

SNN2024

The annual National Neuroscience Society of Romania (SNN) Conference
with international participation

Bucharest, 31 October – 2nd November, 2024

**Nervous System - Body - Environment
Connections in Health and Disease**



ABSTRACT BOOK

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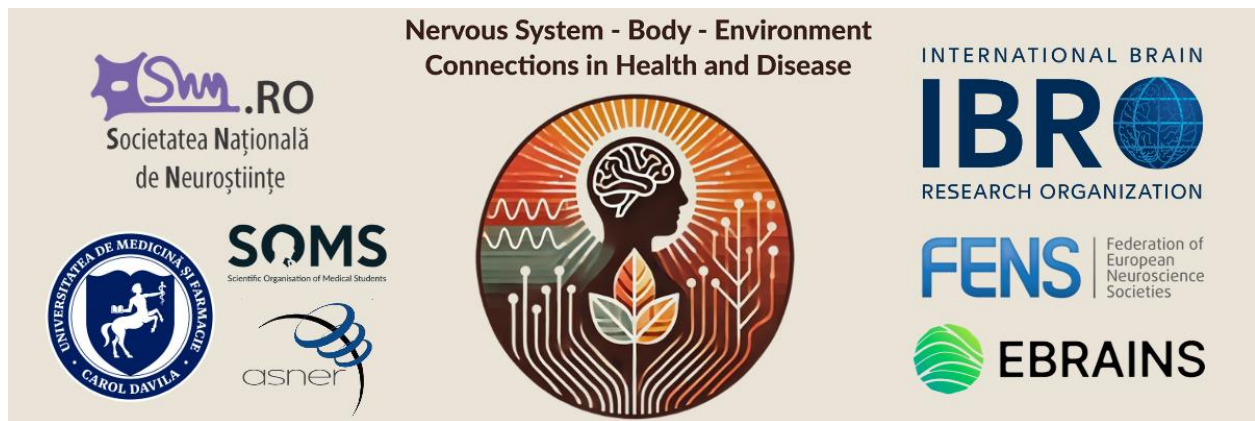
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SNN2024

The annual National Neuroscience Society of Romania (SNN) Conference with international participation

Theme: Nervous system – body – environment connections in health and disease

Date: 31 October – 2nd November, 2024

Venue: Faculty of Medicine, Carol Davila University of Medicine and Pharmacy, 8 Eroii
Sanitari Blvd., 050474 Bucharest, Romania

Invited speakers (selected)

Professor Hannah Monyer – Inhibition that's exciting, [Department of Clinical Neurobiology, Heidelberg University Hospital, DKFZ \(German Cancer Research Centre\)](#)

Dr. Michele Migliore – Cognitive functions and dysfunctions emerging from large-scale models of brain regions, [SUNY Dept. of Neurology, Downstate Health Science University, Brooklyn, USA](#) ; [Institute of Biophysics, National Research Council, Palermo, Italy](#)

Dr. Daniela Popa – Interaction Between the Cerebellum and Forebrain in Basal Ganglia-Related Disorders, [Institut de Biologie de l'École Normale, Paris, France](#)

Dr. Mirela Simon - Variability of nervous tissue excitability under certain physiological and pathological conditions, <https://researchers.mgh.harvard.edu/profile/1638456/Mirela-Simon>

Dr. Siobhain O'Mahony (online) – The role of the gut microbiome in cognitive health across the lifespan, <https://publish.ucc.ie/profiles/C003/somahony>

Dr. Ionuț Dumitru – (online) – Transcriptomic characterization of postnatal human neural progenitors, <https://ki.se/en/people/ionut-dumitru>

SNN2024 Conference website - <https://conf.snn.ro/>

SNN2024 Program - <https://conf.snn.ro/program/>

SNN2024 Program

Thursday, 31 October 2024

14:00 - 15:30 **Dizzy Workshop - Understanding and managing vestibular dizziness: a comprehensive approach.**

14:00 - 16:00 **Onsite registration and poster mounting**

16:00 – 16:40 **Opening Ceremony - Chair Mihai Moldovan, SNN President**

16:40 – 17:00 **FENS and IBRO Neuroscience training and funding opportunities - Ana-Maria Zăgrea, SNN General Secretary**

17:00 – 19:00 **Session 1, Chair Tudor Badea**

Leon Zăgrea - From anthropocentrism to transhumanism.

Tudor Badea - Expression and function of Tusc5 in projection sensory neurons

Mihai Stancu - Ambient sound stimulation tunes axonal conduction velocity by regulating myelin growth on an axon-by axon basis

Sebastian Isac - The perioperative impact of VR in cognitive affective dysfunction - clinical study

Beatrice Radu - Cenobamate - drug safety assessment for a new antiepileptic drug

19:00 - 19:45 - **General Assembly of SNN**

19:45 – Welcome cocktail

Friday, 1st November 2024

8:30 – 9:00 Onsite registration and poster mounting

09:00 - 10:50 **Session 2, Chair Daniela Popa**

Michele Migliore – Cognitive functions an

Daniela Popa - Interaction between the cerebellum and forebrain in basal ganglia-related disorders

Violeta Caragea - The functional expression of the TRPM3 ion channel in the cerebellum

Andrei Ilie - Science 3.0: doing research in the era of blockchain and AI - is it time for a paradigm shift?

10:50 - 11:20 Coffee break

11:20 – 13:30 **Session 3, Chair Mihai Moldovan**

Hannah Monyer – Inhibition that's exciting

Mirela Simon - Variability of nervous tissue excitability under certain physiological and pathological conditions

Mihai Moldovan - To burst or not to burst – an EEG story

Alex Calin - Imaging intracellular chloride dynamics in distinct GABAergic interneuron subtypes during seizures

Miralena Tomescu - Resilience Moderates Neuro-hormonal Response to VR-Simulated Natural Disaster Stress: An EEG Microstate Analysis

13:30 - 14:00 - *Light lunch*

14:00 - 15:00 - **Poster session**

15:00 - 17:00 **Session 4**, Chair Ana-Maria Zagrean

Gratiela Gradisteanu Pircalabioru - From gut to mind: the microbiota in depression and anxiety

Siobhain O'Mahony (*online*) - The role of the gut microbiome in cognitive health across the lifespan

Mara Ioana Ionescu - The role of gestational gut microbiome modulation in shaping maternal behavior and offspring neurodevelopment

Ionut Dumitru (*online*) - Transcriptomic characterization of postnatal human neural progenitors

Sponsor presentation

17:00 – 17:20 Coffee break

17:20 – 19:00 **Session 5**, Chair Aurel Popa

Aurel Popa - Stem cells embedded in a nutritional Hydrogel: a promising method to stimulate neurogenesis after stroke in animal model

Andrei Gresita - 3D bioprinting: an innovative approach to cellular regeneration after cerebral ischemia

Kevyn Boboc – Nanoliposome as a carrier of therapeutic miRNAs to stimulate functional post-stroke recovery after cerebral ischemia

Claudia Iacob - The relationship between sleep deprivation and memory in rodents: A meta-analysis

Saturday, 2nd November 2024

09:00 – 11:00 **Session 6**, Chair Bogdan Amuzescu

Adelina Păduraru – Statins modulate the activity of temperature-gated Transient Receptor Potential channels

Ramona Babes - Artemisinin activates the polymodal ion channel TRPA1 in a non-electrophilic manner

Bogdan Amuzescu - Electrophysiological and pharmacological properties of human Nav1.5 channels: experimental and simulation studies

Melania Magercu - Cerebrospinal fluid from multiple sclerosis patients alters HMC3 human microglia cytoskeleton

Singh Yadav Dharm - Peroxidized retinal pigment epithelial cells as a model of age-related macular degeneration: A Dielectrophoretic study

11:00 – 11:20 Coffee break

11:20 – 12:50 **Session 7 - Young investigators blitz presentations**

13:00 – 13:30 **Concluding remarks, Awards, and Closing Ceremony**

Oral Presentations

O1.Cenobamate – drug safety assessment for a new antiepileptic drug

Beatrice Mihaela Radu¹, Andreea Mateias², Bogdan Amuzescu¹

¹ Department of Anatomy, Animal Physiology and Biophysics, Faculty of Biology, University of Bucharest, Bucharest, Romania.

² Medical and molecular Biotechnology Program, University of Verona, Verona, Italy.

