ISSN 0065-1400 (PRINT)
ISSN 1689-0035 (ONLINE)

2022 Volume 82
Supplement

ACTA NEUROBIOLOGIÆ EXPERIMENTALIS

www.ane.pl

NEURONUS 2022
NEUROSCIENCE FORUM
SUPPORTED BY IBRO

15–17 OCTOBER 2022, KRAKOW, POLAND

NENCKI INSTITUTE OF EXPERIMENTAL BIOLOGY PAS WARSAW, POLAND

ACTA NEUROBIOLOGIAE EXPERIMENTALIS

Volume 82, Supplement, 2022 – 12th Neuronus 2022 Neuroscience Forum

Contents

NEURONUS 2022
NEUROSCIENCE FORUM
SUPPORTED BY IBRO
15–17 OCTOBER 2022, KRAKOW, POLAND

ORGANIZERS

STUDENT NEUROSCIENCE SOCIETY 'NEURONUS'

Institute of Zoology and Biomedical Research, Jagiellonian University

PSYCHOLOGY STUDENTS' ASSOCIATION

Institute of Psychology, Jagiellonian University

Head of the Conference

Alicja Szadziewska

Project Coordinators

Michał Ślęzak
Michał Kuniecki
Aleksandra Gruszka-Gosiewska
Anna Błasiak
Przemysław Adamczyk
Maria Czarnecka
Anton M.L. Coenen

Members of Organizing Committee

Aleksandra Bartosz-Nowakowska
Alicja Radzimska
Anna Leśniewska
Emilia Gawron
Gabriela Rajtar
Gabriela Stopka
Hanna Nikanava
Joanna Doliwa
Kaja Szymanek
Karolina Przyborowicz
Karolina Sekuła
Karolina Warzecha
Kinga Przybylska
Kinga Skoczek
Kornelia Tryzno
Maciej Kania
Marta Kołodziejak
Monika Żuwała
Piotr Rywczak

SCIENTIFIC COMMITTEE

HONORARY PATRONAGE

International Brain Research Organization (IBRO)
Przemysław Czarnek – Minister of Education and Science
Witold Kozłowski – Marshal of the Malopolska Region
Prof. Jacek Majchrowski – Mayor of the City of Krakow
Prof. Jacek Popiel – Rector of the Jagiellonian University
Prof. Jacek Nowak – Dean of the Faculty of Philosophy of the Jagiellonian University
Prof. Joanna Zalewska-Gałosz – Dean of the Faculty of Biology of the Jagiellonian University
Prof. Przemysław Bąbel – Head of the Institute of Psychology of the Jagiellonian University
Prof. Paweł Grzmil – Head of the Institute of Zoology and Biomedical Research of the Jagiellonian University
Polish Neuroscience Society (PTBUN)
Neurobiology Committee of the Polish Academy of Sciences
Prof. Maciej Żylicz – President of Foundation for Polish Science
Nencki Foundation
Poland Innovative
Tygiel Foundation

FUNDERS & SPONSORS

Co-financed by the program ”Excellent Science” of the Minister of Education and Science
International Brain Research Organization (IBRO)
Elmiko
Science Products

MEDIA PATRONS

krakow.pl
studentnews.pl
biotechnologia.pl
Biologhelp
edoktorant
Dziennik Naukowy
Kopalnia Wiedzy
Puls UM

Poster design
Aniela Dmochowska

Contact
info@neuronusforum.pl

PROGRAMME

14TH OCTOBER, 2022
INSTITUTE OF PSYCHOLOGY OF JAGIELLONIAN UNIVERSITY

Workshop I – *Room 2.15*
DeepLabCut by Jessy Lauer
(Swiss Federal Institute of Technology, Lausanne, Switzerland & Harvard University, USA)

Workshop II – *Room 2.12*
Multimodal recordings: an insight into combining EEG with eye tracking and other research methods
sponsored by Brain Products Academy and Elmiko Biosignals

15TH OCTOBER, 2022
AUDITORIUM MAXIMUM, JAGIELLONIAN UNIVERSITY

9:00–10:10 **Opening Ceremony – *Large hall A***
Vice Rector for University Development, Jagiellonian University
prof. Jarosław Górniak
Vice-Dean for Science and International Relations, Faculty of Biology, Jagiellonian University
prof. Magdalena Chadzińska

Keynote lecture – *Large hall A*
Childhood physical activity effects on brain health and cognition
Speaker: Charles Hillman (Department of Psychology, Department of Physical Therapy, Movement, and Rehabilitation Sciences, Northeastern University, USA)

