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1st International Doctoral Workshop  
on Natural Sciences **2012**  
University of Pécs



**PROGRAM**

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# WELCOME

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## Dear Participants!

I am delighted to organize the 1st IDWoNS / UP and to announce that this conference received high interest. This also proves that organizing such a meeting is fully justified and helps to fill a gap. Since the beginning of my PhD studies I have had the idea that similarly to the Student Research (TDK) conference a meeting should be organized for PhD students where they can share their thoughts and experiences with each other. Later I got carried away and asked why couldn't it expand to all natural sciences and why couldn't it be an international conference.

I am pleased that we also received applications from foreign countries, especially from Osijek.

Interdisciplinarity is highly important! Although there has been a number of common research projects and collaborations between faculties, universities and doctoral schools, we hope that the current meeting will help to establish new collaborations. I would like to grab this opportunity to announce the Interdisciplinary Doctoral Student Conference (IDK2013) organized by the Doctoral Student Association of The University of Pécs, which will be held next Spring and will be also international with participation of most scientific fields.

I would like to thank Professor Koller for the continuous encouragement, support and help he provided me with.

Fortunately, we were able to win some grants for the conference, from which we will hopefully be able to provide all participants with a high-quality conference. Thank you very much for the support.

Because of the high number of applications, unfortunately many oral presentation requests had to be rejected, but next we will try to schedule two whole days for the meeting to accommodate more speakers. Meanwhile, I honestly hope that it will be worth to participate in the workshop also without giving a presentation.

There were many requests for an option for TDK students to present their work as an oral presentation. This year we could not make this happen, but next year we will dedicate a section to promising TDK students, as they are potentially the new generation of PhD students.

I want to thank everyone who helped and contributed to the success of the workshop.

I wish that we will be able to learn from each other and that many new friendships and collaborations will be established. Hopefully, the wine tasting and dinner in Villány will also help us to reach these goals.



Zsolt Springó M.D.

## President of the Workshop

Doctoral Student Association of the University of Pécs  
Vice President



# WELCOME

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## Dear PhD students!

It is my great pleasure to welcome you at 1<sup>st</sup> International Doctoral Workshop on Natural Sciences of the University of Pécs (1st IDWoNS / UP). I hope this will be an exciting, unique and annual event.

It is important to emphasize that most of the organization was done by the members of the *Doctoral Student Association of The University of Pécs*. This is also reflected by the program of the workshop, in which many Faculties of the University are represented by the participants. Also, several foreign PhD students - especially from Croatia - are presenting their scientific results.

At the first time in the University of Pécs, the posters will be presented in electronic form (E-posters): projected, instead of printed. I believe this is the future, because it is easier, more flexible and allows more interactions of the minds.

The main purpose of this workshop is to learn to question and discuss the results obtained in the laboratories. Thus please, doubt, ask questions, argue and be brave to disagree. Without these mental activities, there is no scientific advancement. Perhaps, this is the most important knowledge you have to obtain during your PhD education!

I wish you all great workshop!



Akos Koller  
Vice Dean for Scientific Affairs  
Medical School  
University of Pécs  
Chief Patron of the Workshop



## ORGANIZERS

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### ORGANIZER COMMITTEE

- Head organizer:** Zsolt Springó M.D.
- Members:** Renáta Cseharovszky M.D.  
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János Garai M.D. Ph.D.  
András Garami M.D. Ph.D.  
Dóra Gunszt  
Ivan Ivić  
Ákos Koller M.D. Ph.D. D.Sc.  
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Gábor Maász Pharm.D.  
Zoltán Németh  
István Szabó M.D.  
Zoltán Vámos M.D.
- Assistant organizers:** Ádám Avas  
Anna Stalzer

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Róbert Gábrriel Ph.D. D.Sc.
- Members of the speakers evaluation committee:**  
Péter Cséplő M.D.  
András Garami M.D. Ph.D.  
Róbert Mátics Ph.D.

