M. Movsisyan, Department of Clinical Immunology and Allergology, Neuroscience Laboratory of COBRAIN Center, Yerevan State Medical University, Armenia

15.50-16.10 **COGNITIVE DISORDERS AFTER COVID-19** Y. Hovhannisyan, Department of Neurology, Neuroscience Laboratory of COBRAIN Center, Yerevan State Medical University, Armenia

16.10-16.30 **ASSESSMENT OF SMELL AND TASTE DISTURBANCES AMONG COVID-19 CONVALESCENT PATIENTS** K. Melkumyan, Department of Physiology, COBRAIN Center, Yerevan State Medical University, Armenia

16.30-17.00 **"THE BEAUTY OF THE BRAIN" EXHIBITION UNDER THE "ART AND SCIENCE" INITIATIVE (LABORATORY BUILDING FOYER)**

17.00- 17.10 **WRAP-UP**

19.00 **COBRAIN WELCOMING RECEPTION (by invitation only)**

May 17, 2023 Buniatyan lectures in Biochemistry of the Nervous System

Venue: Nelly Khostikyan Auditorium (Blue Hall), YSMU

9.30-10.00 Registration

10.00-10.20 **WELCOMING REMARKS**

10.20-11.00 **SCIENTIFIC PATHWAY OF ACADEMICIAN HRACHYA BUNIATYAN** G. Buniatyan

11.00-11.40 **EMPLOYING CELL-BASED THERAPIES IN CNS DISORDERS** L. Danielyan, Laboratory of Cellular/Molecular Pharmacology, Department of Clinical Pharmacology, EKUT, Germany

11.40-12.10 **TRANSLATIONAL GENETICS: FROM GENE TO THERAPY** H. Nguyen, Ruhr-Universität Bochum, Germany

12.10-12.40 **DIGITAL MOBILITY ASSESSMENT IN NEUROLOGICAL DISEASES** S. Jäger, M Fischer-Bosch-Institute of Clinical Pharmacology, Stuttgart, Department of Clinical Pharmacology, University of Tübingen, Germany

12.40-13.30 **LUNCH BREAK**

13.30-13.50 **BRAIN REWARD SYSTEM AND ITS ROLE IN OBESITY PATHOGENESIS** H. Harutyunyan, Department of Biochemistry, Neuroscience Laboratory of COBRAIN Center, Yerevan State Medical University, Armenia

13.50-14.10 **ALPHA2-ADRENOBLOCKERS REGULATE DEVELOPMENT OF OXIDATIVE STRESS AND COGNITIVE BEHAVIOUR OF RATS UNDER CHRONIC ACOUSTIC STRESS CONDITIONS** A. Manukyan, Department of Medical Chemistry, Yerevan State Medical University, Armenia

14.10-14.30 **BREAK**

14.30-18.00 **NETWORKING NEUROTALKS** (all interested scientists and scientific groups active in neuroscience are welcome to present and share their scientific research directions)

COBRAIN Scientific-Educational Center for Fundamental Brain Research
Yerevan State Medical University named after Mkhitar Heratsi
The International Stress and Behavior Society (ISBS)
Orbeli Institute of Physiology

NEUROSCIENCE WEEK

Final Program Part 2

The 29th International Annual ISBS "Stress and Behavior" Neuroscience and Biological Psychiatry Conference (May 18-19, 2023)

Symposium of L.A. Orbeli Institute of Physiology (May 19, 2023)

In conjunction with:

EU HORIZON 2020 COBRAIN Project Closing Conference (May 16-17, 2023)
Buniatyan Lectures Series in Biochemistry of the Nervous System (May 17, 2023)

May 16-19, 2023, Yerevan, Armenia

NEUROSCIENCE WEEK VENUES

May 18, 2023 – COBRAIN Center, Yerevan State Medical University after Mkhitar Heratsi. 1 Heratsi Str., Yerevan 0025, Armenia
May 19, 2023 - L.A. Orbeli Institute of Physiology of Armenian National Academy of Sciences. 22 Orbeli Brothers Str., Yerevan 0028, Armenia

CONTACTING INFORMATION:

Address: ISBS-CPBP Secretariat, 309 Palmer Court, Slidell, LA 70458, USA
Tel/Fax: +1 (240) 899-9571
Web site: www.stressandbehavior.com
E-mail: isbs.congress@gmail.com

May 18, 2023 ISBS Conference
Venue: Nelly Khostikyan Auditorium (Blue Hall), YSMU

09.00-18.00 Registration open

09.00-09.10 CONFERENCE WELCOMING ADDRESSES: Prof. AV Kalueff, ISBS President

09.10-10.40 PLENARY LECTURES (30 MIN)

09.10-09.40 PLENARY LECTURE 1. CALCIUM AND METABOLIC ACTIVITY IN CORTICAL ASTROCYTES DURING LOCOMOTION IN MICE. AV Semyanov. Jiaxing University College of Medicine, Jiaxing, China; Institute of Bioorganic Chemistry, Moscow, Russia

9.40-10.10 PLENARY LECTURE 2. NEUROLOGICAL DISORDERS AFTER ACUTE SEVERE ETHANOL POISONING IN RATS. TN Savateeva-Lyubimova, AG Aleksandrov, S. Kazakova. Smorodintsev Research institute of influenza of the Ministry of Health, St. Petersburg, Russia

10.10-10.40 PLENARY LECURE 3. MOLECULAR CORRELATES OF DEPRESSIVE -LIKE STATE IN MOUSE MODELS OF EMOTIONAL STRESS: IMPACT OF AGE, GENETIC FACTORS AND ANTI-OXIDANT INTERVENTIONS. T Strekalova, Maastricht University, Maastricht, Netherlands

10.40-11.00 Coffee break

11.00-13.00 PASTUKHOV-ZUKOVSKA SYMPOSIUM
Chairs: AV Semyanov, T Strekalova

11.00-11.15 INTRODUCTION. AV Kalueff

11.15-13.00 CONFERENCE TALKS (15 MIN)

INHIBITION OF AQUAPORIN-4 AGGRAVATES NIGROSTRIATAL ALPHA-SYNUCLEIN PATHOLOGY AND NEURODEGENERATION IN A RAT MODEL OF PARKINSON'S DISEASE. KV Lapshina, MV Khanina, MA Guzeev, IV Ekimova, Sechenov Institute of Evolutionary Physiology and Biochemistry RAS, St. Petersburg, Russia

EFFECT OF POINT MUTATIONS IN *DISC1* GENE ON MOUSE STRESS RESPONSE. KV Smirnova, EV Nehoroshev, ND Chizhova, TG Amstislavskaya, Scientific Research Institute of Neurosciences and Medicine, Novosibirsk State University, Novosibirsk, Russia

LONG-TERM CONSEQUENCES IN RAT OFFSPRING WITH EXPERIMENTAL PRE-ECLAMPSIA: POSSIBILITIES OF PHARMACOLOGICAL CORRECTION WITH GABA DERIVATIVES. VN Perfilova, EA Muzyko, IN Tyurenkov, Volgograd State Medical University, Volgograd, Russia

EFFECTS OF HYDROPONIC TEUCRIUM POLIUM IN AN AMYLOID B-INDUCED ALZHEIMER-LIKE RAT MODEL. KV Simonyan, LP Manukyan, LE Hambardzumyan, LV Darbinyan, VA Chavushyan, Orbeli Institute of Physiology NAS, Yerevan, Armenia

COGNITIVE AND BEHAVIORAL DYSFUNCTION IN LEPTIN-RESISTANT MICE. VA Prikhodko, TM Matuzok, SV Okovityi. St. Petersburg State Chemical and Pharmaceutical University, St. Petersburg, Russia

LOCOMOTION DIFFERENTLY AFFECTS MITOCHONDRIAL RESPIRATION AND H_2O_2 PRODUCTION IN ASTROCYTES AND NEURONS. K Morozova, A Tiaglik, A Fedotova, M Shestopalova, A Zalygin, V Oleinikov, D Bilan, N Brazhe, A Semyanov. Moscow State University, Faculty of Biology, Institute of Bioorganic Chemistry, Moscow, Russia, Department of Physiology, Jiaxing University College of Medicine, Jiaxing, China

ACUTE AND CHRONIC BEHAVIORAL EFFECTS OF GBR 12909, A SELECTIVE DOPAMINE UPTAKE INHIBITOR, IN ADULT ZEBRAFISH. TO Kolesnikova, YuA Viktorova, MM Kotova and AV Kalueff, Sirius University of Science and Technology, Sirius Federal Territory, Institute of Translational Biomedicine, St. Petersburg, Russia

GENERAL DISCUSSION

13.00-14.00 Lunch break

14.00-14.25 HOW TO ACCELERATE THE SPEED AND INCREASE THE QUALITY OF PRE-CLINICAL STUDY, FOLLOWING STANDARD EXTERNAL ENVIRONMENTAL FACTORS FOR ANIMALS. L Bachdasarian, R Bulthuis, A Sargsyan, Metris BV, Hoofddorp, Netherlands; L.A. Orbeli Institute of Physiology NAS, Yerevan, Armenia

14.25-18.00 LAPIN TRANSLATIONAL NEUROSCIENCE SYMPOSIUM
Chairs: AV Kalueff, KB Yenkoyan

14.25-14.30 INTRODUCTION. AV Kalueff

14.30-16.00 CONFERENCE TALKS (15 MIN)

EFFECTS OF OREXIN AND GHRELIN ON HYPOTHALAMIC SELF-STIMULATION IN RATS FOLLOWING CORTICOLIBERIN RECEPTORS BLOCKADE. PD Shabanov, VV Lukashkova, AA Lebedev, Institute of Experimental Medicine, St. Petersburg, Russia

BEHAVIORAL EFFECTS OF THE FORCED SWIMMING-INDUCED STRESS AND GLUCOCORTICOIDS IN MICE IN THE BWP TEST: PILOT STUDIES. IO Mokoseev, DV Krvachenko, NA Salimova, AV Zhdanov, SL Khatsko, AV Kalueff, Ural Federal University, Ekaterinburg, Russia

INFLUENCE OF RESTRAINT STRESS AND ELECTROMAGNETIC RADIATION OF INDUSTRIAL FREQUENCY ON THE ANXIETY-LIKE BEHAVIOR OF THE RATS IN THE OPEN FIELD TEST. AM Kadukova, Institute of Radiobiology NASB, Gomel, Belarus

A NEW METHOD OF DRUG ADMINISTRATION THROUGH THE NOSTRILS OF ZEBRAFISH. DS Galstyan, TO Kolesnikova, AV Kalueff, Institute of Translational Biomedicine, St. Petersburg State University, Institute of Experimental Medicine, Almazov National Medical Research Centre, Ministry of Healthcare, Granov Russian Scientific Center for Radiology and Surgical Technologies, Ministry of Healthcare, St. Petersburg, Russia

INFLUENCE OF THE *DAT* GENE KNOCKOUT ON EARLY RATS DEVELOPMENT. NS Pestereva, DS Traktirov, IR Nazarov, ZS Fisenko, MN Karpenko, VM Klimenko. Institute of Experimental Medicine, Peter the Great St. Petersburg Polytechnic University, Institute of Translation Biomedicine, St. Petersburg State University, St. Petersburg State University, St. Petersburg, Russia

NEW TRANSFORMER MAZE TO EXPLORE DIFFERENT SPATIAL NAVIGATION TASKS IN RODENTS. EV Filatova, GE Gromova, VA Zavyalov, AY Egorov, Sechenov Institute of Evolutionary Physiology and Biochemistry RAS, St. Petersburg State University, St. Petersburg, Russia

16.00-17.40 ONLINE LECTURES (20 min):

16.00-16.20 ADRGL3 AND IMPULSE CONTROL DISORDERS: ZEBRAFISH AS A MODEL FOR DRUG DISCOVERY. M Parker, University of Surrey, Surrey, UK

16.20-16.40 ZEBRAFISH MODELS IN TRANSLATIONAL NEUROSCIENCE RESEARCH: EMPHASIS ON STRESS-RELATED RESPONSES. DB Rosemberg, Department of Biochemistry and Molecular Biology, Natural and Exact Sciences Center, Federal University of Santa Maria, RS, Brazil

16.40-17.00 LOOKING FOR SIMILARITIES IN TRANSCRIPTOMIC FINGERTIPS OF AFFECTIVE DISORDERS IN DIFFERENT VERTEBRATES. KA Demin, AD Shevlyakov, TO Kolesnikova, 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 of Science and Technology, Sirius Federal Territory, Russia

17.00-17.20 EMERGING PHARMACOLOGY OF TRACE AMINE-ASSOCIATED RECEPTORS (TAARS). RR Gainetdinov, Institute of Translational Biomedicine, St. Petersburg State University, St. Petersburg, Russia

17.20-18.00 PLENARY LECTURES

17.20-17.40 PLENARY LECTURE 4: INTEGRATIVE MECHANISMS OF POSTURE AND LOCOMOTOR CONTROL IN NORMAL AND PATHOLOGICAL CONDITIONS. PE Musienko, Sirius University of Science and Technology, Sirius Federal Territory, Institute of Translational Biomedicine, St. Petersburg State University, Russia

17.40-18.00 PLENARY LECTURE 5: THE 'GOLD' FISH IN NEUROSCIENCE RESEARCH. AV Kalueff, Neurobiology Program, Sirius University of Science and Technology,

Sirius Federal Territory, Institute of Translational Biomedicine, St. Petersburg State University, Institute of Experimental Medicine, Almazov Medical Research Center, St. Petersburg, Scientific Research Institute of Neuroscience and Medicine, Novosibirsk, Granov Scientific Research Center of Radiology and Surgical Technologies, St. Petersburg, Ural Federal University, Yekaterinburg, Russia; Neuroscience Laboratory, COBRAIN Center, M Heratsi Yerevan State Medical University, Yerevan, Armenia.

18.00-19.00 ISBS Welcoming reception

May 19, 2023 Orbeli Institute of Physiology Psychophysiology Symposium (Main Conference Hall)

Venue: 22 Orbeli Brothers Str., Yerevan 0028, Armenia

09.00-17.00 Registration open

Prof. NM Ayvazyan, Institute Director

10.15-10.45 **NEUROPHYSIOLOGY TALK: MORPHOFUNCTIONAL ASTROCYTE REMODELLING IN AGING.** A Popov, N Brazhe, K Morozova, K Yashin, M Bychkov, O Nosova, O Sutyagina, A Brazhe, E Parshina, L Li, I Medyanik, DE Korzhevskii, Z Shenkarev, E Lyukmanova, A Verkhratsky, A Semyanov, Jiaxing University College of Medicine, Zhejiang Pro, Jiaxing China; Shemyakin-Ovchinnikov Institute of Bioorganic Chemistry RAS, Moscow State University, Moscow, Sechenov First Moscow State Medical University, Privolzhskiy Research Medical University, Nizhny Novgorod, Institute of Experimental Medicine, St. Petersburg, St. Petersburg, Russia; Medicine and Health, The University of Manchester, Manchester, UK; Achucarro Center for Neuroscience, IKERBASQUE, Basque Foundation for Science, Bilbao, University of the Basque Country UPV/EHU and CIBERNED, Leioa, Spain

10.45-15.40 **ORBELI INSTITUTE OF PHYSIOLOGY PSYCHOPHYSIOLOGY SYMPOSIUM**
Chairs: NM Ayvazyan, PE Musienko, AV Semyanov, AV Kalueff

10.45-11.30 **SYMPOSIAL TALKS (15 MIN)**

SFCO POSITION AND VIBRATION SENSORS AS A HIGHLY SENSITIVE TOOL FOR BEHAVIORAL PHYSIOLOGY RESEARCH. AS Khachunts, SG Gevorgyan, AA Tumanian, AR Sargsyan, GS Gevorgyan, BA Khachunts, L.A. Orbeli Institute of Physiology NAS, Yerevan State University, Yerevan, Armenia

COGNITIVE FEATURES OF ASSESSING STUDENTS' ACADEMIC EMOTIONS IN THE CONTEXT OF COVID-19. NA Sahakyan, EA Avetisyan, AA Petrosyan, NE Tadevosyan, SA Shogheryan, Armenian State Pedagogical University after Abovyan, L.A. Orbeli Institute of Physiology NAS, Yerevan, Armenia

NEUROPHYSIOLOGICAL MECHANISMS OF THE IMPACT OF SPELEOCLIMATE ON THE BODY. VA Semiletova, Voronezh State Medical University named after NN Burdenko, Voronezh,

Russia

11.30-11.45 **BOOK INTRODUCTION: A TALE OF THREE FISH. WRITING A POPULAR SCIENTIFIC BOOK ON ZEBRAFISH NEUROSCIENCE FOR KIDS.** AV Kalueff

11.45-12.15 **Coffee break**

12.15-12.45 PLENARY LECTURES (20 MIN)

PLENARY ONLINE LECTURE 6. A METHOD FOR ASSESSING THE REPRESENTATIVENESS OF QUESTIONNAIRES FOR STRESSORS. Ph. Fauquet-Alekhine, JAK Erskine, Group INTRA Robotics, France; SEBE-Lab Behavioural and Psychological Science, LSE, UK

PLENARY LECTURE 7. MEMORY IS OUR LORD. EVERYTHING NEW IS WELL-FORGOTTEN OLD. AGHAJANYAN EFFECT "PREVIOUSLY UNKNOWN SIGNALS OF DYING". A Tathevosyan, S Kochinyan, Yerevan State Medical University, Yerevan, Armenia

GENERAL DISCUSSION

13.00-14.00 **Lunch break**

14.00-15.00 SYMPOSIAL TALKS (15 MIN)

A NOVEL METHOD FOR REAL-TIME EVENT DETECTION IN THE EEG BASED ON FRAGMENTARY DECOMPOSITION. A Sargsyan, N Tadevosyan, D Melkonian, Orbeli Institute of Physiology, Yerevan, Armenia; KaosKey Pty. Ltd., Sydney, Australia

DEVELOPMENT OF ANALGESIC AND ANTI-INFLAMMATORY COMBINED PREPARATION BASED ON BLUNT NOSED VIPER VENOM AND OREGANO ESSENTIAL OIL. A Darbinyan, L Parseghyan, A Moghrovyan, M Babajanyan, A Voskanyan, Laboratory of purification, certification and standardization of physiologically active substances, LA Orbeli Institute of Physiology NAS, Yerevan, Armenia

ACUTE BEHAVIORAL AND NEUROCHEMICAL EFFECTS OF RESERPINE ON LEOPARD ZEBRAFISH. AD Kozlova, VA Smolyaninova, DS Galstyan, AV Kalueff, Institute of Translational Biomedicine, St. Petersburg State University, Institute of Experimental Medicine, Almazov National Medical Research Centre, Granov Russian Scientific Center for Radiology and Surgical Technologies, Ministry of Healthcare of Russian Federation, St. Petersburg, Russia

INNOVATIVE INTEGRATED MODEL OF HEALTH AND SOCIAL SERVICES FOR PEOPLE WITH MENTAL DISEASES AT CENTER FOR MENTAL HEALTH-ROUSSE, BULGARIA. G Hayredin, Center for Mental Health-Rousse, Angel Kanchev University of Rousse, Rousse, Bulgaria

PSYCHOLOGY OF INDIVIDUAL DIFFERENCES IN SPATIAL ABILITIES OF STUDENTS OF VARIOUS PROFESSIONAL DIRECTIONS. ZR Takhirova, VI Ismatullina, TV Adamovich, AV Kazantseva, RF Enikeeva, E Harisova, A Tukumbetova, EL Soldatova, EK Khusnutdinova, SB Malykh, Ufa University of Science and Technology, Institute of Biochemistry and Genetics, Ufa Federal Research Centre RAS, Ufa, Ural Federal University, Ekaterinburg, Psychological Institute RAE, Moscow, St. Petersburg State University, St. Petersburg, Russian

15.00-15.20 ONLINE TALK (20 min):

EVOLUTION WITH NEURONAL NETWORKS AND INTERNET INTEGRATION IN THE NATURE. M Koshiba, Yamaguchi University, Tohoku University, Yamaguchi, Saitama Medical University, Moroyama, Saitama, Japan

15.20-18.00 JOINT CONFERENCE POSTER SESSION

STUDY OF THE EFFECT OF BACTERIAL MELANIN IN THE ROTENONE MODEL OF PARKINSON'S DISEASE. MH Danielyan, KA Nebogova, VP Khachatryan, OH Nazaryan, ZA Avetisyan, KV Karapetyan. L.A. Orbeli Institute of Physiology NAS, Yerevan, Armenia

GLUTAMATERGIC TRANSMISSION IN THE HIPPOCAMPUS OF AGING KM RATS. EP Aleksandrova, AA Kulikov, EV Chernigovskaya, Sechenov Institute of Evolutionary Physiology and Biochemistry RAS, St. Petersburg, Russia

DISSOCIATION BETWEEN NEURONAL AND ASTROCYTIC CALCIUM ACTIVITY IN RESPONSE TO LOCOMOTION IN MICE. A Fedotova, A Brazhe, M Doronin, D Toptunov, E Pryazhnikov, L Khiroug, A Verkhratsky, AV Semyanov, Moscow State University, Institute of Bioorganic Chemistry RAS, Sechenov First Moscow State Medical University, Moscow, Russia; Jiaxing University College of Medicine, Zhejiang Pro, Jiaxing, China Medical University, Shenyang China; Neurotar, Helsinki, Finland; Faculty of Biology, Medicine and Health, The University of Manchester, Manchester, UK; Achucarro Centre for Neuroscience, Bilbao, Spain; Department of Forensic Analytical Toxicology, School of Forensic Medicine, Department of Stem Cell Biology, State Research Institute Centre for Innovative Medicine, Vilnius, Lithuania

ASTROCYTE DYSFUNCTION IN KRUSHINSKY-MOLODKINA RATS GENETICALLY PRONE TO AUDIOGENIC EPILEPSY. YS Grigorieva, AA Naumova, SD Nikolaeva, MV Glazova, Sechenov Institute of Evolutionary Physiology and Biochemistry RAS, St. Petersburg, Russia

ASSESSMENT OF PSYCHOLOGICAL AND PSYCHOPHYSIOLOGICAL STATE IN PARTICIPANTS OF THE ARTSAKH WAR. AA Sahakyan, NE Tadevosyan, HG Galstyan, LV Vahradyan, Artsakh State University, Stepanakert, Artsakh, L.A. Orbeli Institute of Physiology NAS, Yerevan, Armenia

DYNAMICS OF HRV SPECTRAL PARAMETERS DURING PRESENTATION OF SMOKING-RELATED VR CONTENT IN NON-SMOKERS AND SMOKERS. AA Tumanian, NE Tadevosyan, BA Khachunts, EA Khachatryan, AS Khachunts, L.A. Orbeli Institute of Physiology NAS, Yerevan State University, Yerevan, Armenia

BIOINFORMATICS-BASED ANALYSES OF RODENT SELF-GROOMING BEHAVIOR AND THE EMERGING COMPLEXITY OF ITS MOLECULAR PATHWAYS. AN Ikrin, AM Moskalenko, RR Mukhamadeev, TO Kolesnikova, AV Kalueff, Sirius University of Science and Technology, Sirius Federal Territory, Russia

PROCOGNITIVE EFFECT OF MEDIUM-CHAIN TRIGLYCERIDE SUPPLEMENTATION IS ASSOCIATED WITH ALTERED CORTICAL GLUTAMATERGIC GENE EXPRESSION AND GUT MICROBIOTA COMPOSITION. EA Kim, EA Shirokov, VA Nikitina, AP Schwarz, DU Krytskaya, NA Arseniev, IN Abdurasulova, VM Klimenko, KP Shcherbakova, AN Trofimov, Institute of Experimental Medicine, St. Petersburg State Chemical Pharmaceutical University, Peter the Great St. Petersburg Polytechnic University, Sechenov Institute of Evolutionary Physiology and Biochemistry RAS, St. Petersburg, Russia

EFFECTS OF LEVOTHYROXINE ON THYROIDECTOMIZED RATS: BEHAVIORAL STUDIES.

