

JOURNAL OF PHYSIOLOGY AND PHARMACOLOGY

formerly *Acta Physiologica Polonica*
An Official Journal of the Polish Physiological Society

Vol. 72

Supplement 1

September 2021

28th CONGRESS OF THE POLISH PHYSIOLOGICAL SOCIETY

September 15–17, 2021
(ONLINE)
GDANSK, POLAND

BOOK OF PROGRAMME AND ABSTRACTS

Guest Editors:
Tomasz Wierzba
Pawel Musial
Stanislaw Zajaczkowski

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The Journal of Physiology and Pharmacology is published 6 times annually in one volume by the Polish Physiological Society.

The journal receives funding from the Polish Ministry of Science and Higher Education for promoting of scientific research.

The subscription price is EUR 450 for institutions and EUR 370 for individual subscription; please add EUR 50 postage if your address or institutions is outside of Poland. Within Poland: institutional subscription for the Journal in Polish currency is PLN 960, and personal subscriptions are PLN 600. The price for single regular and supplemental issues is EUR 80 and PLN 160 for foreign and Polish customers, respectively.

Payment for the subscription should be made by Bank transfer to POLSKIE TOWARZYSTWO FIZJOLOGICZNE Zarząd Główny, Bank PKO BP SA KRAKOW 13 1020 2892 0000 5902 0206 3261; IBAN PL 13102028920000590202063261; SWIFT B PKO PL PW. Bank address is: PKO BANK POLSKI SA I ODDZIAŁ, 19/21 Wielopole Street, 30-942 KRAKOW, POLAND.

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PREFACE

Dear Friends and Colleagues,

This abstract book published as a supplement of the Journal of Physiology and Pharmacology includes program, schedule and abstracts presented at the 28th Congress of the Polish Physiological Society, September 15 -17, 2021. The Congress is organized by the local Organizing Committee at Medical University of Gdansk and University of Gdansk on behalf of the Council of the Polish Physiological Society and Polish Academy of Sciences. Due to COVID-19 pandemic the Congress is held for the first time in a virtual format.

Since 1937, the meetings of the Polish Physiological Society have become a recognized forum for the presentation of achievements, new scientific and creative concepts, discussions related to the functioning of human and animal body. The scientific program of the 28th Congress of the Polish Physiological Society consists of the plenary state of art lectures by invited top experts, short lectures based on original research studies and e-poster presentations.

Fifteen thematic sessions cover most fields of modern physiology and pathophysiology, from the single molecule level to the whole organism regulatory interactions. The Congress features over 250 lectures and presentations by more than 750 Authors representing 32 countries from five continents.

We would like to thank all Authors for sharing their scientific knowledge and passion, the Scientific Committee of the Congress and the Reviewers for the invaluable feedback they provided in a short time as well as the editorial staff of the Journal Physiology and Pharmacology.

Best regards,

GUEST EDITORS:

Tomasz Wierzba, Pawel Musial, Stanislaw Zajaczkowski

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28th CONGRESS OF THE POLISH PHYSIOLOGICAL SOCIETY CONGRESS PROGRAMME

Wednesday (September 15, 2021)

- 9:00 – 9:45 (*virtual stream A*) Opening ceremony
- 9:45 – 10:30 (*virtual stream A*) Opening lecture – **SYMPATHETIC OVERACTIVITY AND CARDIOVASCULAR DISEASE – THE ISSUE IS MORE COMPLEX THAN WE THOUGHT**
TRANSCRIPTOMIC STUDIES FOR MALE INFERTILITY DIAGNOSIS AND THERAPY MONITORING.
Prof. Krzysztof Narkiewicz
(*Department of Hypertension and Diabetology, Medical University of Gdansk, Poland*).
- 10:30 – 11:55 (*virtual stream A*) Session I – open lectures and oral presentations
MUSCLE FUNCTION/ MUSCLE EXERCISE
- 10:50 – 13:20 (*virtual stream B*) **Session XII** – open lectures and oral presentations
GASTROINTESTINAL AND LIVER PHYSIOLOGY AND PATHOPHYSIOLOGY, PANCREAS AND LIVER.
- 12:15 – 15:10 (*virtual stream A*) **Session IV** – open lectures and oral presentations
FATIGUE. ADAPTATION TO ENVIRONMENT. THERMOREGULATION
- 13:20 – 14:05 (*virtual stream B*) **Special session I** (AnimaLab)
PHYSIOLOGY COMPLEXITY AND ITS TECHNOLOGY. EXAMPLES FROM MOTOR FUNCTION TO CIRCADIAN RHYTHMS BY UGO BASILE, ITALY.
- 14:15 – 17:45 (*virtual stream B*) **Session IX** – open lectures and oral presentations
NEW INSIGHTS INTO CELLULAR FUNCTIONS
- 15:30 – 17:50 (*virtual stream A*) **Session III** – open lectures and oral presentations
BIOLOGICAL RHYTHMS. SLEEP