### POSTERS EVALUATION COMMITTEE

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János Garai M.D. Ph.D.
- Members of the posters evaluation committee:**  
Renáta Cseharovszky M.D.  
Gábor Maász Pharm.D.  
Márta Wilhelm Ph.D.

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## CHAIRPERSONS

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András Garami M.D. Ph.D.  
Dóra Gunszt  
János Hamar M.D. Ph.D.  
Zsuzsanna Helyes M.D. Ph.D. D.Sc.  
Ákos Koller M.D. Ph.D. D.Sc.  
László Márk Ph.D.  
László Molnár Ph.D.

### **Chairpersons of the E-Poster sessions:**

Márta Balaskó M.D. Ph.D.  
János Garai M.D. Ph.D.  
Endre Sulyok M.D. Ph.D. D.Sc.  
Márta Wilhelm Ph.D.

## PLENARY SPEAKERS

Zoltán Bachman DLA Ph.D.  
Ines Drenjančević-Perić M.D. Ph.D. D.Sc.  
Róbert Gábrriel Ph.D. D.Sc.  
István Kistelegdi jr. DLA  
László Molnár Ph.D.

## GENERAL INFORMATION

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<b>Venue:</b>	Szentágothai Research Center (Science Building) Building B, Room B001 7624 Pécs, Ifjúság útja 20., <i>GPS: 46.0757,18.2035</i>
<b>Date:</b>	October 3, 2012 (Wednesday)
<b>Official language:</b>	English
<b>Registration desk and hours:</b>	In front of Room B001 9:00-18:30
<b>Scientific program:</b>	Six plenary lectures, four symposia and three E-poster sessions
<b>Oral presentations:</b>	Presentation facilities: laptop computer, video projector, MS Office PowerPoint.  If you are a speaker, please give your presentation material in a MS PowerPoint format to the technical assistant in the lecture hall in the morning before the registration starts. We can only accept CD-ROMs or USB memory stick or flash drives.
<b>E-poster presentations:</b>	Presenters are kindly requested to upload their E-poster files in the morning before the registration period starts.  The posters will be displayed during the whole day in front of Room B001.
<b>Ph.D. credit points:</b>	Ph.D. students can earn credit points by passing an optional multiple choice written test exam at the end of the meeting.
<b>Meals:</b>	Lunch will be provided to registered participants at the congress venue.
<b>Internet access:</b>	Free wireless internet access will be provided during the conference.
<b>Social event:</b>	Dinner: Gere Attila Winery (Villány, Diófás sq. 4-12.) Exclusive wine tasting. Tentative return time to Pécs is around Midnight, but it also depends on the mood of the participants.

## DETAILED PROGRAM

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### Wednesday – October 3, 2012

8:00 - 9:00      Uploading posters and presentations

9:00 - 18:30     Registration

10:00 - 10:15

#### **Opening talks**

Ákos Koller *Vice Dean, PTE ÁOK*

József Bódis *Rector, University of Pécs*

Attila Miseta *Dean, PTE ÁOK*

Dóra Gunszt *PTE DOK president*

Péter Fülöp *DOSz presidency member*

János Erostyák *Vice Dean, PTE TTK*

Imre Boncz *Vice Dean, PTE ETK*

#### **Session 1**

**Chairs: Ákos Koller, Dóra Gunszt**

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10:15 - 10:30

#### **Zoltán Bachman**

**(A-01)**

Rolling Stones – Science Building in Pécs

10:30 - 10:45

#### **István Kistelegdi jr.**

**(A-02)**

Energydesign technologies in the Szentágotthai Research Centre

10:45 - 11:05

#### **Ines Drenjančević-Perić**

**(A-03)**

The effects of hyperbaric oxygenation on cerebral vascular function of diabetic rats