Cenobamate (CBM) is a novel antiepileptic drug approved by US FDA in November 2019 and by EMA in March 2021 that is commercially available as Xcopri® and Ontozry®. The drug is recommended for treatment of adults with focal onset seizures and particularly for epilepsy resistant to other antiepileptic drugs. CBM has two neuronal pharmacological targets, being a positive allosteric modulator of GABAA receptors and an inhibitor of Na⁺ channels, particularly of the late persistent Na⁺ current component. The goal of our study is to test the drug safety of this antiepileptic by evaluating its pro-arrhythmic effects. To this purpose, we performed whole-cell patch-clamp recordings on HEK293T cells with persistent/inducible expression of human cardiac ion channel isoforms hNav1.5 (INa), hCav1.2 ($\alpha1c+\beta2+\alpha2\delta1$) (ICaL), hKv7.1+minK (IKs), and hKv11.1 (hERG) (IKr). Additionally, we used human iPSC-derived ventricular-like cardiomyocytes (Ncyte® vCardiomyocytes, NCardia). We demonstrated that CBM (200 μ M) inhibits the peak INa by 69.5±16.6%, and the peak ICaL by 42.8±15.3, and also reduces IKs and IKr (at 20 μ M) in HEK293T cells with persistent/inducible expression of human cardiac ion channel isoforms. We had similar effects on human iPSC-derived ventricular-like cardiomyocytes. In conclusion, CBM's effects on human cardiac ion channels might explain the QT shortening effects. This pronounced INa inhibition exerted by CBM raises the possibility for the drug at clinically relevant concentrations to trigger reentry arrhythmias in preexisting pathological myocardium with conduction heterogeneity in a narrow interval of favorable conditions. Such a possibility, which is common for class I antiarrhythmics, requires increased awareness and careful clinical monitoring of patients with preexisting organic heart pathology during initiation of CBM therapy.

O2.The functional expression of the TRPM3 ion channel in the cerebellum

V.M. Caragea¹, A. Babes¹, T. Selescu¹

¹Department of Anatomy, Animal Physiology and Biophysics, Faculty of Biology, University of Bucharest, Bucharest, Romania

The deep cerebellar nuclei (DCN) are the principal output structure of the cerebellum. The circuits receiving input from DCN neurons are central in modulating the cerebellum's motor and nonmotor functions. However, little is known about the mechanisms facilitating excitability and neurotransmission at these neurons. Various Transient Receptor Potential (TRP) ion channels were shown to regulate neuronal activity in the cerebellar cortex but the characterization of their functional roles in the DCN is lacking. Here, we investigated the functional expression of the noxious heat-sensor TRP Melastatin 3 (TRPM3) ion channel in the adult mouse DCN. First, we established a technique for culturing mouse DCN neurons to perform calcium microfluorimetry recordings under pharmacological manipulations. A high potassium (50 mM) challenge was used to detect the neurons in this culture, while all viable cells were identified by their response to ionomycin. The selective agonist CIM0216 and the antagonist naringenin were employed to test functional TRPM3 expression. Temperature-controlled experiments were performed to determine the temperature sensitivity of TRPM3-expressing DCN neurons. Our preliminary results show that over 40% of the cultured neuronal populations in the adult mouse DCN functionally express TRPM3, with naringenin inhibiting the persistent CIM0216 response in these

neurons. A fraction of the CIM0216-sensitive DCN neurons was also activated by a temperature increase step (35-40 °C). Further work needs to be done in characterizing the function of TRPM3 ion channels in the adult DCN neurons and testing their role in mediating putative high-temperature-triggered mechanisms in the cerebellum.

O3.Resilience Moderates Neuro-hormonal Response to VR-Simulated Natural Disaster Stress: An EEG Microstate Analysis

Miralena I. Tomescu^{1,2,3}, Alexandra Sofonea¹, Alina Chivu^{1,3}, Ciprian Facăeru¹, Cosmina A. Duțică^{1,3}, Alex G. Bîcu^{1,3}, Olgața Barizî^{1,3}, Octavian F. Mirică^{1,3}

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²Ștefan cel Mare University of Suceava – Department of Educational Science, Suceava, Romania

³University of Bucharest - Department of Psychology, Bucharest, Romania

Human responses to acute stress vary widely, from resilience to vulnerability, influenced by neuro-hormonal adaptation mechanisms. To capture inter-individual variability in acute stress response and neuro-hormonal resilience mechanisms, we developed a freely moving CAVE-VR audio-visual simulation of an earthquake (VR-ERT) to induce natural disaster acute stress. A VR control condition was also used without the earthquake simulation (VR-CTRL). We measured resilience using CD-RISC and aversive experience using CTQ questionnaires. To establish acute stress responses, we measured pre-post 5-minute EEG resting states, salivary cortisol (CORT), and self-reported anxiety levels in 31 (15M) and 29 (13M) participants undergoing VR-ERT and VR-CTRL, respectively. Results show a prolonged release of CORT following VR-ERT. At the same time, participants reported significantly higher levels of anxiety ($p<0.001$) after the VR-ERT in opposition to decreasing CORT ($p<0.001$) and anxiety ($p<0.001$) following VR-CTRL. The microstate analysis using six identified microstate classes (A-F) revealed that microstate C mean duration significantly increased ($p=0.005$, $rb=0.57$), and microstate D occurrence decreased ($p=0.08$) after VR-ERT. Resilience significantly moderated the negative association between the temporal dynamics of C and D microstates post-VR-ERT acute stress. Furthermore, resilience significantly moderated VR-ERT-induced CORT ($p<0.001$) and self-report anxiety levels ($p=0.007$) as a function of aversive experiences. These findings suggest that more resilient individuals exhibit neuro-hormonal reactivity to promote efficient adaptation to acute stress through increased CORT and negative correlation between C and D microstates. Understanding the neuro-hormonal resilience mechanisms to acute stress might be crucial for developing effective interventions that foster resilience despite childhood aversive experiences.

O4.The Role of Gestational Gut Microbiome Modulation in Shaping Maternal Behavior and Offspring Neurodevelopment

Mara Ioana Ionescu^{1,2}, Ana Maria Catrina³, Cerasela Haidoiu³, Ioana Alexandra Dogaru¹, Didina Catalina Barbalata¹, Cristian Ciotei¹, Siobhain O'Mahony^{4,5}, Ana-Maria Zagrean¹

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²Department of Pediatrics, Marie Curie Emergency Children's Hospital, Bucharest, Romania

³ Cantacuzino National Military Medical Institute for Research and Development, Cernica, Romania

⁴Department of Anatomy and Neuroscience, University College Cork, Cork, Ireland

⁵APC Microbiome Ireland, University College Cork, Cork, Ireland

Introduction. The prenatal gut microbiome plays a critical role in shaping offspring health and may also influence maternal behavior postpartum, with direct implications for offspring development. Disruptions in the microbiome, caused by prenatal stress or gestational antibiotic (AB) administration, pose significant risks to both maternal and offspring health. We investigated these effects on maternal behavior and offspring neurodevelopment, while also assessing the therapeutic potential of probiotics. **Materials and methods.** Two experimental models were used, both involving pregnant Wistar rats. In **Model 1**, rats were subjected to one week of restraint stress or left undisturbed, with a subgroup receiving a multi-strain probiotic. Maternal care was evaluated on postnatal day (PND) 6 using pup retrieval latency, followed by anxiety assessments through the Elevated Plus Maze (EPM) and Open Field Test (OFT) post-weaning. Offspring neurodevelopmental reflexes and cognitive behavior were also assessed. In **Model 2**, a pregnancy-safe AB cocktail (ampicillin, vancomycin, neomycin, meropenem) was administered during gestation (4 PM-8 AM), with a subgroup also receiving probiotics (8 AM-4 PM). Maternal care and anxiety were assessed as in Model 1, with depression evaluated through the Forced Swim Test (FST). An *in vivo* model of perinatal asphyxia (PA) was induced in offspring on PND6 to assess vulnerability to hypoxic stress. Reflexes and cognitive behaviors were evaluated similarly to Model 1. Fecal samples from dams were collected near term for microbiome analysis. **Results.** Gestational stress significantly impaired maternal care, an effect mitigated by probiotic supplementation. Stressed dams exhibited increased anxiety, which was reduced by probiotics. While neurodevelopmental reflexes in the offspring were not impacted by stress, cognitive behavior was worsened in the stress group but improved with probiotic administration. No significant changes were observed in the gut microbiome of these dams. Dams in the AB group exhibited anxious and depressive-like behaviors, with increased immobility in the FST and impaired maternal care. Probiotics did not alleviate these behavioral deficits, likely due to the potency of the AB regimen. Dams treated with AB showed a microbiome shift, with a reduction in beneficial bacterial strains and an increase in harmful bacteria. Offspring in the PA group exhibited impaired neurodevelopmental reflexes, which were further exacerbated by AB exposure but ameliorated by probiotic treatment. Cognitive impairments were also observed in the AB group, though probiotics had no clear effect on these outcomes. **Conclusion.** Prenatal stress and antibiotic exposure significantly impair maternal behavior and neurodevelopment in offspring, with probiotics showing protective effects under stress conditions but not in the context of potent antibiotics. Probiotic intervention was effective in mitigating certain neurodevelopmental deficits caused by PA, highlighting their potential therapeutic role. However, further research is needed to explore the mechanisms underlying these interactions

O5. Anti-inflammatory MicroRNAs Enhance Behavioral Recovery in Mice Under Inflammatory Stress: A Study of Timing and Efficacy

Boboc Ianis Kevyn Stefan¹, Abuzan Mihaela²; Cercel Andreea Mihaela²; Popa-Wagner Aurel³