Thursday (September 16, 2021)

- 9:00 – 9:40 (*virtual stream C*) **Special session II** (AnimaLab)
HEART RATE VARIABILITY, TIME DOMAIN AND FREQUENCY DOMAIN ANALYSIS
- 9:00 – 10:10 (*virtual stream A*) **Session VIII** – open lectures and oral presentations
ENDOCRINE REGULATIONS. CONTROL OF BODY WEIGHT
- 9:00 – 13:25 (*virtual stream B*) **Session XI** – open lectures and oral presentations
PHYSIOLOGY OF REPRODUCTION
- 9:10 – 10:05 (*virtual stream D*) **Session I** – interactive poster presentation
MUSCLE FUNCTION/ MUSCLE EXERCISE
- 9:45 – 11:20 (*virtual stream C*) **Session VI** – interactive poster presentations Part I
HEART. CARDIOVASCULAR AND RESPIRATORY REGULATION
- 10:05 – 10:55 (*virtual stream D*) **Session IV** – interactive poster presentations
FATIGUE. ADAPTATION TO ENVIRONMENT. THERMOREGULATION
- 10:15 – 11:20 (*virtual stream A*) **Session XV** – open lectures and oral presentations
MISCELLANEA
- 11:00 – 13:55 (*virtual stream D*) **Session II** – interactive poster presentations
CENTRAL NERVOUS SYSTEM. NEUROPHYSIOLOGY. PLASTICITY OF NEURAL FUNCTION

11:30 – 12:15 (<i>virtual stream C</i>)	Session VIII – interactive poster presentations ENDOCRINE REGULATIONS. CONTROL OF BODY WEIGHT
11:30 – 16:15 (<i>virtual stream A</i>)	Session VI – open lectures and oral presentations HEART. CARDIOVASCULAR AND RESPIRATORY REGULATION
12:25 – 13:00 (<i>virtual stream C</i>)	Session III – interactive poster presentation BIOLOGICAL RHYTHMS. SLEEP
13:30 – 15:25 (<i>virtual stream C</i>)	Session XI – interactive poster presentations PHYSIOLOGY OF REPRODUCTION
13:30 – 13:55 (<i>virtual stream B</i>)	Special session III (AnimaLab) THE USE OF SMALL ANIMAL TELEMETRY IN PHYSIOLOGY
13:55 – 14:15 (<i>virtual stream B</i>)	Special session IV (AnimaLab) NEW APPROACHES TO TEACHING PHYSIOLOGY
14:00 – 15:30 (<i>virtual stream D</i>)	Session XII – interactive poster presentations GASTROINTESTINAL AND LIVER PHYSIOLOGY AND PATHOPHYSIOLOGY, PANCREAS AND LIVER
14:20 – 18:05 (<i>virtual stream B</i>)	Session II – open lectures and oral presentations CENTRAL NERVOUS SYSTEM. NEUROPHYSIOLOGY. PLASTICITY OF NEURAL FUNCTION
15:30 – 16:10 (<i>virtual stream D</i>)	Session IX – interactive poster presentations NEW INSIGHTS INTO CELLULAR FUNCTIONS
15:30 – 16:25 (<i>virtual stream C</i>)	Session VII – interactive poster presentations FUNCTIONS OF BLOOD. HEMOSTASIS
16:30 – 18:00 (<i>virtual stream A</i>)	Session VII – open lectures and oral presentations FUNCTIONS OF BLOOD. HEMOSTASIS
16:30 – 17:30 (<i>virtual stream C</i>)	Session VI – interactive poster presentations Part II HEART. CARDIOVASCULAR AND RESPIRATORY REGULATION

Friday (September 17, 2021)