11:05 - 11:15

*Coffee break*

#### **Session 2**

**Chairs: László Márk, Ana Čavka**

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11:15 - 11:30

#### **László Molnár**

**(A-04)**

Brain regeneration in earthworms: an old story with new approaches

11:30 - 11:42

#### **Monika Avdicevic**

**(O-01)**

Gene expression levels of different drug transporters in human NSCLC cell lines

## DETAILED PROGRAM

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- 11:42 - 11:54 Viktor Bagdán (O-02)  
Electronic device for preventing hearing-loss
- 11:54 - 12:06 Judit Bátor (O-03)  
Pro-apoptotic and pro-survival effects of sodium nitroprusside in PC12 cells expressing a dominant inhibitory RasH protein
- 12:06 - 12:18 Éva Borbély (O-04)  
Role of hemokinin-1 in murine adjuvant-induced joint and lung inflammation
- 12:18 - 12:30 Anita Ósói (O-05)  
Oxidative stress in Sprague-Dawley healthy rats that underwent hyperbaric oxygenation
- 12:30 - 12:42 Bence Cselik (O-06)  
„Fatness or Fitness”: Health-Image and Health Strategy in Elementary Schools

12:45 - 13:15 *E-Poster session 1 (with complimentary refreshments)*

### **E-Poster session 1      Chairs: János Garai, Márta Wilhelm**

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- 12:45 - 13:15 Simon Armbruszt (P-01)  
Cocaine- and amphetamine-regulated transcript (CART) peptide immunoreactivity in feeding- and reward-related brain areas of CCK-1 receptor-deficient rats
- Gábor Horváth (P-02)  
Pituitary adenylate cyclase activating polypeptide (PACAP) decreases locomotor behavior in female rats
- Eszter Bánki (P-03)  
Actions of PAC1, VPAC1/VPAC2 receptors on cell bodies and peripheral terminals of primary sensory neurons
- Katalin Csanaky (P-04)  
Examination of PACAP38 in different milk and infant formula samples and PAC1-receptors in mammary gland

## DETAILED PROGRAM

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13:15 - 14:00 *Lunch*

14:00 - 14:40 *E-Poster session 2 (with complimentary refreshments)*

### **E-Poster session 2      Chairs: Endre Sulyok, Márta Balaskó**

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14:00 - 14:40      Zsolt Cselik (P-05)  
Quantitative magnetic resonance imaging of intervertebral disc damage by laser irradiation

Alexandra Cselkó (P-06)  
Differences in physical and psychological performances among male handball players by positions

Tímea Balassa (P-07)  
Enzyme- and lectin-histochemical characterization of cellular compartments in the primary and secondary lymphoid organs of the zebrafish (*Danio Rerio*)

Éva Tékus (P-08)  
The effect of the sympathetic nervous system and dehydration on salivary lactate concentration

### **Session 3      Chairs: Zsuzsanna Helyes, László Molnár**

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14:40 - 15:00      Róbert Gábor (A-05)  
Retinal degenerations

15:00 - 15:12      Zsófia Hajna (O-07)  
Hydrogen-sulphide (H<sub>2</sub>S)-induced CGRP-release and cutaneous vasodilatation are mediated by Transient Receptor Potential Ankyrin 1 (TRPA1) receptors

15:12 - 15:24      Mónika Kaj (O-08)  
Immobility stress – How has the health-related fitness status changed in the Hungarian young adults in the last decades?

## DETAILED PROGRAM

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- 15:24 - 15:36 Gergely Karsai (O-09)  
Polarity and single cell anatomy of peptidergic CCAP neurons in the *Drosophila melanogaster* larva
- 15:36 - 15:48 Zoltán Kellermayer (O-10)  
MAdCAM-1 independent lymphocyte homing to GALT of Nkx2.3-/- mice
- 15:48 - 16:00 András Kiss (O-11)  
Fabrication of a new, solid contact Mg<sup>2+</sup> ion-selective electrode, and its application in Scanning Electrochemical Microscopic corrosion studies
- 16:00 - 16:12 Edit Kiss (O-12)  
Wnt signalling in non-small cell lung cancer
- 16:12 - 16:24 Péter Kóbor (O-13)  
Receptive field properties of colour selective neurones in the cat lateral geniculate nucleus