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³Chair of Vascular Neurology, Dementia and Ageing, University Hospital Essen, 45147, Essen, Germany

This study investigates the effects of intravenous administration of anti-inflammatory microRNAs (miRNAs) on behavioral recovery in two groups of mice subjected to inflammatory stress. Mice were divided into two experimental groups, each receiving a specific anti-inflammatory miRNA treatment. Behavioral assessments were conducted at four distinct time points: 3, 7, 14, and 28 days post-treatment. These assessments included a range of behavioral tests designed to evaluate anxiety-like and depressive-like behaviors, as well as cognitive function. Specifically, the open field test was used to assess anxiety, the forced swim test was employed to evaluate depressive-like behavior, and the novel object recognition task was utilized to measure cognitive performance. Our results demonstrate that both groups of mice exhibited significant improvements in behavioral recuperation over time, with the efficacy of the miRNA treatments differing between the groups. Notably, the most pronounced recovery was observed at 14 days post-treatment, suggesting that this may represent a critical window for the anti-inflammatory effects of miRNAs on behavior. Furthermore, the observed improvements in cognitive and emotional behaviors indicate that miRNA therapies may have a broader impact on neural recovery following inflammatory stress. This study underscores the potential of anti-inflammatory miRNAs as promising therapeutic agents for enhancing recovery from inflammatory conditions. Additionally, these findings provide valuable insights into the timing and effectiveness of miRNA treatments in modulating behavior in a preclinical model. Future research will be necessary to investigate the underlying mechanisms and to optimize these treatments for potential clinical application.

O6. The relationship between sleep deprivation and memory in rodents: A meta-analysis

Cristina Dumitru¹, Claudia I. Iacob², Florin Zamfirache³, Ruxandra Folostina⁴, Beatrice M. Radu³

¹Department of Educational Sciences, Pitești University Centre, The National University of Science and Technology POLITEHNICA Bucharest

²Department of Applied Psychology and Psychotherapy, University of Bucharest

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Previous research has examined the effects of sleep deprivation (SD) on memory, particularly focusing on tasks like spatial memory. However, results across studies have been inconsistent, with conflicting evidence regarding the severity and nature of memory impairments induced by SD in certain memory tasks. This meta-analysis examined the impact of SD on memory in rodents, synthesizing data from 25 experimental studies (78 reports). The analysis explored the influence of different SD protocols on memory performance, focusing on variables like SD duration, memory task type, and sex of the rodents. The results show that SD negatively affects memory, especially in hippocampus-dependent tasks such as spatial memory, with longer durations of SD causing more severe impairments. Subgroup and meta-regression analyses revealed that sex, memory response type, SD duration, and number of learning trials are significant moderators of memory performance. Male rodents displayed greater memory impairments compared to females, and prolonged SD exacerbated deficits, especially in spatial tasks. Despite variability across studies, the overall findings highlight a consistent detrimental effect of SD on memory, reinforcing the critical role of sleep in memory consolidation. The study also identified significant heterogeneity and publication bias, suggesting the need for more standardized research protocols and unbiased publication practices. Future research should consider sex differences, SD duration, the number of learning trials and various types of memory tasks.

07. Statins modulate the activity of temperature-gated Transient Receptor Potential channels

Adelina Păduraru¹, Dan Domocoș¹, Ramona-Mădălina Babeș¹, George Oprîță¹, Alexandru Babeș¹

¹Department of Anatomy, Physiology and Biophysics, Faculty of Biology, University of Bucharest

Statins are cholesterol-lowering drugs which are widely prescribed to prevent stroke and myocardial infarction and their use is constantly increasing. The mechanism of action underlying their effect is based on the inhibition of the enzyme 3-hydroxy-3-methyl-glutaryl-coenzyme A reductase (HMG-CoA reductase) which catalyses the first and key rate-limiting step in the cholesterol biosynthetic pathway. While the beneficial effects of statins in the treatment of atherosclerotic disease have been thoroughly demonstrated, recent studies have uncovered a number of so-called pleiotropic effects of these drugs manifested in both human patients and various animal models of disease, effects which are independent of the cholesterol lowering action of statins. As undoubtedly statins are among the most widely used drugs available in the treatment of cardiovascular disease, to some extent there are concerns accumulating regarding certain adverse effects of these drugs associated with long-term treatment. Statin-induced peripheral neuropathies and statin-associated muscle symptoms, which include pain, are among the problematic aspects of statin treatment reported in the clinical literature. Here we report that two widely used statins (simvastatin and rosuvastatin) have substantial pharmacological effects on a number of temperature-gated Transient Receptor Potential ion channels which are known to be involved in pain sensing. While simvastatin activates TRPA1 and TRPV1, two channels which are associated with nociception, rosuvastatin is a potent and selective agonist of TRPM8, the cold- and menthol-receptor, a channel whose activation is potentially analgesic and antipruritic. These results may shed new light on the mechanisms involved in the off-target effects of statins.

08. Artemisinin activates the polymodal ion channel TRPA1 in a non-electrophilic manner

Ramona M. Babeș¹, Debora-E. Huțanu², George Oprîță², Dan Domocoș², Tudor Selescu², Alexandra Manolache², Teodora Stratulat^{2,3}, Susanne Sauer⁴, Sorin Tunaru³, Alexandru Babeș²

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Artemisinins are very effective in treating malaria. It has been suggested that these compounds may also have anti-nociceptive or anti-tumour effects, but their mechanism of action is not clear yet. The aim of our study was to investigate whether Transient Receptor Potential (TRP) ion channels known for their role in pain sensing are among the molecular targets. For this purpose, we have investigated the effect of the parent compound, artemisinin, on TRP channels expressed in both heterologous and native system using calcium microfluorimetry and patch-clamp techniques. Our data showed that, in HEK293t cells expressing TRPA1, artemisinin induced calcium transients which were concentration dependent and were blocked by the selective TRPA1 antagonist. In addition, we compared the responses of HEK293t cells expressing the wild type human TRPA1 to those expressing two TRPA1 mutants: C621S/C641S/C665S (insensitive to electrophilic agonists) and S873V/T874L (insensitive to non-electrophilic agonists), respectively. The analysis of the calcium transients induced by artemisinin and two TRPA1 agonists, carvacrol (non-electrophilic) and allyl isothiocyanate (electrophilic),

showed that artemisinin and carvacrol have a similar way of action. Also, artemisinin induced calcium transients in a subpopulation of mouse cultured DRG neurons, which were also sensitive to the TRPA1 agonist and antagonist. Finally, artemisinin evoked whole cell currents which were inhibited by the TRPA1 antagonist in both HEK293t cells expressing human TRPA1 and mouse DRG neurons. In conclusion, artemisinin acts as a non-electrophilic agonist of the TRPA1 channel and this may be one of the first steps of its biological actions.

09. Electrophysiological and pharmacological properties of human Nav1.5 channels: experimental and simulation studies

Bogdan Amuzescu¹, Andreea Larisa Mateias^{1,2}, Florian Armășescu¹, Sorin Draga³, Teodor Șulea⁴, Alexandru Dan Corlan⁵, Beatrice Mihaela Radu¹

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⁵Cardiology Research Unit, University and Emergency Hospital of Bucharest, Romania

We performed voltage-clamp experiments on outside-out patches excised from HEK293 cells stably expressing hNav1.5. Upon 3-min exposure to a 808.5 nm laser the peak Na⁺ current amplitude remained steady (96.8±16.0% of initial values) while in control conditions it decreased (35.0±29.2%); in whole-cell experiments relative amplitudes were 111.2±47.0% (laser) vs. 70.6±33.0% (control). We also titrated the effects of cenobamate on hNav1.5 peak and late current (with ATX-II 100 nM in bath) and found apparent IC₅₀ of 87.6 μM (peak) and 46.5 μM (late). Using a multi-pulse voltage-clamp protocol to assess use-dependent block and recurrence formulae for peak current amplitudes at consecutive pulses obtained with supplementary simplifying assumptions, we estimated state-specific blocking/unblocking rates: for open-state $k_{ob}=0.00215\mu\text{M}^{-1}\text{ms}^{-1}$, $k_{ob-1}=0.189\text{ms}^{-1}$, for inactivated-state $k_{ib}=0.0006698\mu\text{M}^{-1}\text{ms}^{-1}$, $k_{ib-1}=0.18252\text{ms}^{-1}$. Applying these and other in vitro pharmacology data (IC₅₀ for hCav1.2, hKv7.1, hERG) to a modified O'Hara-Rudy2011 human ventricular cardiomyocyte electrophysiology model in a 1D string of 50 cardiomyocytes with different connectivities, we found out that 20-fold reduced intermyocyte gap-junction conductivity (300pS/pF) produced significant conduction velocity decreases (0.0145m/s at 100μM cenobamate, a clinically relevant concentration, vs. 0.0205m/s-control). We obtained an open-conformation 3D model of hNav1.5 using AlphaFold2, we embedded it in a DPPC bilayer model with CHARMM-GUI, corrected residue protonation state (pH7.2) with H⁺⁺, added 2 Na⁺ ions in the selectivity filter. By molecular docking we found the cenobamate binding site in the central cavity. We identified 10 mutant variants in the binding site region and explored them via docking and MD: mutants A1642L/Y and A1765R feature higher affinity than wild-type.