9:00 – 10:45 (<i>virtual stream A</i>)	Session XIV – open lectures and oral presentations PHYSIOLOGY MEETS ENGINEERING
9:00 – 11:30 (<i>virtual stream B</i>)	Session XIII – open lectures and oral presentations MULTI-OMICS PROSPECTIVES IN PHYSIOLOGY
10:00 – 10:45 (<i>virtual stream C</i>)	Session V – interactive poster presentations BODY FLUID HOMEOSTASIS. RENAL FUNCTIONS
10:45 – 11:05 (<i>virtual stream C</i>)	Session X – interactive poster presentations AGING
11:10 – 13:55 (<i>virtual stream A</i>)	Session X – open lectures and oral presentations AGING
11:05 – 11:55 (<i>virtual stream C</i>)	Session XIV – interactive poster presentations PHYSIOLOGY MEETS ENGINEERING
11:45 – 13:35 (<i>virtual stream B</i>)	Session V – oral presentations BODY FLUID HOMEOSTASIS. RENAL FUNCTIONS
12:00 – 13:05 (<i>virtual stream C</i>)	Session XV – interactive poster presentations MISCELLANEA
14:00 – 14:30	Closing ceremony

Shaded area – interactive poster sessions

OPENING SESSION

Wednesday (September 15, 2021; 9:00 – 10:30)

Chair:

Prof. STANISLAW OKRASA
President of the Polish Physiological Society
University of Warmia and Mazury in Olsztyn, Olsztyn, Poland

Assoc. Prof. TOMASZ H .WIERZBA
Department of Physiology, Medical University of Gdansk, Poland

SESSION II

**CENTRAL NERVOUS SYSTEM
NEUROPHYSIOLOGY
PLASTICITY OF NEURAL FUNCTION**

Thursday (September 16, 2021; 11:00 – 13:55)

Thursday (September 16, 2021; 14:20 – 18:05)

Chair:

Prof. JOANNA LEWIN-KOWALIK,
Department of Physiology, Medical University of Silesia, Katowice, Poland

Dr. hab. ADRIAN SMEDOWSKI
Department of Physiology, Medical University of Silesia, Katowice, Poland

DETAILED SESSION II SCHEDULE

Opening lectures (Thursday, September 16; 14:20 – 16:50; *virtual stream B*)

- S2.L1 ELECTRICAL COUPLING OF OPTIC NERVE AXONS - A NOVEL MODEL OF GAP JUNCTIONS' INVOLVEMENT IN OPTIC NERVE FUNCTION. **A. Smedowski** (Department of Physiology, Faculty of Medical Sciences in Katowice, Medical University of Silesia, Katowice, Poland).
- S2.L2 BETWEEN RETINA AND BRAIN: PATTERN ELECTRORETINOGRAPHY. **D. Pojda-Wilczek¹, K. Gibinski²** (¹Department of Ophthalmology, Faculty of Medical Sciences in Katowice, Poland, ²University Clinical Centre, Medical University of Silesia in Katowice, Poland).
- S2.L3 THE ROLE OF HUMAN ANTIGEN R (HuR)/ABNORMAL VISUAL SYSTEM-LIKE 1 (ELAVL1) IN AGE-RELATED OCULAR PATHOLOGIES – UPDATING THE PUZZLE. **M. Amadio** (Department of Drug Sciences, Section of Pharmacology, University of Pavia, Pavia, Italy).
- S2.L4 NEUROVASCULAR CROSS-TALK IN RETINAL DISEASES – MODELS OF DIABETIC RETINOPATHY. **M. Pietrucha-Dutczak** (Department of Physiology, Faculty of Medical Sciences in Katowice, Medical University of Silesia, Katowice, Poland).
- S2.L5 CAN WE REGULATE PERINEURONAL NETS AFTER SPINAL CORD INJURY? AN INSIGHT FROM GENE, PROTEIN EXPRESSION AND WFA LABELING. **M. Skup, K. Grycz, A. Glowacka, B. Ji, O. Gajewska-Wozniak** (Group of Restorative Neurobiology, Nencki Institute of Experimental Biology PAS, Warsaw, Poland).