16:30 - 17:00 *E-Poster session 3 (with complimentary refreshments)*

### **E-Poster session 3      Chairs: János Garai, Márta Wilhelm**

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- 16:30 - 17:00 Zsuzsanna Őri (P-09)  
Plant tissue based biosensor with improved sensitivity. Dopamine determination under optimized working conditions.
- Dániel Kánnár (P-10)  
Theoretical investigation of the ion diffusion on graphene surface controlled by external electric field
- Zsolt Vági (P-11)  
We spending money for health with pleasure, but what about expensive food? The price of olive oil and the consumers' opinion
- Filotás Dániel (P-12)  
In vivo electrochemical H<sub>2</sub>S detection

## DETAILED PROGRAM

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### Session 4

**Chairs: János Hamar, András Garami**

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- 17:00 - 17:12 Tamás Kovács (O-14)  
The functional test of Wnt proteins
- 17:12 - 17:24 Yin Li (O-15)  
Effect of the molecular environment on the complex formation of a crown ether derivative with alkali metal ions
- 17:24 - 17:36 Szimonetta Lohner (O-16)  
Vitamin D status in Hungary – novel evidence for supplementation
- 17:36 - 17:48 Péter Nagy (O-17)  
Do we have evidence that the prevalence of childhood overweight and obesity is plateauing?
- 17:48 - 18:00 Sanja Novak (O-18)  
Influence of hyperbaric oxygen treatment on vascular gene expression in healthy Sprague-Dawley rats
- 18:00 - 18:12 Valéria Tékus (O-19)  
Transient Receptor Potential Vanilloid 1 (TRPV1), but not Ankyrin 1 (TRPA1) ion channels mediate mustard oil-induced hyperalgesia in mice
- 18:12 - 18:24 Ivan Ivić (O-20)  
Aging-induced structural changes in arteries. Role of collagen and laminin isoforms
- 18:24 - 18:30 Ákos Koller – Closing remarks**
- 18:30 - 18:45 Written test exam for credit points (optional)

### Evening

**Get-together party**

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- 18:45 Departure to Villány
- 24:00 Tentative return to Pécs
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## A-01

### **Rolling Stones – Science Building in Pécs**

Zoltán Bachman

*Breuer Marcell Doctoral School, Pollack Mihály Faculty of Engineering and Information Technology, University of Pécs, Pécs, Hungary*

## A-02

### **Energydesign technologies in the Szentágotthai Research Centre**

István Kistelegdi jr.

*Energydesign Department, Pollack Mihály Faculty of Engineering and Information Technology, University of Pécs, Pécs, Hungary*

## A-03

### **Retinal degenerations**

Róbert Gábrriel

*Department of Experimental Zoology and Neurobiology, Faculty of Sciences, University of Pécs, Pécs, Hungary*

Environmental information reaches our body through sensory systems out of which vision delivers close to 80% in resting state. The retina executes the first steps of visual processing; its degeneration may lead to major limitations of our social activity.

Retinal disorders can be of genetic origin or metabolic alterations that reach pathological levels. For both types of disorders several experimental animal models have been developed. The most commonly diagnosed genetic disorders are retinitis pigmentosa and microphthalmia. The former condition attracted great attention in the last 10 years. While the former condition can clearly be linked to mutations in rod photoreceptors, the latter condition is more diverse genetically: *microphthalmia* turned out to be a highly interesting locus because of its pleiotropic effects on unrelated tissues such as the retinal pigment epithelium, melanocytes and bones.

Many studies have been performed to reveal the underlying

mechanisms of metabolically induced retinal degenerations. Excitotoxicity models may be useful in mimicking glaucoma cases. Prolonged retinal ischemia (modeled by e.g. bilateral carotid artery occlusion) leads to several disease conditions ranging from ischemic retinopathy to age-related macular degeneration. Retinal neovascularisation which is a major pathologic event in type I diabetes can also be induced experimentally in animals.

