Alliance4Life

A4L_BRIDGE Mini-Conference

Ljubljana, 17–18 February 2025

Funded by
the European Union

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Dear Mini-Conference Participants,

Let me express my sincere gratitude for your active participation in this **Mini-Conference**, organized by **Alliance4Life** and supported by the **A4L_BRIDGE** project.

Our alliance began in 2017 as a project focused on improving governance and research culture at progressive biomedical research institutions in **Central and Eastern Europe**. Over the years, our members have accomplished significant work, and today, we are much more than a project consortium—we are a **permanent structure**, now **implementing our third project funded by the European Union through Horizon Europe**. We have successfully expanded our focus beyond research management to include activities that support our **scientific communities**.

This **conference** marks a significant milestone—the **foundation of the Alliance4Life Virtual Research Center**. Through this initiative, you will have the opportunity to **establish new research collaborations, fund secondments at partner institutions, participate in international mentoring programs, attend joint mini-conferences**, and much more.

The **conference organizing team**, led by **Sergej Pirkmajer**, looks forward to welcoming you to **Ljubljana**, where you will share your **research results and ideas** with like-minded colleagues from **eleven countries** represented in our **Alliance4Life consortium**.

As **Alliance4Life Coordinator**, I am excited to see this community grow and evolve. Let us **jointly create a safe and inspiring space** where **creativity can flourish and new ideas can emerge**!

Sincerely,
Ester Jarour
Alliance4Life Coordinator

Alliance4Life

Alliance4Life in Center Rog: A Symbol of European Academic and Cultural Cooperation

Dear participants, dear colleagues, dear friends,

We are delighted to be organising the A4L_BRIDGE Mini-Conference in Ljubljana. With so many interesting contributions from excellent researchers from the Alliance4Life partner institutions, we have managed to put together an exciting, truly international and diverse scientific programme designed to facilitate and further strengthen cooperation between our institutions and countries. This is also one of the main purposes of establishing the Alliance4Life Virtual Research Center, which we hope will become a focal point for research collaboration within Alliance4Life and beyond.

Center Rog, a former factory, indissolubly combines the historic heritage we all cherish with modern concepts for an engaging public space. With an innovative, almost futuristic juxtaposition of old and new, of technical and artistic, of static and dynamic, of domestic and public, of transparent and hidden, of academic and urban, it also epitomises the conceptual shift in science, which no longer takes place in remote ivory towers that only occasionally offer a glimpse into the inner workings of the scientific mind, but instead involves the active participation of citizens. Much like the glass studios in Center Rog, where a passer-by can observe not only the "ready-made", but the actual metamorphosis of raw materials into beautiful practical objects, such as musical instruments. Certainly an excellent inspiration for the Alliance4Life Virtual Research Center and a metaphor for its mission to combine scientific excellence with active societal engagement.

In addition to the modern Center Rog, the echoes of the history of the Rog factory building also have an unexpected resonance for us.

In 1920s, the factory, originally built in 1879, was significantly expanded and given its current outline according to the plans of professor Alois Král, a graduate of the Czech Technical University in Brno, the hometown of Alliance4Life. As a civil engineer, Alois Král, whose many achievements include the new *Šentjakobski most* (St. James's Bridge), one of the main links across the Ljubljanica River on the edge of the Old Town, is inextricably linked with the academic and cultural life of Ljubljana. In 1920, Alois Král became a professor at the newly founded University of the Kingdom of Serbs, Croats, and Slovenes in Ljubljana (1919), today's University of Ljubljana. Alois Král was not only the Dean of the Technical Faculty of the University of Ljubljana several times, but also the Rector of the University of Ljubljana (1945/46) before returning to his *alma mater* in Brno. In recognition of his academic achievements, the University of Ljubljana awarded him a doctorate *honoris causa* in 1956.

Alois Král
(1884–1969)
Source: Wikipedia

Center Rog is obviously a particularly suitable and symbolic location for the A4L_BRIDGE Mini-Conference and the official launch of the Alliance4Life Virtual Research Centre.

I wish you a pleasant and fruitful conference.

Sergej Pirkmajer
Institute of Pathophysiology
Faculty of Medicine
University of Ljubljana

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General Information

Venue: Center Rog

The Alliance4Life Mini-Conference will take place in the **University Room (Univerzitetna soba)** in Center Rog.

The **University Room (Univerzitetna soba)** in is located on the **2nd floor of Center Rog.**

Address: Center Rog, Trubarjeva cesta 72, Ljubljana

Access: The venue is within walking distance of the city centre.