LV Darbinyan, LE Hambardzumyan, LP Manukyan, LG Avetisyan, VH Sarkisian, KV Simonyan. L.A. Orbeli Institute of Physiology NAS, Yerevan, Armenia

DYNAMICS OF NEURODEGENERATION IN THE HIPPOCAMPUS OF KRUSHINSKY-MOLODKINA RATS CORRELATES WITH THE PROGRESSION OF LIMBIC SEIZURES. AA Kulikov, AA Naumova, AP Ivlev, MV Glazova, EV Chernigovskaya, Sechenov Institute of Evolutionary Physiology and Biochemistry RAS, St. Petersburg, Russia

AGING AFFECTS GABA TRANSMISSION IN THE HIPPOCAMPUS OF RATS GENETICALLY PRONE TO AUDIOGENIC EPILEPSY. AA Naumova, AP Ivlev, AA Usatykh, EV Chernigovskaya, Sechenov Institute of Evolutionary Physiology and Biochemistry RAS, St. Petersburg, Russia

EFFECT OF DERIVATIVES OF NEUROACTIVE AMINO ACIDS ON RESPIRATORY FUNCTIONAL CHANGES IN THE CARDIAC MITOCHONDRIA OF STRESSED ANIMALS. VN Perfilova, MV Kustova, II Prokofiev, IN Tyurenkov, Volgograd State Medical University, Volgograd, Russia

EVALUATION OF THE IMPACT OF MUSIC OF VARIOUS GENRES UNDER INFORMATION LOADS ON THE FUNCTIONAL STATE OF THE BRAIN OF STUDENTS OF DIFFERENT SPECIALIZATIONS. EA Avetisyan, AA Petrosyan, SA Shogheryan, LG Avanesyan. NA Sahakyan, VH Sarkisian, L. A.Orbeli Institute of Physiology NAS, Yerevan, Armenia

MEDIUM-CHAIN TRIGLYCERIDE SUPPLEMENTATION INDUCES ACUTE CHANGES IN GENE EXPRESSION, MONOAMINE LEVELS IN THE BRAIN, AND CYTOKINE LEVELS IN BLOOD OF MALE WISTAR RATS. VA Nikitina, AP Schwarz, DS Traktirov, SA Apryatin, MN Karpenko, DU Krytskaya, VM Klimenko, KP Shcherbakova, AN Trofimov, Institute of Experimental Medicine, Sechenov Institute of Evolutionary Physiology and Biochemistry RAS, St. Petersburg, Russia

HIGH-FRUCTOSE DIET-INDUCED METABOLIC STRESS: VASCULAR AND NEURONAL PARAMETERS OF RAT BRAIN DYSFUNCTION. LM Sukiasyan, VA Chavushyan, Yerevan State Medical University After M. Heratsi, Orbeli Institute of Physiology NAS, Yerevan, Armenia

IDENTIFICATION OF KEY MOLECULAR PATHWAYS IN EPILEPSY PATHOPHYSIOLOGY BY BIOINFORMATICS APPROACHES. AD Shevlyakov, TO Kolesnikova, KA Demin, AV Kalueff, Sirius University of Science and Technology, Sirius Federal Territory, St. Petersburg State University, Almazov National Medical Research Centre, St. Petersburg, Russia

EFFECTS OF ANTIHISTAMINES IN ADULT ZEBRAFISH IN THE NOVEL TANK TEST. MA Gorbunova, SL Khatsko, AV Zhdanov, AV Kalueff, Ural Federal University, Yekaterinburg, Russia

ACUTE AND DELAYED EFFECTS OF NEONATAL IL-1β AND LPS ADMINISTRATION ON NEUROPLASTICITY GENE EXPRESSION: A COMPARATIVE STUDY IN RATS. EA Shirokov, EA Kim, VA Nikitina, AP Schwarz, OE Zubareva, IN Abdurasulova, VM Klimenko, AN Trofimov, FSBSI Institute of Experimental Medicine, Peter the Great St. Petersburg Polytechnic University, St. Petersburg Chemical and Pharmaceutical University, Sechenov Institute of Evolutionary Physiology and Biochemistry RAS, St. Petersburg, Russia

SINGLE AND PROLONGED EFFECT OF AUDIOVISUAL STIMULATION ON COGNITIVE AND AUTONOMIC PROCESSES. NE Tadevosyan, BB Forghan, AS Khachunts, AA Tumanian, L.A. Orbeli Institute of Physiology NAS, Yerevan, Armenia

BEHAVIORAL ASSESSMENT OF THE CHRONIC EFFECTS OF CIPROFLOXACIN ON

ZEBRAFISH. DD Ashkinova, DS Galstyan, AV Kalueff, Institute of Translational Biomedicine, St. Petersburg State University, Institute of Experimental Medicine, Almazov National Medical Research Centre, Ministry of Healthcare, Granov Russian Scientific Center for Radiology and Surgical Technologies, Ministry of Healthcare, St. Petersburg, Russia

INTERACTION BETWEEN THE FALLOPIAN TUBES AND THEIR INFLUENCE ON ELECTRICAL ACTIVITY OF THE UTERINE CORPUS IN RATS. QV Kazaryan, NG Hunanyan, AV Mkrtchyan, TA Piliposyan, RG Chibukhchyan, YY Trofimova, L.A. Orbeli Institute of Physiology NAS, Yerevan, Armenia

USING FAST-SCAN CYCLIC VOLTAMMETRY FOR DOPAMINE RELEASE DETECTION IN ZEBRAFISH BRAIN IN VIVO. YuA Viktorova, TO Kolesnikova,VP Grinevich, VP Grinevich, EA Budygin, AV Kalueff, Neurobiology Department, Sirius University of Science and Technology, Sirius Federal Territory, Russia

EFFECTS OF MONOTREPENOID DIOL (PROTTREMINE) ON BEHAVIOR OF ZEBRAFISH IN THE MPTP-INDUCED MODEL OF PARKINSON'S DISEASE. EA Timofeeva, AA Bashirzade, OV Ardashov, KP Volcho, NF Salakhutdinov, AV Kalueff, TG Amstislavskaya, Novosibirsk State University, Scientific Research Institute of Neurosciences and Medicine, N.N. Vorozhtsov Novosibirsk Institute of Organic Chemistry, Novosibirsk, Russia

REPLICATION STUDY OF GWAS META-ANALYSIS OF COGNITIVE TRAITS IN THE VOLGA-URAL REGION OF EURASIA. A Kazantseva, R Enikeeva, Y Davydova, Z Takhirova, R Mustafin, M Lobaskova, S Malykh, E Khusnutdinova. Institute of Biochemistry and Genetics, Ufa Federal Research Centre RAS, Ufa University of Science and Technology, Bashkir State Medical University, Ufa; Psychological Institute RAE, Department of Psychology, Lomonosov Moscow State University, Moscow, Russia

ANALYSIS OF THE ASSOCIATION OF POLYMORPHIC VARIANTS OF CANDIDATE GENES FOR MATHEMATICAL ANXIETY WITH INDICATORS OF BRAIN ELECTRICAL ACTIVITY. RF Enikeeva, AV Kazantseva, YuD Davydova, RN Mustafin, MM Lobaskova, IM Zakharov, SB Malykh, EK Khusnutdinova, Institute of Biochemistry and Genetics, Bashkir State Medical University, Bashkir State University, Ufa, Psychological Institute RAE, Moscow, Russia

RETICULOSPINAL NEURONS RESPONSES DURING THE STIMULATION OF VESTIBULAR NERVE AND SPINAL CORD. LR Manvelyan, DO Terzyan, ML Grigoryan, LR Ohanyan, Orbeli Instituite of Physiology NAS, Yerevan, Armenia

ONLINE POSTER: THE IMPACT OF EXPOSURE TO NATURAL ENVIRONMENT FILMS AND STATE BODY APPRECIATION. N Jarasunaite, Psychology and Criminology Course, School of Psychology and Sport Science, Anglia Ruskin University Cambridge, Cambridge, UK.

ONLINE POSTER: EFFECT OF AZITHROMYCIN ON THE STATE OF EXPRESSION OF TLR4-SIGNALING GENES IN THE NUCLEUS ACCUMBENS THE RAT BRAIN DURING OF LONG-TERM ALCOHOL WITHDRAWAL. DD Sukhanova, MI Airapetov, SO Eresko, NM Matveev, AA Shchukina, PD Ignatova, AA Mikhailova, DA Ganshina, GP Kosyakova, AA Lebedev, ER Bychkov, PD Shabanov, Department of Neuropharmacology, Institute of Experimental Medicine, St. Petersburg, Russia

18.00-18.20 JOINT NEUROSCIENCE WEEK CONFERENCE CLOSING REMARKS

COBRAIN Scientific-Educational Center for Fundamental Brain Research
Yerevan State Medical University named after Mkhitar Heratsi
International Stress and Behavior Society (ISBS)
Orbeli Institute of Physiology

NEUROSCIENCE WEEK 2023

Abstracts

The 29th International Annual ISBS "Stress and Behavior" Neuroscience and Biological Psychiatry Conference (May 18-19, 2023)

Orbeli Institute of Physiology "Psychophysiology Symposium" (May 19, 2023)

May 16-19, 2023, Yerevan, Armenia

NEUROSCIENCE WEEK VENUES

May 16-18, 2023 – COBRAIN Center, Yerevan State Medical University after Mkhitar Heratsi. 1 Heratsi Str., Yerevan 0025, Armenia

May 19, 2023 - L.A. Orbeli Institute of Physiology of Armenian National Academy of Sciences. 22 Orbeli Brothers Str., Yerevan 0028, Armenia

May 18, 2023 ISBS Conference.

Venue: Nelly Khostikyan Auditorium (Blue Hall), YSMU

PLENARY LECTURES (30 MIN)

PLENARY LECTURE 1. CALCIUM AND METABOLIC ACTIVITY IN CORTICAL ASTROCYTES DURING LOCOMOTION IN MICE. AV Semyanov. Jiaxing University College of Medicine, Jiaxing, China; Institute of Bioorganic Chemistry, Moscow, Russia. **INTRODUCTION:** The brain active milieu concept holds that the brain function depends on interactions among neurons, glial cells, cells of blood vessels, extracellular space, and extracellular matrix. Within this framework, we investigate the function of astrocytes that form networks and interact with all other elements of the brain active milieu. Astrocytes are not electrically excitable cells but can generate complex spatiotemporal patterns of calcium activity. We investigated different parameters of these patterns recorded in cortical astrocytes with two-photon calcium imaging in awake mice moving on a rotating platform. We also studied calcium activity in hippocampal astrocytes using fibrephotometry. In a quiescent state of the animal, calcium activity was characterized by small but regular fluctuations. During running episodes, astrocytic calcium increased significantly in spread and amplitude. Such calcium elevations had a latency from the running onsets and outlasted the running episodes. The functional relevance of delayed and slow calcium transients in the astrocytic network is currently unclear, and can be associated with memory storage or metabolic processes. Therefore, we performed label-free metabolic imaging (Raman microspectrometry) in awake mice running on a treadmill. We observed that running episodes correlate with prolonged increases in the amount of reduced mitochondrial cytochromes in astrocytes but not neurons. On the contrary, the amount of reduced cytochromes in neurons decreased. Our results demonstrate the strong involvement of cortical astrocytes in the brain activity associated with animal locomotion.

PLENARY LECTURE 2. NEUROLOGICAL DISORDERS AFTER ACUTE SEVERE ETHANOL POISONING IN RATS. TN Savateeva-Lyubimova, AG Aleksandrov, S Kazakova, Smorodintsev, Research institute of influenza of the Ministry of Health, St. Petersburg, Russia. **INTRODUCTION:** Neurotoxic lesions are the consequence of acute severe poisoning by ethanol. This is the most common cause of disability and significantly affecting the quality of life. Consequently, the features of neurotoxic lesions induced by ethanol in experiment have a relevance and considerable value in clinical practice. **METHODS:** This study was conducted in 20 male Wistar rats (190-210 g). Animals were obtained from an accredited laboratory animal nursery. Animal experiments were carried out in agreement with European and national directives for the protection of experimental animals and were approved by the competent local ethical committee. 40% ethanol was administered at a dose of 8,6 g / kg in a volume of 2,72 ml/100 g body weight (LD_{50}) two times with an interval of 15 minutes. The severity of the coma was assessed by a scoring system. This system includes parameters of neurological status and vital function (cyanosis, miosis, righting reflex, corneal and pupillary reflexes, pain and sound reactions, body temperature, respiratory rate). The evaluation of movement coordination was carried out in the beam walking test. Behavioral reactions were evaluated in the elevated plus maze test before the experiment and 24 h after poisoning. **RESULTS AND DISCUSSION:** Ethanol caused a comatose state of varying severity in animals. The mortality rate was 25% and occurred with an exorbitant coma (27 points). The other animals were in a superficial or deep coma. Only 8 animals were able to be tested out from 15 animals in the post-comatose period. Evaluation of movement coordination showed insignificant increasing of missteps and slips comparing with data before experiment. Behavior assessment showed a significant 4-fold decrease of the total number of visits to the arms, a 3-fold decrease of time spent in the center zone and 5,4-fold increase of immobility time comparing with data before experiment in the elevated plus maze test. This indicated a decrease in spatial orientation,

exploration and emotional lability. Therefore, complications arising at the somatogenic stage concern, first of all, the neuropsychic sphere of the organism.

PLENARY LECURE 3. MOLECULAR CORRELATES OF DEPRESSIVE-LIKE STATE IN MOUSE MODELS OF EMOTIONAL STRESS: IMPACT OF AGE, GENETIC FACTORS AND ANTI-OXIDANT INTERVENTIONS. T Strekalova, Maastricht University, Maastricht, Netherlands. **INTRODUCTION:** 'Emotional stress' is primarily triggered by the cognitive processing of negative input. It is regarded as probably the most serious etiologic factor of depression that is challenging to recapitulate in animals. While available stress paradigms achieve considerable face and construct validity in modelling depressive disorders, broader use of naturalistic stressors instead of the more prevalent models with artificial challenges inducing physical discomfort or pain may substantially contribute to the development of novel antidepressants. During the last years, we investigated behavioral, molecular and neuroanatomical correlates of potential model of 'emotional stress', the ultrasound stress paradigm. In this model, a 3-week exposure of Wistar rats and Balb/c mice to unpredictably alternating frequencies of ultrasound between the ranges of 20-25 and 25-45kHz, which are known to correspond with an emotionally negative and with a neutral emotional state, respectively, for small rodents in nature, was shown to induce behavioral and molecular depressive-like changes. Both rats and mice display decreased sucrose preference, elevated "despair" behavior in a swim test, reduced locomotion and social exploration. These abnormalities are accompanied by numerous changes in molecular read-outs of depressive-like syndrome. Apart from classic antidepressants, powerful antioxidants were shown to counteract the ultrasound-induced changes. Remarkably, mice display inter-individual variability to stress-induced state and can be stratified to 'resilient' and 'susceptible' subgroups. Other models, such as rat exposure can be considered as potential paradigms of 'emotional stress', which is not related to physical stressors or pain, and can be successfully used to model a depressive like state in mice as well. In essence, rodent models of 'emotional stress' are likely to provide improved validity in the modelling of clinical depression and may help advance translational research and drug discovery for this disorder.

11.00-13.00 PASTUKHOV-ZUKOVSKA SYMPOSIUM
Chairs: AV Semyanov, TV Strekalova
CONFERENCE TALKS (15 MIN)

INHIBITION OF AQUAPORIN-4 AGGRAVATES NIGROSTRIATAL ALPHA-SYNUCLEIN PATHOLOGY AND NEURODEGENERATION IN A RAT MODEL OF PARKINSON'S DISEASE. KV Lapshina, MV Khanina, MA Guzeev, IV Ekimova, Sechenov Institute of Evolutionary Physiology and Biochemistry RAS, St. Petersburg, Russia. **INTRODUCTION:** The water channel aquaporin-4 (AQP4) is an essential regulator of water homeostasis in the brain. AQP4 also participates in the glymphatic clearance of brain parenchyma from various metabolites, including amyloidogenic proteins that contribute to the development of neurodegenerative diseases, such as Parkinson's disease (PD). The key role in PD pathogenesis belongs to misfolded α-synuclein and its post-translational modifications, which evoke the formation of toxic oligomers and the development of neurodegeneration. Our work examined the effect of AQP4 pharmacological inhibition on the development of α-synuclein pathology, neurodegeneration rate and compensatory processes in the nigrostriatal system in the rat model of PD, evoked in male Wistar rats by microinjections of the selective proteasome inhibitor lactacystin (LC) into the substantia nigra (SNpc). To suppress AQP4 activity, we performed the microinjections of its inhibitor, TGN020, into the lateral ventricle of the brain. The immunoblotting, filter trap assay, immunohistochemistry and behavioral tests were applied to assess α-synuclein pathology, neurodegenerative changes in nigrostriatal system and motor disturbances. The LC - induced PD model was characterized by the appearance of α-synuclein pathology and prethreshold loss of dopamine (DA)ergic neurons in the SNpc (27%) and their axons in the dorsal striatum (19%) compared to the level at the clinical stage, as well as by a lack of changes in the level of tyrosine hydroxylase (TH) (a key enzyme of DA synthesis in SNpc neurons), and in motor function. Such pathophysiological signs are characteristic of the preclinical stage of PD. The use of TGN020 accelerated the transition from the preclinical to clinical stages of PD, as evidenced by the aggravation of α-synuclein pathology and neurodegeneration in the nigrostriatal system, attenuation of compensatory processes, and the development of PD-like motor symptoms. Our data suggest that AQP4 plays an essential role in molecular mechanisms of neuroprotection. Reduced AQP4 activity can disrupt the glymphatic system functioning, resulting in waste accumulation. AQP4 water channel may be a promising target for the development of novel preventive therapies for PD and other neurodegenerative diseases. **RESEARCH SUPPORT:** RSF grant 22-25-00607.

EFFECT OF POINT MUTATIONS IN *DISC1* GENE ON MOUSE STRESS RESPONSE. KV Smirnova, EV Nehoroshev, ND Chizhova, TG Amstislavskaya, Scientific Research Institute of Neurosciences and Medicine, Novosibirsk State University, Novosibirsk, Russia. **INTRODUCTION**: The etiology of mood disorders involves both genetic and environmental factors. Disc1 gene is a predictor of psychopathologies including depression and schizophrenia. Disc1-Q31L$^{-/-}$ (Q31L) and Disc1-L100P$^{-/-}$ mice (L100P) have point mutation in *Disc1* that produces depressive-like and schizophrenia-like phenotypes, respectively. Chronic unpredictable stress (CUS) is a well-studied model of depression. However, its effect on mice with mutations in Disc1 gene remains unknown. Given data on the influence of CUS duration on depressive-like phenotype, the aim of this study was to investigate varying duration of CUS effect on Disc1 mutant mice. **METHODS:** C56BL/6, Q31L and L100P mice were subjected to CUS for 2 and 4 weeks, and then assessed behaviorally in different tests. After that mice were sacrificed and trunk blood obtained for plasma corticosterone analysis (ELISA). Statistical analysis for normally distributed samples was performed using two-factorial ANOVA and Post-hoc Fisher test (LSD) or the Mann-Whitney U-test (M-U). **RESULTS AND DISCUSSION:** The 2-week stress increased anxiety-like (LSD, $p<0.001$) and depressive-like behavior (LSD, $p<0.05$) in Q31L, but 4-week stress increased locomotor activity (M-U, $p<0.05$) without other effects. In L100P mice, 2- and 4-week stress induced depression-like behavior (LSD, $p<0.05$). Furthermore, 2-week stress increased L100P emotionality (M-U, $p<0.01$) and social interaction (M-U, $p<0.05$), whereas 4-week CUS decreased exploratory behavior (M-U, $p<0.001$). ELISA showed increased corticosterone level in control L100P mice (M-U, $p<0.05$). Varying duration of CUS did not affect corticosterone levels in Disc1 mutant mice, unlike C56BL/6 (M-U, $p<0.001$; increased after 2-week CUS). This Disc1 point mutations altered stress response in mice. Genetically conditioned depressive-like behavior was affected by shorter chronic stress, whereas mice genetically predisposed to schizophrenia-like behavior were strongly affected by 2- and 4-week stress. Interestingly, basal corticosterone level was unaffected by stress in both Q31L and L100P, suggesting another regulatory mechanism of stress response in these mice. **RESEARCH SUPPORT:** Federal budget for fundamental scientific research (project №122042700001-9).

LONG-TERM CONSEQUENCES IN RAT OFFSPRING WITH EXPERIMENTAL PRE-ECLAMPSIA: POSSIBILITIES OF PHARMACOLOGICAL CORRECTION WITH GABA DERIVATIVES. VN Perfilova, EA Muzyko, IN Tyurenkov, Volgograd State Medical University, Volgograd, Russia. **INTRODUCTION:** Pre-eclampsia is a severe complication of pregnancy, characterized by various adverse consequences in children. In particular, on the part of the nervous system, emotional and cognitive disorders are noted, manifested as anxious and depressive behavior, impaired memory, attention, learning, etc. Promising compounds for the treatment of these pathologies are GABA derivatives, since they are low-toxic and have neuroprotective and antihypoxic effects. **METHODS:** Experimental pre-eclampsia (EP) was simulated in female rats by replacing drinking water with 1.8% NaCl solution from days 1 to 21 of pregnancy. From the 40th to the 70th day of life, the offspring of animals were intragastrically injected with purified water (control groups from females without and with EP), GABA derivatives succicard 22 mg/kg, salifen 7.5 mg/kg, phenibut 25 mg/kg and the reference drug pantogam 50 mg /day (experimental groups). At the age of 70 days, 6, 12 and 18 months, the psycho-emotional state of the offspring was studied in the tests "Open field", "Elevated plus maze", "Ball burying", "Porsolta" and cognitive functions in Recognition of a new object, Conditioned passive avoidance, Extrapolation escape tests, Barnes maze. **RESULTS AND DISCUSSION:** The 70-day-old, 6-, 12- and 18-month-old offspring born to rats with EP showed an increased level of anxiety, manifestations of obsessive-compulsive disorder, depressive behavior, as well as short-term and long-term memory, as evidenced by the results of the above tests. Succicard, salifen, phenibut and pantogam had an anxiolytic effect, limited compulsive and depressive behavior, improved memory in the offspring of rats with EP of different ages. However, by 18 months, the effect of therapy in the pubertal period began to weaken, and only succicard retained high activity. Thus, among the studied GABA derivatives, succicard was one of the most promising substances for the correction of psychoemotional and cognitive impairments in the early and late stages of postnatal ontogenesis in the offspring of rats with EP. **RESEARCH SUPPORT**: The Volgograd State Medical University.