### A-04

#### **Brain regeneration in earthworms: an old story with new approaches**

Laszlo Molnar<sup>1</sup>, Balint Horvath<sup>2</sup>, Pollák Edit<sup>1</sup>

<sup>1</sup>*Department of General Zoology, University of Pécs, Hungary*

<sup>2</sup>*Department of Pathology, University of Pécs, Hungary*

By means of conventional light and electron microscopy and whole mount immunocytochemistry the shape and size further the pattern of GABAergic landmark structures of the extirpated and the renewed earthworm brain were investigated. If one of the circumpharyngeal connectives (CCs) was cut through and the other one cauterized during the brain extirpation an absolutely asymmetric brain regenerated: neither its size and shape nor GABA labelling were not identical with the excised brain. At the cut side approximately a normal size hemiganglion at the cauterized side a significantly smaller one regenerated. In the cauterized CC neither GABA immunoreactive neurons nor migrating undifferentiated cells were found. However, its diameter often increased up to twofold of the original size because of the axon swelling as the consequence of the blocked axonal transport. These findings suggest that the dedifferentiation of central neurons and their migration along the ventral nerve cord pathways do not contribute to the brain regeneration. In contrast the elaboration of neuroactive substances (transmitters, neurohormones, growth factors) from the central nervous system via the CCs could mediate the migration and attachment of earthworm stem cells (neoblasts) to the cut surface of CC and could mediate their differentiation to neuronal, glial, muscular and connective tissue cells resulting the formation a new brain and its capsule.

### A-05

#### **The effects of hyperbaric oxygenation on cerebral vascular function of diabetic rats**

Ines Drenjančević-Perić

*Dept of Physiology and Immunology, Medical Faculty University Josip Juraj Strossmayer, Osijek, Croatia*

Untreated diabetes mellitus leads to many vascular complications, e.g. microangiopathy and macroangiopathy, while diabetic patients have higher risks of developing stroke. Inhibition of 20-HETE and/or increasing of epoxyeicosatrienoic acids (EETs) levels may decrease cerebral damage following stroke. Hyperbaric oxygenation (HBOT) is widely used clinical treatment for various ischemic injuries but is still experimental in treatment of stroke. Underlying cellular and molecular mechanisms of HBOT by affecting vascular function are still not known completely. Our recent studies in diabetic rats showed significantly reduced dilation of cerebral resistance vessels in response to reduced  $pO_2$  and ACh, which is restored with HBOT, possibly mediated by effect of CYP450-epoxygenases' vasodilating metabolites EETs on  $K_{ATP}$  channels. In addition, our data on mRNA expression showed up-regulation of CYP4A3 and CYP450-epoxygenase genes in cerebral blood vessels in diabetic rats treated with HBOT, and increased protein expression of CYP4A1, CYP4A2 and CYP4A3. The latest two share 97% homology, and both are known to catalyze arachidonic acid  $\omega$ -hydroxylation and 11,12-epoxidation thus promoting not only vasoconstriction, but also vasodilation.

Taken all together, these results demonstrate that HBOT promotes protection of vascular function by changing mRNA and protein expression, and subsequently, restoring dilation of cerebral vessels, thus improving cerebrovascular function and tissue perfusion in diabetes mellitus by affecting several enzymatic pathways, most prominently CYP450 hydroxylases and epoxygenases.

### O-01

#### **Gene expression levels of different drug transporters in human NSCLC cell lines**

M. Avdicevic<sup>1</sup>, V. Csongei<sup>2</sup>, T. Kovacs<sup>2</sup>, E. Kiss<sup>2</sup>, J. Rapp<sup>2</sup>, J.E. Pongracz<sup>2</sup>

<sup>1</sup>*University Hospital Centre Osijek, Scientific Unit, Huttlerova 4, HR-31300 Osijek*

<sup>2</sup>*University of Pecs, Medical School, Szigeti ut 12, 7624 Pecs*

Drug transporters are membrane proteins involved in all aspects of drug up-take and function. As such they are potential therapeutic targets. In recent years an enormous progress has been made in understanding the role of drug transporters in kidney, intestine, liver and brain. In contrast, little is known about the role of drug transporters in the lung. Even less is known about drug transporters in pulmonary diseases and their potential role in developing resistance to therapy.