010. Cerebrospinal fluid from multiple sclerosis patients alters the cytoskeleton in HMC3 human microglia

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²Central Military Emergency Hospital "Dr. Carol Davila", Bucharest, Romania

Inflamed microglia have dual functions in multiple sclerosis (MS) pathophysiology: their initial response is neuroprotective, but their

prolonged activity can drive neurodegeneration. The cerebrospinal fluid analysis is a valuable tool for clinical decision making, but it is also important for research into MS pathogenesis. We investigated the actin filaments to characterize the human microglia functional states when exposed in vitro to relapsing-remitting cerebrospinal fluid samples from de novo diagnosed MS patients, using a serum-free (defined) culture approach. During the 48 hours exposure, we observed that the MS-exposed microglia exhibit shorter but more numerous actin filaments, whereas their distribution within the cells was not affected when compared to non-treated controls. These changes were associated with significantly increased migration and proliferation patterns. To conclude, understanding how human microglia react under cerebrospinal fluid exposure may provide unique insights in controlling the chronic MS progression.

O11.Peroxidized retinal pigment epithelial cells as a model of age-related macular degeneration: A Dielectrophoretic study

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Age-related macular degeneration (AMD), a common eye disease in the elderly population, is characterized by the progressive degeneration of retinal pigment epithelial (RPE) cells, often due to weakened antioxidant defenses. One promising treatment consists in injecting healthy RPE cells into the subretinal space, which requires pure, healthy RPE cell suspensions. In this study, we explored the potential of using dielectrophoresis (DEP) to electrically characterize and separate healthy RPE cells from a mixture with oxidized cells. BPEI-1 rat RPE cells were exposed to hydrogen peroxide to simulate oxidative stress, creating an in vitro AMD model. Cell viability was assessed through multiple methods, including microscopy, impedance-based real-time cell analysis, and the MTS assay. Dielectrophoretic spectra were recorded for both healthy and oxidized cells, and their crossover frequencies and electrical properties such as membrane conductivity, permittivity, and cytoplasm conductivity were calculated. These parameters were then used in COMSOL simulations to model a microfluidic DEP separation chip. Results showed that increasing hydrogen peroxide concentration led to a shift in the first crossover frequency to lower values and increased the cell membrane permittivity, indicating membrane peroxidation. Treatment with the antioxidant N-acetylcysteine reduced these changes, confirming the oxidative damage. The differences in crossover frequencies between healthy and oxidized cells were sufficient to separate them within the simulated DEP separation chip. This study highlights the potential of DEP for effectively separating healthy RPE cells from oxidized ones, offering a promising technique for preparing pure RPE cell suspensions for AMD therapies.

Poster Session

P1.Harnessing the Gut-Brain Axis: Maternal Probiotic Supplementation for Neuroprotection in Offspring Against Perinatal Asphyxia

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Background: Perinatal asphyxia, resulting from oxygen deprivation during birth, significantly increases the risk of adverse neurodevelopmental outcomes in neonates, including cognitive and motor impairments. Recent studies have highlighted the critical role of the gut microbiome in neurodevelopment, while also showing that maternal dysbiosis in the third trimester may exacerbate neurodevelopmental risks. We hypothesized that probiotic supplementation could counter these effects and offer neuroprotection against perinatal hypoxia. Objective: This study aimed to assess the neuroprotective effects of probiotics by measuring reactivity following perinatal hypoxia using the Burst-Suppression Reactivity Index (BSRI). Methods: We conducted an experiment with four groups: Probiotic Hypoxia (PRO_Hypoxia), Probiotic Normoxia (PRO_Normoxia), Control Hypoxia (CTRL_Hypoxia), and Control Normoxia (CTRL_Normoxia). Reactivity was assessed at P70 (in adult rats), following surgical implantation of EEG electrodes with two bipolar front-occipital leads. Under deep sedation with chloral hydrate, EEG acquisition was performed, and BSRI was computed in an offline mode. Results: Our findings demonstrate that reactivity was significantly reduced in the hypoxia groups compared to their normoxia counterparts, highlighting the negative impact of hypoxia on neurodevelopmental reactivity. Notably, the PRO_Hypoxia group exhibited higher BSRI scores than the CTRL_Hypoxia group, suggesting a neuroprotective effect of probiotic supplementation in the hypoxia-exposed group. Conclusion: These results support the hypothesis that probiotic supplementation may confer neuroprotective benefits in neonates exposed to perinatal hypoxia, potentially by fostering a healthier gut microbiome. Although further research is needed, this study suggests that a simple intervention such as maternal probiotic administration could reduce the morbidities associated with perinatal asphyxia.

P2.Mapping brain stem circuits involved in visually evoked defensive behaviours in Brn3Cre mice.

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Objective: To map brain stem circuits involved in visually evoked defensive behaviours in Brn3 Cre mice. Methods: Stereotactic intracerebral injection of a cre-dependent AAV-FLEX-tdTomato virus was performed in Brn3bCre mice in the optic and inner grey layers of the superior colliculus (SC, 4 animals) and the mesencephalic dorsolateral periaqueductal grey matter (PAG, 1 animal). Intracardiac paraformaldehyde fixation was performed on day 30 after injection, followed by retina and brain dissection and brain sectioning on a vibratome. Low-resolution maps (5X) were generated for all sections

of interest. High-resolution images of the areas of interest were captured on a Zeiss Imager Z2 equipped with an Apotome for fluorescence imaging and Axiovision software. Results: In the superior colliculus, ipsilateral to the injection site, we observed cell bodies in the optic and inner grey layers. In addition, projections were observed in the microcellular tegmental nucleus, the dorsal terminal nucleus of the accessory optic tract, the anterior part of the anterior pretectal nucleus, the parabigeminal nucleus and the dorsal lateral geniculate nucleus. Surprisingly, we observed axons projecting from the SC through the optic tract, crossing the chiasm, and climbing up into the contralateral optic tract. Likely, these fibres terminated in the contralateral dorsolateral geniculate nucleus. No signal was observed in the retinas. Conclusions: AAVFLEX-tdTomato injections in Brn3bCre mice reveal Brn3b+ cell bodies in the ipsilateral optic and inner grey layer of the superior colliculus. The midbrain, superior colliculus, thalamus, and pretectal region contained target nuclei containing projections of Brn3b+ neurons. We identify a novel path for contralateral signal spread from the SC via the optic chiasm without spreading into the retinas.

P3.Evaluating the EEG reactivity to photic stimulation in the sedated epileptic brain

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Clues about the functioning of the default mode network (DMN) can be obtained from electroencephalography (EEG) by using the default EEG reactivity (DER). The default oscillatory macrostate (DEM) is identified as the macrostate showing the highest decrease in occurrence probability during intermittent photic stimulation (IPS). This study aimed to investigate DER, in the deeply sedated epileptic brain. We used a genetic rat model of absence epilepsy, the adult Wistar Albino Glaxo Rijwijk (WAG/Rij) rat. Controls consisted of age-matched Wistar rats. Deep anaesthetic coma was induced by isoflurane. We performed cortical EEG recordings during the induced altered state of consciousness and the subsequent recovery. One eye received IPS in 1-minute epochs with 0.5 Hz. Visual evoked potential (VEP) was assessed by EEG of the fronto-occipital region contralateral to the stimulus while ipsilateral EEG was used to investigate DER by calculating the decrease in DEM occurrence ratio (DEM_R) during IPS compared to a 1-minute epoch before stimulation. The fraction of time spent in suppression over 1-minute intervals defined the suppression ratio (SR) during BS. Depth of anaesthesia was measured by the the fraction of DEM occurrence prior to stimulation. IPS caused a decrease in DEM occurrence without triggering seizures. The DER was larger in WAG/Rij as compared to controls for the same DEM occurrence before stimulation. The difference was attenuated following ethosuximide. Our data suggests that interictal functional abnormalities of the WAG/Rij brain could be detected by DER measurements with implications for the development of new antiseizure medications.