10:10–10:45 **Flashtalks – *Large hall A***

10:45–11:15 **Coffee Break**

11:15–13:15 **Special Biological Session I – *Large hall A***
Astrocytes
Speakers: Alexei Verkhratsky, Mykhailo Batiuk, Dmitri Rusakov, Olena Bukalo

Cognitive Session I – *Large hall B*
How does exercise benefit cognition and emotion?
Speakers: Irene Estaban-Cornejo, Tomasz Ligęza, Dominika Pindus, Angelika Maurer

13:15–13:45 **Lunch**

13:45–15:00 **Poster Session I – *Exhibition room***

15:00–16:00 **Keynote lecture – *Large hall A***
From a demand-based to a supply-limited view of brain energetics
Speaker: Suzana Herculano-Houzel (Department of Psychology and Biological Sciences, Vanderbilt University, USA)

16:00–17:30 **Biological Session II – *Large hall A***
Basic Neuroscience
Speakers: Aleksandra Pękowska, Katarzyna Ciuba, Michael Gabriel, Joanna Danielewicz

Cognitive Session II – *Large hall B*
Emotional processing in modern neuroscience – from human-rat dyads to VR devices
Speakers: Magdalena Pietruch, Malwina Ankiewicz, Jan Argasiński, Anna Kaźmierowska, Ingrida Zelionkaite

Medical Session I – *Medium hall A*
Biomarkers of Neurodegeneration
Speakers: Kaj Blennow, Fernando Gonzalez-Ortiz, Przemysław Kac, Patrycja Dzianok

17:30–18:00 **Coffee Break**

18:00–19:00 **Keynote lecture – *Large hall A***
The cinematic brain: Mapping the human emotion circuits with motion pictures
Speaker: Lauri Nummenmaa (Human Emotion Systems Laboratory at Turku PET Centre, Finland)

19:00– **Welcome Reception**

16TH OCTOBER, 2022
AUDITORIUM MAXIMUM, JAGIELLONIAN UNIVERSITY

7:00–8:00 **Run for your brain!**
Parking lot in front of the Institute of Psychology of the Jagiellonian University, 6 Ingardena Street
Neu-run-us

9:00–10:00 **Keynote lecture – *Large hall A***
Routes to enhance stress resilience: Manipulation of genes or environment?
Speaker: Mathias Schmidt (Max Planck Institute of Psychiatry, Munich, Germany)

10:00–11:30 **Biological Session III – *Large hall A***
Neural substrates of affective behavior
Speakers: Marcelina Olga Węzik, Natalia Roszkowska, Olga Gulka, Karolina Protokowicz, Patryk Sambak

Cognitive Session III – *Large hall B*
Approaches to increase replicability in neuroscience – lessons learned from consortia, many analysts and cooperative data collection
Speakers: Sven Mueller, Katharina Paul, Elena Cesnaite, Vanja Kovic

Biological Session IV – *Medium hall A*
Markers of Aging
Speakers: Urszula Wojda, Natalia Pudełko-Malik, Anna Mietelska-Porowska, Gregory Petrazzo

11:30–12:00 **Coffee Break**

12:00–13:30 **Biological Session V – *Large hall A***
Advanced neurotechnologies for brain activity monitoring and modulation
Speakers: Zoltan Fekete, Csaba Horváth, Zsófia Lantos, Kirti Sharma

Cognitive Session IV – *Large hall B*
Plastic brain and language – adaptive changes of neural networks
Speakers: Aleksandra Herman, Marta Wójcik, Agata Wolna, Jonas Walther, Anna Stróż

Medical Session II – *Medium hall A*
Translational Neuropsychiatry
Speakers: Ali Jawaid, Weronika Tomaszewska, Kinga Farkas, Katarzyna Hryniewiecka, Suelen Baggio, Sabina Podlewska

13:30–14:00 **Lunch**

14:00–15:15 **Poster Session II – *Exhibition hall***

15:15–17:00 **Biological Session VI – *Large hall A***
Systems Neuroscience of Sensory Processing
Speakers: Flavio Donato, Bartosz Zglinicki, Magdalena Sabat, Maciej Kania, Marek Brodzki

Cognitive Session V – *Large hall B*
Neuroimaging of the reading brain
Speakers: Milene Bonte, Katarzyna Chyl, Agnieszka Dębska, Agnieszka Glica, Katarzyna Wasilewska

Computational Session I – *Medium hall A*
New methods in MRI
Speakers: Rita Nunes, Michał Rafał Zaręba, Dominika Ciupek, Marcin Sińczuk, Alaa Alghanimy