Our first results have been gained with qPCR from 2D cell cultures of lung adenocarcinoma (A549 and H2122) and squamous cell lung carcinoma (H157 and H520) cell lines. A marked decrease of Organic Cation Transporter SLC22A3 gene expression in squamous cell carcinoma and of Organic Anion Transporter Polypeptide SLCO4C1 gene expression in adenocarcinoma have been detected. Further experiments are on their way to confirm the above data in primary tumour samples and investigate the functional role of the above transporters in lung epithelium.

### O-02

#### **Electronic device for preventing hearing-loss**

Viktor Bagdán<sup>1</sup>, Kálmán Máthé<sup>2</sup>, László Czimerman<sup>2</sup>, József Pytel M.D.<sup>3</sup>

<sup>1</sup>*Department of Health Sciences Doctoral School, University of Pécs, Hungary;*

<sup>2</sup>*Mihály Pollack Department of Engineering and Information Technology, University of Pécs, Hungary;*

<sup>3</sup>*Medical School Department of Otorhinolaryngology, Head and Neck Surgery, University of Pécs, Hungary*

Background: The nowadays wide-spreading MP3 and MP4 players,

## ORAL PRESENTATION ABSTRACTS

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powerful Class-D headphone amplifiers can cause hearing-loss due to the continuous high sound pressure level.

Challenge: To prevent hearing-loss, to create a simple electronic module which can raise the sensation of volume, without raising the sound pressure level (SPL), and without modifying the tone and sound character.

Brief description: The invention is related to the medical and health sciences.

It is a simple electronic module, which modeling the distortion of human ear, and produce natural sound experience with low sound pressure level (SPL). The device can raise the sensation of volume with low SPL and without changing the full range frequency response. The amplification method affects advantageously the SPL/Sound Perceptual ratio.

Selected Applications: The module can be used advantageously in hearing aids, because it can bring back the sensation of higher frequencies. The module can be used in every electronic device, where the sound amplification is desired (headphone amplifier, sound amplifier, PA-systems)

Development status: Development of prototype is finished. We are planning medical examination and tests in humans, to determine the best adjustments. We have to determine also the transfer function of human ear in non-linear basis.

IP Status: Patent pending.

*Key words: hearing-loss, hearing-aid, ear distortion, non-linear transfer function, sensation of volume*

### O-03

#### **Pro-apoptotic and pro-survival effects of sodium nitroprusside in PC12 cells expressing a dominant inhibitory RasH protein**

Judit Bátor, Judit Varga, József Szeberényi

*Department of Medical Biology, Medical School, University of Pécs, Hungary*

Toxic concentrations of the second messenger nitric oxide cause cellular stress leading to cell death. Ras proteins, possible targets of nitric oxide induced nitrosylation may act as mediators in nitrosative stress. To analyze the possible involvement of Ras proteins in nitric oxide cytotoxicity, a PC12 rat pheochromocytoma cell line expressing a dominant negative Ras

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mutant protein was used in this study. Cytotoxic concentrations of the nitric oxide donor sodium nitroprusside activated several pro-apoptotic mechanisms (stimulation of the stress kinase pathways mediated by JNK and p38MAPK, inhibition of the translation initiation factor eIF2 $\alpha$ , induction and phosphorylation of the p53 protein) and inhibited Akt-mediated anti-apoptotic signaling, independent of Ras function. Simultaneously, Ras-dependent stimulation of the pro-survival ERK pathway was also observed, followed by an increased activation of the caspase-9/caspase-3 cascade in cells with impaired Ras function. It is thus concluded that nitric oxide stimulation of multiple signaling pathways contributes to the cell death program, while concomitant activation of the Ras/ERK pathway provides a certain degree of protection.