EFFECTS OF HYDROPONIC *TEUCRIUM POLIUM* IN AN AMYLOID B-INDUCED ALZHEIMER-LIKE RAT MODEL. KV Simonyan, LP Manukyan, LE Hambardzumyan, LV Darbinyan, VA Chavushyan, Orbeli Institute of Physiology NAS, Yerevan, Armenia. **INTRODUCTION:** Several pathogenic pathways are associated with the progression of Alzheimer's disease (AD), including synaptic failure in the cholinergic networks. *Teucrium polium* (felty germander) has been recognized as a promising candidate for treating AD and related disorders. However, the key role of amyloid β (25-35) in the rat basal forebrain cholinergic circuit and the protective effect of *Teucrium polium* against amyloid β (25-35)-induced disruption of synaptic

plasticity remain poorly understood. The open field test was used to assess anxiety, exploration, and locomotion, assessed using a video-tracking device for 5 min. In the present study, using the open field test and in vivo extracellular single-unit recordings, we studied the efficacy of hydroponic *Teucrium polium* on amyloid β (25-35)-induced neuronal dysfunction in the hippocampus and basolateral amygdala in response to high-frequency stimulation (HFS) of the cholinergic nucleus basalis magnocellularis (NBM) in rats. After 12 weeks, intracerebroventricular injection of amyloid β (25-35) results in a predominance of inhibition during HFS and post-stimulus time and an abnormal evoked spike activity. The exploratory activity and rearing frequency of amyloid β (25-35)-injected rats were also reduced. *Teucrium polium* ameliorated the expression and balance of excitatory and inhibitory responses in the hippocampus and basolateral amygdala and increased locomotor activity in the open field test. Thus, *Teucrium polium* treatment reduced amyloid β (25-35)-induced short-term synaptic plasticity alterations in the NBM-hippocampus-basolateral amygdala circuit by facilitating neurotransmission, modulating network plasticity, and alleviating anxiety-like behavior. **RESEARCH SUPPORT:** The Enterprise Incubator Foundation, Faculty Research Funding Program (2022).

COGNITIVE AND BEHAVIORAL DYSFUNCTION IN LEPTIN-RESISTANT MICE. VA Prikhodko, TM Matuzok, SV Okovityi, St. Petersburg State Chemical and Pharmaceutical University, St. Petersburg, Russia. **INTRODUCTION:** C57Bl/Ks-db+/+m (db/db) mice are resistant to leptin due to an autosomal recessive mutation in the leptin receptor gene. Db/db mice exhibit hyperphagia, morbid obesity, insulin resistance, chronic hyperglycaemia and hyperinsulinaemia, and are prone to a wide spectrum of related metabolic comorbidities. Some studies on this mouse strain report various behavioral abnormalities and neurological deficits, probably related to progressive type 2 diabetes mellitus, vascular dysfunction, and alterations in brain metabolism. In our work, we aimed to explore and define the cognitive and behavioral dysfunction in adult male db/db mice. **METHODS:** All experiments were carried out in complience with the Basel declaration and the Rules of proper laboratory practice of the Eurasian Economic Union. 10 yound adult (4 month) male wild-type (WT) and 10 young adult same-age male db/db mice were consequently tested in the Open field, Elevated plus maze, Light/dark box, Spontaneous alternation, Novel object recognition, and Tail suspension tests. The Tail suspension test was repeated after 3 days with a 20 min-interval single-dose clomipramine (10 mg/kg b. w.) pretreatment. **RESULTS AND DISCUSSION:** In the Open field test, a decrease in distance covered, mean velocity, number of line crossings, rears, and hole pokes was observed in the db/db mice ($p<0.05$, $p<0.01$), while spatial preference was not different between the groups. In the Elevated plus maze and the Light/dark box tests, db/db mice exhibited increased open/light space preference, reduced number of arm visits and exploratory reactions ($p<0.05$, $p<0.01$), resulting in lower anxiety index values compared to WT specimens ($p<0.05$). Spontaneous alternation rate in the T-maze was markedly reduced in the db/db group, indicative of a short-term spatial memory deficit. Novel object recognition appeared normal in both groups; however, greatly reduced exploration was observed among the db/db mice. In the Tail suspension test, immobility duration was increased in db/db mice compared to WT controls ($p<0.05$), and was significantly reduced by clomipramine administration ($p<0.05$). **CONCLUSIONS:** Overall, leptin-resistant mice exhibit poorer short-term memory and an apathetic, depressive-like phenotype characterized by reduced locomotion and exploration, and proneness to inescapable stress-induced behavioral despair. **RESEARCH SUPPORT:** The work used the equipment of the Analytical Center of the Russian Ministry of Health under Agreement 075-15-2021-685 (2021) funded by the Russian Ministry of Education and Science.

LOCOMOTION DIFFERENTLY AFFECTS MITOCHONDRIAL RESPIRATION AND H_2O_2 PRODUCTION IN ASTROCYTES AND NEURONS. K Morozova, A Tiaglik, A Fedotova, M Shestopalova, A Zalygin, V Oleinikov, D Bilan, N Brazhe, A Semyanov, Moscow State University, Faculty of Biology, Institute of Bioorganic Chemistry, Moscow, Russia, Department of Physiology, Jiaxing University College of Medicine, Jiaxing, China. **INTRODUCTION:** Due to its high metabolic activity, the human brain consumes up to 20% of the total oxygen uptake of the body while at rest. However, various cell types of the brain are characterized by different profiles of energy metabolism and spatial organization of electron transport chain (ETC) complexes in the inner mitochondrial membrane. Rapid response of these cells to the changes in oxygen supply (e.g. locomotion, hypoxia, brain activity etc) underlies the normal functional activity of the brain. Therefore, the goal of the present study was to assess the redox state of the ETC complexes in astrocytes and neurons together with monitoring of the blood oxygenation in vessels in cortex of awake mice under locomotion. **METHODS:** Astrocytes and neurons in the somatosensory cortex (S1) of C57Bl/6 mice were identified by the expression of green fluorescent protein and near infrared fluorescent protein respectively, following the AAVs injection. The redox state of the ETC complexes and blood oxygenation was assessed using Raman microspectroscopy with excitation wavelength of 532 nm. In addition, we used

the mitochondrial form of genetically encoded sensor HyPer7 to monitor H_2O_2 production in the mitochondria matrix. **RESULTS AND DISCUSSION:** The blood oxygenation level during locomotion increased in both arterioles and venules of the somatosensory cortex, wherein the relative amount of reduced cytochromes B and C reversibly decreased in neurons and increased in astrocytes in response to animals' activity (running on the treadmill or grooming). Apart from ETC overloading in astrocytes we observed H_2O_2 production in their mitochondria with no significant changes of H2O2 level in neurons. We suggest that H_2O_2 produced in astrocytes' mitochondria plays significant role in the intercellular signaling, contributing to synaptic plasticity. **RESEARCH SUPPORT:** The Russian Science Foundation grant 23-44-00015.

ACUTE AND CHRONIC BEHAVIORAL EFFECTS OF GBR 12909, A SELECTIVE DOPAMINE UPTAKE INHIBITOR, IN ADULT ZEBRAFISH. TO Kolesnikova, YuA Viktorova, MM Kotova, AV Kalueff, Sirius University of Science and Technology, Sirius Federal Territory, Institute of Translational Biomedicine, St. Petersburg, Russia. **INTRODUCTION:** Dopamine plays a key role in locomotion control, cognition, motivation and reward systems in human and animals. Dopaminergic drugs are used for Parkinson's disease, schizophrenia, bipolar disorder or epilepsy. However, the search for dopaminergic drugs increasing synaptic dopamine, but not the release of dopamine (like do illicit drugs), is necessary. GBR 12909, a selective dopamine uptake inhibitor, was developed as a treatment for cocaine and alcohol addiction. Despite clinical studies, molecular mechanisms of GBR 12909 central effects in both human and animals remain poorly understood. The zebrafish (*Danio rerio*), a small teleost fish, became a popular object in psychopharmacology and neurobiology research. **AIM:** Given the rich spectrum of pharmacological activity, strong behavioral/physiological effects of GBR 12909 in rodents and humans, as well as high potential for clinical treatment, further studies may help understand the psychopharmacology of this and related compounds. Here, we further characterize the effects of GBR 12909 in-vivo by assessing its acute (Zabegalov et al., 2023) and chronic behavioral effects in adult zebrafish. **METHODS:** A total of 150 wild type short-fin zebrafish (50:50 male:female ratio) were used for this study. The novel tank test (NTT) was used to assess zebrafish behavior for 5 min, scoring the latency (s) and number of top entries, time spent in the upper part of tank (top), duration and frequency of freezing behavior, the number of anxiety-like erratic movements, distance travelled, frequency and duration of mobility and immobility states using the Ethovision XT11.5 software. Shoaling test (ST) assessed inter-fish distance and shoal area for 10 min. We first evaluated acute effect of 0.25, 0.5 и 1 mg/L of GBR 12909 in adult zebrafish compared with control after standard 20-min pre-treatment in NTT and ST (Zabegalov et al., 2023). Then we measured behavioral effects of chronic 1-week GBR 12909 treatment in doses of 0.05 mg/L, 0.1 mg/L and 0.2 mg/L vs. control in NTT. Finally, we analyzed the effects of GBR 12909 after 3-day chronic treatment with 0.2 mg/L vs. control in NTT. **RESULTS AND DISCUSSION:** Acute effects showed hypolocomotion in fish treated with 1 mg/L of GBR 12909, reducing distance travelled in NTT (Zabegalov et al., 2023). Top frequency and top duration decreased in 1 mg/L vs. control and 0.25 mg/L, and the latency of top entries was significantly longer than in control group. In ST, 1 mg/L demonstrated lower inter-fish distance and shoal area vs. control, vs. 0.1 and vs. 0.5 mg/L. We report toxic effects of 0.1 mg/L and 0.2 mg/L of GBR and noted ataxia, loss of posture, screw-like swimming and belly swimming, and fish mortality. Despite of toxic effects, no significant differences were found in all doses in NTT and ST (Zabegalov et al., 2023). In contrast, chronic exposure with 0.2 mg/L GBR 12909 increased velocity, high-mobile swimming and top duration vs. control. Taken together, this suggests acute treatment with GBR 12909 suppresses locomotor activity and modulate zebrafish behavior similar to another DAT inhibitor, d-amphetamine. Interestingly, zebrafish DAT knockout also evokes elevated anxiety with bottom preference and thigmotaxis, consistent with an anxiogenic profile of GBR 12909 observed here. However, chronic 3-day exposure increased exploratory activity and locomotion in zebrafish. Thus, these findings support zebrafish sensitivity to dopamine inhibitors and suggest that aquatic models based on these fish can be a useful tool to probe CNS effects of GBR 12909 and related synthetic drugs. **RESEARCH SUPPORT:** The Russian Science Foundation project 23-25-00246.

HOW TO ACCELERATE THE SPEED AND INCREASE THE QUALITY OF PRE-CLINICAL STUDY, FOLLOWING STANDARD EXTERNAL ENVIRONMENTAL FACTORS FOR ANIMALS. L Bachdasarian, R Bulthuis, A Sargsyan, Metris BV, Hoofddorp, Netherlands; L.A. Orbeli Institute of Physiology NAS, Yerevan, Armenia. For the discovery and development of medicines or for the environmental studies animal testing is still obligatory. Besides the use of animal testing in pharmaceutical companies it is also used in other companies, such as cosmetics ones. Lately, animal testing gets more resistance than it ever had. People do not think it works properly and find it is not ethical, so they want to see alternatives. For finding alternatives, three R's are used: Reduction, Refinement and Replacement. These are the guiding principles

for the use of animals in research in several countries. For most diseases and disorders animal models exist. For some there are only a few models available, while for others there are many. Diseases and disorders that are studied which are based on animal behavior observation models are for example autoimmune diseases, genetic diseases, neurodegenerative diseases, psychiatric disorders, neurological disorders and vascular disorders. All kind of behaviors can be observed. Sometimes it is just one specific behavior that is examined while other times it is several different behaviors. Not only behavior is observed, but also the ultrasound vocalizations are an important indicator for some models. Another important aspect of life that is often studied is the sleep pattern of the animal in combination with health, diseases, disorders and drugs. Current trends in the pharmaceutical industry require new translational approaches from the pre-clinical test. Those aspects can be achieved by animal (rats, mice) experiments in which not only one variable (e.g. one behavior) at the time is analyzed but rather a multidimensional approach: (Physiological Parameters+ Several Animal Behaviors + Ultra Sound Vocalization (USV)+ different parameters from the study) are applied. Therefore, automation and integrating different measuring technologies become crucial aspects of this process. Combining our knowledge, we can set up a gold standard for the animal models and animal behavioral definitions, but also a gold-standard behavioral phenotyping strategy, thereby increasing the translational capacity of the animal models. Method We have proceeded far along the road towards an ideal measuring method of behaviors with Laboras and Sonotrack system. By critically reviewing all behavioral disorders and animal models that are currently used, and the behavioral phenotyping assays that are applied, future directions are pointed out. Animal models are always a compromise between mimicking the complexity of the actual disorder and designing practical experiments. There is another big problem in medical science, some diseases have similar symptoms and disorders, so it is very difficult to make a correct diagnosis of the disease. Given the complexity of neurodegenerative and psychiatric diseases and its etiology, researchers often focus only on single features or parameter of disease when using animal models. Metris B.V. (Netherlands) proposes to use multi-dimensional and multi-functional parameters for neurodegenerative behavioral study. Behavior = function {internal stimuli / external stimuli} Behavior = function {dynamic internal stimulus /from drug effects}; if external factors = constant •A constant environment is essential to build reliable behavioral study and analysis •To enhance the quality of the study and have better statistical probability, It is important to analyze many parameters from the same behavior (i.e. group of parameters or matrix) Proper analysis and the robust statistic of the data is very important in in-vivo experiments. The use of many independent parameters in the automated recognition of a behavior of the animal is therefore crucial. To recognize a behavior automatically, LABORAS applies the 'Matrix Method' involving the analysis of several parameters that are derived from the measurement system. Metris B.V. is a company that makes measure equipment for animal behavior, especially for mice and rats. Metris BV use two of the three R's in our systems: reduction and refinement. The systems produced by Metris company allow you to use less animals, and this will be less interfering with animal behavior. Measuring matrix parameters and all kinetic energy in in-vivo experiments is very important to obtain a full ethogram of behaviors shown by laboratory animals. Traditional methods based on observation or video analysis offer only limited tracking information. Metris Laboras system enables measurement of all types of kinetic/movement energy while other non-invasive automated systems for behavior detection can only measure the locomotion component of the kinetic energy (e.g. locomotion energy $mv^2/2$, on base of position change). In addition, the matrix method and technology used in Laboras provides a way to measure more behaviors and to recognize them completely automatic and more. By combining parameters from different systems the matrix will get better and further improve the quality of robust statistic. LABORAS system is an advanced and powerful system that automates behavior recognition and classification of laboratory animals (mice and rats), based on the analysis of force and energy. It tracks position and recognize more than 18 BEHAVIORS such as locomotion, immobility, freezing, grooming, eating, drinking, rearing, climbing, scratching, circling, hind limb licking, head shake (HS), wet dog shake (WDS). SONOTRACK system for recording, playback and visualization of ultrasounds vocalizations in laboratory animals (15-125KHz). SONOTRACK AUTOMATED CALL CLASSIFICATION SOFTWARE in Mice is the first and only Call Classification software on the market that revolutionizes USV studies by automatically classifying mouse USV calls into 15 different categories. DSI telemetry system for measuring physiological parameters remotely (without wire measuring pressure, temperature, ECG, EEG, EMG, identification, activity, respiration). SLEEPSIGN / Kissei-SLEEPSIGN software for automatic detection and deep analysis of sleep stages in the animals on the basis of EEG, EMG signals. ASSYST software is a user-friendly, reliable, computational tool for detection of EEG seizures from prolonged EEG recording.

14.25-18.00 LAPIN TRANSLATIONAL NEUROSCIENCE SYMPOSIUM

Chairs: AV Kalueff, KB Yenkoyan

EFFECTS OF OREXIN AND GHRELIN ON HYPOTHALAMIC SELF-STIMULATION IN RATS FOLLOWING CORTICOLIBERIN RECEPTORS BLOCKADE. PD Shabanov, VV Lukashkova, AA Lebedev, Institute of Experimental Medicine, St. Petersburg, Russia. **INTRODUCTION:** A neuropeptide corticoliberin (corticotropin releasing hormone, CRH), mediates brain response to external and internal stressors. CRH interacts with its specific receptors, CRH-R1 and CRH-R2, the former key for emotional reactions. The role of individual brain peptides (orexin, ghrelin) as regulators of stress-dependent CRH signaling remains poorly understood. Here, we study the interaction between the peptide systems of orexin, ghrelin and CRH in reinforcing effects on the self-stimulation response of the lateral hypothalamus and conditional place preference (CPP) in rats. **METHODS:** Experiments were performed on 74 male Wistar rats weighing 200-220 g, kept in a group of 5 individuals in standard plastic cages under vivarium conditions. The main model for the study was the implantation of electrodes and cannulas into brain structures: nichrome monopolar electrodes in glass insulation were implanted bilaterally into the lateral hypothalamic nucleus (electrode diameter 0.25 mm, bare tip length 0.25-0.30 mm, its thickness 0.12 mm), stainless steel metal guide cannulas with a diameter of 0.2 mm were implanted unipolarly into the right ventricle of the brain simultaneously with electrodes inserted into the lateral hypothalamus. To activate brain self-stimulation in rats, we used the classical version of the study of brain self-stimulation in the form of pedal self-stimulation in a Skinner box. Behavioral experiments were started no earlier than 10 days after the operation. At the end of all experiments, morphological control of the localization of the electrode tips was carried out on a series of frontal brain sections, which were stained according to the Nissl method, and preliminary coagulation was carried out through the implanted electrodes with a current of 1 mA for 30 s. Orexin A (Orexin A human, rat, mouse, cat. No. O6012; Sigma-Aldrich, USA) was used for pharmacological analysis; ghrelin (Ghrelin rat, cat. No. 1465 Tocris, England); non-selective CRH antagonist astressin (Sigma-Aldrich, USA), which were used in 3 dosages: 0.1; 1; 10 μg, injected into the lateral ventricle of the brain (icv) through an implanted cannula. Peptide substances were dissolved in distilled water and injected in a volume of 1 μl using a CMA-100 microinjector (Sweden) for 30 s 10-15 min before testing after determining the initial values of self-stimulation of the lateral hypothalamus (10-12 experiments). **RESULTS AND DISCUSSION:** The possible functional interaction of the orexin, ghrelin, and CRH systems in tests of self-stimulation of the lateral hypothalamus was studied. Experiments have shown that orexin at a dose of 10 mcg (icv) and ghrelin at doses of 1 mcg and 10 mcg (icv) slightly (1 mcg, + 7-13%) or moderately (10 mcg, + 18-20%) increased the number of clicks on the pedal in 10 minutes. Astressin in the same doses with intraventricular administration reduced the number of pedal strokes by 27-33%. At the same time, simultaneous administration of orexin and astressin (1 μg and 10 μg icv each), as well as ghrelin with astressin (1 μg and 10 μg icv each) moderately reduced the effects of spontaneous self-stimulation. With intraventricular administration of orexin, ghrelin and astressin at a dose of 0.1 μg, as well as their combinations at doses of 0.1 μg, spontaneous self-stimulation practically did not change. Consequently, all the studied peptides, when introduced into the brain ventricles, had biological activity, which manifested itself at doses of 1 and 10 μg. At a dose of 0.1 μg, the peptides were inactive in this test. The combined administration of orexin and ghrelin with astressin slightly changed the profile of their activity, however, the inhibitory effect of astressin on self-stimulation slightly decreased, especially in the combination of orexin + astressin (1 and 10 μg). This indicates a possible interaction of the studied peptides in the phenomena of self-stimulation of the lateral hypothalamus and reinforcement in general. The results obtained demonstrate that the self-stimulation response of the lateral hypothalamus in rats can be considered as a fairly adequate method for studying the central action of pharmacological substances and for assessing the reinforcing properties of pharmacological agents that have an emotional reinforcing effect. With the systemic administration of psychostimulants (amphetamine, phencyclidine, cocaine) and opiates (morphine, trimeperidine, fentanyl), as a rule, the frequency of pressing the pedals in the Skinner chamber is always increased when registering the reaction of self-stimulation of the lateral hypothalamus (the activation level is usually + 32-70% of the initial indicators). The present study showed that the neuropeptide orexin A at a dose of 10 μg, when administered into the lateral ventricle of the brain, moderately activated the self-stimulation response, increasing the number of pedal strokes by 20%. Ghrelin at 1 and 10 μg, as well as orexin A, had a moderate reinforcing effect in this model (+13-19%). As for self-stimulation of the hypothalamus, astressin at doses of 1 and 10 μg suppressed this reaction by 27-32%, exhibiting a typical inhibitory effect. At a dose of 0.1 μg, astressin was inactive. It is important to emphasize that of the three neuropeptides studied, two (orexin A and ghrelin) revealed an activating effect in the brain self-stimulation model, and one (astressin) had a clearly inhibitory effect. This is a spontaneous reaction of self-stimulation. The degree of activation should be assessed as moderate, however, using the example of a self-stimulation reaction, it corresponded to the action of opiates (trimeperidine, fentanyl), which, in behavioral doses, increase the number of pedal strokes, usually up to + 18-21%. The self-stimulation response is a rather

rigidly determined response with only two degrees of freedom (press the pedal - do not press the pedal), which under normal conditions can only be activated by psychostimulants. Here we see a clear focus on increasing the number of pedal strokes under the influence of the peptides ghrelin and orexin A, but in contrast to psychostimulants such as amphetamine, which do not change the threshold for the appearance of a reaction. This is a fairly characteristic phenomenon that distinguishes the action of CNS activating peptides from psychostimulants. The second feature of the action of peptides was the manifestation of the effect in a certain range of doses – e.g., 1 and 10 (but not 0.1) μg injected into brain ventricles. Overall, the order of activating effects of orexin A and ghrelin was similar, depending little on the dose. For most peptides, they act in a rather narrow dose range, typical for this type of peptides. And, finally, the third feature is the initial direction of the action. If ghrelin and orexin A in almost all experiments showed an activating effect on the reinforcement mechanisms (positive reinforcing effect), then astressin in most experiments had an inhibitory effect on the self-stimulation reaction, while acting as a typical depriming agent similar to an anxiolytic, reducing both the number of clicks on pedal, and increasing the thresholds of self-stimulation. **CONCLUSIONS:** Orexin and ghrelin injected into the cerebral ventricles (1 and 10, but not 0.1 μg), activate the positive reinforcement system upon self-stimulation of the lateral hypothalamus, which can block the CRF receptor antagonist astressin. A non-selective corticoliberin antagonist astressin, when administered intraventricularly, dose-dependently reduces reinforcing properties of spontaneous electrical stimulation of the lateral hypothalamus, as well as the secondary reinforcing effects of orexin and ghrelin in CPP.