17:00–17:30 **Coffee Break**

17:30–18:30 **Keynote lecture – *Large hall A***
Fish feelings: Motivational internal states in larval zebrafish
Speaker: Florian Engert (Department of Molecular and Cellular Biology, Center for Brain Science, Harvard University, USA)

20:30– **Neuronus Party**

17TH OCTOBER, 2022
AUDITORIUM MAXIMUM, JAGIELLONIAN UNIVERSITY

9:00–10:00 **Keynote lecture – *Large hall A***
Diversity of oxytocin circuits modulating distinct socio-emotional behaviors
Speaker: Valery Grinevich (Central Institute of Mental Health, University of Heidelberg, Germany)

10:00–11:30 **Biological Session VII – *Large hall A***
Hypothalamic control of behavior
Speakers: Frank Meye, Karolina Hajdukiewicz, Emilia Gawron, Alan Kania

Cognitive Session VI – *Large hall B*
Search for neural biomarkers of aware consciousness
Speakers: Ilona Kotlewska, Łucja Doradzińska, Karolina Golec, Julia Papiernik, Klaudia Krystecka

Medical Session III – *Medium hall A*
Novel targets in retinal ganglion cell neuroprotection
Speakers: Marialaura Amadio, Piotr Rodak, Joanna Machowicz, Anna Pacwa

11:30–12:00 **Coffee Break**

12:00–13:30 **Biological Session VIII – *Large hall A***
Mitochondrial dysfunctions in neurological disorders
Speakers: Alessandro Prigione, Sinéad A. O'Sullivan, Aleksandra Stawikowska, Carla Ramon

Cognitive Session VII – *Large hall B*
Pupillometry: Getting information in the glimpse of an eye
Speakers: Alexandre Zénon, Beaupoil Laurent, Bartłomiej Król-Józaga, Monika Riegel, Jakub Cacek

13:30–14:00 **Lunch**

14:00–15:15 **Poster Session III – *Exhibition hall***

15:15–16:30 **Biological Session IX – *Large hall A***
Blood-brain barrier
Speakers: Aleksandra Rutkowska, Fionä Caratis, Jakub Jurczyk, Ewelina Czuba

Cognitive Session VIII – *Large hall B*
Specificity of language network in the contingentally blind brain
Speakers: Maksymilian Korczyk, Marta Urbaniak, Dominika Radziun, Łukasz Bola, Jacek Matuszewski

Computational Session II – *Medium hall A*
Novel methods in EEG
Speakers: Joanna Duda-Goławska, Piotr Biegański, Anna Grabowska, Nikodem Hryniewicz, Sandra Frycz

16:30–17:00 **Coffee Break**

17:00–18:00 **Keynote lecture – *Large hall A***
Built to learn: Insights into nature and nurture from studies with people born blind and cultural expertise
Speaker: Marina Bedny (Department of Psychological and Brain Sciences, Johns Hopkins University, USA)

18:00–18:15 **Awards & Closing Ceremony – *Large hall A***

Epilepsy is a complex disease that involves a diverse set of symptoms and neurological disorders. A conservative model of the imbalance between the excitatory and inhibitory neurotransmitter systems is insufficient to understand the mechanisms of epilepsy. Therefore, it is necessary to include non-classical signaling molecules such as nitric oxide (NO). However, it has not been possible to clearly define whether endogenous NO is a pro or anticonvulsive. The purpose of the study was to determine the temporal profile of changes in the activation of the brain nitrergic system in response to seizures and to correlate the activation of the nitrergic system with the intensity of seizures. The study used a pilocarpine model of epilepsy. The kinetics of NO release was determined by electron paramagnetic resonance spectroscopy followed by NO spin trapping. Seizures were classified on the basis of modified Racine's scale. The data obtained allowed us to determine that after epileptic seizures, intense NO release lasts for the first 12 h. After this, the NO concentration drops sharply to levels that are not significantly different from those in control animals. Additionally, no significant correlation was found between the levels of NO released in the brain and the intensity of seizures.

Funding: This research was funded by the Priority Research Area BioS under the program "Excellence Initiative-Research University" at the Jagiellonian University in Cracow, grants U1U/P03/DO/14.33 and U1U/P03/D0/14.90.