*Support: INTAS (51022), GVOP-362.1-2004-04-0172/3.0 and SROP-4.2.2/B-10/1-2010-0029.*

*Key words: nitric oxide, sodium nitroprusside, PC12 cells, Ras, apoptosis*

### O-04

#### **Role of hemokinin-1 in murine adjuvant-induced joint and lung inflammation**

Éva Borbély<sup>1,2</sup>, Zsófia Hajna<sup>1,2</sup>, Alexandra Berger<sup>4</sup>, Katalin Sándor<sup>1</sup>, István Tóth<sup>1</sup>, László Kereskai<sup>3</sup>, Erika Pintér<sup>1,2</sup>, János Szolcsányi<sup>1</sup>, Christopher J. Paige<sup>4</sup>, John P. Quinn<sup>5</sup>, Andreas Zimmer<sup>6</sup>, Zsuzsanna Helyes<sup>1,2</sup>

<sup>1</sup>*Department of Pharmacology and Pharmacotherapy, University of Pécs, Hungary*

<sup>2</sup>*János Szentágothai Research Center, University of Pécs, Hungary;*

<sup>3</sup>*Department of Pathology, University of Pécs, Hungary*

<sup>4</sup>*Ontario Cancer Institute, University Health Network, Canada;*

<sup>5</sup>*School of Biomedical Sciences, Liverpool University, UK;*

<sup>6</sup>*Laboratory of Molecular Neurobiology, Department of Psychiatry, University of Bonn, Germany*

Hemokinin-1 is encoded by preprotachykinin C (Tac4) gene predominantly in immune cells and acts mainly at neurokinin 1 (NK1) receptors. We analysed its role in chronic arthritis and pulmonary

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inflammation using gene-deleted (Tac4<sup>-/-</sup>, NK1<sup>-/-</sup>) mice.

Complete Freund's adjuvant (CFA) was injected intraplantarly and into the tail root. Paw volume was measured with plethysmometry and touch sensitivity with aesthesiometry throughout a 21-day-period. Semiquantitative histopathological scoring of the tibiotarsal joints and the lungs was performed on the basis of characteristic inflammatory changes. Interleukin 1-beta (IL-1 $\beta$ ) in the joint homogenate was determined with ELISA, NK1 receptor expression in the lung with RT-PCR.

Inflammatory mechanical hyperalgesia was significantly smaller from day 11 in Tac4<sup>-/-</sup> and NK1<sup>-/-</sup> animals compared to C57BL/6 wildtypes, but oedema was not altered. IL-1 $\beta$  concentration and inflammatory histological changes in the joint and lung were reduced only in the Tac4<sup>-/-</sup> group. Pulmonary NK1 receptor expression was downregulated in CFA-treated wildtypes, and more severe inflammation developed in NK1<sup>-/-</sup> animals.

Hemokinin-1 increases hyperalgesia in the later phase of chronic arthritis through NK1 receptors and plays a predominant role in histopathological alterations and cytokine production via a presently not identified target. NK1 receptor plays a protective role in the immune-mediated airway inflammation.

*Support: SROP 4.1.2.B-10/2/KONV-20/0-0002 and SROP-4.2.2/B-10/1-2010-0029*

*Key words: hemokinin-1, neurokinin 1 receptor, joint and lung inflammation*

### O-05

#### **Oxidative stress in Sprague-Dawley healthy rats that underwent hyperbaric oxygenation**

Anita Čosić, Aleksandar Kibel, Ana Čavka, Ines Drenjančević-Perić  
*Department of Physiology and Immunology, Faculty of Medicine Osijek,  
Josip Juraj Strossmayer University of Osijek, Croatia*

Oxidative stress is caused by an imbalance between the production of reactive oxygen species and a biological system's ability to readily detoxify the reactive intermediates or easily repair the resulting damage.

The aim of this study was to investigate whether intermittent hyperbaric

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oxygenation (HBO) causes an increase of oxidative stress in male and female rats and whether there are differences in the amount of stress between the sexes.

Healthy male (N=6) and female (N=6) Sprague-Dawley rats 10 weeks old were housed doubly in shoebox style cages with free access to standard rat chow and tap water, maintained on a 12:12 hour light: dark cycle. The animals were divided into control group and HBO group. Rats from the HBO group were treated in a hyperbaric chamber with 100% O<sub>2</sub> for two hours a day during four consecutive days.[1] On the fifth day, arterial blood samples were collected to determine Ferric reducing ability of plasma (FRAP) and Thiobarbituric Acid Reactive Substances (TBARS; based on reaction of malonaldehyde (MDA) with thiobarbituric acid). Student t-test was used for statistical analysis.