BEHAVIORAL EFFECTS OF THE FORCED SWIMMING-INDUCED STRESS AND GLUCOCORTICOIDS IN MICE IN THE BWP TEST: PILOT STUDIES. IO Mokoseev, DV Krvachenko, NA Salimova, AV Zhdanov, SL Khatsko, AV Kalueff, Ural Federal University, Ekaterinburg, Russia. **INTRODUCTION:** Major depressive disorder (MDD) affects one in five people in their lifetime and is the leading cause of disability worldwide. However, the mechanisms involved in the pathogenesis of MDD remain to be fully understood, and current therapies remain ineffective in a large proportion of patients. Thus, the focus of modern psychiatric research is on uncovering the underlying etiology of depression. The Forced Swim Test (FST) is one of the most widely used tests in the laboratory to evaluate symptoms of depression and depression-like states in both rats and mice. In addition, FST is valuable for assessing antidepressant-like effects of most currently available antidepressants. We have changed some of the parameters of the traditional FST by dividing it into a light and a dark part. **METHODS:** A total of 30 white 5-month-old male mice were used for this study. Mice were divided into 3 groups (n = 10 per group): control, treatment with glucocorticoids (GC) and simulated despair behavior (DB) for 18 days. An elevated plus maze (EPM) test was used as a pre-test, here to evaluate the behavior of mice for 5 minutes. Here we assessed the latency, frequency and duration of motor activity, freezing, being in the dark and light arms. FST was assessed for active and passive swimming and climbing in both the light and dark parts of the test. **RESULTS AND DISCUSSION:** We found that mice treated with glucocorticoids spent more time in the dark part of the FST, increasing the total duration of passive swimming vs. controls. At the same time, DB mice spent more time in the light part of FST, and the total duration of active swimming increased. **RESEARCH SUPPORT:** Ural Federal University, Ekaterinburg, Russia.

INFLUENCE OF RESTRAINT STRESS AND ELECTROMAGNETIC RADIATION OF INDUSTRIAL FREQUENCY ON THE ANXIETY-LIKE BEHAVIOR OF THE RATS IN THE OPEN FIELD TEST. AM Kadukova, Institute of Radiobiology NASB, Gomel, Belarus. **INTRODUCTION:** Stress contributes to the development of both neurological and psychiatric diseases. Electromagnetic field radiation (EMF) of industrial frequency (50 Hz) with prolonged exposure can lead to the development of long-term effects, including degenerative processes in the Central nervous system, the development of endocrine disorders and diseases of the circulatory system. In real-life conditions humans are exposed to multiple stimuli are considered in combination with non-ionizing EMF radiation these can to enhance the adverse effects of each stimulus in isolation. **METHODS:** Experiments were performed on 70 adult female Wistar rats (~250 g), housed under standard laboratory conditions with a 12 h light/dark cycle, at constant temperature (22 ± 1°C). Free access was allowed to tap water and standard rodent chow. All experimental procedures were approved by the EU Directive 2010/63/EU about animal protection and welfare. Rats were divided into several groups: 1 Control; 2 Restraint stress (4 h/day for 7 days); 3 Exposure to EMF radiation (50 Hz, 4h/day for 22 days); 4 Combined exposure to EMF radiation (4/h day for 22 days) and restraint stress (4 h/day for 7 days, starting from the 16th day of the experiment); groups 5, 6 and 7 were similar to groups 2, 3, 4, but received biologically active supplements (Jerusalem artichoke and vitamin D). Open field test was used to detect general locomotor activity, frequency of defecation and urination, the frequency of grooming acts (short and long) in rats. Behavioral data were analyzed between-groups using one-way ANOVA.

RESULTS AND DISCUSSION: The level of anxiety of experimental animals reached the maximum value in "Restraint stress" and "EMF radiation" groups, but without synergistic effects in the combined group. The number of acts of defecation and the frequency of grooming (long) increased in the combined EMF radiation + restraint stress group. In supplements-treated rats there was increased locomotor activity, especially the number of crossed peripheral squares, and fewer urinations (reducing in the "EMR + dietary supplements" group by 69.9% vs. control level, and by 60.0% vs. the "EMF radiation" group, $p<0.05$). Urinations in the "EMR + stress + dietary supplements" group were reduced by 62.1% vs. the "Stress" group ($p<0.05$).

A NEW METHOD OF DRUG ADMINISTRATION THROUGH THE NOSTRILS OF ZEBRAFISH. DS Galstyan, TO Kolesnikova, AV Kalueff, Institute of Translational Biomedicine, St. Petersburg State University, Institute of Experimental Medicine, Almazov National Medical Research Centre, Ministry of Healthcare, Granov Russian Scientific Center for Radiology and Surgical Technologies, Ministry of Healthcare, St. Petersburg, Russia. **INTRODUCTION.** Due to numerous advantages of nasal mucosa as a target for drug delivery, a wide range of drugs can be administered intranasally, including neuroactive agents. Zebrafish have a highly developed olfactory system, and use it to detect food, predators, and potential mates, similar to that of other vertebrates. **METHODS.** A total of 72 wild-type adult short-fin zebrafish were used for this study, which were dripped into the nostrils with 1 µl of arecoline solution at 10, 5, 1 mg/ml or water (control group). After administration, the fish were placed in a plastic beaker (0.25 L) for 4 min. The novel tank test (NTT) was used to evaluate the behavior of zebrafish within 5 min of drug administration. Behavioral parameters (frequency, top entry duration and delay, distance traveled, frequency and duration of freezing) were calculated using Noldus EthoVision XT11.5 software. Statistical data were analyzed using the Kruskal-Wallis (KW) test followed by Dunn's post hoc test for significant KW data ($P < 0.05$). **RESULTS AND DISCUSSION.** A dose of 10 mg/mL induced anxiolytic behavior in fish, resulting in higher top times ($p=0.0244$). At 10 mg/ml, there were fewer transitions to top ($p=0.014$). These effects are similar to those of arecoline in adult zebrafish using acute 20-min exposure by water immersion. By employing this new method of drug administration, the duration of the acute experiment can be curtailed and the utilization of medications can be minimized. **RESEARCH SUPPORT.** The Russian Science Foundation project 23-25-00412.

INFLUENCE OF THE *DAT* GENE KNOCKOUT ON EARLY RATS DEVELOPMENT. NS Pestereva, DS Traktirov, IR Nazarov, ZS Fisenko, MN Karpenko, VM Klimenko, Institute of Experimental Medicine, Peter the Great St. Petersburg Polytechnic University, Institute of Translation Biomedicine, St. Petersburg State University, St. Petersburg State University, St. Petersburg, Russia. **INTRODUCTION:** DAT-KO rats have knock-outed DAT (dopamine transporter) gene. This model was developed to study disorders caused by the accumulation of extracellular dopamine with a simultaneous decrease in its intracellular content (e.g., ADHD). The study aimed to assess the maturation dynamics of the nervous system in the offspring of DAT-KO rats during their natural development. **METHODS:** The study used on the 6-8th day "Pendulum reflex"; 8th day "Reaction to acoustic stimulus"; 30th day test "Open field"; Day 30-35 Morris water maze. The used two groups of animals, WT (n=16) и DAT-KO (n=14). **RESULTS AND DISCUSSION:** Pups of the KO group on 4th and 5th days made significantly more revolutions in the "Pendulum reflex" test than WT animals, however, there were no significant differences between the groups on subsequent days. In all three groups, acoustic stimulus response was finally formed on the 15th day of postnatal development. KO rats showed higher speed of movement and longer distance traveled in the "Open field" test vs. WT rats. The movement trajectories of the KO group rats had a pronounced stereotypical circular pattern. The percentage of time spent by DAT-KO rats in the target quadrant of Morris water maze was significantly less than that of control animals. This shows the formation of some reflexes in DAT KO animals from postnatal days 8 to 35. **RESEARCH SUPPORT:** RSF project number 22-25-000124.

NEW TRANSFORMER MAZE TO EXPLORE DIFFERENT SPATIAL NAVIGATION TASKS IN RODENTS. EV Filatova, GE Gromova, VA Zavyalov, AY Egorov, Sechenov Institute of Evolutionary Physiology and Biochemistry RAS, St. Petersburg State University, St. Petersburg, Russia. **INTRODUCTION:** Various mazes are commonly used tools for studying different cognitive aspects in laboratory animals. Despite the variety, they all have certain limitations. For example, it can be important to develop a task where an animal on its way to the goal would use only one spartial strategy, instead of several different ovelaping strategies. **METHODS:** The advantage of the novel transformer maze (RF Patent No. 2789575) is the ability to study different behavioral tasks in the same setting. The maze has a modular design that permits to quickly change tasks as follows: 1). Targeted navigation by signpointers, when an animal uses only distal clues, without relying on landmarks and remembering the path (conditioned behavior), 2). Route-based task - egocentric navigation without any map or clues, and 3). Allocentric navigation task based on landmarks and the environmental cues. The training protocol excludes the

possibility for the animal to use several strategies at the same time, which makes it possible to explore different navigation mechanisms separately. **RESULTS:** We tested the new transformer maze in the dopamine dysfunction rat model by comparing the control Wistar and dopamine transporter heterozygous (DAT-HET) rats in this novel paradigm, with the black wall color as a cue in a signpoints task. The study revealed different learnig strategies between the two groups, including insightful learning behavior typical for Wistar rats, and trial-and-error learning in DAT-HET rats. Overall, the new transformer maze enables the discovery of differing learning and performance patterns of these rats. This maze can be a useful tool for cognitive behavioral and pharmacological analyses of learning, memory and navigation. **RESEARCH SUPPORT:** State assignment 075-00967-23-00, grant 94030300.

16.00-17.40 ONLINE LECTURES (20 min):

ADRGL3 AND IMPULSE CONTROL DISORDERS: ZEBRAFISH AS A MODEL FOR DRUG DISCOVERY. M Parker, University of Surrey, Surrey, UK. **INTRODUCTION:** The talk will present data from two studies exploring the genetic basis of, and potential treatments for externalising disorders (ED) such as attention-deficit/hyperactivity disorder (ADHD) using zebrafish. The first study focused on the development of non-stimulant-based therapeutics for ADHD. Using a genetic model of ADHD in zebrafish (knock out of *adgrl3.1,* which codes for the G protein-coupled receptor L3), we identified five putative therapeutics using drug repurposing, including aceclofenac, amlodipine, doxazosin, and moxonidine. We then offer a novel tool for understanding the neural circuits of ADHD, and find a putative role for the imidazoline 1 receptor system in ADHD and identifying novel therapeutics. In a second study we characterized externalizing behaviors in *adgrl3.1-/-*zebrafish, revealing highly impulsive, bold, and hyperactive phenotypes with attentional deficits. These behaviors were rescued by atomoxetine, demonstrating noradrenergic mediation. Transcriptomic analyses revealed several differentially expressed genes and enriched gene clusters, suggesting new putative functional pathways underlying ED-related behaviors and potential targets for treatment. Together, these studies provide insights into the genetic basis and potential treatments for ED such as ADHD. The findings offer a novel tool for understanding the neural circuits of these disorders, identifying novel therapeutics, and highlighting potential targets for treatment, and demonstrate the utility of zebrafish as a model system for psychiatric drug development.

ZEBRAFISH MODELS IN TRANSLATIONAL NEUROSCIENCE RESEARCH: EMPHASIS ON STRESS-RELATED RESPONSES. DB Rosemberg, Department of Biochemistry and Molecular Biology, Natural and Exact Sciences Center, Federal University of Santa Maria, RS, Brazil. **INTRODUCTION:** The zebrafish (*Danio rerio*) is a freshwater teleost widely used in behavioral neuroscience research. The genomic and physiological conservation, associated with the presence of well-characterized behaviors, make zebrafish an attractive system to assess specific phenotypes involved in human pathological conditions. Here, I will briefly discuss the use of zebrafish models to mimic psychiatric comorbid symptoms of epileptic seizures, focusing on how a naturalistic stressor (conspecific alarm substance) can facilitate pentylenetetrazole-evoked seizures. Moreover, I will emphasize how both acute and chronic stressors are known to affect the spatio-temporal exploratory activity and homebase formation in zebrafish tested in the open field. This corroborates the use of zebrafish models to investigate the evolutionarily conserved basis of stress responses in vertebrates.

LOOKING FOR SIMILARITIES IN TRANSCRIPTOMIC FINGERTIPS OF AFFECTIVE DISORDERS IN DIFFERENT VERTEBRATES. KA Demin, AD Shevlyakov, TO Kolesnikova, 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 of Science and Technology, Sirius Federal Territory, Russia. **INTRODUCTION:** Affective disorders are pervasive, debilitating, and often resistant to treatment, posing a pressing yet unresolved biomedical challenge. Animal models, such as the chronic unpredictable stress (CUS) model which exposes animals to various stressors over weeks to induce anxiety and/or depression-like behavior, are commonly employed to study the underlying mechanisms of affective disorders. These models are widely applied to vertebrates such as rats (*Rattus norvegicus*) and zebrafish (*Danio rerio*), as being the closest related to human. However, despite their close relationship and homology, there are limitations in translating findings from animal models to human affective pathology. While there are significant differences in affective pathology between fish, rodents, and humans, there are evolutionary conserved pathological cascades that persist across species. **CONCLUSIONS:** Targeting these "core" pathogenic mechanisms in vertebrates may enable more effective utilization of animal models for studying affective disorders. To test this hypothesis, we compare gene expression, gene set expression, and

transcription factor analysis using a wide range of tools. Finally, analyzing expression of cliques formed by genes that are orthologues between 3 studied species we suggested new conservative molecular pathway that may be related to affective disorders pathogenesis in vertebrates. **RESEARCH SUPPORT:** The Russian Science Foundation grant 23-25-00246.

EMERGING PHARMACOLOGY OF TRACE AMINE-ASSOCIATED RECEPTORS (TAARS). RR Gainetdinov, Institute of Translational Biomedicine, St. Petersburg State University, St. Petersburg, Russia. Trace amines are endogenous biogenic amine compounds classically regarded as composing beta-phenylethylamine, p-tyramine, tryptamine, p-octopamine, and others. Vertebrates express a family of receptors termed trace amine-associated receptors (TAARs). Humans possess 6 functional receptors: TAAR1, TAAR2, TAAR5, TAAR6, TAAR8 and TAAR9. With the exception of TAAR1, all other TAAR are expressed in olfactory epithelium neurons, where they detect diverse innate odors, including pheromones. Outside the olfactory system, TAAR1 is the most thoroughly studied with both central and peripheral roles. TAAR1 has been already identified as a novel therapeutic target for schizophrenia. Among other TAARs, TAAR5 represents the most interest as regard to depression, since it is expressed in limbic brain areas and TAAR5 knockout mice have remarkable alterations in emotional behaviors. Thus, anxiolytic and/or antidepressant action of future TAAR5 antagonists could be predicted. Data from TAAR5 and other TAAR knockout mice indicate that TAARs are not just olfactory receptors sensing innate socially-relevant odors, but also play important neuronal functions in the limbic brain areas. In general, “olfactory” TAAR-mediated brain circuitry may represent a previously unappreciated neurotransmitter system involved in the transmission of innate odors into emotional behavioral responses.

17.20-18.00 PLENARY LECTURES (20 min)

PLENARY LECTURE 4: INTEGRATIVE MECHANISMS OF POSTURE AND LOCOMOTOR CONTROL IN NORMAL AND PATHOLOGICAL CONDITIONS. PE Musienko, Sirius University of Science and Technology, Sirius Federal Territory, Institute of Translational Biomedicine, St. Petersburg State University, Russia

PLENARY LECTURE 5: THE ‘GOLD’ FISH IN NEUROSCIENCE RESEARCH. AV Kalueff, Neurobiology Program, Sirius University of Science and Technology, Sirius Federal Territory, Institute of Translational Biomedicine, St. Petersburg State University, Institute of Experimental Medicine, Almazov Medical Research Center, St. Petersburg, Scientific Research Institute of Neuroscience and Medicine, Novosibirsk, Granov Scientific Research Center of Radiology and Surgical Technologies, St. Petersburg, Ural Federal University, Yekaterinburg, Russia; Neuroscience Laboratory, COBRAIN Center, M Heratsi Yerevan State Medical University, Yerevan, Armenia. **INTRODUCTION:** Brain disorders are one of the most common human diseases. Zebrafish (*Danio rerio*) today is the second (after mice) most used model object in biomedicine in terms of the number of animals used per year. The validity of the model is provided by the ease of use and maintenance, conservative physiology, high genetic homology with humans (70%), rapid development, and the possibility of high-throughput bioscreening in vivo. Based on 15 years of experimental work of our laboratory, the report will formulate the principles of using zebrafish in studies of a number of brain pathologies (acute and chronic stress, addiction, pharmacogenic syndromes) and their molecular mechanisms. The talk will present new own data on the important role of zebrafish in modern neuropharmacology, and demonstrate the success of its multidisciplinary integration with the latest methods of biological research - molecular biology, bioinformatics, omics technologies, chemical biology and artificial intelligence systems. **RESULTS AND DISCUSSION:** The importance of studies of the pathogenesis of CNS diseases on zebrafish is emphasized, the evolutionary conservatism and ease of laboratory application of which successfully identify new biomarkers, mechanisms of complex heterogeneous brain diseases, as well as potential targets for their correction. **CONCLUSIONS:** Zebrafish is a strategic and promising model organism for research in the field of neuropharmacology, primarily translational, and for the creation of new drugs 1) for the treatment of a wide range of brain diseases, including 2) more effective than existing ones, and 3) drugs with personalized properties. **RESEARCH SUPPORT:** St. Petersburg State University, Sirius University of Science and Technology, Almazov Medical Research Centre.

NEUROPHYSIOLOGY TALK: MORPHOFUNCTIONAL ASTROCYTE REMODELLING IN AGING. A Popov, N Brazhe, K Morozova, K Yashin, M Bychkov, O Nosova, O Sutyagina, A Brazhe, E Parshina, L Li, I Medyanik, DE Korzhevskii, Z Shenkarev, E Lyukmanova, A Verkhratsky, A Semyanov, Jiaxing University College of Medicine, Zhejiang Pro, Jiaxing China; Shemyakin-Ovchinnikov Institute of Bioorganic Chemistry RAS, Moscow State University, Moscow, Sechenov First Moscow State Medical University, Privolzhskiy Research Medical University, Nizhny Novgorod, Institute of Experimental Medicine, St. Petersburg, St. Petersburg, Russia; Medicine and Health, The University of Manchester, Manchester, UK; Achucarro Center for Neuroscience, IKERBASQUE, Basque Foundation for Science, Bilbao, University of the Basque Country UPV/EHU and CIBERNED, Leioa, Spain. **INTRODUCTION:** Little is known about age-dependent changes in structure and function of astrocytes and of the impact of these into the cognitive decline in the senescent brain. The prevalent view on the age-dependent increase in reactive astrogliosis and astrocytic hypertrophy requires scrutiny and detailed analysis. Using two-photon microscopy in conjunction with 3D reconstruction, Sholl and volume fraction analysis we demonstrate a significant reduction in the number and the length of astrocytic processes, in astrocytic territorial domains and in astrocyte-to-astrocyte coupling in the mouse aged hippocampus. Probing physiology of astrocytes with patch-clamp revealed deficits in K^+ and glutamate clearance in old mouse astrocytes. These changes paralleled impaired synaptic long-term potentiation (LTP) in hippocampal CA1 in old mice. Changes in mouse astrocytes may not fully capture changes in the human brain astrocytes. To address this issue, we analyzed astrocytes and neurons in the neocortical access tissue of younger (22-50 years) and older (51-72 years) adult patients who underwent glioma resection. Aging decreased the amount of reduced mitochondrial cytochromes in astrocytes but not neurons. The total amount of protein was decreased in astrocytes and increased in neurons. Aged human astrocytes showed morphological dystrophy quantified by the decreased length of branches, decreased volume fraction of leaflets, and shrinkage of the anatomical domain. Dystrophy correlated with the loss of gap junction coupling between astrocytes and increased input resistance. Human aging was accompanied by the upregulation of glial fibrillary acidic protein (GFAP) and downregulation of membrane-cytoskeleton linker Ezrin associated with leaflets. No significant changes in neuronal excitability or spontaneous inhibitory postsynaptic signaling were observed. **CONCLUSIONS:** Thus, human brain aging is associated with the impaired morphological presence and mitochondrial malfunction of astrocytes, but not neurons.

10.45-15.40 **L.A. ORBELI INSTITUTE OF PHYSIOLOGY PSYCHOPHYSIOLOGY SYMPOSIUM**

Chairs: NM Ayvazyan, PE Musienko, AV Semyanov, AV Kalueff

SFCO POSITION AND VIBRATION SENSORS AS A HIGHLY SENSITIVE TOOL FOR BEHAVIORAL PHYSIOLOGY RESEARCH. AS Khachunts, SG Gevorgyan, AA Tumanian, AR Sargsyan, GS Gevorgyan, BA Khachunts, L.A. Orbeli Institute of Physiology NAS, Yerevan State University, Yerevan, Armenia. **INTRODUCTION:** The evolution of research methods in behavioral physiology from descriptive (qualitative) to analytical (quantitative) clearly correlates with the development of technologies for monitoring the activity of experimental animals. A qualitative leap is associated with the use of computer technology, providing unprecedented opportunities for video and audio monitoring. A special place among monitoring methods is the method of animal activity tracking by recording microseismic oscillations of the experimental chamber. The aim of the study was to assess the applicability of sensors developed by PSI Ltd. using Single layer Flat Coil Oscillator (SFCO) technology for monitoring various behaviors in small experimental animals. **METHODS:** To demonstrate the possibility of using SFCO sensors in behavioral physiology, we used a stabilograph developed jointly with PSI Ltd. for studying the regulation of human postural balance. The device was equipped with four position and four vibration sensors. We mounted an experimental chamber of 45*45 cm on the stabilograph, in which we placed animals (white rats of 220-270 g). The registration frequency (sampling rate) of sensor signals was 1 kHz. After registration, the data were analyzed using MatLab and Diadem (USA). Video recording of rat behavior was performed synchronously with the registration of microseismic activity. **RESULTS AND DISCUSSION:** The obtained data make it possible to

identify individual specific reactions of the rats (moving, rearing, grooming, head shakes, etc.). Digital processing of microseismic signals allows us to track animal's movement through the chamber with necessary details. It was impossible to obtain convincing signals of heartbeat and respiration rate presently, due to the high level of environmental signals affecting animal behavior (i.e., laboratory location on the 4th floor, non-rigidly laminated floor, busy traffic near the building). **RESEARCH SUPPORT:** PSI Ltd. has provided sensors and devices for signal registration for the present study.