BLOCKADE OF H3 HISTAMINE RECEPTORS FACILITATES ANTISEIZURE ACTION OF PENTOXYPHILLINE

Prybolovets KO[1]*, Poshyvak OB[2], Pervak MP[1], Yehorenko OS[1], Godlevsky LS[1]

[1]Department of Biophysics, Informatics and Medical Devices, Odesa National Medical University, Odesa, Ukraine, [2]Department of Pharmacology, Danylo Halytsky Lviv National Medical University, Lviv, Ukraine
**E-mail: kseniaprib@ukr.net*

Considering the important role of inflammation in epilepsy development is reasonable to investigate the effects of combined usage of different modulators of neural inflammation. The work aimed to investigate the effects of the blocker of histamine H3 pitolisant hydrochloride (Selleck, USA) and pentoxyphilline (Sigma-Aldrich, USA), which prevents proinflammatory cytokines elaboration upon pentylenetetrazol (Sigma-Aldrich, USA) (PTZ)-kindled seizures in rats. Male Wistar rats four months of age kindled to the stage of generalized tonic-clonic seizure fits with PTZ (35 mg/kg, i.p.) were used in observations. Pentoxyphilline (50 mg/kg, i.p.) administered with pitolisant (5 mg/kg, i.p.) caused the increase of first seizure manifestations latency by 67.2% in comparison with the control group of kindled rats ($P<0.05$). Also, PTZ-induced generalized tonic-clonic fits were prevented, and seizure severity was 1,6+0,2 scored points which were 2.6 times less than the control value ($P<0.01$). Both the latency of first seizures and their severity were significantly different when compared with separate effects of pentoxifylline (100 mg/kg, i.p.) or pitolizant (10 mg/kg i.p.) administrations ($P<0.05$). Also, ictal potentials were absent in the ventral hippocampus under conditions of combined drug administration. Hence, gained data showed that blockade of H3 histamine and endogenous proinflammatory cytokines resulted in synergic antiseizure effects.

Funding: This research was funded by the Ministry of Health Care of Ukraine (Number of research work 0121U114510).

THE MECHANISM OF REALIZATION OF ANTISEIZURE EFFECTS OF CEREBELLAR ELECTRICAL STIMULATION

Bidnyuk VK[1], Pervak MP[1], Poshyvak OB[2]*, Yehorenko OS[1], Varava SV[1], Godlevsky LS[1], Haustov OO[1]

[1]Department of Biophysics, Informatics and Medical Devices, Odessa National Medical University, Odessa, Ukraine, [2]Department of Pharmacology, Danylo Halytsky Lviv National Medical University, Lviv, Ukraine
**E-mail: olesya.poshyvak@gmail.com*

We have reported that electrical stimulations of cerebellar structures resulted in the heightened antiseizure effectiveness of diazepam against pentylenetetrazol (PTZ)-kindled seizures. Such effects might be explained by the increased antioxidant mechanisms in the brain tissue, which counterparts oxidative stress, as a fundamental pathogenetic mechanism of chronic epileptic activity. The work aimed to investigate the state of antioxidant defense in the cerebral cortex of PTZ-kindled rats under electrical stimulations (100 Hz, 0,25 ms, 50-100 mcA, 2,5 s) of the paleocerebellar cortex (V-VII lobules). Kindling was produced *via* three weeks of PTZ administration (35 mg/kg, i.p.), and animals with fully developed generalized seizure fits were included in the observation. Kindled animals were stimulated two times daily, three days starting 24 h after the last kindled seizure fit, and testing PTZ was administered afterward. The net reduction of superoxide dismutase activity – by 40.7% and catalase – by 32.0% in comparison with the control group of animals registered 24 h after the last sham stimulation. Besides, the level of free thiols in the cerebral cortex was ten times greater than in kindled rats ($P<0.02$). Gained data favoring the

role of antioxidant mechanisms as contributing to antiseizure effects of cerebellar ES.

EFFECT OF KETOGENIC DIET ON THE NEURAL DEVELOPMENT – BEHAVIOR RESEARCH

Wojciech Kosiek*, Zuzanna Rauk, Zuzanna Setkowicz-Janeczko

Laboratory of Experimental Neuropathology, Institute of Zoology and Biomedical Research, Jagiellonian University, Cracow, Poland
**E-mail: wj.kosiek@doctoral.uj.edu.pl*

The ketogenic diet is a special dietary system that induces a state of ketosis in the body. Many studies indicate that the state of ketosis has a positive effect in the treatment of selected neurological conditions with particular application to drug-resistant epilepsy. This study examines to what extent a ketogenic diet will affect the behavior of young Wistar rats of both sexes in an open field test, which is unique for this type of study. The rats were divided into three dietary groups: ND, a control group on a standard diet; KDND, rats whose mothers were exposed to the ketogenic diet prenatally; and KD, rats that were on the ketogenic diet from conception to 21 days of life (P21). Rats were subjected to the field test twice at P30 and P60. In the case of females at P30, trends can be seen for decreasing distance and increasing resting time where in males there were no statistically significant differences. In contrast, at P60 the changes for females were in resting time, which was lower for the groups on the ketogenic diet. There were no statistically significant differences in males.