Oral presentations (Thursday, September 16; 16:55 – 18:05; *virtual stream B*)

- S2.L6 MECHANISMS OF OXIDATIVE STRESS IN THE RAT HEART IN A ROTENONE MODEL OF PARKINSON'S DISEASE. **O. Gonchar, O. Klymenko, T. Drevytska, V. Nosar, L. Bratus, I. Mankovska** (Bogomoletz Institute of Physiology, National Academy of Science of Ukraine, Kiev, Ukraine).
- S2.L7 INFLUENCE OF BONE MARROW-DERIVED MESENCHYMAL STEM CELL THERAPY ON CCL2, CCL19 AND CCL20 LEVELS IN MINIMALLY CONSCIOUS STATE PATIENTS. **W. Czelejewska, E. Sinderewicz, W. Maksymowicz, K. Jezierska-Wozniak** (Department of Neurosurgery, Laboratory of Regenerative Medicine, School of Medicine, Collegium Medicum, University of Warmia and Mazury in Olsztyn, Olsztyn, Poland).
- S2.L8 DROSOPHILA BRAIN REWARD SYSTEM AND POSSIBLE CONSEQUENCES FOR UNDERSTANDING THE HUMAN PLEASURE. **J. Dvoracek^{1,3}, D. Kodrik^{1,2}** (¹University of South Bohemia, Ceske Budejovice, Czech Republic, ²Institute of Entomology, Biology Centre, CAS, Ceske Budejovice, Czech Republic; ³Psychiatric Hospital Cerveny Dvur, Czech Republic).
- S2.L9 PSYCHOPHYSIOLOGICAL, HORMONAL, AND RECEPTOR CORRELATIONS OF GENDER AND INDIVIDUAL DIFFERENCES IN PAIN SENSATION. **I. Kvachadze¹, M. Apkhazava¹, M. Tsagareli^{1,2}** (¹Tbilisi State Medical University, Tbilisi, Georgia; ²Beritashvili Center for Experimental Biomedicine, Tbilisi, Georgia).

*Session summary***Poster session** (Thursday, September 16; 11:00 – 13:55; *virtual stream D, interactive*)

- S2.P1 A NEW LOOK AT THE EXISTENCE OF THE INTERACTION OF THE AMYGDALA WITH THE VISUAL SYSTEM. **K.H. Miryusifova¹, A. Allahverdiyeva¹, N. Huseynova¹, E. Panachova¹** (Institute of Physiology, Baku, Azerbaijan).
- S2.P2 INHIBITION OR STIMULATION OF SHELL NUCLEUS ACCUMBENS CHANGES INTRAVESICAL PRESSURE AND CARDIOVASCULAR PARAMETERS IN WISTAR RATS. **R. De Carvalho¹, B. Antonio¹, N. Dsouki¹, B. Do Vale¹, P. Aronsson², L. De Luca Jr³, M. Sato¹** (¹Department of Morphology and Physiology, Centro Universitario FMABC, Santo Andre, SP, Brazil, ²Department of Pharmacology, Institute of Neuroscience and Physiology, Sahlgrenska Academy, University of Gothenburg, Gothenburg, Sweden, ³Department of Pathology and Physiology, Dentistry School, Sao Paulo State University (UNESP), Araraquara, SP, Brazil).
- S2.P3 BIDIRECTIONAL EFFECT OF THE EXTREMELY LOW-FREQUENCY ELECTROMAGNETIC FIELD (50 HZ) ON BDNF LEVEL. **A. Klimek, H. Kletkiewicz, A. Siejka, M. Klimiuk, J. Maliszewska, M. Jankowska, A. Nowakowska, J. Wyszowska, M. Stankiewicz, J. Rogalska** (Department of Animal Physiology and Neurobiology, Faculty of Biological and Veterinary Sciences, Nicolaus Copernicus University in Torun, Poland).
- S2.P4 EARLY-LIFE STRESS AFFECTS PERIPHERAL AND BRAIN RESPONSE TO IMMUNE CHALLENGE IN FEMALE RATS. **A. Solarz, I. Majcher-Maslanka, J. Kryst, A. Chocyk** (Maj Institute of Pharmacology, Polish Academy of Sciences, Department of Pharmacology, Laboratory of Pharmacology and Brain Biostructure, Krakow, Poland).
- S2.P5 COMPARATIVE ANALYSIS OF THE INFLUENCE OF EPIPHYSIS AND SUPRACHIASMATIC NUCLEUS OF HYPOTHALAMUS ON VISION FUNCTION. **U. Hashimova, E. Panahova, X. Miryusifova, A. Alahverdiyeva, N. Huseynova** (Institute of Physiology named after A.I. Garayev of ANAS, Baku, Azerbaijan).
- S2.P6 CONFIRMATION OF THE INFLUENCE OF AMIGDALA ON THE FUNCTIONS OF THE VISUAL ANALYZER STRUCTURES IN AMIGDALAR EPILEPSY. **A. Alahverdiyeva, U. Hashimova, E. Panahova, X. Miryusifova, N. Huseynova** (Institute of Physiology named after A.I. Garayev of ANAS, Baku, Azerbaijan).
- S2.P7 THE ACTIVATED MICROGLIA IN HIPOCCAMPUS AS A CHARACTERISTIC OF STREPTOZOTOCIN INDUCED MODEL OF ALZHEIMER DISEASE IN RATS. **J. Dunacka, G. Swiatek, I. Majkutewicz, P. Matulewicz, B. Grembecka, W. Glac, D. Wrona** (Department of Animal and Human Physiology, University of Gdansk, Faculty of Biology, Gdansk, Poland).