P4. The impact of maternal gut dysbiosis on hippocampus in rat offspring's

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Gestational antibiotic administration changes the gut microbiota composition, leading to gut dysbiosis. The dysbiosis of maternal gut microbiota was closely related with neurodevelopmental impairments and altered social behavior in rat offspring born from antibiotics-treated dams. We aimed to assess the effects of maternal dysbiosis triggered by gestational antibiotic administration (GAA) and perinatal asphyxia (PA) on neuroinflammation and injury in the hippocampus of rat offspring. Our preliminary study evaluated the effects of two different antimicrobial cocktails (GAA-1 and GAA-2) administered on gestational day 11 and PA on Wistar rat offspring. Initially, GAA-1 comprising ampicillin, vancomycin, neomycin, clindamycin, and amphotericin-B, followed by PA exposure on postnatal day (PND)6. Due to elevated miscarriage rates, the cocktail was revised to a pregnancy-safe combination (GAA-2) comprising ampicillin, vancomycin, neomycin, and meropenem. The levels of TNF- α and S-100B were measured in the hippocampal tissue homogenate using ELISA. The Lowry method was used to determine the total protein content. TNF- α and S100B levels were quantified and expressed as ratios relative to the total protein content (pg/ μ g protein). The TNF- α and S-100B hippocampal levels were measured 24 hours post-asphyxia. GAA-1 did not induce significant variability between groups in the assessment of S-100B protein levels ($p > 0.05$). In GAA-1 experiment, PA resulted in a significant main effect ($p = 0.010$) for TNF- α levels. In GAA-2 experiment, AB administration induced a significant main effect ($p = 0.026$) for S-100B protein. In addition, AB administration resulted in a significant main effect ($p = 0.028$) on TNF- α levels, although no direct variability between each group was observed ($p > 0.05$), due to the small number of samples. Our preliminary findings suggest that PA increased hippocampal inflammation and injury, augmented by antibiotic administration during pregnancy.

P5. A Bioinformatics Approach to Limiting Inflammation in Neurological and Neuropsychiatric Disorders by Targeting TRPV1

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TRPV1 is a ligand gated non-selective cation channel in the vanilloid receptor family (Caterina et al, 2000), that is found in the membrane of primary afferent neurons in dorsal root ganglia, as well as in central nervous system (CNS) neurons located in the periaqueductal grey, substantia nigra, locus coeruleus, hypothalamus (McGaraughty et al. 2003; Toth et al. 2005), and postnatal superior colliculi. TRPV1 induces long term depression in postnatal superior colliculi synapses, therefore it plays a role in their refinement. Without this refinement, the developing colliculi have altered sensory processing which is seen in autism. Inflammation is also seen in neurological and neuropsychiatric disorders. Amino acids such as glutamine and phenylalanine reduce the inflammatory response of macrophages (Lina Duo, 2020), and, in this study, we analysed if glutamine,

phenylalanine, histidine, and tryptophan can be used as direct modulators of TRPV1 in CNS neurons as well.

P6. Staining methods for assessing the number of hippocampal neurons in rats after brain injury

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CBRN agents may cause a variety of medical and psychological effects. The severity of effects depends on different parameters, such as the type of agent and the routes of exposure. Some may be associated with brain injury. We aimed to optimize different staining methods to assess the total number of neurons in rat hippocampus. We stained serial sagittal FFPE brain sections from 3 senescent Wistar rats males with anoxic brain injuries and 3 control adult rats using different methods. The Nissl stainings (Cresyl violet/Luxol fast blue and toluidine staining) were routinely performed to estimate the number of hippocampal neurons and to characterize the neuronal degeneration. The immunofluorescent labeling and evaluation of the expression level of the neuronal nuclear marker NeuN were performed by comparison with Nissl staining. The total number of neurons stained with Cresyl and NeuN, respectively, was quantified and the lesion extent was estimated. The morphology and neuronal density in the hippocampus were assessed. In both CA2 and CA3 hippocampal areas, morphological changes in neurons were observed in the senescent injured brains compared to control rats. Alterations of the hippocampal neuronal density were also observed in the senescent anoxic brain injury. The validation of the Nissl staining was achieved by evaluating neurons in hippocampal areas that were fluorescently labeled for NeuN. Similar to the Nissl method, the number of positive NeuN neurons was lower in senescent injured rats compared to control. Although Nissl staining is the most common method of quantifying neuronal density, the specificity of the Nissl method is lower because Cresyl violet also stains other cell types such as glial cells. Therefore, the detection of NeuN by immunostaining validates the Nissl method, being necessary for the analysis of neuronal degeneration in various neuropathologies. In addition, the analyses must be correlated with Caspase-3 and BDNF quantification.

P7. Atypical EEG Microstate Dynamics in Underground Miners

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Increasing research suggests that changes in miners' brains and cognitive functioning due to work conditions predispose to increased accident risks. We aim to explore the effects of work conditions in underground miners (UM) on their resting-state brain activity using EEG microstate analysis and their association with cognitive functioning. In this study, 21 UM ($M = 37.15$) and 24 overground workers (OW) ($M = 35.14$) underwent an assessment of verbal memory (O-VMPT), cognitive flexibility (WSCIT), visual attention (Trial Making Test -TMT), inhibitory capacities (Stroop Test), and executive planning (ToL). We found that UM individuals have lower scores on verbal memory ($p < 0.001$, $r = -0.604$), cognitive flexibility ($p = 0.007$, $r = -0.45$), but higher scores on visual attention ($p = 0.008$, $r = 0.48$) and inhibitory capacities ($p = 0.016$, $r = 0.44$) compared to OW. Using

the microstate analysis, we identified four microstates (A, B, C, and E) that best explained the data consistently across the UM and OW groups. On microstate temporal dynamics, we found increased microstate A (delta (0-4 Hz) and theta (4-8 Hz) frequencies) and C (beta frequency (15-30 Hz)) in UM compared to OW. Moreover, we found a significant correlation between the increased C dynamics and executive planning in UM (ToL correct responses ($p=0.035$)). In addition, results show a decreased presence of microstate B in UM compared to OW in delta and theta frequencies associated with cognitive flexibility deficits ($p=0.013$). These findings suggest that UM functioning might be associated with an increased risk of accidents tapping on the mechanism of regulating cognitive flexibility and executive planning via associated B and C temporal dynamics.

P8. Neural correlates of self-hood

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The major and very specific role of the Default Mode Network in self-referential

processing could make this region one of the main candidates for a neural correlate of self-hood and self-consciousness. The level of DMN maturity and functionality could reflect the level of self-consciousness and the level of self-related cognitive abilities.

P9. Challenges in Studying the Impact of Gestational Gut Dysbiosis and Perinatal Asphyxia on Neurodevelopmental Reflexes in Rat Offspring

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Introduction. The gestational gut microbiota plays a crucial role in shaping infant neurobehavior and postnatal brain resilience. This study explores the challenges encountered when studying the impact of gestational antibiotic administration (GAA) and perinatal asphyxia (PA) on the neurodevelopmental reflexes of offspring. Materials and methods. GAA-1 was initiated on the 11th gestational day using ampicillin, vancomycin, neomycin, clindamycin, and amphotericin-B. PA exposure was performed on postnatal day (PND) 6. On PND 7-9, pups were assessed using the following early-life behavioral tests: righting reflex (RR), limb grasping reflex (LGR), cliff avoidance (CA), negative geotactic reaction (NGR), and grip strength response (GSR). The high miscarriage rates during GAA-1 led to the revision of the antibiotic cocktail to a pregnancy-safe formulation (GAA-2): ampicillin, vancomycin, neomycin, and meropenem, with the addition of a multi-strain probiotic. Results. GAA-1 caused a high percentage of miscarriages and lower birth weights in offspring, compared to no miscarriages in GAA-2. PA significantly lowered oxygen saturation levels to 45.41%. Prolonged response times were observed in both PA and antibiotic groups, with slight variations across tests. Offspring from the antibiotic group had impaired neuroreflexes in RR and NGR, which were partially improved with probiotic supplementation. No significant effects were seen in GSR. Conclusion. Preliminary findings show that maternal dysbiosis and PA could cause early-onset brain impairment, underscoring the need for caution in recommending GAA. Probiotics show potential in mitigating PA-related neurodevelopmental issues. Further research

into the impact of maternal microbiota on brain development may yield novel therapeutic strategies.

P10. Postpartum Maternal Behaviour - Under the Influence of Gestational Stress and Antibiotics

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Offspring health is influenced by the prenatal microbiome, possibly through altering postpartum maternal behaviour. Prenatal stress and gestational antibiotic use disturb the microbiome, posing risks to mother and her offsprings. Here two studies are presented highlighting the impact of both antibiotic administration and stress during pregnancy on postpartum maternal behaviour. Furthermore, the beneficial effect of administering a multi-strain probiotic during gestation was assessed. For antibiotics evaluation, an antibiotic cocktail (ampicillin + vancomycin + neomycin + meropenem) was administered to a sub-group of pregnant rats daily (4pm-8am) starting with embryonic day (E) 11. Another sub-group was given additionally a multi-strain probiotic daily (8am-4pm). Alongside maternal care and anxiety evaluation, depressive tendencies were assessed using Forced Swim Test. Regarding gestational stress evaluation, the pregnant rats were subjected to one week of restraint stress (E14). A sub-group received probiotic supplementation. During postnatal day 6 pup retrieval latency was evaluated to assess maternal care. Afterwards, Elevated Plus Maze and Open Field Test were used post-weaning to evaluate anxiety. Dams exposed to antibiotic presented increased anxiousness and depressive-like behaviour, without any effect on maternal care. Probiotics did not alleviate these behavioural manifestations. Gestational stress influenced maternal care, inducing anxious behaviour, which was ameliorated by probiotic treatment ($p<0.05$). In conclusion, both adverse gestational events exerted negative effects, leading to anxiety, and depression in the case of antibiotics. Probiotics appear to reduce the negative impact of gestational stress but not that of antibiotics. Further research is required to determine the extent of the beneficial properties of probiotic administration.