COGNITIVE FEATURES OF ASSESSING STUDENTS' ACADEMIC EMOTIONS IN THE CONTEXT OF COVID-19. NA Sahakyan, EA Avetisyan, AA Petrosyan, NE Tadevosyan, SA Shogheryan, Armenian State Pedagogical University (ASPU) named after Abovyan, L.A. Orbeli Institute of Physiology NAS, Yerevan, Armenia. **INTRODUCTION:** The present research was performed during coronavirus epidemic, with a sharp transition from traditional to distant format of education, using the ASPU Google Meet application through the Google for Education system implemented in ASPU Google Classroom. We examined emotional, psycho-emotional (especially "academic emotions"-like) cognitive features of students during COVID-19 as a forced distance learning. Students (19–22-year-old students) were evaluated psychophysiologically during distant lessons of different duration (60 and 80 min). Physiological changes in the emotional state (vegetative indicators) were evaluated by the modern biofeedback (electrocardiography ECG, mathematical analysis of heart rate variability (HRV)) method. Recording of an electrocardiogram (ECG) lasting 20 minutes, in a sitting position, in the first lead (left/right hand) and mathematical analysis of heart rate variability (HRV MV) using the hardware-software complex "ELEFIZ", was performed both under physiological conditions (relative) rest, and functionally when performing the “Clock Carousel” test. Comparative analysis of the ITRS index (regulatory system tension index), SI (stress index) and IVE index (vegetative equilibrium index), reflecting the balance of sympathetic-parasympathetic systems, obtained by histographic or variational pulsometry methods showed low efficiency of 80-min forced distance learning and the level of stress tension among students. Functional (Accure %), quantitative (WR %) and temporal (dmT and aeT) indices ensuring stability of student attention were tested in the psychophysiological "Clocks Carrousel" test. In contrast to the 60-minute class duration, the 80-min class showed a sharp increase in the number of errors and omissions in test execution (WR_%) (10.32±6.95 and14.52±5.74, respectively), which indicates a lower level of attentional stability. The 80-min forced distant learning is stressful and has low effectiveness. **RESEARCH SUPPORT:** The Science Committee of RA project № 21T-1F013.

NEUROPHYSIOLOGICAL MECHANISMS OF THE IMPACT OF SPELEOCLIMATE ON THE BODY. VA Semiletova, Voronezh State Medical University named after N.N. Burdenko, Voronezh, Russia. **INTRODUCTION:** Speleotherapy is a complex non-drug method to promote health, necessitating further studies if its adaptive effects on human body. Here, we study changes in the functional state of the brain of a healthy person in terms of EEG activity parameters and parameters of the visual evoked potentials (vEP) for a flare under the influence of speleotherapy. **METHODS:** EEG was recorded in a state of functional rest before and after a 2-h speleotherapy session using an «Encephalan - EEGR - 19/26» electroencephalograph (Medicom, Taganrog). The amplitude and duration of vEPs to the flash was assessed using ther "Neuromian" NMA-4-01 neuromyoanalyzer. The study complied with the ethical standards developed in accordance with the Declaration of Helsinki and the Ministry of Health of the Russian Federation. Each participant was informed about the purpose of the study by signing an agreement to participate in the experiment. **RESULTS AND DISCUSSION:** Under the influence of the speleo-session, the average power of theta- and alpha-EEG rhythms decreased, and the average power of the beta-1 rhythm increased. After a session of speleotherapy, the average power of the beta-2 range decreased in the functional state of rest with the subjects' eyes open and increased in the functional state of rest with eyes closed. Changes in the power of theta and alpha rhythms in the occipital and parietal leads under the influence of short-term influence of speleotherapy were revealed. The activity of the right hemisphere in most areas decreased after therapy in the state of functional rest. The functional state of rest with open eyes after a speleotherapy session revealed more significant correlations of the theta rhythm power in the right hemisphere, as the number of correlations of theta rhythm severity in all registered areas of the brain diffusely increased, which may indicate moderate stress. Our findings can be interpreted as a state of moderate stress as a result of a short-term effect of speleotherapy on the human body.

PLENARY ONLINE LECTURE 6. A METHOD FOR ASSESSING THE REPRESENTATIVENESS OF QUESTIONNAIRES FOR STRESSORS. Ph. Fauquet-Alekhine, JAK Erskine, Group INTRA Robotics, France; SEBE-Lab Behavioral and Psychological Science, LSE, UK. **INTRODUCTION:** In the context of the assessment of psychosocial risks in companies, some methods are based partially or totally on the use

of questionnaires. These questionnaires are often used within occupational groups and allow a statistical evaluation of the effect of stressors depending on the questionnaire used. For some questionnaires, items are categorized by the authors. For example, this is the case with the Job Content Questionnaire developed by Karasek et al. (1998) or the Job Stress Survey elaborated by Spielberger (1994). The first categorizes questions according to 5 dimensions (decision latitude, psychological demand, social support, physical demand and job insecurity), the second according to 3 dimensions (lack of support, job pressure, other). This example shows that for two questionnaires of about thirty items each, the dimensions of stress at work explored by the questions can be very different from the point of view of their authors. It may be interesting for the analyst conducting a psychosocial risk assessment in the workplace to have a tool that assesses which dimensions of the stressors are explored when choosing a questionnaire to make the assessment, and to verify which are under-represented by the questionnaire. This would make it possible to increase the relevance of the choice according to what needs to be explored in the company and/or to complement the use of an initial questionnaire by a second. The proposed method consists of relying on substantial work that has drawn up an exhaustive mapping of the categories of psychosocial risks in companies. Two are recommended in the «Palgrave Handbook of occupational stress » (Fauquet-Alekhine & Erskine, 2023): that of Leka identifying 10 dimensions (Leka et al., 2003) and that of Gollack identifying 6 dimensions (Gollac & Bodier, 2010). These categorizations have the advantage of being independent from the viewpoint of questionnaire designers. **METHODS:** To illustrate the method of assessing the representativeness of questionnaires for stressors, three questionnaires are analyzed according to Gollac's categorization: Job Content Questionnaire (32 items), the Job Stress Survey (30 items), and the Perceived Stress Scale (Cohen et al., 1983; 14 items). For each questionnaire, items are individually categorized according to one or more dimensions of Gollac's categorization. Following this, the degree of independence of the dimensions is analyzed by calculating two by two dimensions the Loevinger's H coefficient (Loevinger, 1948). This makes it possible to verify that each dimension is represented by a set of items different from the other dimensions; otherwise, it shows that the questionnaire loses relevance. Finally, the representativeness of each of the dimensions is calculated according to the percentage of items concerning each of the dimensions: this makes it possible to assess whether one of the dimensions is underrepresented in the analysis contributing to the assessment of psychosocial risks. **RESULTS AND DISCUSSION:** The 6 dimensions of Gollac's categorization are: Work intensity and working time, Autonomy, Social relationships at work, Emotional demands, Insecurity of the work situation, Value conflicts. The calculations give the following results. Job Content Questionnaire has the highest degree of dimension independence ($H<0.2$) but the last three are under-represented compared to the first three. Job Stress Survey presents a satisfactory degree of dimension independence ($H<0.3$, low dependency) and a good representativeness of each dimension. Percieved Stress Scale has a low degree of dimension independence ($H<0.4$) and a significant underrepresentation of three of the dimensions. These results indicate that, if the analyst is forced to choose only one of these three questionnaires to carry out an assessment of psychosocial risks in companies, it is better to choose the Job Stress Survey if it is expected to cover all the dimensions of occupational stress. This method of assessing the representativeness of questionnaires concerning stressors is particularly effective for comparing questionnaires of less than 50 items. Beyond that, the items are generally numerous enough to be diversified and cover all dimensions of psychosocial risks. However, experience shows that the analysts-practitioners are often constrained in time, both in terms of the time participants take the questionnaire, and in terms of the time it takes to analyze the data. This commits them to moving towards shorter questionnaires most of the time.

PLENARY LECTURE 7. MEMORY IS OUR LORD. EVERYTHING NEW IS WELL-FORGOTTEN OLD. AGHAJANYAN EFFECT "PREVIOUSLY UNKNOWN SIGNALS OF DYING". A Tathevosyan, S Kochinyan, Yerevan State Medical University, Yerevan, Armenia. Completing the jubilee year, the 100th anniversary of our University, it is timely to recognize an important discovery made within its own walls by I. A. Aghajanyan and his sons A. Aghajanyan and V. Aghajanyan. Here, we will discuss the "extreme stress" (stress of death) and the feedback between dying and remaining alive individuals, known as the Aghajanyan effect (1977). Indirectly, we came across it during the 44-Day war in Armenia, working in a hospital where every day young, 18-20 year-old soldiers were admitted. In the evenings, we were with them, and they opened their souls to us. They all constantly emphasized one circumstance. There, on the front line where they died in hundreds, information was either completely absent, or was very scanty. As a result, the majority ran "towards the danger" and died. A small monograph by I.A. Aghajanyan "Previously unknown signals of the dying" (1977) was devoted to the discovery of the feedback phenomenon between dying and surviving individuals of the same biological species at the levels of reproduction, sex, life experience, adaptation to a fatal factor and changes in immunological status. Death is extreme stress. Both Western and Eastern medicine recognize the presence of "human energy", "vital energy", "energy field", "energy

zone". The impact of a stressor on a person causes the release of energy. With the discovery of quantum, the vital energy is not just a charge, but it carries information. It is clearly manifested in a situation of concentrated placement of peoples' objects (agglomeration) that are interconnected not only on a territorial basis, but also by different cultural, economic, social situational ties.Today we know what physiological, biochemical, molecular, mediator, cellular and humoral processes underlie the reactions of vital activity and, in particular, those of stress and its mechanism. The General Adaptation Syndrome (GAS) and its changes corresponding to evolution have been studied (Tathevosyan, 2011). The second phase of GAS is the phase of stress. The energy accumulates and abruptly breaks off with lethal stress, which leads to the release of an energy clot, a bundle of energy, in which the situational gestalt is mirrored. It is an analogy to the well-known from physics principle of "jumping" of an electron from one higher orbit to a lower one with the release of a quantum of energy. This happens instantly and simultaneously, an electron disappears from one orbit and appears in another (teleportation). It can be assumed that the quantum is a "joining" top of the triangle of physics and psyche, matter and consciousness. Dope evolution. The energy bundle with information is emitted. These signals in the form of quanta are radiated from dying individuals. Considering the holographic structure of the Universe, they propagate over long distances. Any stress, however weak, is accompanied by radiation. To the threat of extinction in the form of violent death of individuals, any population of living beings responds with an outbreak of reproduction. Sexual dimorphism is preserved. Male deaths lead to the predominant birth of males, female death – to predominant birth of females. As many male soldiers die during wars, more boys are born. To prove the discovery, over the course of 15 years, from 1976 to 1991, experiments were carried out on representatives of many biological species in many leading scientific institutions of Novosibirsk and Yerevan by I.A. Aghajanyan and his sons. They also recorded the transfer of information about the "disastrous" trap without transferring the fact of its danger as a result of incomplete information. Mechanisms of self-defense and volitional incentives did not work due to fear (Tathevosyan). Already in 1985 they realized that in wildlife there worked a principle of antithesis: with incomplete information, a living system is more likely to make a decision that is the opposite of the only correct one, which is provoked by fear and panic in the situation of "stress of death". Studying the problem of stress for more than 50 years and having developed a new direction in medicine – stressology, the evolution and its viability are ensured by the action of the principle of the universal hectogram (triangle). The algorithm of evolution is a triangle, an equilateral triangle. The angles at the base are the basic components. The upper angle is the result of their interaction in the form of a NEW phenomenon/paradigm, which contains the properties of the basic ones and an order of magnitude higher than they are. Examples: father >>> mother > CHILD; hydrogen >>> oxygen > WATER; acid >>> alkali > SALT. Stress and behavior are basic angles of the hectogram. Naturally, there is a search for its upper angle and the answer to the question "What is the "upper angle"? The answer/conclusion is - only QUANTUM, a bundle of energy carrying information. System analysis, as a kind of logical and methodological tool for studying various complex processes, makes it possible to understand and explain the mechanisms of new/old, unknown properties of the whole, of the entire system.

A NOVEL METHOD FOR REAL-TIME EVENT DETECTION IN THE EEG BASED ON FRAGMENTARY DECOMPOSITION. A Sargsyan, N Tadevosyan, D Melkonian, L.A. Orbeli Institute of Physiology, Yerevan, Armenia; KaosKey Pty. Ltd., Sydney, Australia. **INTRODUCTION:** Timely and accurate detection of EEG events is of special importance in many neurophysiological and neurological studies involving analysis of various event-related and evoked potentials, as well as spontaneous epileptiform activity. Such tools would help researchers in understanding the mechanisms of various neurological disorders, including epileptogenesis and localization of epileptic zones. Timely detection of seizure occurrences in epileptic patients and alerting caregivers for prompt intervention would drastically improve the quality of life of epileptic patients and reduce mortality. **METHODS:** We propose a method for real-time detection of specific patterns in the EEG, including various forms of epileptiform activity. The innovative aspect of the method is decomposition of the EEG signal into elementary components (Fragmentary decomposition, FD), using original technique of short-term Fourier transform. FD creates accurate model of the signal and provides more elaborate way for waveform analysis which identifies specific shape of each peak in the time course of nonstationary EEG. The components of the EEG model are then processed by an original temporal pattern recognition algorithm, which may be tuned for recognition of any specific combination of model components. The method and the software may work in real-time (online) and offline processing modes. **RESULTS AND DISCUSSION:** The method was successfully applied to automatically find and extract spike complexes in long term recordings from four rodent models of genetic and acquired epilepsies (WAG/Rij, GAERS, Post-SE and PTE) in a study of the frequency properties of the spike-waves. It was revealed that the spike component of the spike-wave has similar frequency properties in all models. In another study the method was used to identify unique patterns at seizure onset in human intracranial and

scalp EEG, allowing to detect the seizures at very early stage. In the majority of processed cases (31 patients), the detection occurred a few seconds before the significant increase of spike amplitudes. The proposed technology may be applied for detection of various events, including interictal or ictal spike-wave complexes, K-complexes, event-related and evoked potentials, eye-blinks, different modalities of sensory and motor evoked potentials (visual, auditory, somatosensory, olfactory). This makes the method a useful tool in many biomedical applications in such fields as neurophysiology, neurology, neuropsychology, neuropathology, neurosurgery, psychiatry, behavioral physiology, etc.

DEVELOPMENT OF ANALGESIC AND ANTI-INFLAMMATORY COMBINED PREPARATION BASED ON BLUNT NOSED VIPER VENOM AND OREGANO ESSENTIAL OIL. A Darbinyan, L Parseghyan, A Moghrovyan, M Babajanyan, A Voskanyan, Laboratory of purification, certification and standardization of physiologically active substances, L.A. Orbeli Institute of Physiology NAS, Yerevan, Armenia. **INTRODUCTION:** Modern medicine needs new non-steroidal analgesic drugs with minimized side effects. The deepening of knowledge of nociceptive mechanisms is always of interest to doloromics and the search for new, effective drugs for the treatment of pain remains a topical issue.Natural resources are the best raw materials for obtaining new anti-pain therapeutic agents. It is known that the combination of several therapeutic agents is often an advantage, as it allows for to reduce of the doses of the active ingredients in the drug and, therefore, reduces the toxicity and the possibility of resistance development in target cells, and provides the possibility of synergism of drug effects. Due to a lack of verbal feedback, pain cannot be directly evaluated in rodents, so certain methods that quantify "pain-like" behaviors or nociceptive effects were used. **AIM:** The aim of the work was to study the anti-pain and anti-inflammatory effects of the combined preparation of Caucasian blunt-nosed viper venom and Armenian oregano essential oil. **METHODS:** Studies have been conducted in animal models of pain using well-known behavioral tests to assess pain and inflammation; formalin test - to evaluate the effectiveness of the drug in the acute and inflammatory stages of formalin action development, carrageenan test - to evaluate the anti-inflammatory activity of the drug, hot plate test - to determine the involvement of thermal receptors in the mechanism of pain relief. **RESULTS AND DISCUSSION:** Through the formalin test, the results showed that intraperitoneal injection of the combined preparation (4% Armenian oregano essential oil + Caucasian blunt-nosed viper venom 1/20LD50) demonstrated effective pain relief for more than 80% compared to standard painkillers (analgin, diclofenac). The results of the study using the carrageenan test showed that the intraperitoneal injection of the combined drug showed an anti-inflammatory effect of less than 50%. The results of the hot plate test showed that TRPV1 receptors are not involved in the pain relief mechanism of the combined drug. **CONCLUSION:** Mechanisms of the anti-pain effect of snake venom phospholipase a2 related with peripheral desensitization of nociceptors and analgesic effect of cannabinoid CB2 receptors activation by b-caryophyllene and b-caryophyllene epoxide of oregano essential oil are discussed.

ACUTE BEHAVIORAL AND NEUROCHEMICAL EFFECTS OF RESERPINE ON LEOPARD ZEBRAFISH. AD Kozlova, VA Smolyaninova, DS Galstyan, AV Kalueff, Institute of Translational Biomedicine, St. Petersburg State University, Institute of Experimental Medicine, Almazov National Medical Research Centre, Granov Russian Scientific Center for Radiology and Surgical Technologies, Ministry of Healthcare of Russian Federation, St. Petersburg, Russia. **INTRODUCTION.** One of the important ways to study the mechanisms of development and treatment of depressive conditions in translational biomedicine is the reseprin model of depression. Reserpine inhibits the vesicular transporters of momnamines VMAT1 and VMAT2, and, accordingly, monoamine neurotransmission is suppressed. So, the aim of the present study was to evaluate the acute behavioral effects of reserpine in adult zebrafish. **METHODS.** A total of 36 adult short-finned wild-type (leopard) zebrafish were used for this study. All fish were divided into 2 groups: 40 mg/l reserpine and control group. Before testing, zebrafish were placed in a 0.25 L plastic beaker containing drug for 20 minutes. Reserpine was previously dissolved in 2 ml of dimethyl sulfoxide (DMSO) solution (2 ml of DMSO was also added to the beaker with the control group). Behavior was recorded on days 3, 7 and 14 after acute exposure to 40 mg/l reserpine in the novel tank test (NTT). Behavioral parameters such as frequency, duration of being in the top, distance traveled were calculated using the Noldus EthoVision XT11.5 software. High performance liquid chromatography (HPLC) was used to assess the level of monoamines in the brain. The fish were euthanized in ice water followed by decapitation, their brains were dissected on ice, frozen in liquid nitrogen, and stored at −80°C. Statistical data were analyzed using the Mann-Whitney (MW) test. Statistical significance between the considered parameters was set at p<0.05 in all tests. **RESULTS AND DISCUSSION.** Reserpine on the 3rd and 7th days after acute exposure caused hypolocomotion with statistically significant differences in the distance traveled (p=0.0007 on the 3rd and p=0.0381 on the 7th). Also on the 3rd day, the fish after reserpine showed a low number of swims to the upper part of the tank. On the 14th day, the zebrafish after reserpine showed, on the contrary,

high values of the distance traveled (p=0.0196). Neurochemical analysis showed that, after the 3rd day of exposure to reserpine, the levels of dopamine (p=0.0406) and serotonin (p=0.0181) were reduced compared to control fish. The results of the study showed that leopard zebrafish show high sensitivity to the action of reserpine, which is expressed in a decrease in activity in the NTT, but with the restoration of behavior on the 14th day. The decrease in dopamine and serotonin levels after the 3rd day of exposure to the drug may indicate the potential of the drug to cause a depressive effect. **RESEARCH SUPPORT.** The Russian Science Foundation project 23-25-00412.

INNOVATIVE INTEGRATED MODEL OF HEALTH AND SOCIAL SERVICES FOR PEOPLE WITH MENTAL DISEASES AT CENTER FOR MENTAL HEALTH-ROUSSE, BULGARIA. G Hayredin, Center for Mental Health-Rousse, Angel Kanchev University of Rousse, Rousse, Bulgaria. **INTRODUCTION:** Improving mental health and psychosocial well-being are essential components in the overall process of improving the health and progress of a nation. A neglected but independent part of this nation are those suffering from mental illness and disorders. The implementation of this innovative model contributes to addressing a wide range of needs of people with chronic mental illness by solving fundamental problems. **METHODS:** Along with the core activities, psychosocial rehabilitation is an integral part of the treatment process and contributes to reducing the incidence of severe re-hospitalization by providing continuous monitoring, systematic treatment and therapeutic counseling of persons with severe chronic mental illness. Replacing the existing institutionalized format of mental health care with that of comprehensive and integrated care in the community, with accompanying rehabilitation and re-socialization, is the priority goal, the foundation and the long-term perspective on which this innovative integrated model operates. **RESULTS AND DISCUSSION:** Centre for Mental Health-Ruse offers an innovative complex-integrative model of health and social services related to diagnosis, treatment, psychosocial rehabilitation, socio-legal counseling, educational and vocational training and guidance, aimed at improving the quality of life of patients and consumers. The aim is to restore the individual's resources, to encourage, stimulate and implement their adaptive potential, and to overcome the stigma of mental illness in the family and community. **CONCLUSIONS:** The uniqueness of this model stems from its comprehensive, holistic approach, combining simultaneously and integratively the activities of treatment, rehabilitation, resocialization, sheltered employment, job placement and autonomy, leading to an improved quality of life.

PSYCHOLOGY OF INDIVIDUAL DIFFERENCES IN SPATIAL ABILITIES OF STUDENTS OF VARIOUS PROFESSIONAL DIRECTIONS. ZR Takhirova, VI Ismatullina, TV Adamovich, AV Kazantseva, RF Enikeeva, E Harisova, A Tukumbetova, EL Soldatova, EK Khusnutdinova, SB Malykh, Ufa University of Science and Technology, Institute of Biochemistry and Genetics, Ufa Federal Research Centre RAS, Ufa, Ural Federal University, Ekaterinburg, Psychological Institute RAE, Moscow, St. Petersburg State University, St. Petersburg, Russian. **INTRODUCTION:** Spatial thinking is an evolutionarily adaptive feature of human necessary for a person to cognize of world around us. Spatial abilities are a reliable predictor of individual academic achievements in scientific, technical, engineering and mathematical fields (STEM). **METHODS**: Assessing the development of spatial abilities, we used 312 respondents aged 17-34 years of various professions and both sexes, using a battery of psychodiagnostic techniques (four tests for the detection of spatial abilities: mechanical reasoning; paper folding; pattern assembly; share rotation). In addition, we assessed the intellectual skills of the respondents by using the Raven test and academic performance scores. Because 16 respondents deviated at distance of Mahalonobis (>95%), they were excluded from the subsequent analysis. Thus, the group included 296 subjects (60 men and 236 women). To compare scores for each test, two predictors were used - sex and professional sphere (socio-humanitarian, technical and natural science), and an assessment was made of the interaction of these factors in stratified groups. Determination of the correspondence of the distribution to the normal was carried out using the test of Shapiro-Wilk. Subsequently, analysis of variance (ANOVA) was used, corrected for false positives by the FDR (False Discovery Rate) method. **RESULTS AND DISCUSSION:** We found significant differences in mechanical reasoning based on sex ($p=0.0001$, $p_{fdr}=0.001$), and in academic success of subjects based on their professional field ($p=0.0001$, $p_{fdr}=0.001$). **RESEARCH SUPPORT:** The Ministry of Science and Higher Education of Russian Federation (FZWU-2023-0002), mega-grant from the Government of the Republic of Bashkortostan (contract 1, 2022).

ONLINE TALK: EVOLUTION WITH NEURONAL NETWORKS AND INTERNET INTEGRATION IN THE NATURE. M Koshiba, Yamaguchi University, Tohoku University, Yamaguchi, Saitama Medical University, Moroyama, Saitama, Japan. **INTRODUCTION:** Humans belong to the primate family, and share many common genes with its diverse species. When a child freely creates independent play, trees and wood, water, sky, and soil bring diversity to the child's neural development. On the other hand, the increasing complexity of digital networks, which are uniquely produced and developed by humans, also contributes to

environmental diversity and may impact neural development. To combine these two different directions from nature of the earth and from digital human knowledge, it may be difficult in adult compared to children. This dynamic integration may suggest novel evolution of human and any biological creatures but also possibilities of degeneration risks if there is less thoughtfulness near future. Through our uncompleted approaches of exploring support systems of developmental psychology in non-human primate models and humans (from children to adults), the optimized balancing of diversified factors simultaneously would be required on the nature versus IT evolutional road, full of psychiatric issues currently. Our recent cross-taxon studies of human and non-human primate neurobehavioral and psycho-cognitive aspects will be introduced and discussed.