- S2.P8 EFFECT OF SEROTONIN, ADRENALINE AND DOPAMINE ON THE FUNCTION OF THE VISUAL SYSTEM STRUCTURES. **N. Huseynova, U. Hashimova, E. Panahova, X. Miryusifova, A. Alahverdiyeva** (Institute of Physiology of ANAS A.I. Garayeva, Baku, Azerbaijan).
- S2.P9 INFLUENCE OF CAFFEINE ON THE GENE EXPRESSION OF PROINFLAMMATORY CYTOKINES AND THEIR RECEPTORS IN THE HYPOTHALAMIC-PITUITARY UNIT. **M. Wojcik¹, M. Tomczyk¹, J. Bochenek¹, D. Tomaszewska-Zaremba¹, A. Antushevich¹, A. Krawczynska, A. Herman², A.P. Herman¹** (¹The Kielanowski Institute of Animal Physiology and Nutrition Polish Academy of Sciences, Poland, ²Faculty of Health Sciences, Warsaw School of Engineering and Health, Warsaw, Poland).
- S2.P10 THE CB₁ RECEPTOR ANTAGONIST REDUCES THE PRESSOR RESPONSE OF ANGIOTENSIN II AND ANGIOTENSIN 1-7 INJECTED INTO PARAVENTRICULAR NUCLEUS OF THE HYPOTHALAMUS (PVN) IN CONSCIOUS NORMOTENSIVE AND HYPERTENSIVE RATS. **K. Minczuk, B. Malinowska** (Medical University of Bialystok, Bialystok, Poland).
- S2.P11 THE EFFECT OF NIACIN, VITAMIN B₃, ON THE β -AMYLOID-ASSOCIATED PROCESS OF NEURODEGENERATION. **A. Litwiniuk¹, M. Kalisz¹, L. Martynska¹, M. Chmielowska¹, A. Domanska^{1,2}, W. Bik¹** (¹Department of Neuroendocrinology, Centre of Postgraduate Medical Education, Warsaw, Poland, ²Department of Physiological Sciences, Warsaw University of Life Sciences (SGGW), Warsaw, Poland).
- S2.P12 SWIM TRAINING AMELIORATES OXIDATIVE STRESS IN THE SPINAL CORD OF ALS MICE. **K.P. Dzik¹, D.J. Flis^{1,2}, Z.K. Bytowska², M.J. Karnia¹, W. Ziolkowski², J.J. Kaczor¹** (¹Gdansk University of Physical Education and Sport, Gdansk, Poland, ²Medical University of Gdansk, Gdansk, Poland).
- S2.P13 THE EFFECT OF BENZO[A]PYRENE ON OXIDATIVE STRESS IN CHICKEN EMBRYOS BRAIN. **R. Muchacka, L. Kolodziejczyk, G. Formicki, A. Gren** (Institute of Biology, Pedagogical University of Krakow, Krakow, Poland).
- S2.P14 NEUROPHYSIOLOGICAL STUDY OF DISORDER AND RECOVERY OF SPATIAL MEMORY IN AN EXPERIMENTAL MODEL OF ALZHEIMER'S DISEASE. **E. Panakhova, U. Hashimova, K. Javadova, I. Galandarli, Kh. Miryusifova** (Institute of Physiology, Baku, Azerbaijan).
- S2.P15 EFFECT OF DIMETHYL FUMARATE ON DISORDERS OF THE OLFACTORY BULB NEUROGENESIS IN THE STREPTOZOTOCIN-INDUCED RAT MODEL OF ALZHEIMER'S DISEASE. **E. Kurowska, I. Majkutewicz, J. Rucinski, D. Myslinska, K. Sawicka, N. Piekarczyk** (University of Gdansk, Department of Animal and Human Physiology, Gdansk, Poland).