P11. End-tidal CO2 monitoring during hyperventilation test: an accurate predictor of cerebral vasoconstriction

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The hyperventilation test is used in clinical practice for diagnosis and therapeutic purposes; however, in the absence of a standardized protocol, the procedure varies significantly. The purpose of our study was to evaluate the cerebrovascular response induced by hyperventilation using noninvasive techniques, such as near-infrared

spectroscopy (NIRS) and capnometry. **Materials and Methods:** We recruited 46 volunteers with no preexisting medical conditions. Each subject was asked to breathe at a baseline rate (8–14 breaths/min) for 2 min and then to hyperventilate at a double respiratory rate for the next 4 min. The parameters recorded during the procedure were the regional cerebral oxyhemoglobin and deoxyhemoglobin concentrations via NIRS, ETCO₂, and the respiratory rate. **Results:** During hyperventilation, ETCO₂ values dropped ($31.4 \pm 12.2\%$) vs. baseline in all subjects. Changes in cerebral oximetry were observed only in those subjects ($n = 30$) who registered a decrease (%) in ETCO₂ of $37.58 \pm 10.34\%$, but not in the subjects ($n = 16$) for which the decrease in ETCO₂ was $20.31 \pm 5.6\%$. According to AUC-ROC analysis, a cutoff value of ETCO₂ decrease $>26\%$ was found to predict changes in oximetry (AUC-ROC = 0.93, $p < 0.0001$). Seven subjects reported symptoms, such as dizziness, vertigo, and numbness, throughout the procedure. **Conclusions:** The rise in the respiratory rate alone cannot effectively predict the occurrence of a cerebral vasoconstrictor response induced by hyperventilation. Synchronous ETCO₂ and cerebral oximetry monitoring could be used to validate this clinical test.

P12. Development of a non-invasive EKG system using Sprague-Dawley rats

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Introduction: In research, in order to obtain results with fewer factors that could influence the rat, consideration should be given to the methods used to record data. The aim of this project is to develop a non-invasive system for recording EKG signals in rats, a system characterized by an affordable cost and an easy-to-implement step-by-step construction. **Materials and Methods:** The system was built using an ESP32 development board, a PCB board, an AD8232 sensor, electrodes, a switch button, and a battery. Two software programs were used for data recording: Arduino, allowed the ESP32 board to communicate via Wi-Fi with the computer and transmit data from the sensor and Python, that saved the data in an Excel document and generated a graph of the unfiltered data. To identify suitable electrodes and their position, 2 types of electrodes were tested, as such or modified (with or without a sponge or treated with Ag/AgCl). To fix the position of the electrodes on the animal's skin, a vest was made, to which the system components were attached. Recordings with the anesthetized or freely moving rat (Sprague-Dawley, male) were made in derivation II and filtered at the end in MatLab. **Results:** Once the final EKG system was assembled (using low-cost components), along with the accompanying final jacket, measurements were taken with the rat awake and roaming free. On the EKG all characteristic waves could be distinctly observed. **Conclusion:** The recorded electrocardiography measurements confirmed the validity and functionality of the constructed system.

P13. Characterisation of an Area Centralis in the retina of Brn3cCre; Brn3bCKOAP mice

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Retinal Ganglion Cell (RGCs) number density is a key feature of retinal specialization for high visual acuity, as seen in retinal foveae or area centralis (ArCe) in mammals. Mice are broadly used as a genetically tractable model of mammalian vision, however a region of high visual acuity was not previously described. The Pou4f family/Brn3 family transcription factors are expressed in partially overlapping cell populations in RGC. Using combinatorial genetics in Brn3cCre; Brn3bCKOAP mice our group previously reported a region of high RGC density, oriented in a temporo-nasal fashion. We report now experiments characterizing ArCe cell types and developmental features. Using sparse AAVFLEXeGFP virus infections in Brn3cCre; Brn3bCKOAP retinas combined with anti-Brn3b and anti AP (Alkaline Phosphatase) immunostainings, we found that the majority of Brn3b+Brn3c+ RGCs belong to the OFF-DS (JamB) and OFF-delta (OFF-sustained) types, with a few instances of midget-like and small bistratified cells. To explore the developmental timing of ArCe formation, we analyzed retina, SC and LGN of Brn3cCre; Brn3bCKOAP mice at postnatal days P0, P7, P15 and adults. Preliminary data suggests postnatal refinement of ArCe density gradient relative to the rest of the retina. In addition, we found that Brn3b does not play a significant role in ArCe formation. To investigate the effects of albinism on ArCe formation, we analyzed the ArCe of TyrCj/Cj mice. The Tyr gene encodes the enzyme tyrosinase involved in Melanin production, and Tyr loss of function leads to albinism. In humans, albinism affects development of the fovea. Using TyrCj/Cj; Brn3cCre; Brn3bCKOAP mice and appropriate controls we found that albinism does not significantly affect position and density gradient of ArCe RGCs. Future experiments will explore ArCe placement relative to mouse ipsi-contra territories and consequences on visual function of Brn3c+Brn3b+ RGC ablation.

P14. In Silico Comparative Analysis of Phytochemicals from Rubus fruticosus with relevance for neurodegenerative diseases

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This study focuses on an in silico comparative and descriptive analysis of the phytochemical compounds in *Rubus fruticosus* using the computational tool SwissADME, with an emphasis on their potential applicability to neurodegenerative diseases such as Alzheimer's disease (AD). SwissADME enables the prediction of comprehensive pharmacokinetic profiles, including GI-absorption, BBB permeability via the BOILED-Egg model, and drug likeness. Moreover, this study evaluates the probability of these compounds being actively effluxed by P-gp (PGP+), which is crucial for assessing their bioavailability and potential therapeutic effectiveness in the CNS. The interaction of phytochemicals with P-gp can significantly influence their ability to penetrate the BBB, with higher efflux probabilities indicating reduced CNS accessibility. Additionally, similarities and differences between these compounds are highlighted to assess their therapeutic potential. Using Swiss Target Prediction and Swiss Dock, the study further evaluates the interaction of these phytochemicals with crucial enzymes and molecular targets involved in neurodegeneration, such as: β -secretase and acetylcholinesterase, kinases like GSK3 β , CDK5, and ERK2, β -amyloid protein and microtubule-associated protein tau. Key bioactive compounds from *R. fruticosus*—noted for their antioxidant, anti-inflammatory, and neuroprotective effects—are compared against established AD treatments, including galantamine and rivastigmine. This comparative analysis underscores the potential of *R. fruticosus* phytochemicals as viable candidates for developing treatments for neurodegenerative diseases, with the potential to enhance cognitive function and delay or slow disease progression in conditions like AD. By integrating computational methods, this research seeks to facilitate the discovery and development of new drug from natural sources, like *R. fruticosus*, while emphasizing the necessity of experimental validation to confirm the bioinformatic predictions.

P15.OPTO-ELECTRICAL CHARACTERIZATION OF MURINE MELANOMA SUB-LINES: PERSPECTIVES FOR NEUROSCIENCES

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Studies on malignancy of melanoma metastasis in brain has uncovered interesting relationships between tumor cells and neural environments called metastatic niche [1]. Advanced, label-free techniques like dielectrophoresis (DEP) and optical tweezers (OT) non-invasively assess cells mechanical, optical and electrical properties, providing insights into melanoma cells' biophysical behaviors. DEP moves cells in an inhomogeneous electric field with strength and direction depending on the geometrical and electrical properties of the cell and medium, while controlling the field's frequency and intensity [2]. OT works similarly but uses a highly focused laser beam of wavelength where the cell is transparent, exploiting the light intensity gradient for cell manipulation [3]. Both techniques provide forces of tens of pico Newtons, and combining them allows studying cells' properties and their interactions with various substrates [3, 4]. This study used F1 and F10 sub-lines of B16 murine melanoma culture, performing population DEP and single-cell DEP measurements using specific lab-designed DEP chambers [5]. From population DEP spectra cells' membrane permittivity and cytosol conductivity were computed using Open DEP software. For single-cell measurements, OT held a cell while increasing the DEP field until the cell escaped the electro-optical trap (escape voltage). Bright-field microscopy recorded this process, showing that escape voltages were negatively correlated with cell radius. The observed differences between the sub-lines were linked to their optical properties [6] which may influence the OT force. There are perspectives to use the combined DEP-OT trap to quantify the malignant nature of a cell.