Registration

The registration desk, located near the University Room (Univerzitetna soba), will be open on Monday 17 February 2025 from 8:00. Registration will be possible throughout the Mini-Conference.

Coffee breaks, lunch, and dinner

Coffee breaks, lunches, and dinner (covered by the registration) will take place near the University Room (Univerzitetna soba) in Center Rog. In addition, Cafeteria Specialka, located at the venue, offers a selection of drinks and snacks (not covered by registration).

Oral presentations

Please load your presentation on the computer in University Room (Univerzitetna soba) before the start of your session. A member of the organizing team will be there to assist.

Conference secretariat

Tina Štukelj (tina.stukelj@mf.uni-lj.si)
Sergej Pirkmajer (sergej.pirkmajer@mf.uni-lj.si)

Programme

Programme

Monday, 17 February 2025	
8:00 – 9:45	Registration
9:45 – 10:00	**Welcome Address**
	Ksenija Geršak (Slovenia), vice-dean for research, Faculty of Medicine, University of Ljubljana
10:00 – 11:30	**Session I: Neurobiology I**
	Chairs: Jernej Jorgačevski (Slovenia), Miriam A. Hickey (Estonia)
10:00 – 10:20	**Jernej Jorgačevski (Slovenia):** The Research group Cell Physiology: Research, Innovation, and Expertise
10:20 – 10:40	**Evaldas Pipinis (Lithuania):** Sensory-driven methods to diagnose, monitor and treat
10:40 – 11:00	**Miriam A. Hickey (Estonia):** Early trigeminal and sensory impairment and lysosomal dysfunction in accurate models of Wolfram syndrome
11:00 – 11.20	**Kristina Mlinac Jerković (Croatia):** The role of gangliosides in shaping the neuronal membrane landscape in health and disease
11.20 – 11.30	Q & A
11:30 – 12:00	**Coffee Break**
12:00 – 13:30	**Session II: Neurobiology II**
	Chairs: Tomaž Marš (Slovenia), Valentina Lacovich Strašil (Czech Republic)
12:00 – 12:20	**Karolina Kucharova (Slovakia):** Intervention strategies to treat trauma-induced paraplegia
12:20 – 12:40	**Jaanus Harro (Estonia):** Sensivity to rewards: Is it the matter of neural circuits, general metabolism, or both?
12:40 – 13:00	**Jozef Hritz (Czech Republic):** Phosphorylation-Driven Tau–14-3-3 Interactions: Unraveling Their Role in Alzheimer's Disease
13:00 – 13:20	**Valentina Lacovich Strašil (Czech Republic):** Microgliosis and interferon response in the brain of Adar Mavs mutant mice is rescued by Pkr deletion
13:20 – 13:30	Q & A
13:30 – 15:00	**Lunch**
15:00 – 16:30	**Session III: Cardiovascular Diseases**
	Chairs: Filip Sedlić (Croatia), Dovilė Karčiauskaitė (Lithuania)
15:00 – 15:20	**Filip Sedlić (Croatia):** The role of mitochondria in cardiovascular disease
15:20 – 15:40	**Martin Helán (Czech Republic):** Searching for new sepsis biomarkers
15:40 – 16:00	**Dovilė Karčiauskaitė (Lithuania):** Role of Psychosocial Stress in Cardiovascular Risk
16:00 – 16:20	**Mate A. Balazs (Hungary):** Advancing Oncology Care: Integrating Pharmacovigilance, Research, and Education for Drug and Patient Safety
16:20 – 16:30	Q & A
16:30 – 17:00	**Coffee Break**
17:00 – 17:40	**Launch of Alliance4Life Virtual Research Centre**
	Sergej Pirkmajer (Slovenia), Jernej Jorgačevski (Slovenia), Filip Sedlić (Croatia)
17:40 – 18:00	**Faculty of Medicine: New campus – New opportunities**
	Tomaž Marš (Slovenia), vice dean for medicine, Faculty of Medicine, University of Ljubljana