- S2.P16 EFFECT OF PREBIOTICS SUPPLEMENTATION ON SOCIAL BEHAVIOUR AND PLASMA TUMOR NECROSIS FACTOR- α LEVEL DISTURBANCES IN HIGH- AND LOW-RESPONDERS RATS WITH CENTRAL AMYGDALA HYPERACTIVATION. **J. Rucinski, E. Kurowska, N. Piekarczyk, D. Myslinska, I. Majkutewicz** (University of Gdansk, Department of Animal and Human Physiology, Gdansk, Poland).
- S2.P17 IMPROVED MOTOR FUNCTION AS A RESULT OF THE INFLUENCE OF MINOCYCLINE ON MOTOR CORTEX NEURONS IN CORTICAL MODEL OF PHOTOTHROMBOTIC ISCHEMIC STROKE IN RATS. **K. Pawletko¹, A. Grajozek^{1,2}, H. Jedrzejowska-Szypulka¹** (¹Department of Physiology, School of Medicine in Katowice, Medical University of Silesia, Katowice, Poland, ²Department of Experimental Medicine Medical University of Silesia, Katowice, Poland).
- S2.P18 CHANGES IN THE RESPONSIVENESS OF THE RAT DORSOMEDIAL HYPOTHALAMUS TO DIFFERENT METABOLIC CONDITIONS UNDER HIGH-FAT DIET. **A.M. Sanetra, K. Palus-Chramiec, L. Chrobok, J.S. Jeczmiem-Lazur, J.D. Klich, M.H. Lewandowski** (Jagiellonian University in Krakow, Krakow, Poland).
- S2.P19 MODULATION OF PAIN IN BRAIN LIMBIC AREAS: ROLE OF OPIOID AND CANNABINOID SYSTEMS. **N. Tsiklauri¹, N. Tsagareli^{1,2}, I. Kvachadze², M. Tsagareli^{1,2}** (¹Beritashvili Center for Experimental Biomedicine, Tbilisi, Georgia; ²Tbilisi State Medical University, Tbilisi, Georgia).
- S2.P20 MINOCYCLINE AFFECTS SPLEEN T AND B LYMPHOCYTES PERCENTAGE IN STREPTOZOTOCIN-INDUCED MODEL OF ALZHEIMER'S DISEASE IN RATS. **G. Swiatek, J. Dunacka, W. Glac, B. Grembecka, I. Majkutewicz, D. Wrona** (Department of Animal and Human Physiology, Faculty of Biology, University of Gdansk, Gdansk, Poland).
- S2.P21 EFFECT OF KETOGENIC DIET ON NEURODEVELOPMENTAL REFLEXES. **W. Kosiek, Z. Rauk, Z. Setkowicz-Janeczko** (Jagiellonian University, Krakow, Poland).
- S2.P22 ARCHITECTURE OF A FUNCTIONAL SYSTEM OF THE SAGITTAL BALANCE MAINTAINING. **A. Goncharova** (Kharkiv National Medical University, Kharkiv, Ukraine).
- S2.P23 EFFECT OF PROCAINE BLOCKADE OF THE VENTRAL TEGMENTAL AREA ON THETA RHYTHM INDUCED BY PHARMACOLOGICAL ACTIVATION OF THE PEDUNCULOPONTINE NUCLEUS. **A. Piwka, J. Orzel-Gryglewska, A. Walczek** (University of Gdansk, Department of Animal and Human Physiology, Gdansk, Poland).
- S2.P24 MET-ENKEPHALIN INVOLVEMENT IN THE PROTECTION OF CEREBELLAR AND FRONTAL CORTEX IN VAGOTOMIZED RAT. **K. Pierzchala-Koziec¹, M. Wieczorek², A. Kobrzycka², P. Napora²** (¹Department of Animal Physiology and Endocrinology, University of Agriculture in Krakow, Poland, ²Department of Neurobiology, University of Lodz, Lodz, Poland).
- S2.P25 FREQUENCY-DEPENDENT PLASTICITY OF SPONTANEOUS ACTION POTENTIALS WITHIN IDENTIFIED LYMNAEA'S NEURONS. **Z. Seval, A.V. Sidorov** (Belarusian State University, Minsk, Belarus).

