



Photo: Balázs Papdi

8-9.  
April  
2021  
Szeged

# XVI. MEETING OF NOBEL LAUREATES AND TALENTED STUDENTS

A joint program of the Foundation for the Future of Biomedical Sciences in Szeged, the University of Szeged and the Biological Research Centre Szeged



**SZEGEDI TUDÓS AKADÉMIA**  
**SZEGED SCIENTISTS ACADEMY**

# PROGRAM

08 April 2021

Thursday

**08.30–08.35 OPENING**

**08.35–09.40 SÁNDOR BÁN: THE CELL DIVISION**

**09.40–10.40 BROADCASTING OF A LABORATORY PRACTICE RECORDED  
IN SZTE PRIMARY AND SECONDARY GRAMMAR SCHOOL  
SZEGED**

*Led by István Csigér, Szent-Györgyi senior teacher*

**10.40–10.50 BREAK**

**10.50–11.50 PRESENTATION OF THE SZENT-GYÖRGYI STUDENTS**

*(in English)*

**Noémi Vida:** *Modeling VV-ECMO induced inflammatory  
reaction in large animal*

**Leó Asztalos:** *When less is more - generalist HLA alleles and  
antitumor immunity*

**Dávid Tóth:** *Analysis of SARS-CoV-2 and mAtg8 proteins  
interaction in MCF-7 cells*

**Suzina Gyulai-Nagy:** *Multiple roles of exosomes in cell  
migration*

**Roland Fejes:** *Sepsis and therapy - from impaired  
mitochondria to multiorgan failure*

**11.50–13.00 INTERACTIVE TASKS FOR THE SZENT-GYÖRGYI PUPILS**  
*(upon preliminary assignment)*

**08.30–11.10 PLENARY SESSION** *(in English)*

**08.30–08.40** Dr. János Szabad: *Introduction of Dr. Tim Hunt*

**08.40–09.10** Dr. Tim Hunt: *Some lessons from a life in science: How the discovery of single facts can illuminate distant areas, hitherto dark*

**09.10–09.40** Live discussion, questions

**09.40–09.50** Break

**09.50–10.10** Dr. Péter Hegyi: *Introduction of the Szeged Scientists Academy*

**10.10–10.30** Sándor Bán: *Introduction of the secondary school educational program of the Szeged Scientists Academy*

**10.30–10.45** Szent-Györgyi Pupil 2021 Excellence Award Ceremony, presentation of the Awardee

**Botond Szikra:** *Ecological experiments, and the carbon fixation in plants*

**10.45–11.10** Talent Prize 2021 Award Ceremony, presentation of the Awardee

Parallel program:

**09.50–10.40** Closed discussion of the Szent-Györgyi Students with Dr. Tim Hunt

**11.10–10.20 BREAK****11.20–12.30 THE 75<sup>TH</sup> ANNIVERSARY OF ALBERT SZENT-GYÖRGYI'S NOBEL PRIZE AWARD CONFERENCE**

*(summary video of the conference held on 22-25 March 2012, welcoming 9 Nobel laureates in Szeged)*

# LECTURE ABSTRACTS

In the sequence of performance

## NOÉMI VIDA

### **VV-ECMO induced inflammatory reaction in large animal**

Extracorporeal membrane oxygenation (ECMO) is usually used as an intensive care therapy method, when the lungs or the heart as well requires external help to restore normal oxygenation. Our main goal in this experiment was to analyse the process of deterioration of microcirculation and mitochondrial functions in a clinically relevant large animal model. We would like to map out the exact pathomechanism behind ECMO induced inflammation in the clinical setting. Examining these components would lay down the foundation of a novel therapy's development, which could aid the protection of organ barriers during ECMO usage. We created a large animal model, which can endure a 30-hour anaesthesia and is susceptible to represent ECMO induced inflammatory responses. With the data gained we can demonstrate the decline in microcirculatory activity and worsened mitochondrial function, thus the decreased function in mucous membrane barrier through time.