Tuesday, 18 February 2025	
9:00 – 10:30	**Session IV: Metabolism**
	Chairs: Sergej Pirkmajer (Slovenia), Iuliana Ceausu (Romania)
9:00 – 9:20	**Maija Dambrova (Latvia):** Unlocking the Potential of Acylcarnitines: Biomarkers and Modulators in Metabolic Research
9:20 – 9:40	**Livia Petriskova (Slovakia):** Multi-omics analysis as a tool for the discovery of novel candidate molecules with the potential to promote adipose tissue metabolic activity
9:40 – 10:00	**Iuliana Ceausu (Romania):** Glycemic disturbances and Pregnancy – the window of opportunity for early prevention and personalized medicine
10:00 – 10:20	**Kamila Bendíčková (Czech Republic):** The effect of BCG vaccination and latent infections on clinical progression of sepsis and COVID-19
10:20 – 10:30	Q & A
10:30 – 11:00	**Coffee Break**
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	Chairs: Maija Dambrova (Latvia), Karolina Kucharova (Slovakia)
11:00 – 11:20	**Sergej Pirkmajer (Slovenia):** Skeletal muscle: a central nexus of metabolism and endocrinology
11:20 – 11:45	**Lea Rems (Slovenia):** Electroporation in cardiac treatments: from ablation to gene delivery
11:45 – 11:55	Q & A
11:55 – 12:00	**Closing of the A4L_BRIDGE Mini-Conference**
12:00 – 13:00	**Lunch**

Abstracts

The Research Group Cell Physiology: Research, Innovation, and Expertise

Jernej Jorgačevski

University of Ljubljana, Faculty of Medicine, Ljubljana, Slovenia

The Research Group Cell Physiology is one of the four research programs at the Institute of Pathophysiology, Faculty of Medicine. Its research spans both applied and basic science. Applied research focuses on cell-based immunotherapy and the development of electrophysiology and electrofusion equipment. This has recently led to the development of a GMP-certified, cell-based immunotherapy, successfully tested in a clinical trial, with plans to extend this approach to other solid tumors. Basic research focuses on neurophysiology, investigating fundamental physiological and biophysical aspects of cellular processes such as exocytosis, vesicle trafficking, and cytosolic signaling involving messengers and metabolites. In our studies we investigate how these processes relate to brain disorders such as cancer, brain edema and neurodegenerative diseases, including Alzheimer's disease and intellectual disability. To achieve this, we employ advanced fluorescence microscopy techniques (confocal microscopy, super-resolution microscopies SIM and STED, and FRET-based microscopy), electrophysiology, and molecular biology to analyze cellular, organelle, and single-molecule functions using cell cultures, tissue slices, and transgenic animal models (mice and Drosophila). This equipment is part of the Core Facility Database at the University of Ljubljana (Faculty of Medicine) and was successfully utilized in the latest Open Access Call in collaboration with St. Anne's University Hospital Brno.

Sensory-driven methods to diagnose, monitor and treat

Evaldas Pipinis

Vilnius University – Faculty of Medicine, Lithuania

The Center for Applied Neurosciences at Vilnius University (CAN) focuses on using sensory-driven methods to improve the diagnosis, monitoring, and treatment of neurological and mental health disorders. By studying how the brain responds to sensory inputs like sounds, we develop tools and therapies that are tailored to individual needs. Our work includes creating optimised stimulation approaches for individualised biomarkers. We also develop non-invasive technologies, such as brain-computer interfaces (BCIs) and neurofeedback systems, that use sensory stimuli to guide and improve brain activity. These innovations help in diagnosing conditions like psychosis, mood disorders, dementias, epilepsy, as well as supporting treatment and recovery. Through global partnerships, CAN applies cutting-edge research to clinical settings, making sensory-driven neuroscience a part of personalized healthcare.

Early trigeminal and sensory impairment and lysosomal dysfunction in accurate models of Wolfram syndrome

Miriam A. Hickey

University of Tartu, Estonia

Parkinson's disease (PD) is a highly prevalent neurodegenerative disease that causes bradykinesia, stiffness of movement and impaired gait and balance in patients. Dysfunction of skin sensation and peripheral neuropathy (PN) are now also well recognized, and indeed, PN in PD can negatively impact gait and balance.

Levodopa is the gold standard of care in PD, but it is metabolised to homocysteine, which may contribute to PN in PD.

We show that levodopa, at concentrations similar to peak plasma levels observed in patients, has deleterious effects on sensory neurons in vitro that are not related to homocysteine. We also show that even short-term levodopa, at clinically relevant concentrations, causes sensory dysfunction in vivo and that this sensory dysfunction is partially alleviated with vitamin B12.

Our data advocate for the co-administration of vitamin B12 with high-dose levodopa to protect peripheral neurons in PD.

The role of gangliosides in shaping the neuronal membrane landscape in health and disease

Kristina Mlinac Jerković

University of Zagreb School of Medicine, Croatia

Gangliosides, dominant determinants of mammalian brain glycome, act as co-receptors and binding partners of an array of proteins and are associated with pathogenesis of neurological disorders, e.g. epilepsy or Alzheimer's disease. However, the mechanism leading from changed gangliosidome to clinical presentations of these disorders remains a puzzle. The aim of our group is to investigate the effect of gangliosides on selected plasma membrane ion transporters and proteins involved in synaptic plasticity. For that purpose, we utilize molecular biology approaches combining targeted inactivation of ganglioside biosynthetic genes by CRIPSR-Cas9 technology in vitro, high sensitivity mass spectrometry, enzyme activity assays, ion flux assessment and calcium transients monitoring. We hope our research will facilitate understanding the neurobiological basis of complex brain disorders' ethiopathogenesis.