15.20-18.00 JOINT CONFERENCE POSTER SESSION

STUDY OF THE EFFECT OF BACTERIAL MELANIN IN THE ROTENONE MODEL OF PARKINSON'S DISEASE. MH Danielyan, KA Nebogova, VP Khachatryan, OH Nazaryan, ZA Avetisyan, KV Karapetyan, L.A. Orbeli Institute of Physiology NAS, Yerevan, Armenia. **INTRODUCTION:** Parkinson's disease (PD) is a slowly progressive chronic neurological disease that primarily affects the motor system. Most motor symptoms are caused by damage to dopaminergic neurons in the substantia nigra pars compacta (SNc). In the present study, bacterial melanin (BM) was used, the therapeutic effect of which is due to the improvement of the trophic effects of the brain tissue, inhibition of the inflammatory process and gliosis, which are inherent in PD. **METHODS:** Here, we study the effect of BM on the morphofunctional state of SNc using a rotenone model of PD. Studies were carried out on SNc of intact rats, on a PD model 4 weeks after rotenone injection and on a PD model with BM injection for 4 weeks. Morphohistochemical studies were carried out by the method for detecting the activity of Ca^{2+}-dependent acid phosphatase. Animal behavior was studied using a cylinder test. **RESULTS AND DISCUSSION:** Under conditions of rotenone intoxication (PD model), depigmentation and sharp changes in the intracellular structures of SNc neurons (morphological and metabolic disorders) are noted. Neurons undergo severe atrophy, significant changes in the cytoplasm and nucleus occur inside the cells, and a decrease in the activity of acid phosphatase in the cytoplasm of cells is noted. Behavioral tests have shown that the animals exhibit a form of behavior inherent in PD (freezing, immobility). With the introduction of BM, positive changes in the structural properties of neurons are observed in SNc in comparison with the model of PD. The morphological picture of neurons is close to normal, the shape and size of the cells are preserved. In the cytoplasm of cells, an increase in phosphatase activity is observed, which indicates the activation of metabolic processes. Our previous electrophysiological studies have shown that SNc neurons exhibit excitotoxicity in PD, which accompanies neurodegenerative damage, which was successfully eliminated by exposure to BM. These data are confirmed by our morphohistochemical and behavioral tests. Thus, BM shows neuroprotective activity, accelerating the compensatory recovery in the central nervous system against the background of developing neurodegenerative changes inherent in PD. In the future, additional studies are needed to decipher the mechanisms of the effect of BM in order to create new-generation drugs based on it for the prevention and treatment of PD. **RESEARCH SUPPORT:** The Science Committee of RA research project 21T-1F282.

GLUTAMATERGIC TRANSMISSION IN THE HIPPOCAMPUS OF AGING KM RATS. EP Aleksandrova, AA Kulikov, EV Chernigovskaya, Sechenov Institute of Evolutionary Physiology and Biochemistry RAS, St. Petersburg, Russia. **INTRODUCTION**: Temporal lobe epilepsy is caused by morphological and biochemical changes in the hippocampus. These propagating and strengthening changes often lead to neurodegeneration. One of the relevant models of this process is audiogenic kindling, when with repeated stimulations epileptiform activity is spreading to the limbic system. Age-related disturbances in the glutamatergic system involved in the development of limbic epilepsy are currently not well understood. **METHODS**: We used Krushinsky-Molodkina (KM) rats genetically prone to audiogenic epilepsy as a model. To examine the contribution of inherited epilepsy into the age-related impairment of glutamatergic transmission in the hippocampus, we compared aged (16-18-months) KM rats with control Wistar rats of the same age. To study the role of epileptic state in the long-term glutamatergic system we compared naïve and kindled rats after 7 days of rest. Similarly, we analyzed changes in aged rats, 7 months after kindling. We then performed immunohistochemical and Western blot analyses on those groups. **RESULTS AND DISCUSSION**: KM rats develop epilepsy as the result of abnormal glutamatergic system disturbances. Young KM rats have decreased expression of proteins involved in the glutamatergic system, compared to the line of origin, Wistar rats. Here we showed, that old KM rats, that were not subjected to kindling, in contrast to Wistars, have increased number of cells, expressing neuron activation factors pErk1/2 and FRA-

1, as well as higher levels of proteins of glutamatergic transduction (NR2a, Vglut1). Previously we showed that kindling results in changes on every level of glutamatergic transduction in hippocampus: higher levels of pERK1/2 and ERK-dependant transcriptional factors p-Creb, c-fos, enzyme glutaminase and glutamate vesicular transporter Vglut1, as well as glutamate receptors mGlur1 and mGlur5. These changes persist over time, as kindled rats 7 days after seizures have demonstrated. At the same time, when both naïve and kindled KM rats were studied 7 months after audiogenic seizures, levels of those proteins compared to old Wistar rats were decreased. Altogether, obtained data let us to suppose that genetic predisposition to the reflex epilepsy is a damaging factor in aging hippocampus that affects glutamatergic system. **RESEARCH SUPPORT:** The Russian Science Foundation (RSF) Grant № 23-24-00101. Part of analyses was performed at Research Resource Center #441590 at Sechenov Institute of Evolutionary Physiology and Biochemistry.

DISSOCIATION BETWEEN NEURONAL AND ASTROCYTIC CALCIUM ACTIVITY IN RESPONSE TO LOCOMOTION IN MICE. A Fedotova, A Brazhe, M Doronin, D Toptunov, E Pryazhnikov, L Khiroug, A Verkhratsky, AV Semyanov, Moscow State University, Institute of Bioorganic Chemistry RAS, Sechenov First Moscow State Medical University, Moscow, Russia; Jiaxing University College of Medicine, Zhejiang Pro, Jiaxing, China Medical University, Shenyang China; Neurotar, Helsinki, Finland; Faculty of Biology, Medicine and Health, The University of Manchester, Manchester, UK; Achucarro Centre for Neuroscience, Bilbao, Spain; Department of Forensic Analytical Toxicology, School of Forensic Medicine, Department of Stem Cell Biology, State Research Institute Centre for Innovative Medicine, Vilnius, Lithuania. **INTRODUCTION:** Orchestrated activation of different cell types and their interactions within the brain active milieu provide the cellular basis for brain functions. We investigated and compared how the astrocytic and neuronal calcium activity patterns are organized and change while head-fixed mice were moving around an airlifted platform. **METHODS:** The genetically encoded calcium indicator, GCaMP6f, was expressed under the astrocyte- or neuron-specific promoter in C57BL/6 mice. Two-photon calcium imaging was performed on the somatosensory cortex of awake head-fixed mice navigating Mobile HomeCage (Neurotar, Finland). **RESULTS AND DISCUSSION:** Ca^{2+} activity in astrocytes was low at periods of animal quiescence but significantly increased during locomotion. Ca^{2+} signals first appeared in the distal processes and then propagated to astrocytic somata where exhibited oscillatory behavior, suggesting that astrocytic soma operates as both signal integrator and amplifier. In contrast to astrocytes, profound Ca^{2+} activity was detected in neurons in quiescent periods and it further increased during locomotion. Neuronal Ca^{2+} rose almost immediately following the onset of locomotion, whereas astrocytic Ca^{2+} signals emerged with a time lag of several seconds. Neurons reliably responded to each episode of locomotion, while Ca^{2+} elevations in astrocytes were significantly diminished in response to the second locomotion in each pair of sequential locomotion episodes. Thus, neuronal Ca^{2+} response is primary and reflects sensory input routed by neurons. Astrocytic Ca^{2+} dynamics is secondary and likely to provide metabolic and homeostatic support of intercellular communication and plasticity within the brain active milieu. **RESEARCH SUPPORT:** The Russian Science Foundation grant 22-14-00033.

ASTROCYTE DYSFUNCTION IN KRUSHINSKY-MOLODKINA RATS GENETICALLY PRONE TO AUDIOGENIC EPILEPSY. YS Grigorieva, AA Naumova, SD Nikolaeva, MV Glazova, Sechenov Institute of Evolutionary Physiology and Biochemistry RAS, St. Petersburg, Russia. **INTRODUCTION**: Epilepsy is one of the most common neurological disorders, which is often accompanied with hippocampal sclerosis along with considerable alterations in morphology and functions of hippocampal astrocytes referred as reactive astrogliosis. Various aberrations revealed in astrocytes affect all astrocyte functions crucial for regulation of neuronal excitability. Patients with temporal lobe epilepsy (TLE) demonstrate mutations in genes that regulate astrocyte metabolism. Thus, impaired glial functions can be not only the consequence of epileptiform activity but also the etiology substrate of inherited epilepsy. **METHODS**: Worldwide approach to study the mechanisms of epilepsy is the use of epilepsy-prone rodents. In our experiments, we recruited the inbred Krushinsky-Molodkina rats (KM) genetically prone to audiogenic epilepsy. Single acoustic stimulations of KM rats induce reflex seizures, while audiogenic kindling results in the spread of epileptiform activity to the forebrain structures including the hippocampus and is referred as a model of TLE. To elucidate, whether astrocyte abnormality is genetically determined or induced by epileptiform activity, we analyzed the hippocampal astrocytes of the naïve and epileptic KM rats. Since KM rats were genetically derived from Wistar ones, we compared naïve KM and Wistar rats to elucidate the effects of epileptogenesis by analysing hippocampal astrocytes after 7-, 14-, and 23-day audiogenic kindling. The main markers of astrocyte activity (GFAP, ALDH1L1, AQP4, EAAT1 and 2, and GABAT3) were analyzed by Western Blot and qPCR. **RESULTS AND DISCUSSION**: Astrocytes of naïve KM rats were characterized by dramatically reduced expression of AQP4. Since dysfunction of AQP4 correlates with intense neuronal activity

accompanying seizures, decreased AQP4 in the hippocampus of KM rats is likely inherited and can mediate seizure susceptibility. Analysis of epileptic rats revealed that short-term audiogenic kindling affected only EAAT1, while long-term kindling led to an increase of GFAP expression and further decrease in AQP4 accompanied with a dramatic decrease in the expression of astrocyte GABA and glutamate transporters. Previously, we confirmed 14-day kindling of KM rats as a valid model of TLE, while 7-day kindling only partly affected the hippocampus. Thus, our data demonstrate that the development of epilepsy in KM rats is accompanied by the growing dysfunction in astrocytes. **RESEARCH SUPPORT:** The RSF grant 23-24-00342.

ASSESSMENT OF PSYCHOLOGICAL AND PSYCHOPHYSIOLOGICAL STATE IN PARTICIPANTS OF THE ARTSAKH WAR. AA Sahakyan, NE Tadevosyan, HG Galstyan, LV Vahradyan, Artsakh State University, Stepanakert, Artsakh, L.A. Orbeli Institute of Physiology NAS, Yerevan, Armenia. **INTRODUCTION:** Military actions have various types of impact on the psyche and behavior of participants in such actions. Human nature is quite vulnerable to strong stress factors of war (danger, death of colleagues, wound, disability, pain). Nowadays, when continuous wars are going on in different parts of the world, it is reasonable to study the real scale of the negative effects of war on the psychological and psychophysiological state of participants in military actions. It becomes important to identify the nature of effects of stress factors on the health of participants in military actions, as well as to develop preventive measures that would mitigate functional changes caused by stress. The aim of this work was to investigate the general functional state of the participants of the Artsakh war by studying the psychological and psychophysiological characteristics. **METHODS:** The study was carried out among participants in military actions (83 men, 18-35 years of age), who were divided into three groups: group I – army recruits; group II – volunteers; and group III – participants who had been wounded (wounds of various degrees). The control group included individuals of the same age group (36 men) who did not participate in military actions and did not reside in areas of such actions. The adapted psychological computerized tests (Taylor Manifest Anxiety Scale TMAS and Pichot Inventory) were used to study the psychological state. The characteristics of voluntary attention were assessed using the “Clocks Carrousel” psychophysiological test, similarly to the d2 Test. **RESULTS AND DISCUSSION:** Psychological and psychophysiological analyses revealed higher depression, asthenia and anxiety and lower concentration and productivity of attention and mental performance in subjects of all groups vs. controls. Interestingly, subjects of the 3rd group had more pronounced psychological characteristics and relatively low scores in the voluntary attention test than groups 1 and 2. As such, altered characteristics of voluntary attention are determined by a disturbance in the perception process and a reduced information processing speed. Thus, psycho-emotional stress in military combatants likely disorganizes brain functional networks, resulting in reduced cognitive functions.

DYNAMICS OF HRV SPECTRAL PARAMETERS DURING PRESENTATION OF SMOKING-RELATED VR CONTENT IN NON-SMOKERS AND SMOKERS. AA Tumanian, NE Tadevosyan, BA Khachunts, EA Khachatryan, AS Khachunts, L.A. Orbeli Institute of Physiology NAS, Yerevan State University, Yerevan, Armenia. **INTRODUCTION:** Smoking addiction is a worldwide and costly problem. Some studies have suggested that people smoke cigarettes in order to relieve negative emotions, reduce stress and relax. Different therapies and interventions have been developed to overcome smoking addiction. Systematic reviews have shown promising results showing VR cue exposure therapy can be used to reduce nicotine craving. The use of VR skills training appears to be a viable method to reduce smoking in nicotine-dependent adults. **METHODS**: Fourteen non-smokers (mean age ± SD: 31 ± 5.6 years) and 13 smokers (30 ± 5.0 years) participated in the study. All participants were males. Four continuous 5-minute VR scenarios (360°) were presented to participants: 1) neutral activity without smoking; 2) the subject saw the attributes of smoking (ashtray, lighter, pack of cigarettes); 3) the subject saw smoking people; 4) the subject smoked himself. Content actions took place in a café. While the participants were watching VR content, ECG (with subsequent HRV analysis), respiration and body temperature were registered using a "NeXus 10 MkII" portable device (Netherlands). **RESULTS AND DISCUSSION**: At all stages, respiration amplitude in smokers was higher than in non-smokers, reflecting compensation for reduced alveolar ventilation in smokers. In smokers, spectral analysis of HRV showed an increase in LF/HF and index of centralization (IC) and a decrease in HF% compared to baseline when they saw smoking people, indicating a shift in autonomic balance toward sympathetic predominance and increased activity of the central circuit of heart rhythm regulation. However, when the subjects smoked themselves, there was a decrease in LF/HF and IC and an increase in HF%, which may be related to a “virtual” sense of satisfaction. The non-smokers in stages 2 and 3 of the study showed a slight decrease in LF/HF and IC and an increase in HF%, indicating that they were relaxed and not affected by the attributes of smoking and smokers. But there was a significant increase in LF/HF and IC and a decrease in HF% when smoking in a VR environment. We

suppose that this is due to the “internal taboo of smoking”. **RESEARCH SUPPORT:** The PMI Science Armenia and EIF “Faculty Research Funding Program” and “The best tech solutions in non-tech industries” competition.

BIOINFORMATICS-BASED ANALYSES OF RODENT SELF-GROOMING BEHAVIOR AND THE EMERGING COMPLEXITY OF ITS MOLECULAR PATHWAYS. AN Ikrin, AM Moskalenko, RR Mukhamadeev, TO Kolesnikova, AV Kalueff, Sirius University of Science and Technology, Sirius Federal Territory, Russia. **INTRODUCTION**: Self-grooming is an innate behavior involved in hygiene maintenance and other physiological processes. Given its high conservation and complex patterned nature, this behavior can also be a useful translational tool for studying aberrant behavior seen in clinical neuropsychiatric disorders. **METHODS:** Here, we constructed a comprehensive dataset of mouse 227 genes whose genetic variance resulted in rodent self-grooming phenotypes. An additional 40 interactor genes were added by the STRING database (mean confidence interval = 0.40), to generate sufficient protein-protein interaction (PPI) connectivity network with major clusters of the overall network of 145 (from 267) genes. The CytoHubba plugin of Cytoscape (version 3.9.1) was then used to search the global PPI network for hub genes using the Betweenness, Stress, and BottleNeck methods. **RESULTS AND DISCUSSION:** Overall, CTTNB1, DLG4, MAPT, EP300, GSK3B, and 25 other genes were most central (hub) for mouse grooming behavior. We also assessed the involvement of these hub genes in selected molecular pathways using the ShinyGO tool version 0.77 (p-value = 0.05). The enrichment analysis of the GO biological processes and the KEGG pathways for these 30 hub genes revealed most of them as those involved in neurodegeneration (Alzheimer, Huntington) and glutamatergic synapse pathways. The Metascape analyses of the hub genes show that these genes are related to pathway behavior. Our analyses identified the following clusters within the mouse self-grooming PPI networks: postsynaptic density, WNT-signaling, transcription factors, neuronal cell cycle, NOS-mediated monoaminergic neurotransmission, microtubulal regulation/tauopathy, neuronal differentiation/trafficking, neurodevelopmental gene regulation and mitochondrial function. These findings may offer novel important insights into complex behavioral regulation operated by genes and their respective molecular cascades. In essence, these results suggest that molecular mechanisms underlying normal and aberrant grooming in mice involve processes far beyond traditional neurotransmission signaling, but also engage multiple other cellular processes currently not directly recognized as associated with grooming per se. Thus, the growing complexity of genetic determinants and associated molecular pathways for rodent self-grooming (and, by analogy, other complex behaviors in general) can facilitate our improved understanding of neurological disorders with repetitive behaviors and their potential molecular targets for pharmacological or gene therapy correction. **RESEARCH SUPPORT**: The Neurobiology Program (NRB-RND-2116) and the Graduate Program in Genetics and Genetic Technologies, Center of Genetics and Life Sciences, Sirius University of Science and Technology.

PROCOGNITIVE EFFECT OF MEDIUM-CHAIN TRIGLYCERIDE SUPPLEMENTATION IS ASSOCIATED WITH ALTERED CORTICAL GLUTAMATERGIC GENE EXPRESSION AND GUT MICROBIOTA COMPOSITION. EA Kim, EA Shirokov, VA Nikitina, AP Schwarz, DU Krytskaya, NA Arseniev, IN Abdurasulova, VM Klimenko, KP Shcherbakova, AN Trofimov, Institute of Experimental Medicine, St. Petersburg State Chemical Pharmaceutical University, Peter the Great St. Petersburg Polytechnic University, Sechenov Institute of Evolutionary Physiology and Biochemistry RAS, St. Petersburg, Russia. **INTRODUCTION:** The neuroprotective effects of ketosis, induced by a ketogenic diet (KD), are well established. However, prolonged adherence to KD can lead to side effects. The consumption of medium-chain triglycerides (MCTs) offers a potential way to achieve a state of moderate ketosis on a normal diet, correcting cognitive impairments. Both KD and MCT consumption lead to changes in gut microbiota, which may affect brain activity. This study aimed to investigate the effects of moderate ketosis, induced by MCTs, on memory indices, gut microbiota composition, and expression of glutamatergic-related genes in the brain cortex. **METHODS:** Adult male Wistar rats on a standard diet were tested in behavioral tests (Y-maze, open field), after which part of the rats had their food removed for 6 hours a day and were orally administered MCTs (2 ml/kg/day) for two weeks, and then repeated the tests, adding Morris Water Maze. After the final MCT administration, the animals were euthanized, blood was collected for biochemical analysis, and the brain was collected for qPCR. The microbiota composition was studied using genomic DNA sequencing isolated from animal feces. Statistical analysis of the results: rm-ANOVA, Student's t-test, U-test, $p < 0.05$. **RESULTS AND DISCUSSION**: MCT administration increased ketone body concentration in the blood, improved working memory, suppressed locomotor activity, and improved spatial memory compared to the control group. The expression of genes encoding glutamatergic NMDA and AMPA receptor subunits (GluN2a, GluN2b, GluA1, GluA2) was increased in the brain cortex of the MCT group, indicating more active memory consolidation. The MCT group had increased levels of *Bacteroidota* and decreased

levels of *Patescibacteria* in gut microbiota composition. These results suggest that MCTs can be a promising approach for further research into the protective effects of a ketogenic diet in cognitive impairment models in laboratory rats. **RESEARCH SUPPORT:** Russian Science Foundation project 19-75-10076.

EFFECTS OF LEVOTHYROXINE ON THYROIDECTOMIZED RATS: BEHAVIORAL STUDIES. LV Darbinyan, LE Hambardzumyan, LP Manukyan, LG Avetisyan, VH Sarkisian, KV Simonyan. L.A. Orbeli Institute of Physiology NAS, Yerevan, Armenia. **INTRODUCTION:** Thyroid hormones are essential for brain development and function. Thyroidectomy may result in cognitive difficulties due to altered brain function. These alterations have also been observed in animal models, such as adult rats, in which hypothyroidism is associated with deterioration of memory and learning capacity. The purpose of this study was to explore the effects of levothyroxine on the behavior of thyroidectomized rats. The open-field locomotion test is used primarily to examine motor function by measuring spontaneous activity in an open field. The rats were placed in an open field, and their movements were videotaped using automated computer programs. Rearing, line crosses, cleaning, general movement, number of lines crossed, preference for particular sections, and/or fecal movements were calculated to examine behavior and anxiety. We found that levothyroxine-treated rats differed in the distance traveled during open field testing, and the percentage of time spent in the perimeter of the test and general exploratory activity levels were influenced by thyroidectomy. **RESEARCH SUPPORT:** The Science Committee of RA research project 22YR-1F003.

DYNAMICS OF NEURODEGENERATION IN THE HIPPOCAMPUS OF KRUSHINSKY-MOLODKINA RATS CORRELATES WITH THE PROGRESSION OF LIMBIC SEIZURES. AA Kulikov, AA Naumova, AP Ivlev, MV Glazova, EV Chernigovskaya, Sechenov Institute of Evolutionary Physiology and Biochemistry RAS, St. Petersburg, Russia. **INTRODUCTION:** Krushinsky-Molodkina (KM) rats are audiogenic epilepsy prone animals. Initiation zone for acute audiogenic seizure (AGS) is the Inferior Colliculli. Repetitive AGSs spread epileptiform activity through limbic (hippocampus) and forebrain structures. This phenomenon has been called audiogenic kindling (AK). AK can be considered as the model of temporal lobe epilepsy (TLE). TLE associated with neurodegeneration and cognitive deficit. Mechanisms that mediate neuronal death under epileptic conditions are still actively investigated. Apoptosis and autophagy are processes involved in cell survival and cell death and might contribute to epileptogenesis. The purpose of our study was to analyze dynamics of seizure-induced apoptosis and autophagy in the hippocampus of KM rats during different stages of TLE development. Adult KM rats were required in the experiment. Hippocampi of KM rats were collected for analysis after 4, 7, 14 or 25 AGS. Naïve KM rats were used as control group**. METHODS:** Behavioral analysis of seizure patterns; Western blotting of apoptotic and autophagy proteins; IHC, morphometric analysis; Tunel assay. **RESULTS AND DISCUSSION:** After 4 AGS, neither apoptosis nor autophagy was affected. However, after 7 AGS, we found more apoptotic cells in the granule cell layer of the dentate gyrus accompanied by the activation of mitochondrial and p53-dependent pathways of apoptosis. In a week after 7 AGS, we observed recovery of granular cell population, likely due to increased neurogenesis. Additionally, we demonstrated an increase in beclin-1 level and LC3B2/LC3B1 ratio, and a decrease in p62 level reviling of activation of autophagy. Staining with Anti-LC3B and Anti-CathD antibodies revealed increased autophagy in CA4 pyramidal cells. In later stages of TLE development, CA4 pyramidal cells survived, suggesting a neuroprotective role for autophagy. A week after 14 AGS yielded the second wave of neurodegeneration that affected both the granule and hilar cells, including mossy cells. Thus, our data show irreversible neurodegeneration of the hippocampus following limbic seizures during TLE development.