PROFOUND ALTERATIONS IN HIPPOCAMPAL LIPID RAFTS FOLLOW *IN VITRO* EPILEPTIFORM ACTIVITY, HYPOXIA AND OXYGEN-GLUCOSE DEPRIVATION

Laia Amat-Garcia[1,2], Nádia C. Rodrigues[3], José Carvalho-Rosa[2], Isabel Silva[4], Diana Cunha-Reis[1,2,3]*

[1]Departamento de Química e Bioquímica, and Biosystems & Integrative Sciences Institute (BioISI), Faculdade de Ciências da Universidade de Lisboa, Lisboa, Portugal, [2]Instituto de Medicina Molecular, Faculdade de Medicina da Universidade de Lisboa, Lisboa, Portugal, [3]Instituto de Ciências Biomédicas Abel Salazar, Universidade do Porto, Porto, Portugal
**E-mail: dcreis@fc.ul.pt*

Seizures and hypoxic-ischemic conditions are brain insults associated to increased risk of epileptogenesis. Lipid rafts, important CNS signalling platforms, may have a crucial role in both synaptic and homeostatic plasticity. We now investigated the alterations in hippocampal lipid raft dynamics that follow such insults *in vitro*. Hippocampal slices from male Wistar rats superfused with aCSF (5% O_2/95% N2) were exposed to 10-min hypoxia (HYPX, 5% CO_2/95% N2) or oxygen-glucose deprivation (OGD, 5% CO_2/95% N2 and partial replacement of glucose by sucrose). Epileptiform activity (EA) was induced by 10-min exposure to 10 uM bicuculine (ictal-like EA) or 30-min superfusion with 0-Mg2+ aCSF (mM: $MgCl_2$, 0; KCl, 6). Lipid raft markers and synaptic markers were evaluated by western blot 50-min following those insults. Flotilin-1, caveolin-1 and gephyrin were markedly reduced following all insults whereas PSD-95 suffered only changes following ictal-like EA and 0-Mg2+ exposure. VGlut1 was very markedly enhanced following HYPX and OGD and VGAT was moderately increased only after OGD. Altogether this suggests a major role for lipid rafts in the early response to seizures and hypoxia/ischemia. These may be related abnormal neurotransmitter signalling, synaptic vesicle recycling or early adaptive synaptic plasticity phenomena following those insults.

Funding: Work supported by FCT, IP, Portugal. Grants: UIDB/04046/2020 and UIDP/04046/2020 BioISI; FCT/POCTI PTDC/SAUPUB/28311/2017 EPIRaft. Contract Norma Transitória – DL57/2016/CP1479/CT0044.

THE EFFECT OF MINOCYCLINE ON SIZE CHANGES IN THE NECROSIS AREA IN CORTICAL MODEL OF PHOTOTHROMBOTIC ISCHEMIC STROKE IN RATS

Katarzyna Pawletko[1,2]*, Katarzyna Bogus[3], Aniela Grajoszek[1,2], Halina Jędrzejowska-Szypułka[1], Jarosław Barski[1,2]

[1]Department of Physiology, School of Medicine in Katowice, Medical University of Silesia, Katowice, Poland, [2]Department for Experimental Medicine, Medical University of Silesia, Katowice, Poland, [3]Department of Histology, Faculty of Medical Sciences in Katowice, Medical University of Silesia, Katowice, Poland
**E-mail: katarzyna.pawletko@gmail.com*

Stroke is still a leading cause of death worldwide. In survivors, it can result in long-term disabilityin with various severity ranges. Minocycline, by launching plethora of neuroprotective mechanisms may be beneficial as the treatment. Therefore, it is important to develop new strategies for treating ischemic strokes. Our goal was to examine the effect of treatment on the ischemic area and conditio of motor function in rats. Photothrombotic focal ischemia of motor cortex was produced in 72 male Long-Evans rats. We tested time windows: 12 h, 24 h, 48 h and 7 days . Half of the experimental groups received an intravenous dose of minocycline (1 mg/1 kg b.w/1 ml solution, 10 min after stroke). CatWalk XT, Grip Strength-test and elevated runway-tests were performed. Nissl staining and immunohistochemistryon paraffin scraps were performed. The size, shape and area of the necrosis were measured. In groups with minocycline we observed statistically significant improvement the volume and