Intervention strategies to treat trauma-induced paraplegia

Karolina Kucharova

Biomedical Research Center of the Slovak Academy of Sciences, Slovakia

There is currently no effective therapy to reduce neurological dysfunction caused by spinal cord injury (SCI). Our team utilized treatments such as electrical stimulation, pharmacological interventions and rehabilitation to facilitate the recovery of functions after SCI. We used functional, molecular and morphological techniques to understand the impact of post-traumatic treatment. SCI affects the whole body, which is why our research is not limited to the CNS. In our latest study focusing on supplementation after injury, we observed a significant effect of the natural antioxidant carnosine on changes in neurotrophic factors in both neuronal and muscle tissue. A better understanding of the effect of post-traumatic interventions on the whole organism and monitoring their impact on regenerative processes may be crucial for the development of rational therapeutic strategies in the future. Supported by VEGA 2/0117/24, APVV-19-0324

Sensivity to rewards: Is it the matter of neural circuits, general metabolism, or both?

Jaanus Harro

University of Tartu, Estonia

Jaanus Harro[1], Evelyn Kiive[2], Margus Kanarik[1], Urmeli Katus[3], Diva Eensoo[4], Inga Villa[3], Jarek Mäestu[5], Marten Vares[6], Karita Laugus[1],Toomas Veidebaum[4]

[1] *Division of Neuropsychopharmacology, Department of Chemistry, University of Tartu, Ravila 14A Chemicum, 50411 Tartu, Estonia;* [2] *Division of Special Education, Department of Education, University of Tartu;* [3]*Department of Family Medicine and Public Health, University of Tartu;* [4] *Department of Chronic Diseases, National Institute for Health Development, Tallinn, Paldiski mnt 80, 15092 Tallinn, Estonia;* [5] *Division of Exercise Biology, Institute of Sport Sciences and Physiotherapy, University of Tartu;* [6] *Department of Psychology, University of Tartu, Tartu, Estonia*

Rewards are rewarding owing to their hedonic or metabolic value. Individual differences in sensitivity to rewards are predictive of mental health problems but may reflect variation in metabolic types. Reward sensitivity is dissociable from the trait of positive affect. We have distinguished two independently variable aspects of reward sensitivity, the striving towards multiple rewards (Openness to Rewards) and the strong pursuit and fixation to a particular reward (Insatiability by Reward). Their association with markers of metabolism and relevant behaviours was assessed in a longitudinal study of representative birth cohort samples, the Estonian Children Personality Behaviour and Health Study (original n=1238; data collected at age 15, 18 and 25) Across adolescence and young adulthood, openness to rewards was positively associated with physical activity and negatively with blood pressure and serum levels of glucose, insulin and cholesterol levels. In contrast, insatiability by reward was positively associated with serum triglyceride levels and negatively with energy intake and cardiorespiratory fitness. Importantly, Insatiability by Reward was also positively associated with body weight, body mass index, sum of five skinfolds, waist circumference, hip circumference and waist-to-height ratio. Only Openness to Rewards clustered together positive affectivity. The relationship of the two aspects of reward sensitivity with affective aggressiveness depended on the HCRTR1 genotype, suggesting a differential coping styles with stress. Experimental study in rats revealed that serum glucose levels after chronic stress were strongly influenced by the interaction of two traits, positive affectivity and carbohydrate craving. Corresponding alterations in striatal monoamine turnover were also found. Conclusively, the two facets of reward sensitivity have a fairly different association with a variety of metabolic and health-related measures, and this relates to stress coping styles. This may explain the variable findings in literature, and suggests that individual differences in reward sensitivity are part of a complex physiological variability, including energy expenditure profiles.

Phosphorylation-Driven Tau–14-3-3 Interactions: Unraveling Their Role in Alzheimer's Disease

Jozef Hritz

Masaryk University, Czech Republic

Over 80% of neuronal microtubule-associated proteins (MAPs) are composed of Tau protein. Tau protein is an intrinsically disordered protein that plays also a key role in Alzheimer's disease (AD). In brains of AD patients, Tau occurs abnormally phosphorylated and aggregated in neurofibrillary tangles (NFTs). Together with Tau, 14-3-3 proteins – abundant cytosolic dimeric proteins – were found colocalized in the NFTs. We aimed to reveal the effects of phosphorylation by protein kinase A (PKA) on Tau structural preferences and provide better insight into the interaction between Tau and 14-3-3 proteins.