ARCHITECTURE OF A FUNCTIONAL SYSTEM OF THE SAGITTAL BALANCE MAINTAINING

A. GONCHAROVA

Kharkiv National Medical University, Kharkiv, Ukraine

Body balance is required for a static position and locomotor function. Its maintaining means alignment of the different levels structures of the body in space with respect to each other for organizing the skeleton geometry and locomotor apparatus structure so as to ensure their correspondence to gravity. In the form of mechanical stress this environmental factor affects the processes of adaptive remodeling of bone tissue, and a number of other structures with it. The state of the bone tissue is even considered as a reflection of the effects of gravity on the body in the evolution. The balance of the body in space can be characterized by such an integrative indicator as the sagittal balance of the spine - the vertical alignment of the trunk above the pelvis. Its quantitative characteristic is the horizontal distance between the centers of the body of the 7th cervical vertebra (C7) and the posterosuperior border of the sacrum on lateral radiographs of the spine in full growth. To understand the mechanisms of maintaining the sagittal balance within physiological borders, it is important to consider it within the P.K. Anokhin's concept of functional system. In this case, the sagittal balance should take a central place forming the functional system, being the final adaptive result of functioning, that is, one of the parameters of homeostasis, for the maintenance of which all functional systems of the body are formed. In the architecture of such a functional system, it is necessary to distinguish functional blocks - structures that interact with each other to maintain this parameter and perform a certain role, for further multilateral study of such systems. The receptors that determine homeostasis parameter (sagittal balance) deviations and trigger the functional system are vestibuloreceptors, proprioceptors, and the visual sensory system. In the physiological center, which includes a number of central nervous system structures, the resulting afferentation is integrated in the creation of motor programs. At each current moment, there are changes in the state of the body's executive structures involved in maintaining the sagittal balance. Such efferent structures are not only skeletal and muscle macrostructures, but also elements of bone microarchitecture. They undergo changes in a shorter time interval during remodeling, ensuring the body adaptation with the external environment at higher levels of interaction. Consideration of the structures involved in maintaining the sagittal balance from this point of view will allow us to determine the possible causes of its displacement and methods of its correction.

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EFFECT OF PROCAINE BLOCKADE OF THE VENTRAL TEGMENTAL AREA ON THETA RHYTHM INDUCED BY PHARMACOLOGICAL ACTIVATION OF THE PEDUNCULOPONTINE NUCLEUS

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The ventral tegmental area (VTA) and the pedunculopontine nucleus (PPN) are structures that have important influence on the induction and regulation of hippocampal theta rhythm, which plays a key role in important processes such as memory and REM sleep. PPN is one of the initial structures of an extensive theta rhythm induction network, additionally - one of the nuclei that sends cholinergic projections to the VTA. Recent studies has also shown that VTA stimulation is accompanied by the theta rhythm in the hippocampus. However, the functional relationships between these structures and hippocampal theta rhythm is still not fully understood. The aim of the experiment was to investigate the effect of pharmacological cholinergic activation (carbachol) of PPN and inactivation (procaine) of VTA on the formation and regulation of hippocampal theta rhythm. The surgery was performed under urethane anesthesia (maintained at such a level that theta rhythm does not appear spontaneously). Rats were implanted with the use of stereotaxic frame with bilateral hippocampal recording electrodes and bilaterally with standard pedestal guides for infusions to the VTA and PPN. Local field potential (LFP) was recorded from the hippocampal electrodes during the whole experiment with the use of Spike-2 software. Total power in the hippocampal signal was analyzed. Theta and delta bands peak power (P_{max}) was extracted. P_{max} value in the theta frequency band (3–4 Hz and 4–5 Hz) temporarily decreased after intra-VTA injection of procaine during carbachol - induced theta episode in comparison to control group. P_{max} value in the delta frequency band (1–2 Hz and 2–3 Hz) temporarily increased after intra-VTA injection of procaine during carbachol-induced theta episode in comparison to control group. In control group - water injection to VTA during carbachol - induced theta rhythm episode had no effect in the signal power (P_{max}) in both theta and delta bands. The results suggest that the VTA probably might be a part of the broad network involved in theta rhythm induction.

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