AGING AFFECTS GABA TRANSMISSION IN THE HIPPOCAMPUS OF RATS GENETICALLY PRONE TO AUDIOGENIC EPILEPSY. AA Naumova, AP Ivlev, AA Usatykh, EV Chernigovskaya, Sechenov Institute of Evolutionary Physiology and Biochemistry RAS, St. Petersburg, Russia. **INTRODUCTION:** It is well-known that aging is accompanied with attenuation of the inhibitory GABA transmission in the brain and especially in the hippocampus. These alterations can be exacerbated with age-related neurological disorders including neurodegenerative diseases and epilepsy. At the same time, interrelation between age-dependent dysfunction of GABAergic system and genetic predisposition to epilepsy is now poorly understood. **METHODS:** Here, we used naïve Krushinsky – Molodkina (KM) rats genetically prone to reflex (audiogenic) epilepsy. To reveal the contribution of inherited epilepsy into the age-related impairment of GABA transmission in the hippocampus, we compared old (16-18-months) KM with control Wistar rats of the same age. To estimate the contribution of aging to defects of inhibitory hippocampal system associated with genetic epilepsy, old KM rats were compared with adult (4-month) rats of this strain. Comprehensive

study of proteins responsible for the activity of GABAergic neurons, GABA synthesis, and its action on postsynaptic targets in the hippocampus was performed with use of immunohistochemical, Western blot, and real-time PCR analyses. **RESULTS AND DISCUSSION:** We report increased expression of GAD67 in the hippocampus of old KM rats vs. Wistar control, indicating upregulated GABA synthesis in the hippocampal cells. Moreover, KM rats demonstrated more GAD67-positive hippocampal cells with nuclear expression of transcription factor Fra-1, suggesting increased activity of GABAergic neurons. These changes were accompanied by decreased expression of GABA(A) receptors, likely associated with enhanced GABA binding stimulating receptor turnover. Analysis of Cl^- transporters revealed unchanged expression of NKCC1 along with higher expression of KCC2 which could indicate more intensive Cl^- efflux from GABA target cells and, as a result, more effective GABA inhibition. However, as compared with adult KM rats, old ones demonstrated downregulation of proteins responsible for the functional activity of GABAergic cells (GAD67, parvalbumin, transcription factor CREB) in the hippocampus, while the expression of GABA(A) receptors and Cl^- transporters was similar in both age groups. Altogether, genetic predisposition to the reflex epilepsy is associated with more active inhibitory transmission in the hippocampus of old animals which can prevent spontaneous seizures, yet aging negatively affects this protective mechanism. **RESEARCH SUPPORT:** The Russian Science Foundation (RSF) Grant 22-75-00060, part of the analyses was performed at Research Resource Center #441590 at Sechenov Institute of Evolutionary Physiology and Biochemistry.

EFFECT OF DERIVATIVES OF NEUROACTIVE AMINO ACIDS ON RESPIRATORY FUNCTIONAL CHANGES IN THE CARDIAC MITOCHONDRIA OF STRESSED ANIMALS. VN Perfilova, MV Kustova, II Prokofiev, IN Tyurenkov, Volgograd State Medical University, Volgograd, Russia. **INTRODUCTIONS:** The stress reaction is characterized by damage of cells and tissues in several organs, particularly, in the heart. Cardiac mitochondrial dysfunction is considered to be one of pathogenetic mechanisms resulted from excessive release of catecholamines and glucocorticoids. Stress activates iNOS that produces large amounts of NO, and in turn reactive nitrogen oxide species. **METHODS:** The experiments involved 56 female rats. Stress was induced by hanging animals at dorsal cervical skin position for 24 hours. Female rats were divided into 7 groups (n=8 per group): control rats (group 1), stressed rats received saline solution (group 2), stressed animals received glufimet (glutamic acid derivative) in dose of 29 mg/kg (group 3) and stressed animals received phenibute (GABA derivative) in dose of 50 mg/kg (group 4), stressed animals received the blocker iNOS-aminoguanidine (AMG) at a dose of 50 mg/kg (group 5), stressed animals received AMG (50 mg/kg) and glufimet (29 mg/kg) (group 6), stressed animals received AMG (50 mg/kg) and phenibut (50 mg/kg) (group 7). The mitochondrial fraction was taken by differential centrifuging of heart homogenate. Respiration was measured by polarography using Clark electrode in freshly isolated mitochondria. The functional state of mitochondria was assessed using Respiratory Control Ratio (RCR) according to Chance B, and Williams G.R. RCR was calculated as the ratio of the oxygen consumption rate in the presence of oxidation substrates (potassium malate (0.5 mmol)/potassium glutamate (0.5 mmol) for first complex; succinate (1 mmol) for second complex) and 0.2 mM ADP to the rate after exhaustion ADP (V4). **RESULTS AND DISCUSSION:** Stress induced by immobilization and pain leads to uncoupling of respiratory and oxidative phosphorylation processes in cardiac mitochondria that were expressed as reduction of RCR both for first and second complex. Glufimet and phenibute significantly decresed the stress damaging effect on mitochondria and increased RCR for both complex compare with stress control. Blockade of iNOS contributed to the coupling of respiration and phosphorylation in the heart mitochondria of stressed animals, RCR was higher than that of females in the control group for both complex of respiratory chain. Glufimet and phenibut increased RCR under conditions of iNOS blockade. Thus, stress induced by immobilization and pain leads to uncoupling of respiration with phosphorylation in cardiac mitochondria, while GABA and glutamic acid derivatives decrease mitochondrial damage in heart of stressed animals. **RESEARCH SUPPORT:** The Volgograd State Medical University.

EVALUATION OF THE IMPACT OF MUSIC OF VARIOUS GENRES UNDER INFORMATION LOADS ON THE FUNCTIONAL STATE OF THE BRAIN OF STUDENTS OF DIFFERENT SPECIALIZATIONS. EA Avetisyan, AA Petrosyan, SA Shogheryan, LG Avanesyan, NA Sahakyan, VH Sarkisian, L.A. Orbeli Institute of Physiology NAS, Yerevan, Armenia. **INTRODUCTION:** Studying psychophysiological changes in brain functional state (FS) is important because of its marked impact on life in general, and due to associated information, socio-psychological, emotional and other stress-inducing factors that continuously affect the psyche. The search for ways to prevent pathological changes in brain FS caused by imbalanced sympathetic-parasympathetic reactions for the speedy restoration of homeostasis in the functioning of the brain systems and stabilization of the psychophysiological status of the body is therefore highly relevant. **METHODS:** Two groups of 18-20 years old students (biologists and musicians, n=20 each) were tested for

psychophysiological features of various genres (rock and classical music) and to probe how they affect regulation of brain FS during certain cognitive tasks that require the integration of auditory, visual and motor components. **RESULTS AND DISCUSSION:** The QL (quality of life) test showed higher level of physical vs. mental health in both groups, whereas intergroup differences were observed the delay in both physical and socio-psychological capabilities in biologists with an accentuated decrease in role activity. The «Clocks Carrusel» test (visual and motor reactions) found a regular change in mental activity in accordance with the capabilities of each group, however, when music (i.e., an auditory analyzer) is connected, musicians do not experience reduced cognitive processes (e.g., speed of processing figures, concentration of attention) typical for biologists. Analyzing ECG with mathematical analysis of heart rate variability, we found a sharp centralization of regulatory processes when music was connected. **RESEARCH SUPPORT:** The Science Committee of RA.

MEDIUM-CHAIN TRIGLYCERIDE SUPPLEMENTATION INDUCES ACUTE CHANGES IN GENE EXPRESSION, MONOAMINE LEVELS IN THE BRAIN, AND CYTOKINE LEVELS IN BLOOD OF MALE WISTAR RATS. VA Nikitina, AP Schwarz, DS Traktirov, SA Apryatin, MN Karpenko, DU Krytskaya, VM Klimenko, KP Shcherbakova, AN Trofimov, Institute of Experimental Medicine, Sechenov Institute of Evolutionary Physiology and Biochemistry RAS, St. Petersburg, Russia. **INTRODUCTION:** Medium-chain triglycerides (MCT) possess neuroprotective properties, but the underlying molecular mechanisms are insufficiently understood. We previously demonstrated that chronic 3 g/kg/day MCT improved working memory in rats without causing chronic metabolic changes. Studying the acute effects of MCT on brain gene expression and immunomodulating effects is important for identifying the mechanisms of procognitive effects of MCT. **METHODS:** We administered a single oral dose of 3 g/kg MCT to rats and assessed their blood cytokines (by multiplex immunoassay), brain gene expression (by RT-qPCR), and striatal monoamine levels (by HPLC) at 30, 60, 120, and 180 min post-administration. **RESULTS AND DISCUSSION:** In the dorsal hippocampus, MCT administration significantly reduced gene expression of the matrix metalloproteinase-9 (*Mmp9*) at 120-180 min and glucose transporter (*Glut3*) at 120 min, increased the fibroblast growth factor-2 (*Fgf2*) mRNA at 180 min, and increased the relative mRNA levels of NMDA receptor subunits (*GluN1* and *GluN2a*, but not *GluN2b*) at 180 min after administration. Blood ketone body levels inversely correlated with the *GluN1* and *GluN2a* hippocampal expression. In the medial prefrontal cortex, the *GluN2b* and *GluA1* expression peaked at 60 min. Striatal levels of dopamine, serotonin, and their metabolites were not affected, while the HVA/DOPAC ratio significantly increased at 30 min compared to baseline. Several cytokines, including IL-1β, IL-10, and LIX, showed a similar pattern of decreasing at 60 min and then returning to baseline levels at 120-180 min. Leptin and RANTES levels also initially decreased at 60 min but increased vs. baseline at 120-180 min. IL-2 levels decreased at 30 min, remaining low until 180 min, with unaltered VEGF, TNF-α, MIP-1α, IL-4, IL-13, and IL-17. In summary, acute MCT administration affects brain gene expression and blood cytokine levels, suggesting potential therapeutic effects of MCT in neurological and immunological disorders. **RESEARCH SUPPORT:** Russian Science Foundation project no. 19-75-10076.

HIGH-FRUCTOSE DIET-INDUCED METABOLIC STRESS: VASCULAR AND NEURONAL PARAMETERS OF RAT BRAIN DYSFUNCTION. LM Sukiasyan, VA Chavushyan, Yerevan State Medical University after M. Heratsi, L.A. Orbeli Institute of Physiology NAS, Yerevan, Armenia. **INTRODUCTION:** Neurodegenerative diseases are highly comorbid with metabolic syndrome (MS), diabetes and microvascular dysfunction. A high-fructose diet causes MS in rats, with ashyperglycemia, hyperinsulinemia, hyperuricemia, hyperlipidemia, oxidative stress and endothelial dysfunction stimulating microvascular and neuronal disorders of the brain. Here, we evaluated the role of microvascular disorders and neuronal plasticity in deleterious effects of a high-fructose diet in the rat brain**. RESULTS:** Intensive long-term consumption of fructose induces oxidative stress and an increase in NO and ET-1 levels in the blood plasma. Fructose-mediated microvascular dysfunction is expressed in lessened average size and density (or area percentage) of microvessels in the prefrontal and entorhinal cortex in rats. In the neurons of the prefrontal and entorhinal cortex, a homeostatic level of background spike activity, as well as the intensity (or magnitude) and balance of the excitatory and inhibitory responses caused by the stimulation of cholinergic NBM corresponding to the conditions of intensive long-term consumption of fructose has been revealed. These data points to new targets for cholinergic therapy in diabetic dementia. **CONCLUSIONS:** Glycemic control, activation of antioxidant systems, prevention of brain microvascular dysfunction, establishment and stabilization of compensatory homeostatic plasticity of the cortical cholinergic local networks emerge as potential therapeutic targets for metabolic stress caused by intensive and prolonged consumption of foods high in fructose.

IDENTIFICATION OF KEY MOLECULAR PATHWAYS IN EPILEPSY PATHOPHYSIOLOGY BY BIOINFORMATICS APPROACHES. AD Shevlyakov, TO Kolesnikova, KA Demin, AV Kalueff, Sirius University of Science and Technology, Sirius Federal Territory, St. Petersburg State University, Almazov National Medical Research Centre, St. Petersburg, Russia. **INTRODUCTION:** Clinical effectiveness of modern antiepileptic drugs remains low, including treatment-resistant types of epilepsy and numerous reported side effects. As genetic factors play a key role in epilepsy and its treatment, various genetic and genomic technologies continue to dissect the genetic causes of this disorder. However, the exact pathogenesis of epilepsy is not fully understood, necessitating further research based on advanced genetic and systems biology approaches. Here, we applied a computational in silico analysis to generate a network of molecular pathways involved in epilepsy, based on all known human candidate epilepsy genes and their established molecular interactors. This revealed potential downstream pathways which have not yet been considered as promising targets for antiepileptic treatment. **METHODS**: The search for genes associated with epilepsy was performed in the OMIM and GeneCards databases using the terms “epilepsy/epileptic". STRING (version 11.5) was used for building a network of protein-protein interactions. The Cytoscape software (version 3.9.1) and its plugins (CytoHubba and MCODE) examined the hub elements of the network. To identify significantly enriched molecular pathways, we applied GO biological process, KEGG and reactome pathway enrichment analyses of hub genes. **RESULTS AND DISCUSSION:** The search results revealed 623 genes, which have significant association with epilepsy. STRING constructed a graph based on protein-protein interactions, which contained 623 nodes and 560 edges. 25 most significant genes were identified by Cytoscape software. The enrichment analysis revealed the most significant pathways in epilepsy: mTOR signaling pathway; assembly of NMDA receptors; gap junction trafficking; microtubule-dependent trafficking and cell cycle; electron transport chain and thermogenesis; autophagy etc. These results suggest that not only ion channels play an important role in epilepsy, but multiple other processes can trigger epilepsy indirectly. Thus, more attention to the development of drugs aimed at these additional pathways, is warranted. **RESEARCH SUPPORT:** The Neurobiology Program (NRB-RND-2116), Graduate Program in Genetics and Genetic Technologies, Center of Genetics and Life Sciences, Sirius University of Science and Technology. KAD was supported by St. Petersburg State University state budgetary funds (project 93020614).

EFFECTS OF ANTIHISTAMINES IN ADULT ZEBRAFISH IN THE NOVEL TANK TEST. MA Gorbunova, SL Khatsko, AV Zhdanov, AV Kalueff, Ural Federal University, Yekaterinburg, Russia. **INTRODUCTION**: Histamine receptors mediate multiple functions in the organism, from allergic reactions to memory and sleep, hence representing an important target for drug discovery. The first-generation antiallergenic H1-receptor antagonists exert strong anticholinergic and antiserotonergic side effects, and were replaced by more advanced and more effective second-generation drugs. Despite proven efficiency in rodents and humans, their testing in other, alternative model species broadens our understanding of their pharmacology, fostering the development of newer and more promising therapies. Here, we used zebrafish, a model organism effectively implicated to toxicology and drug screening studies due to their easy husbandry and various physiological similarities with humans. Here, we assessed the effects of the first-generation (chloropyramine) and the two second-generation (loratadine and cetirizine) antihistaminergic drugs on zebrafish behavior. **METHODS:** The study involved 82 wild-type short-fin adult zebrafish. All fish were experimentally naive with 50/50 male-female ratio and kept in a 30L aquarium filled with filtered water. Animal behavior was assessed in the novel tank test (NTT), based on anxiety-like hallmarks using the EthoVision and RealTimer software. The NTT included 5-min video recordings of control and experimental groups acutely exposed to the chloropyramine, loratadine and cetirizine at 1, 5, and 10 mg/L (n=8-10). Statistical analysis used the Kruskal-Wallis test, followed by Dunn’s post-hoc correction ($p<0.05$). **RESULTS AND DISCUSSION:** All three drugs significantly changed fish locomotion, reducing distance traveled and average velocity but increasing low acceleration frequency vs. control. Chloropyramine at 5 and 10 mg/L and loratadine at 1-10 mg/L reduced in the number of top entries vs. control. Fish treated with 5 mg/L chloropyramine showed more top duration, while 10 mg/L of loratadine reduced this pattern. Loratadine-treated group displayed longer top latency and more freezing bouts than controls. Additionally,10 mg/L chloropyramine evoked ataxia and overt erratic movements. Overall, chloropyramine induced a sedative effect in zebrafish, typical for the first-generation antihistamines. While loratadine also promoted sedation, ceterizine reduced only locomotor, but not other behavioral patterns, thus producing most positive CNS activity with fewer side effects. **RESEARCH SUPPORT:** Ural Federal University, Yekaterinburg, Russia.

ACUTE AND DELAYED EFFECTS OF NEONATAL IL-1β AND LPS ADMINISTRATION ON NEUROPLASTICITY GENE EXPRESSION: A COMPARATIVE STUDY IN RATS. EA Shirokov, EA Kim,

VA Nikitina, AP Schwarz, OE Zubareva, IN Abdurasulova, VM Klimenko, AN Trofimov, FSBSI Institute of Experimental Medicine, Peter the Great St. Petersburg Polytechnic University, St. Petersburg Chemical and Pharmaceutical University, Sechenov Institute of Evolutionary Physiology and Biochemistry RAS, St. Petersburg, Russia. **INTRODUCTION:** Inflammatory stress and infectious diseases experienced in early postnatal ontogeny can impair normal CNS development and facilitate predisposition towards cognitive dysfunction later in life. Various proinflammatory cytokines, particularly interleukin (IL)-1β, are key mediators of these events, while changes in the expression of neuroplasticity genes present one of possible molecular mechanisms of such adverse outcomes. **METHODS:** This study examined both immediate and delayed effects of course administration of moderate-pyrogenic doses of LPS and IL-1β during the third week of life on the expression of *Bdnf*, *Fgf2* genes, and the expression ratio of *Mmp9* to *Timp1* in medial prefrontal cortex (mPFC) and dorsal hippocampus (DH) of male Wistar rats. Tissue samples were collected either 2 hours after the completion of the administration course or in adulthood, and RT-qPCR was used to measure gene expression. Two of the most stably expressed genes among the candidate genes were selected as reference using RefFinder, analyzed statistically with one-way ANOVA and post-hoc pairwise comparison ($p<0.05$). **RESULTS AND DISCUSSION:** Suitable reference genes for mPFC of pups were *Pgk1* and *B2m*, for mPFC of adult animals *Hprt1* and *B2m*, for DH of pups *B2m* and *Rpl13a*, for DH of adults *Pgk1* and *Sdha*. A significant increase in the expression level of *Fgf2* was observed in mPFC of pups subject to IL-1β administration in comparison both to control and LPS groups, while in adult rat mPFC *Fgf2* expression level was significantly decreased in LPS group vs. both control and IL-1β groups. The adult rat DH expression ratio of *Mmp9* to *Timp1* was significantly decreased in the LPS vs. control and IL-1β groups. Thus, IL-1β- and LPS-induced models of early postnatal inflammation differentially alter the expression of various neuroplasticity-related genes, calling for caution when comparing results obtained using these models.

SINGLE AND PROLONGED EFFECT OF AUDIOVISUAL STIMULATION ON COGNITIVE AND AUTONOMIC PROCESSES. NE Tadevosyan, BB Forghan, AS Khachunts, AA Tumanian, L.A. Orbeli Institute of Physiology NAS, Yerevan, Armenia. **INTRODUCTION:** Increasing human functional capabilities is an important task given an increasing stress load on the organism. The use of non-invasive and non-drug methods for improving and correcting of the organism functional state (FS) becomes necessary. Audiovisual stimulation (AVS) involves stimuli of different modality (light, sound) affecting the frequency of brain biorhythms, based on the targeted activation of the organism reserve capabilities. The aim of this study was to investigate the effect of single and prolonged AVS on memory processes and heart rate variability. **METHODS:** The study involved 25 subjects (men and women, aged 23-27) engaged in mental work. A portable device of light and sound stimulation (Photosonix Inner Pulse) was used for AVS training, the interface of which allowed choosing the suitable intensity and frequency of exposure. The subjects completed a 30-min AVS session for 15 consecutive days. Heart rate variability was determined by the dynamics of RR intervals using “BioMouse Research” hardware-software complex developed by the NeuroLab company. Memory processes were assessed in the psychophysiological Memory Capacity Biotester test. **RESULTS AND DISCUSSION:** In the dynamics of 15 days of prolonged AVS, there was a pronounced increase in the speed of information retrieval from long-term and short-term memory volume, which is due to the formation of new flexible neural connections and improvement of neurodynamic processes. During long-term AVS, we also observed changes in the central regulation of heart rhythm, namely, a decrease in the tension of regulatory systems and an increase in the influence of parasympathetic regulation. Thus, prolonged use of AVS had a significant effect on memory and autonomic processes. Long-term AVS likely affects the level of activation of the cerebral cortex through the modulating systems of the brain, which determines changes in FS and activation of human functional reserves. In contrast, a single use of AVS did not alter human memory and autonomic processes.

BEHAVIORAL ASSESSMENT OF CHRONIC EFFECTS OF CIPROFLOXACIN ON ZEBRAFISH. DD Ashkinova, DS Galstyan, AV Kalueff, Institute of Translational Biomedicine, St. Petersburg State University, Institute of Experimental Medicine, Almazov National Medical Research Centre, Ministry of Healthcare, Granov Russian Scientific Center for Radiology and Surgical Technologies, Ministry of Healthcare, St. Petersburg, Russia. **INTRODUCTION:** Ciprofloxacin is a fluoroquinolone antibiotic widely used to treat respiratory, urinary and gastrointestinal infections. However, mounting evidence supports its CNS effects as well. **METHODS:** A total of 42 adult short-fin wild-type zebrafish were divided into 3 groups: ciprofloxacin 10, 50 mg/l and controls. The fish were kept in a solution of the substance in standard small 4-L tanks. The behavior in the novel tank test (NTT) was recorded on days 3, 7 and 14, scoring the frequency, cumulative duration in top, distance traveled, frequency and duration of freezing by Noldus EthoVision XT11.5 software, and analyzing data by Kruskal-Wallis (KW) followed by Dunn's post hoc tests ($P<0.05$). **RESULTS**

AND DISCUSSION: Drug effects appeared only on day 14 of the experiment. Fish treated with 10 and 50 mg/l spent less time in top than controls ($p < 0.05$). In addition, 50 mg/l evoked fewer top entries ($p < 0.05$). Such anxiogenic-like behavior of zebrafish observed here may reflect the oxidative damage of the brain tissue, the effect on GABA receptors, and/or a likely impact on gut microflora.