Using multidimensional nuclear magnetic resonance spectroscopy (NMR), we unveiled differences in their binding affinity, stoichiometry, and interfaces with single-residue resolution, including proline residues.

In conclusion, we propose quite complex interaction mode between the Tau and 14-3-3 proteins.

Microgliosis and interferon response in the brain of Adar Mavs mutant mice is rescued by Pkr deletion

Valentina Lacovich Strašil

Masaryk University, Czech Republic

Mutations in ADAR1 cause Aicardi-Goutières syndrome, a severe auto inflammatory encephalopathy with aberrant interferon (IFN) induction. Mice lacking Adar1 show aberrant high level of IFN-related proteins and are embryonically lethal. In Adar/Mavs double mutants, the IFN induction is prevented and survival prolonged, making them suitable to investigate Adar1 function. We have analyzed the brain of Adar mutants and found a significant upregulation of IFN response proteins together with activation of astrocytes and downregulation of homeostatic microglial markers. Immunohistochemistry showed morphological changes in microglia and astrocytes, confirming their aberrant activation. In Adar/Mavs/Eif2ak2 triple mutants, aberrant ISG induction and microglia activation are prevented, indicating the key role of Pkr, whose expression is also increased by IFN signaling. Decreased levels of some motor proteins in Adar/Mavs are not rescued by removing Pkr or by preventing its aberrant activation.

The role of mitochondria in cardiovascular disease

Filip Sedlic

University of Zagreb School of Medicine, Croatia

A proper mitochondrial function is maintained by several mechanisms, commonly called mitochondrial quality control (MQC). Mitochondrial unfolded protein response (UPRmt), mitophagy, mitochondrial biogenesis, and mitochondrial dynamics are most important branches of the MQC. We demonstrated that many MQC genes and proteins are downregulated in human failing myocardium. Patients with heart failure with lower expression of UPRmt proteins received heart transplantation earlier in life, suggesting that lower activity of the UPRmt may accelerate heart failure in patients. Inhibition of several UPRmt proteins increased endothelial cell injury in vitro, further suggesting that UPRmt is important for cell survival in stressed cells. Moreover, we also showed that mitochondria in adult cardiomyocytes can transmit calcium and ROS waves that are dependant and independent of the opening of mitochondrial permeability transition pore.

Searching for new sepsis biomarkers

Martin Helán

St. Anne's University Hospital Brno – ICRC, Czech Republic

Sepsis is a clinical syndrome characterized by dysregulated response to infection. It represents a leading cause of mortality in ICU patients worldwide. Although sepsis is in the point of interest of research for several decades, its clinical management and patient survival are improving slowly. Monitoring of the biomarkers and their combinations could help in early diagnosis, estimation of prognosis and patient's stratification and development of new targeted treatment. This presentation recapitulates results of last 7 years of our collaborative translation research in the field. Promising new molecules such as Soluble Endoglin, Hepcidin, Ferritin or different cellular markers on immune cells could have predictive potential in Septic shock, critical Covid-19 and/or post-surgery patients.

Role of Psychosocial Stress in Cardiovascular Risk

Dovilė Karčiauskaitė

Vilnius University – Faculty of Medicine, Lithuania

Epidemiological evidence indicates that is associated with a 40–50% increased risk of developing coronary heart disease. Psychosocial stress exerts its influence on the cardiovascular system through both direct mechanisms, such as hormonal dysregulation, and indirect mechanisms, such as behavioral changes that promote cardiovascular risk factors. However, one of the major challenges in stress research is the absence of a universal, validated tool or biomarker to measure chronic stress effectively.

In our research, we utilized cortisol analysis from scalp hair as a marker of chronic stress exposure. This innovative approach was applied to examine the relationship between stress-related hair steroid hormone levels and cardiovascular disease risk factors. Our findings revealed the association between prolonged glucocorticoid secretion and a higher prevalence of conventional cardiovascular disease risk factors and metabolic syndrome.

Advancing Oncology Care: Integrating Pharmacovigilance, Research, and Education for Drug and Patient Safety

Mate A. Balazs

Semmelweis University, Hungary

The Oncology Unit at Semmelweis University, Department of Internal Medicine and Oncology is a leading breast cancer center in Hungary. The recently established Pharmacovigilance and Patient Safety Research Group is a dynamic initiative with three primary objectives:

Collecting real-world data on novel cancer medicines regarding safety and efficacy and other aspects of clinical oncology;

- Implementing key performance indicators for drug and patient safety in relation to health economy and patient reported outcomes in oncology care;
- Developing protocols and recommendations to improve treatment quality to ensure patient and drug safety.