P16.Cortisol values as a possible marker for brain-personality pathologies. An example for anxiety and depression

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Introduction. Mental health is a topic with many interventions and corresponding research to be done, as health risks are rising, especially among adolescents and young adults. A goal of my research is to find practical instruments, as training as a medical assistant/nurse, to facilitate an early diagnose and help patients, and, if possible, to prevent pathologies or relapsing. Methods. The subjects were students, adolescents or young adults (N=207, age 14-18 years, N=39, age 15-26 years). Questionnaires for: empathy, anxiety, depression, fluidity, were administered and cortisol samples were taken before and after a humanistic counselling group interaction, to assess its biological impact. Results. Firstly, a psychological marker called fluidity is supported by a fluidity equation showing a cognitive bias for pathological high anxiety and depression. Secondly, a neurobiological marker, supported by equations for anxiety and depression, can be found, allowing the computing of the emotional values of interest from cortisol values. Conclusion. If mathematical functions can be constructed having as their argument psychological and biological variables, then, adding them a global brain-personality equation, they can help practitioners predict the level of anxiety or depression, for example, from cortisol values and psychological variables, prior to their intervention and therapy or medication treatment. As these equations work, when we increased the sample from 39 subjects to 51 subjects, there are arguments to assess a marker-like value for the combined variables

and the corresponding equations, making them possible medical instruments to diagnose and adjust interventions and therapy.

P17.Quadrigeminal plate circuit involved in focus and defense responses to stimuli

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The Quadrigeminal Plate, made of 2 superior colliculi (SC) and 2 inferior colliculi (IC), analyses sensory information and generates focus and motor responses compatible with stimuli. The hypothesis is that the reflex centre of defense behaviours triggered by harmful visual and auditory stimuli is in the connections between the intermediate and deep regions of the SC. The superficial region of the SC analyses visual and somatosensory information. It then sends its assessment to the intermediate and deep layers, and here, together with sound information from the IC and auditory cortex (Katz LN et al., 2023), it is integrated and analysed. If the analysis deems stimuli harmful, a defense command is initiated. This command is then conveyed to the oculomotor, trochlear and abducens nuclei in the ventral tegmental area (VTA) (Zheng Zhou et al., 2019), and then it is directed to extrinsic eye muscles via cranial nerves 3,4 and 6 and to facial muscles via cranial nerve 7. The command also goes to the central mesencephalic reticular formation. From here, projections to the spinal cord, through the reticulo-spinal fasciculus, transmit to the anterior horn and then to skeletal muscles via spinal nerves. Instructions also travel through the tectospinal tract to spinal nerves. There is also communication between the SC, hypothalamic, thalamic nuclei (Paul J, 2006), periaqueductal grey, lateral intraparietal area (the latter 2 modulate attention), globus pallidus (role in movement). According to current understanding of autism, it is partly due to improper development of the 2 SC that normal emotional and motor responses to stimuli cannot be generated (Rubin Jure, 2022). Therefore the 2 superior colliculi play a role in helping the individual focus on and move in response to stimuli. Mapping of this circuit is done via invasive EEG and optogenetic techniques.

P18.Temporal dynamics of EEG Microstates in Autism Spectrum Disorder: A preliminary intra-OXT study

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Autism spectrum disorder (ASD) is a neuro-developmental condition whose etiology and pathogenesis remain poorly understood, and no pharmacological treatment is available for patients. It has been suggested that the intranasal oxytocin administration (IN-OXT) might be considered a potential therapeutic option for autism spectrum disorders (ASD), but the results are yet inconclusive. To further explore this, we investigated the effects of IN-OXT in 25 children with ASD who either received OXT or placebo (PLCB) nasal sprays (OXT: n=10; PLCB: n=10) over a period of 4 weeks, using EEG microstate analysis on broadband and band-specific frequencies (alpha 8-12Hz, beta 12-30Hz, gamma 30-65Hz, theta 4-8Hz, delta 0.5-4Hz). At baseline, the experimental group was compared with a healthy control group (n=30; HC: F=14, mean age=12 years) using resting-state EEG. Our band-specific results demonstrate a significant

increase of microstate A ($p=0.01$), microstate B ($p=0.02$) and C ($p=0.03$) in the alpha band ($p=0.02$) in ASD individuals, when compared to controls. At T1, 24 hours after the last nasal spray administration, microstate C significantly decreased ($p=0.02$) in ASD individuals when compared to the placebo group. Notably, we also discovered a significant decrease of microstate B ($p=0.002$) in the delta band at T2, 4 weeks after cessation of the daily administrations. These findings underscore the potential of intranasal oxytocin to assess longitudinal changes in the temporal dynamics of children with ASD.

P19.Oxytocin and Emotional Regulation Moderate EEG Microstate Dynamics Following Social Imitation

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Social imitation (SI) changes well-being, closeness, spontaneous cognition, and EEG microstates by possibly increasing oxytocin (OXT) levels. Here, we investigated the effects of OXT and emotional regulation (Difficulties in Emotional Regulation Scale - DERS) on previously observed C and D microstate changes following the SI task of imitating an actor's arm movements. In 36 subjects (23M), DERS and salivary OXT were assessed for SI and control tasks on two separate days in a randomized fashion, with at least a week delay. Δ OXT moderates the association between D and C microstates dynamics ($p=0.068$) and between C and E microstates dynamics ($p<.001$). In individuals with more Δ OXT post-SI, these correlations were significantly negative (D-C: $p=0.002$; C-E: $p=0.002$), whereas in individuals with less Δ OXT post-SI, only the C-E interaction was significantly positive ($p=0.004$). Emotional regulation strategy scores (DERS) significantly moderate the relation between D and C dynamics ($p=0.011$) and between D and E microstate dynamics ($p<.001$). In individuals with low scores in DERS (better emotional regulation strategies), the correlations were significantly negative (D-C: $p<.001$) and positive (D-E: $p=0.024$). In those with high scores in the DERS strategy (worse emotional regulation strategies), only the negative relation between D and E was significant ($p=0.006$). The findings of this study, which highlight the modulation of specific microstates through the release of oxytocin and emotional regulation traits during SI, present a novel contribution to the field of socio-emotional microstates.

P20.BEAM WALKING MOTOR INDEX: AN INNOVATIVE TEST IN AN AGED ANIMAL MODEL OF STROKE

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Annually, 15 million people worldwide suffer from strokes, increasing the pressure on researchers to develop novel, effective treatments and reliable tests for assessing post-stroke recovery. Our study aimed to establish and validate a new motor performance index that evaluates recovery in both young and aged animals, with

recommendations for optimal sample sizes. We used 20 young and 27 aged Sprague–Dawley rats, randomly assigned to either stroke or sham surgery. The equipment included a beam with adjustable width (5 cm at the start, narrowing to 1.5 cm), placed 50 cm above the ground, a mirror for observing paw movements, and a video camera for recording trials. The proposed motor index evaluated not only the performance difference between the affected and unaffected sides but also overall performance, factoring in speed and coordination. This new test offers significant advantages over existing methods by reducing the number of animals needed to achieve statistical power (80%), especially in aged rodents. The performance index was calculated for acute, subacute, and chronic phases, showing a 99.99% power in young animals with a sample size of 3-5, while aged animals required 16-38 to reach an average power of 73.73%. This reduction in animal numbers is crucial for studying aged populations. Our approach provides a cost-effective and efficient method for assessing motor function and evaluating stroke therapies in experimental models, particularly in aging animals. Ultimately, this performance index offers a powerful tool for advancing stroke research and improving the assessment of therapeutic outcomes in preclinical studies.

P21.Temporal Dynamics of EEG Microstates During Divergent Thinking

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Divergent thinking (DT) is essential for generating creative ideas by exploring new possible solutions. Recent studies demonstrate a dynamic interplay between DT and executive functions (EF) in the creative process. However, the literature on the underlying mechanisms and how they temporally interact remains inconclusive. Hence, the aim of this study was to identify the nature of the temporal dynamics of networks involved in DT and the implications of EF in the creative process. The EEG recordings were acquired from 25 participants (60% women) who completed the Alternative Uses Task (AUT), in which participants found alternative uses for everyday objects followed by a control condition involving a serial subtraction task (SST). The EEG microstate analysis on both conditions revealed that six different microstates (A-F) explained 89% of the variability in the data. Results were compared between conditions for three temporal parameters: mean duration (MD), frequency of occurrence (OC) and ratio of time coverage (TC). The results indicated that microstate C (MD, $p=0.03$; TC, $p=0.04$; OC, $p=0.04$), microstate E (TC, $p=0.02$; OC, $p=0.01$) and microstate D (MD, $p=0.03$) were significantly increased during the AUT task, whereas microstate F (all parameters, $p < 0.001$) was decreased when compared to SST. Given previous microstates' relation to resting-state networks, our results suggest that the differences between DT processes might involve network dynamics associated with both mind-wandering (microstate C) and executive functioning (microstate D).