## LEÓ ASZTALOS

### **When less is more - generalist HLA alleles and antitumor immunity?**

The immune system is fundamental in eliminating pathogens and tumorous cells. Our research group investigates the HLA molecules, which play a central role in immune recognition. These molecules present protein-sequences to the immune system, which can be from pathogens, mutated tumour proteins or harmless proteins from our own cells. There are many different HLA molecules, therefore two individuals potentially carry different variants. The different HLA variants can present different protein-sequences, and this genetic variability affects how susceptible we are to infectious, autoimmune and tumorous diseases. During our research we noticed an interesting phenomenon: In tumours it is not always beneficial if the HLA molecules present many different mutant proteins. Contrary, in this case the anti-tumor immune response of these patients is insufficient. Our results can help to decide which patients will potentially respond to immunotherapy and which ones should be treated with other therapies.

## DÁVID TÓTH

### **Analysis of SARS-CoV-2 and mAtg8 proteins interaction in MCF-7 cells**

The members of Nidovirales order (MHV, SARS and MERS) form double-membrane vesicles (DMVs) in infected cells and isolate replication-transcription complexes, thus using host cell membranes for their own replication. The mAtg8 is a key protein of DMVs formation. The mAtg8 interactor proteins connect to mAtg8 through LIR motif.

Our overarching aim was to identify novel host factors that may interact with SARS-CoV-2 proteins and to understand the biological importance of LIR motifs on SARS-CoV-2 proteins.

10 LIR motif containing SARS-CoV-2 proteins were predicted with databases and software. The predicted proteins were expressed with marked mAtg8 proteins and endogenous mAtg8.

Most of the predicted interactions via bioinformatics approaches were experimentally testified with microscopy. One of the coronavirus proteins formed membrane rearrangements (so-called edemosomes). Our analysis characterized the mechanism and regulators of this phenomenon.

## SZUZINA GYULAI-NAGY

### **Multiple roles of exosomes in cell migration**

Intercellular communication is crucial in the survival of multicellular organisms, which can be mediated by the intercellular transport of exosomes. The exosomes are phospholipid-bilayered extracellular vesicles with diameter of 20-100 nm, and they modulate cell migration.

In our experiments, we used myoblasts (skeletal muscle cells) and carried out live-cell microscopy, we isolated exosomes, studied their uptake, and performed super-resolution microscopy. We analysed the images by several image analysis programmes. The migration parameters were significantly increased by the isolated exosome fraction; furthermore, the exosomes are taken up by the myoblasts and they show polarized intracellular distribution in the migrating cells.

Our observations could also describe the migration of other cell types, while the exosomes may have potential clinical application.

## ROLAND FEJES

### **Sepsis and therapy - from impaired mitochondria to multiorgan failure**

A szepszis mai tudásunk szerint egy igazolt, vagy feltételezett fertőzés. According to the latest definition, sepsis is dysregulated host response caused by a confirmed or suspected infection leading to multiple organ failure (MOF). This condition associated with tissue hypoxia might originate from the mitochondrial-microcirculatory dysfunction syndrome (MMDS), where the oxygen delivery and consumption are deteriorated. Proper therapy for sepsis is still a global challenge for medicine, so there is an increase on demand on MMDS- and MOF-targeted treatments. Our research team developed therapeutic strategies that can directly or indirectly affect MMDS and MOF by inhibiting-activating molecules present in endogenous regulatory system (kynurenic acid) and microcirculatory regulatory receptors (endothelin-1). In our experiments we use a septic rat model, in which the microcirculation is examined by real-time video-microscope imaging, the mitochondrial respiration is measured by high-resolution respirometry, and the severity of MOF is evaluated with a scoring system developed by our team.

## BOTOND SZIKRA

### **Ecological experiments, and the carbon fixation in plants**

In 2019 I had to conduct a small ecology research for Kitaibel Pál Biology Competition, and while I was walking by some construction sites, I was wondering what kind of plants could endure such harsh circumstances. So I did my research on the flora of these sites. I counted the species, in order to calculate their diversity. I also measured the pH and nitrate concentrations in the soil of the construction sites, and the particulates in the air. I had read about the fact that stress increases the free amino acid concentrations in plants, and I tried to show this effect with TLC. The durability of plants had arisen my interest for their adaptation to different climates. In the second half of my presentation, I will talk about the different carbon-dioxide incorporation pathways, such as the C3, C4 and CAM mechanisms.

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and talented students:



Szeged Megyei Jogú Város



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