To have an unequivocally strong base to build a robust research background a Clinical Research Training Program was designed to engage students and early-career researchers in innovative academic studies, facilitating knowledge sharing, improving skills and provide perspectives in terms of clinical research.

Unlocking the Potential of Acylcarnitines: Biomarkers and Modulators in Metabolic Research

Maija Dambrova

Latvian Institute of Organic Synthesis, Latvia

Acylcarnitines, derivatives of fatty acid energy metabolism in mitochondria and peroxisomes, play a vital role in metabolic health and disease. Their plasma concentrations fluctuate significantly between fasted and fed states, revealing key metabolic processes. Elevated levels of diverse acylcarnitines are increasingly evaluated in metabolomic studies exploring disease mechanisms, nutritional states, and therapeutic responses. Altered acylcarnitine profiles are linked to inborn errors of fatty acid metabolism, cardiovascular and neurological diseases, ischemic injury, certain cancers, and drug effects. Acylcarnitines may serve as biomarkers for conditions like insulin resistance, heart failure, and inherited metabolic disorders. Advancing our understanding of acylcarnitine roles and regulation could lead to improved insights into metabolic dysregulation and enable personalized interventions.

Multi-omics analysis as a tool for the discovery of novel candidate molecules with the potential to promote adipose tissue metabolic activity

Livia Petriskova

Biomedical Research Center of the Slovak Academy of Sciences, Slovakia

The pharmacological induction of thermogenesis is a promising strategy to increase energy expenditure. Despite discovering bioactive molecules activating adipose tissue thermogenesis, clinical trials show limited efficacy. This study explores new candidates enhancing thermogenic activity via multi-omics analysis of paired human brown and white adipose tissue biopsies. Brown fat samples, characterized by UCP1 mRNA expression and multilocular lipid droplets, and adjacent white fat were collected from 15 thyroid surgery patients. Transcriptomic, metabolomic, and lipidomic analyses were performed with GO, KEGG, and BioPAN bioinformatics. Functional screening of 100 genes silenced via siRNA in hMADS brown adipocytes assessed mitochondrial respiration. Differentially regulated transcripts, metabolites, and lipids were identified, highlighting mitochondrial lipids in brown fat and glycerolipids in white fat. Pathway analysis revealed potential lipid-processing genes influencing thermogenesis.

Glycemic disturbances and Pregnancy – the window of opportunity for early prevention and personalized medicine

Iuliana Ceausu

University of Medicine and Pharmacy "Carol Davila" Bucharest, Romania

More than ever, in 2025, the importance of pregnancy and glycemic evaluation and control during pregnancy is a part of a much larger picture related to human reproduction problems, quality of life, individualized assessment of health quality, and not the least, "in utero" determination of the adulthood diseases 1. The issues are related to numbers – the decline of birth rates and fertility rates worldwide, to quality of life – the preventable and the postponing of many adult degenerative diseases by early prevention and interventions and to education - for medical staff and women education concerning pregnancy and nutrition, for health policymakers and state politicians, who are more than ever responsible for recognizing social health and preventive medicine an "investment" in human life and future of humanity.

The effect of BCG vaccination and latent infections on clinical progression of sepsis and COVID-19

Kamila Bendíčková

International Clinical Research Center, Czech Republic

Objectives: Several years after the COVID-19 pandemic, the role of trained immunity in COVID-19 remains controversial, and questions regarding the long-term effects of COVID-19 on immune cells remain unresolved. We investigated the roles of Bacillus Calmette–Guérin (BCG) vaccination and latent infections in the progression of COVID-19 and sepsis.

Methods: We conducted a prospective analysis of 97 individuals recovering from mild-to-critical COVID-19 and 64 sepsis patients. Immune cell frequencies, expression of functional markers, and plasma titres of anti-Toxoplasma gondii/cytomegalovirus/BCG antibodies were assessed and their impact on disease severity and outcomes were determined. To examine monocyte responses to secondary challenge, monocytes isolated from COVID-19 convalescent patients, BCG vaccinated and unvaccinated volunteers were stimulated with SARS-CoV-2 and LPS.