P22. Glutamine Reverses Hyperexcitability of DRG Neurons in Neuropathic Pain: Patch Clamp Insights from a Rat Neuropathic Pain Model

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Neuropathic pain, often linked to increased excitability in dorsal root ganglion (DRG) neurons, is a common consequence of nerve injury. This study explores the effects of glutamine supplementation on DRG neuron excitability in a rat model of neuropathic pain, the Spared Nerve Injury (SNI) model. Using patch clamp action potential recordings on cultured DRG neurons, we compared four groups: Sham, Sham + Glutamine, SNI, and SNI + Glutamine. In the SNI group, key markers of hyperexcitability included lowered action potential threshold, reduced overshoot, lowered amplitude, and shortened afterhyperpolarization (AHP) period. Glutamine administration significantly normalized these electrophysiological markers in SNI-affected rats, bringing them closer to control levels. This suggests that glutamine plays a role in modulating DRG neuron excitability and may offer a novel therapeutic approach to alleviating neuropathic pain by reversing neuronal hyperexcitability. These findings open the door to further research on glutamine's molecular mechanisms and potential applications in clinical neuropathic pain treatment.

P23. Influence of glutamine supplementation on peripheral TRPV1 in the SNI neuropathic pain model

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Chronic pain is a debilitating condition that serves no protective role in response to injury. Instead, it persists in the absence of an initial stimulus or after it has resolved, usually lasting for extended periods of time. One promising approach for addressing chronic pain involves targeting the Transient Receptor Potential (TRP) ion channel family, members of which play various roles in nociceptive mechanisms. Among them, the Nobel-awarded TRPV1 stands out as the chief transducer of noxious signals and a convergence point for multiple pro-inflammatory pathways. This study integrates three research areas: pain, macrophages, and TRPV1 channels, theorizing that glutamine could polarize macrophages toward a neuroprotective phenotype. Certain anti-inflammatory compounds secreted by macrophages could, in turn, suppress the activity of TRPV1 channels expressed in nociceptive neurons. We analyzed the effects of glutamine administration on TRPV1 responses in the SNI neuropathic pain model. Adult male Sprague-Dawley rats underwent sham or SNI ligation surgery, then were administered either saline solutions (0.85%) or glutamine solutions (1g/kg). Calcium imaging was used to record TRPV1-mediated Ca²⁺ transients in DRG neurons following two 20-second pulses of 300 nM capsaicin. Our inaugural study uncovered changes in TRPV1's activation pattern in some of the glutamine-treated conditions. Statistically significant differences were almost constantly observed between the Sham+NaCl and Sham+Glu groups, suggesting that glutamine has a measurable effect under Sham conditions. However, no differences were found between the SNI+NaCl and SNI+Glu groups, or, perhaps more notably, between Sham+NaCl and SNI+NaCl, contradicting already existing literature.

P24. Event Related Potentials and Theta rhythms as predictors of cooperative behavior

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Understanding what the triggers are for and how the brain generates cooperative behavior is a crucial step in the development of better education systems and behavioral therapies. In this study, we've developed a version of a socio-economic game (Prisoner's Dilemma), with the purpose of measuring event related potentials (ERPs) during the result presenting phase and correlating them with behavioral data and theta rhythms. The components of time-locked ERPs that we have analyzed were the N200, P300, Late Positivity Potential (LPP) and Late Negativity Potential (LNP), mainly to observe if we could predict the subject's intention to reciprocate the result they received from their opponent, a strategy known as "tit-for-tat". This opponent was represented by a computer algorithm for both groups, while one group was led to believe that its opponent was human. For this latter group, we have observed a pronounced early negative response as well as a late negative spike in amplitude, which may imply a strong emotional valence encoding by the brain, and which were elicited before a reciprocal "defect" response. We have also uncovered theta waves patterns over the frontal medial-lateral areas of the brain after a "defect" response, a possible intervention of the limbic system in the case of the simulated social encounter. The brain generated predominantly positive responses in cases where the result matched the previous choice and more notably in the group that knew played against a computer. We concluded that certain ERP components and brain waves correlations can describe the cooperative behavior or its absence

P25. Neuroprotective Effects of Foeniculum vulgare Mill. in Modulating Cognitive Impairment and Oxidative Stress in an Alzheimer's Disease Model

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Alzheimer's disease (AD) is a progressive neurodegenerative disorder marked by cognitive decline, oxidative stress, and cholinergic dysfunction. Current treatments provide limited effectiveness (benefits), prompting research into natural compounds with neuroprotective properties. *Foeniculum vulgare* Mill., known for its anti-inflammatory and antioxidant effects, has shown potential in alleviating neurodegenerative conditions. This study aimed to assess the ameliorative effects of *F. vulgare* essential oil (FVEO) on cognitive impairment and oxidative stress in a scopolamine-induced zebrafish model. Additionally, the pharmacokinetic profiles of FVEO compounds were evaluated *in silico* to explore their therapeutic potential. Adult Tübingen wild-type zebrafish (*Danio rerio*) were randomly divided into 10 experimental groups. Cognitive impairment was induced using scopolamine (SCOP, 100 μM). FVEO was administered at concentrations of 25, 150, and 300 μg/L. The experimental groups included a control, a positive control treated with galantamine (GAL, 1mg/L), and groups exposed to SCOP alone or in combination with FVEO or GAL. Cognitive performance was assessed using behavioral tests, including the NTT, Y-maze, and NOR test. Biochemical markers such as AChE activity, SOD, CAT, GPX, and MDA levels were measured. FVEO significantly improved cognitive performance in behavioral tests, enhanced exploratory behavior, normalized AChE activity, and reduced oxidative stress markers in scopolamine-treated zebrafish. The comprehensive *in silico* pharmacokinetic analysis revealed favorable absorption and drug-like properties of the major FVEO compounds. FVEO

demonstrates significant neuroprotective effects, effectively mitigating cognitive deficits and oxidative stress in a zebrafish model of AD. These findings suggest that FVEO could be a promising candidate for treating neurodegenerative diseases, highlighting that further studies are recommended to explore its clinical applications.

P26.Effects of Diesel exhaust particles on cell lines and nervous tissue

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Diesel exhaust particles (DEP), with diameters of 1-10µm and ~0.1 µm, once inhaled enter the bloodstream and may penetrate the blood-brain barrier and activate astrocytes and microglia, triggering neuroinflammation and inducing neurodegenerative disorders (Kang YJ et al. 2021; Thiankhw K et al. 2022). Instead of standardized DEP preparations (PM2.5), we used in experiments a similar home-made PM preparation obtained from a Diesel engine catalizer fragment and resuspended in DMEM:F12 medium with or without passing through a 0.45µm methylcellulose filter. We aimed to investigate the cytotoxic effects of DEP on HEK293, HeLa, SH-SY5Y cells with an assay in a 96-well plate, seeding each well with 20,000 cells in 100µL medium (control) or 90µL medium+10µL filtered/unfiltered microparticles suspension. Each condition was tested in quadruplicate and each experiment was run thrice. After 24h of DEP exposure 10 µL resazurin were added per well; after a 4h exposure the fluorescence (450nm ex./490nm em.) was measured with a CytoFlex3 plate reader. Preliminary results indicate a reduced cell viability of DEP-exposed cells. For all cell types, unfiltered DEP produced a significant (10-20%) reduction in viability; filtered DEP exerted no effect. Human neuroblastoma SH-SY5Y cells exhibited the highest sensitivity, suggesting a heightened vulnerability of neuronal cells to DEP. The second objective is to analyze rat brain slices incubated for 7 days in DMEM:F12 medium+bicarbonate Ringer 1:1 in four different conditions: control, DEP in DMSO 1o/oo, unfiltered/filtered DEP. Then, silver staining will be performed on paraffin-embedded 300µm brain slices to observe differences between "healthy" and DEP-exposed brain slices.

P27.Olfaction Influence on Attention Regulation

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The thesis, *Olfaction Influence on Attention Regulation*, explores how olfactory stimuli may modulate attention, mainly when directed toward digital environments. The research hypothesizes that specific scents can influence cognitive engagement, particularly amid the fragmented attention associated with digital multitasking. Drawing from philosophical perspectives on attention and cognitive science, the study integrates neuroscience to investigate olfactory influence on cognitive processes. An experimental design exposes participants to scents - peppermint, clove, lemon, rosemary, and frankincense, while they perform a Stroop test, a task commonly used to measure attention and cognitive flexibility. Participants' brain response is recorded with a Muse device, an alternative EEG headset. The findings indicate that certain odors, such as peppermint, enhance cognitive performance by reducing reaction times and improving focus, while scents like frankincense foster calm, as reflected by the heart rate and the brainwave analysis. Results suggest that olfactory stimuli could serve as regulatory tools when subjects are exposed to digital distractions. Although the study provides initial evidence of olfaction's potential in attention regulation, limitations include the small sample size and reliance on self-reported data. Future research should consider larger, more diverse samples and advanced measurement techniques, such as EEG analysis and olfaction testing. In conclusion, the thesis highlights olfaction's significant but underexplored role in cognitive modulation, proposing a multisensory approach to improve attention and productivity in digital environments. Further research could open avenues for practical applications in education, workplace productivity, and therapeutic settings