INTERACTION BETWEEN THE FALLOPIAN TUBES AND THEIR INFLUENCE ON ELECTRICAL ACTIVITY OF THE UTERINE CORPUS IN RATS. QV Kazaryan, NG Hunanyan, AV Mkrtchyan, TA Piliposyan, RG Chibukhchyan, YY Trofimova, L.A. Orbeli Institute of Physiology NAS, Yerevan, Armenia. **INTRODUCTION:** Myometrial smooth muscle tissue has a syncytial organization, which is inherently myogenic and characterized by the certain innervation. This tissue also has pacemaker areas in specific locations, which is giving a strong reason to state that electrical activity conduction and, accordingly, contractions are determined by the location of these areas. Reproductive organ pushes the fetus out from the paired fallopian tubes, into the uterine corpus. Meanwhile, each horn is an autonomous organ and ensures the integrative functional activity of the entire reproductive system and thus affects the automatism of the uterine corpus. Thus, the relationship between pacemaker activities of the left and right ovarian horn areas and the uterine corpus, which are characterized by their own electrical rhythms, remain poorly understood. **METHODS:** Experiments were performed in situ on female rats (200-250 g). The abdominal cavity was opened by a medial incision of the abdominal wall and the fallopian tubes with the uterine corpus were exposed. The uterus was denervated by transection of the nerves plexus hypogastricus, uterinus, uterovaginalis. The relationship between the spontaneous electrical activities of paired fallopian tubes, and, accordingly, each of them with the uterine corpus, was studied by stepwise transections. Spontaneous electrical activity was registered by bipolar electrodes. The amplitude (A), mean rise - rate (V), rise-time (T/2 - action potential duration of upgoing phase) and half width (t - action potential duration forming the upper half of its amplitude) of peaks of spontaneous action potentials (AP) were determined. Recordings were done by an 8-channel device developed at the Orbeli Institute of Physiology. Signal registration was performed using the Lab View-V 2018 software. The subsequent statistical analysis of recorded signals was carried out by using the Origin-8.5 and Sigma Plot 11.0 software and Student's t-test. **RESULTS AND DISCUSSION:** Comparative analysis of changes in the characteristics of automatism after corresponding transections (right horn parameters after right horn transection vs. the norm; left horn parameters after left horn transaction vs. the norm) showed decreased (by 36.7%) amplitude of the action potentials in the right uterine horn. This index, deemed important and informative in literature, was surprisingly decreased by only 7-8% in the left uterine horn. The values of similar parameters of electrical activity decreased in the uterine corpus after transection of the right (the amplitude by 29.83% and the rise rate by 17.6%), then the left (by 36.67% and 16%, respectively) uterine horns. Overall, the left horn remains resistant to the conditions of its isolation. Moreover, a relatively greater functional relationship with the uterine corpus has been reveled and ability to compensate the “lack” of influence of the right uterine horn (in case of transaction) on the uterine corpus. During pathology of one fallopian tube, another tube may compensate and take over the function (our data suggest better compensation from the left, more active fallopian tube).

USING FAST-SCAN CYCLIC VOLTAMMETRY FOR DOPAMINE RELEASE DETECTION IN ZEBRAFISH BRAIN IN VIVO. YuA Viktorova, TO Kolesnikova, VP Grinevich, VP Grinevich, EA Budygin, AV Kalueff, Neurobiology Department, Sirius University of Science and Technology, Sirius Federal Territory, Russia. **INTRODUCTION:** The zebrafish is a valuable model object in neurobiology and pharmacological drug screening. Zebrafish are also useful for studying conditions associated with CNS dopamine imbalance that lead to Parkinson's disease, affective disorders and drug abuse. Given the wide range of behavioral phenotypes associated with pharmacological and genetic modulation of dopamine transmission, fast-scan cyclic voltammetry may be useful to measure the release- and reuptake of dopamine at the synapse on zebrafish *in vivo.* This method can allow to detect and quantify the neurotransmitter response after stimulation in real time using carbon electrodes and investigate its dynamics in certain brain structures. Using it in disease models, we can gain a deeper understanding of the changes that occur at the molecular level. **AIM:** Here, for the first time, we applied fast-scan cyclic voltammetry on anesthetized zebrafish and obtained pilot data on in vivo dopamine detection in the telencephalon of zebrafish. **METHODS:** Using this method in zebrafish required a special adjustment for fixing zebrafish embedded in water for the installation of electrodes (RF patent). The procedure included low-temperature anesthesia with ice, performing skull microsurgery for opening the dorsal surface of telencephalon, fish fixation and inserting electrodes. A stimulating electrode and a carbon fiber working microelectrode (exposed fiber length 100-150 μm; diameter 6 μm) were inserted into the dorsal telencephalon area, and an Ag/AgCl reference electrode was inserted into the contralateral hemisphere. The electrodes were connected to the voltametric amplifier interfaced with the High Definition Cyclic

Voltammetry (HDCV) software. A 1-s electrical stimulation at 10 Hz was applied. Extracellular dopamine was detected at the carbon fiber electrode every 100 ms by applying a triangular waveform (−0.4 V to +1.3 V). The dopamine signal was verified by a background-subtracted cyclic voltammogram characterized by oxidation and reduction peaks occurring at +0.6 and −0.2 V, respectively. **RESULTS:** We were able to detect basal dopamine signal corresponding to dopamine oxidation (0.6 V) and an electrically-evoked peak of dopamine signal which was interfered by changes in pH and accompanied with changes in adenosine concentration. The peak amplitudes of both signals were quantified as 0.3 nA (40 nM of dopamine). **CONCLUSIONS:** Dopamine detection in fish performed here suggests a wide application of the fast-scan cyclic voltammetry for *in vivo* registration and characterization of dopamine dynamics in zebrafish models. **RESEARCH SUPPORT:** The Neurobiology program and the Graduate Program in Genetics and Genetic Technologies of Sirius University of Science and Technology.

EFFECTS OF MONOTREPENOID DIOL (PROTTREMINE) ON BEHAVIOR OF ZEBRAFISH IN THE MPTP-INDUCED MODEL OF PARKINSON'S DISEASE. EA Timofeeva, AA Bashirzade, OV Ardashov, KP Volcho, NF Salakhutdinov, AV Kalueff, TG Amstislavskaya, Novosibirsk State University, Scientific Research Institute of Neurosciences and Medicine, N.N. Vorozhtsov Novosibirsk Institute of Organic Chemistry, Novosibirsk, Russia. **INTRODUCTION**: Monoterpenoid diol (Diol, 1*R*,2*R*,6*S*)-3-methyl-6-(prop-1-en-2-yl)cyclohex-3-ene-1,2-diol, Prottremine®) demonstrates overt antiparkinsonic effects and almost completely recovers locomotor and exploratory activity. It also reduces muscle rigidity and alleviates sensorimotor deficits in rodent models of Parkinson's disease (PD). However, the ability of Diol to influence cognitive performance, and the underlying mechanisms of this effect, remains unknown. Here, for the first time we evaluated the effect of monoterpenoid Diol on motor, affective and cognitive functions on the drug-induced PD model in zebrafish. **METHODS:** PD model was created by intraperitoneal injection of MPTP (1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine), a neurotoxin that causes PD symptoms by destroying dopaminergic neurons; preparation of an administered solution (experiment day) of MPTP, Diol at doses of 2.0, 20.0 and 200.0 mg/kg. Behavioral testing involved a novel tank test and a passive avoidance test, which included a day of habituation, three days of learning and one day of testing, performed as a battery with 24-h intervals. Statistical analysis was performed using the Friedman and Kruskal-Wallis tests. **RESULTS AND DISCUSSION**: Diol at 2.0 mg/kg caused no retention of fear conditioning (Friedman test). In the novel tank test, Diol at 20.0 mg/kg increased distance traveled and average velocity vs. fish injected with MPTP ($p < 0.01$). Diol alone in intact animals at 20.0 mg/kg did not induce anxiety, while 200.0 mg/kg, on the contrary, caused an anxiolytic-like effect, increasing time spent in top ($p < 0.05$). Diol at 200.0 mg/kg also reduced freezing behavior in the novel tank test, likely due to positive effects on motor activity, since anxiety behavior, which can also elevate freezing, was not corrected by MPTP. Diol restores motor activity, but does not change the increased anxiety of zebrafish in the PD model, which affects the performance in the passive avoidance test. Therefore, Diol in explored doses did not affect impaired long-term associative memory in the passive avoidance test. However, 20.0 mg/kg restored motor activity in zebrafish amenable to the neurotoxic effects of MPTP. **RESEARCH SUPPORT:** Budgetary funding for basic scientific research project 122042700001-9.

REPLICATION STUDY OF GWAS META-ANALYSIS OF COGNITIVE TRAITS IN THE VOLGA-URAL REGION OF EURASIA. A Kazantseva, R Enikeeva, Y Davydova, Z Takhirova, R Mustafin, M Lobaskova, S Malykh, E Khusnutdinova, Institute of Biochemistry and Genetics, Ufa Federal Research Centre RAS, Ufa University of Science and Technology, Bashkir State Medical University, Ufa; Psychological Institute RAE, Department of Psychology, Lomonosov Moscow State University, Moscow, Russia. **INTRODUCTION:** The search for genetic and environmental factors of individual liability to cognitive abilities involves both hypothesis-driven and hypothesis-free approaches. The latter, including genome-wide association studies (GWAS) and their meta-analyses, examines genetic loci associated with cognitive domain (e.g., educational attainment and general intelligence factor). However, based on "universalist genes hypothesis", examining if GWAS SNPs are also implicated in other cognitive abilities, such as nonverbal intelligence (NVI, i.e. individual's ability to use problem-solving strategies and manipulate visual information without using verbal skills), becomes interesting. The present study aimed to replicate the effect of GWAS SNPs of cognitive abilities on NVI in VUR sample. **METHODS:** We enrolled university students (N = 1011; 18-25 years; 80% women, European ancestry) from the Volga-Ural region (VUR) of Eurasia, who passed through the assessment of NVI using the Raven Progressive Matrices (Raven, 2000). We have searched through one of the most recent GWAS meta-analysis of educational attainment (Savage et al., 2018) to select the most significant SNPs ($p < 10^{-13}$): *TUFM rs7187776, SH2B1 rs7198606, ZNF638 rs2287326, NEGR1 rs12128707, ATP2A1 rs8055138, EXOC4 rs1362739*, and *CSE1L rs6063353*. Statistical analysis included linear regression controlled for biological sex, ethnic background, and the

presence of APOE ε4 "risky" allele (PLINK v.1.09). Various social/lifestyle parameters, including sex, age, and stressful rearing in childhood were also included as covariates in linear regression models to search for gene-environment interactions. Gene-gene interactions were examined with R v.4.1.2. **RESULTS AND DISCUSSION:** We confirmed the effect of CSE1L rs606335 (β_{ST} = 0.07; p = 0.011 – in total sample; β_{ST} = 0.187; p = 0.007 - in men), ZNF638 rs2287326 (β_{ST} = -0.07; p = 0.036 – in total sample; β_{ST} = -0.07; p = 0.044 – in women; β_{ST} = -0.15; p = 0.029 – in ApoE ε4-carriers), and EXOC4 rs1362739 (β_{ST} = -0.07; p = 0.046 – in women; β_{ST} = -0.10; p = 0.013 – in ApoE ε4-non-carriers) on NVI in the VUR cohort. In addition, a combined effect of the CSE1L and ZNF638 (p = $1.47x10^{-3}$) explained up to 1.7% of variance in NVI in the total sample. Our results implicate *ZNF638, CSE1L* and *EXOC4* genes, which mediate adipogenesis and signal transduction pathways, in the manifestation of cognitive abilities, and, therefore, corroborate the link between cognitive and metabolic traits. Nevertheless, observed association of only half of examined GWAS SNPs previously related to educational attainment points to the complexity of replication of data reported for the combined samples of Europeans in other ethnic groups. **RESEARCH SUPPORT:** The Ministry of Science and Higher Education of the Republic of Bashkortostan (agreement no. 1, 2022), the Russian Science Foundation (17-78-30028), and the Ministry of Science and Higher Education of Russian Federation (075-15-2021-595).

ANALYSIS OF THE ASSOCIATION OF POLYMORPHIC VARIANTS OF CANDIDATE GENES FOR MATHEMATICAL ANXIETY WITH INDICATORS OF BRAIN ELECTRICAL ACTIVITY. RF Enikeeva, AV Kazantseva, YuD Davydova, RN Mustafin, MM Lobaskova, IM Zakharov, SB Malykh, E. K. Khusnutdinova, Institute of Biochemistry and Genetics, Bashkir State Medical University, Bashkir State University, Ufa, Psychological Institute RAE, Moscow, Russia. **INTRODUCTION:** Mathematical anxiety (MA) is a negative emotional reaction to mathematics, which has a cognitive-affective nature [1]. We analysed the associations of 23 SNPs responsible for the development of high MA, with indicators of brain electrical activity. **METHODS:** The study involved 81 healthy individuals from the Republic of Bashkortostan (mean age 20.3 ± 3.87 years). MA level was assessed via MA Rating Scale. SNPs genotyping was performed via KASP-PCR. To study the bioelectrical activity of the brain in the context of the paradigm for the study of MA, we used the method of recording visual evoked potentials (VEP). The recording was made on the surface of the scalp electrodes 64 (Brainproducts, Munich, Germany). **RESULTS AND DISCUSSION:** In this paper, according to the research method paradigm evoked potential N100 and P600 components. The analysis has shown that N100 component is more pronounced in individuals with rs6994992*T allele NRG1 gene is compared with the genotype rs6994992*C/C at presentation predictors arithmetic tasks. For rs1387923 of the NTRK2 gene differences were found in the event-related potential for both arithmetic and algebraic tasks. Namely, the P600 component was more pronounced in carriers of the genotype rs1387923*C/C of the NTRK2 gene in parieto-occipital lead compared to carriers of the rs1387923*T allele. Revealed findings evidence association of NTRK2 and NRG1 genes with individual variations in MA.

RETICULOSPINAL NEURONS RESPONSES DURING THE STIMULATION OF VESTIBULAR NERVE AND SPINAL CORD. LR Manvelyan, DO Terzyan, ML Grigoryan, LR Ohanyan, Orbeli Instituite of Physiology NAS, Yerevan, Armenia. **INTRODUCTION.** The motor activity of the body is the result of a complex interaction between the motor structures of the brain and spinal cord. The reticular neurons play the key role in the interaction between integration and execution of movements as these areas of medulla oblongata affect the motoneurons of the spinal cord. Evolutionary it's interesting to study the influence of motor structures on amphibian motoneurons, since they are the least differentiated. However, amphibians motor structures with the cerebellum provide regulation of body balance, orientation in three-dimensional space, and modification of muscle tone. In this work the vestibulo-reticulo- spinal relationships were studied. Methods. The experiments were performed on frogs (Rana ridibunda) of both sexes using the isolated perfused brain method. The animals were anesthetized with MS-222 solution. A computer analysis of the data was carried out using programs NiDiadem and Origin 8.5. Results and discussion. Intracellular activity of 250 reticular neurons was recorded. Stimulation of the vestibular nerve in 230 reticular neurons elicited chemically transmitted excitatory postsynaptic potentials (EPSPs). The latency of EPSP in 174 neurons was 1.1-3.08 ms (in av. 2.22±0.47 ms, n=174). An increase in the intensity of stimulation led to the emergence of action potentials (APs) based on EPSP with a latency of 1.83-6.73 ms (in av. 3.92±1.13 ms, n=148). The changes of temporal parameters were non-significant at different intensities of stimulation, thus these EPSPs were classified as monosynaptic. The registered EPSPs in 56 reticular neurons were characterized by a longer and more unstable latency of 3.15-6.82 ms (4.1±0.77 ms; n=56) depending on the intensity of stimulation. An increase in the intensity of stimulation led to the emergence of APs with a latency of 4.26-10.31 ms (in av. 6.43±1.28 ms; n=39). The above-mentioned temporal characteristics, their instability and dependence on the intensity of stimulation indicate their polysynaptic origin. During spinal

cord stimulation, 228 reticular neurons, which respond orthodromically to vestibular nerve stimulation, developed antidromic action potentials. Cells responding to stimulation of the cervical spinal cord were identified as C-neurons. They were projected to the cervical and thoracic spinal cord. The latency of these APs was within 0.37-1.66 ms (in av. 0.7±0.22 ms; n=105). Cells activated by lumbar stimulation were identified as L-neurons. They were projected to the lumbosacral spinal cord. The latency of these APs was 0.51-1.8 ms (in av.1.05±0.3 ms; n=123). The reticulospinal neurons are scattered in small groups throughout the medial reticular formation and do not form a nucleus. The axons of amphibian reticulospinal neurons, as part of the ventral funiculus, are in monosynaptic contact with motoneurons of the cervical and lumbar thickenings. The data of this study clearly shows the role of reticulospinal neurons in the implementation of the vestibular effect on spinal motor mechanisms

THE IMPACT OF EXPOSURE TO NATURAL ENVIRONMENT FILMS AND STATE BODY APPRECIATION. N Jarasunaite, Psychology and Criminology Course, School of Psychology and Sport Science, Anglia Ruskin University Cambridge, Cambridge, UK. The study aimed to investigate the effect of sound on state body appreciation when a natural environment was simulated. The project used a repeated measure design and randomly allocated participants to watch a one-minute video of Aldeburgh beach in the United Kingdom, with or without sound. Participants completed the State Body Appreciation Scale-2 (SBAS-2) before and after watching the video. Results showed a non-significant increase in state body appreciation in the group that watched the video with sound compared to the group that watched the video without sound. The findings suggest that exposure to a natural environment with sound can improve state body appreciation. This study provides a novel contribution to the literature on body image and nature, highlighting the importance of sensory experiences in the development of positive body image. The limitations of the study and implications for future research are discussed. Overall, this study suggests that interventions promoting exposure to natural environments with sound could be effective in improving body image and should be considered by practitioners and policymakers.

EFFECT OF AZITHROMYCIN ON THE STATE OF EXPRESSION OF TLR4-SIGNALING GENES IN THE NUCLEUS ACCUMBENS THE RAT BRAIN DURING OF LONG-TERM ALCOHOL WITHDRAWAL. DD Sukhanova, MI Airapetov, SO Eresko, NM Matveev, AA Shchukina, PD Ignatova, AA Mikhailova, DA Ganshina, GP Kosyakova, AA Lebedev, ER Bychkov, PD Shabanov, Department of Neuropharmacology, Institute of Experimental Medicine, St. Petersburg, Russia. **INTRODUCTION:** Prolonged alcohol consumption causes activation of neuroinflammation pathways in various brain structures. One of the mechanisms involved in this process is increased activity of TLR4-signaling intracellular pathways. Nucleus accumbens (NAc) is the ventral striatum, an important part of the mesolimbic pathway involved in the internal reinforcement system and addiction. Thus, increased activity in the TLR4-signaling system may be a reason for neuroinflammation and subsequent neurodegeneration during chronic ethanol intake. While azithromycin (AZM) may influence neuroinflammatory pathways, the exact mechanism of such action is unclear. **METHODS:** Modeling of chronic alcoholism was carried out by oral administration of a 20% ethanol solution (2 g/kg, daily) for 1 month. At the end of alcoholization, animals were given oral azithromycin (40 mg/kg, 160 mg/kg) for three days. The control group of rats was treated with water throughout the experiment. Brain samples were collected on the 7th day of alcohol withdrawal. Total RNA was obtained using Extract RNA (Eurogen, RF). Reverse transcription was performed using the MMLV RT kit (Eurogen, RF). Real-time PCR was performed in 10 µl of a mixture containing SYBR Green MIX (Eurogen, RF), a mixture of primers (BioBeagle, RF). The data were counted by the $2^{\Delta\Delta CT}$ method and statistically processed by Mann-Whitney U-test. **RESULTS AND DISCUSSION:** Prolonged alcoholisation increased TLR4 mRNA in the nucleus accumbens of rats (2.15-fold, $p \leq 0.05$), on the 7th day of alcohol withdrawal mRNA levels remained elevated (1.22-fold, $p \leq 0.05$). There was a 1.65-fold ($p \leq 0.05$) decrease in TLR4 mRNA levels in the AZM group (40 mg/kg) and a 5.26-fold ($p \leq 0.05$) decrease in the AZM group (160 mg/kg). Similar results were obtained for key proinflammatory cytokines. Elevated levels of *Il1b* and *Ccl2* expression were observed in the long-term alcoholization group and in the alcohol withdrawal group, whereas AZM administration reduced mRNA levels of these cytokines. In addition, AZM altered IRF3 and Hmgb1 mRNA content. Here, reduced mRNA levels of the anti-inflammatory cytokines IL4 and IL11 were observed on day 7 of withdrawal, but AZM continued to dose-dependently reduce the expression of these genes. The data obtained in the model of chronic alcoholism indicate the ability of AZM to alter the expression of TLR4-signaling genes in rat nucleus accumbens in a dose-dependent manner. Future studies may evaluate such changes in protein levels, as well as at different periods of alcohol withdrawal. **RESEARCH SUPPORT:** The state assignment of the Ministry of Science and Higher Education of the Russian (2022-2025) «The search for molecular targets for pharmacological action in addictive and neuroendocrine disorders and the creation of new pharmacologically active substances acting on CNS receptors» (FGWG-2022-0004).

ORGANIZERS:

The International Organizing Committee:

Allan V. Kalueff, DrSci, MAE (New Orleans), ISBS President, Conference Chair
Armen A. Muradyan, DrSci (Yerevan), Co-Chair
Konstantin B. Yenkoyan, DrSci (Yerevan), Co-Chair
Naira M. Ayvazyan, DrSci (Yerevan), Co-Chair
Victor M. Klimenko, DrSci (St. Petersburg), ISBS Vice President
Adel S. Tadevosyan, DrSci (Yerevan)
Mamiko Koshiba, PhD (Tokyo)
Shun Nakamura, PhD (Tokyo)
Dusko Kozic, DrSci (Belgrade)
Philip Fauket-Alekhine, PhD (Paris)

The Local Organizing Committee:

Konstantin B. Yenkoyan, DrSci (Yerevan), Co-Chair
Naira M. Ayvazyan, DrSci (Yerevan), Co-Chair
Mikhail I. Aghajanov, DrSci (Yerevan), Co-Chair
Adel S. Tadevosyan, DrSci (Yerevan)
Lilit S. Martirosyan (Yerevan)
Mariam R. Movsisyan (Yerevan)
Lilit Z. Mkrtchyan (Yerevan)
Mariam H. Grigoryan (Yerevan)
Astghik S. Palyan (Yerevan)
Elen V. Sahakyan (Yerevan)
Hamlet K. Torosyan (Yerevan)

The Scientific Program Committee:

Victor M. Klimenko, DrSci (St. Petersburg), Co-Chair
Mikhail I. Aghajanov, DrSci (Yerevan), Co-Chair
Konstantin A. Demin, PhD (Tokyo)
Seyran P. Kocharyan (Yerevan)
Hayk A. Harutyunyan (Yerevan)
Artem S. Grigoryan (Yerevan)
Katarine S. Fereshetyan (Yerevan)

Please join us for the forthcoming Conferences and symposia:

www.cobrainarmenia.org
www.stressandbehavior.com