Results: Post COVID-19 patients showed immune dysregulation regardless of disease severity characterized mainly by altered expression of activation and functional markers in myeloid (CD39, CD64, CD85d, CD11b) and lymphoid cells (CD39, CD57, TIGIT). Strikingly, post-critical COVID-19 patients showed elevated expression of CD57 in CD8+ T cells compared to other severity groups. Additionally, a higher frequency of CMV and T. gondii seropositive- alongside a lower frequency of BCG seropositive- patients were associated with severe and critical COVID-19. However, the monocyte response to stimulation was unaffected by the severity of COVID-19.

Conclusion: These findings highlight the long-term alterations of immune cells in post-COVID-19 patients emphasizing the substantial impact of COVID-19 on immune function. However, our data showed no relationship between previous BCG vaccination and protection against SARS-CoV-2 infection.

Skeletal muscle: a central nexus of metabolism and endocrinology

Sergej Pirkmajer

University of Ljubljana, Faculty of Medicine, Ljubljana, Slovenia

Skeletal muscle, an essential force-generating tissue, maintains posture, powers movement, and enables life-sustaining respiration. As a quintessential converter of chemical energy into mechanical work, it is a genuine *machina carnis*. A Herculean organ, intricately linked to strength and violence in human imagination and art. None of this could be surmised from its Latin name *musculus*, which paradoxically means a "little mouse". The diminutive term, of uncertain etymology, may not seem particularly appropriate for the largest tissue in the body, but perhaps it inadvertently suggests that muscle is more than meets the eye. Indeed, it is the largest reservoir of proteins and potassium, an important metabolic tissue, and a major site of hormonal action. As well as receiving signals that regulate its metabolic responses, skeletal muscle is itself a source of myokines and other signal transmitters that drive metabolism in a variety of organs. Shedding further light on the regulation of muscle metabolism and endocrine function has been a major focus of our fundamental research programme (P3-0043) as well as the MyoCRINE (J7-3153) and NeuroMyo (J7-60125) research projects, funded by the Slovenian Research and Innovation Agency.

Electroporation in cardiac treatments: from ablation to gene delivery

Lea Rems

University of Ljubljana, Faculty of Electrical Engineering, Tržaška cesta 25, 1000 Ljubljana, Slovenia

Electroporation involves brief exposure of cells or tissues to short, high-intensity pulsed electric field that creates nanoscale defects/pores in cell membranes. Depending on the electric field strength, this enables one to transiently permeabilize the cells without affecting their viability (reversible electroporation), or induce cell death due to loss of homeostasis (irreversible electroporation). Reversible electroporation serves as the basis for enhancing cellular uptake of therapeutic molecules, while irreversible electroporation enables nonthermal tissue ablation. In recent years, irreversible electroporation has achieved significant success in cardiac tissue ablation for treating atrial fibrillation, demonstrating a better safety profile and efficiency compared to existing thermal ablation methods. Ablation of ventricles for treating ventricular tachycardias is currently under development. Additionally, there is potential for using electroporation in cardiac gene therapy, particularly for promoting cardiac muscle regeneration following myocardial infarction. This lecture will provide an overview of current medical applications of electroporation with emphasis on cardiac treatments, and discuss our ongoing efforts within the scope of an ERC-StG project to understand the fundamental mechanisms of how electroporation affects cardiomyocytes and their electrophysiology, as well as to advance electroporation for cardiac gene therapy.

Alliance4Life Virtual Research Centre

Alliance4Life Virtual Research Centre

The Alliance4Life Virtual Research Center (VRC) is a collaborative platform for scientists and researchers from partner institutions to exchange knowledge, initiate joint projects, and develop new research directions. The VRC provides structured opportunities for cross-institutional collaboration, skill-building, and resource sharing within the life sciences community.

Governance Structure

The VRC operates under a rotating directorship to ensure shared leadership and diversity of perspectives. The director is elected every three years by the Alliance4Life Board. The current VRC Director is Associate Professor Sergej Pirkmajer from the University of Ljubljana, serving a term until 2028.

Each research department within the VRC also has a dedicated head, who is responsible for driving and organizing collaboration activities, such as webinars, mini-conferences, and collaborative grant proposals.

Evolving Research Focus

The VRC is designed to grow with the needs of its scientific community. If a member of Alliance4Life wishes to establish a new research department, they can submit a New Department Application Form available on the website. Upon approval by the Alliance4Life Board, the department will be officially established, and a director will be appointed to lead its collaborative efforts.

What can you expect?

As a VRC member, you will have access to scientific events, funding opportunities, and collaboration programs, including:

Scientific Activities & Events

Mini-Conferences – Annual in-person events where VRC members and external collaborators present their latest findings, fostering new research partnerships.

Webinars & Scientific Meetings – Regular virtual discussions led by department directors, featuring expert speakers and panel discussions on emerging topics.

Journal Club – Interactive sessions where members discuss recent publications with authors and experts, promoting knowledge exchange across research areas.

Virtual Courses for PhD Students – Online skill-building courses designed for early-career researchers, led by senior experts within the VRC.

Collaboration & Opportunities

Seed Fund – A funding program supporting small-scale collaborative projects, with mentorship from department directors to guide early-stage research initiatives.

Open Access to Research Infrastructure – Shared access to laboratory facilities, databases, and specialized tools across VRC departments to enhance research capabilities.

Job Vacancies – A network-driven platform for sharing open research positions within the Alliance4Life community.

Resources & Knowledge Sharing

Publications & Reports – Access to downloadable scientific papers, policy briefs, and project reports.

Templates & Guidelines – Presentation templates, grant writing guides, and event planning materials to support research and communication.

Data Sharing & GDPR Compliance – Best practices and guidelines for secure data sharing and ethical collaboration.

Societal Engagement

Patient & Professional Associations – Members are encouraged to connect with patient organizations and professional bodies, ensuring that research aligns with societal needs.

Advisory Group Involvement – Opportunities to engage patient representatives in the research process through advisory roles, strengthening the real-world impact of scientific work.

Joining the VRC

Become a member

Active scientists and researchers from Alliance4Life partner institutions are invited to become members of existing VRC departments. Members are expected to contribute by participating in discussions, engaging in collaborative projects, and attending events.

As the platform is currently in its alpha phase, early members will:

Receive regular updates and newsletters featuring events, funding opportunities, and research resources.

Gain early access to the beta version of the VRC platform, helping to shape its future functionality and features.

To maintain the quality of the network, all applicants undergo a scientific credibility review before joining.

Establish a new department

The VRC is designed to evolve with the needs of its researchers. If an important area of life sciences is not yet covered, members have the opportunity **to establish a new Virtual Department**.

To maintain the quality of the network, all applicants undergo a scientific credibility review before joining.

If you want to know more, become a member, or create a new department scan the QR code:

Current VRC departments

The VRC currently has three departments, but this is only the starting point and we hope to have many new departments soon.

Cardiovascular Diseases

Head: *Associate Professor Filip Sedlić, University of Zagreb School of Medicine*

The virtual Department of Cardiovascular Diseases is dedicated to advancing research on the mechanisms, diagnosis, and treatment of heart and vascular conditions. Researchers within this department focus on a range of topics, including myocardial regeneration, early detection of cardiovascular risks, and the development of personalized treatment strategies. Collaborative projects have included multi-center clinical trials and AI-driven analysis of cardiovascular health data. A key priority of this department is to foster cooperation with patient associations to better understand patient needs and raise awareness about cardiovascular health across the Alliance4Life community.

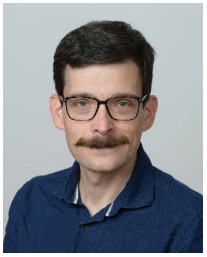
Neurobiology

Head: *Associate Professor Jernej Jorgačevski, University of Ljubljana, Faculty of Medicine*

The virtual Department of Neurobiology at the Alliance4Life Virtual Research Center focuses on understanding the structure and function of the nervous system, with a particular emphasis on neurodegenerative diseases, cognitive processes, and neural repair mechanisms. Researchers collaborate to explore molecular and cellular mechanisms underlying conditions such as Alzheimer's and Parkinson's diseases, with the goal of identifying biomarkers and potential therapeutic interventions. Advanced technologies like optogenetics, functional MRI, and neural network modeling are used to study brain activity and behavior. The department also explores interdisciplinary collaborations with data science and AI specialists for large-scale brain data analysis.

Metabolism and endocrinology of skeletal muscle

Head: *Associate Professor Sergej Pirkmajer, University of Ljubljana, Faculty of Medicine*



The virtual Department of Metabolism and Endocrinology of Skeletal Muscle focuses on skeletal muscle as a major metabolic tissue, a target for metabolic hormones, and a source of signaling molecules such as myokines. Researchers study the impact of metabolic disorders, including diabetes and obesity, physical inactivity, and aging on skeletal muscle, as well as its role in whole-body metabolism in both health and disease. The overarching goal is to translate fundamental findings into therapeutic strategies for conditions such as diabetes, metabolic syndrome, and sarcopenia. Collaborative efforts with other departments of the virtual research center, professional organizations, and patient associations ensure a multidisciplinary and holistic approach to tackling these complex health challenges.

Alliance4Life

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