Male control rats have significantly higher FRAP than female controls (FRAP mM ♀  $0.05 \pm 0.03$ , ♂  $0.16 \pm 0.02$ ,  $P < 0.001$ ), while there was no difference in TBARS between sexes in the control group (TBARS  $\mu\text{M}$  ♀  $0.56 \pm 0.37$ , ♂  $0.27 \pm 0.08$ ,  $P = 0.132$ ). Four days of HBO therapy did not cause any significant changes in FRAP or TBARS in male rats compared to male controls, whereas TBARS were significantly higher after HBO therapy in female rats compared to female controls with no changes in FRAP.

The results of this study may indicate that male rats have higher level of oxidative stress in control conditions, while four days of HBO therapy caused increase of oxidative stress only in female rats. Further studies are needed to conclusively interpret differences in maintaining oxidative balance between sexes in control conditions and during exposure to HBO therapy.

*Support: This study was partially supported by grant of Ministry of Science, Education and Sports, Croatia, #219-2160133-2034 and USPHS NIH GM31278 (to JRF).*

*Key words: oxidative stress, HBO therapy, FRAP, TBARS*

**O-06**

### **„Fatness or Fitness”: Health-Image and Health Strategy in Elementary Schools**

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The main focus of our research is to observe the functions of the ongoing health strategy in elementary education. I analyzed the data collected from the institute, interpreted the results, and examined some possibilities of operative planning that lead to strategy aims, that are the experience based short-term aims. Finally I interested to have a good health education program can be successfully transferred to other institutions.

We suppose that already in elementary school it is important to being health related education in order to have it as a skill at adult age. We believe that efforts of an enthusiastic group of teachers, through health related education, can lead to successful design and realization strategy. We further hypothesize that with regular data collection we could be able to predict if we are heading to the right direction and see what needs to be modified.

1. With a follow up study it was the aim to obtain a wide picture of nutrition and the physical activity related habits of the students. 2. To explore the changes of the healthy lifestyle of students. 3. To prove that it is worth inventing health related education strategy even basic level. 4. To show that all strategy works everywhere only if participants are interested int he realization of the program. 5. To provide recommendations for future steps.

Subjects: Nine hundred and forty-five elementary school students, age 11-14 years from five elementary school participated in the study. From the topics of health related education strategy only physical activity and life style related points were analyzed.

Subjects voluntarily filled out questionnaire that contained both multiple choice questions and questions requiring written answer. The questionnaire was prepared based on mine 2009 questionnaire with special respect to nutrition and physical activity. The questions were related to the aspects of health and physical activity, and the internal and external environment of the students and the geographical area. We also investigated the nutrition habits and their individual opinions about: what kind of food they think to be healthy; what are their nutrition habits; and weather they require more sport

activities in school. We also measured their BMI.

In conclusion it can be stated that we achieved positive results regarding nutrition and physical activity habits. We found that student have sufficient knowledge about the importance of health and physical activity. The sport activity itself is judged positively. For some reasons, however, they practically do not realize them. Health education, beside the contribution of the family, schools could develop and refine health conscious behaviour with higher chance in early elementary school age. Similar numbers of items of domestic and international measurements of BMI compared with regard to much better results have been achieved. To reach the aims of health related education it is important to develop health consciousness. This requires a beneficial relationship between the educators and the children as well as a good example of healthy lifestyle from the teachers themselves.

### O-07

#### **Hydrogen-sulphide (H<sub>2</sub>S)-induced CGRP-release and cutaneous vasodilatation are mediated by Transient Receptor Potential Ankyrin 1 (TRPA1) receptors**

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Capsaicin-sensitive sensory neurons express Transient Receptor Potential Ankyrin 1 (TRPA1) and Vanilloid 1 (TRPV1) receptors. TRPA1 is activated by allylisoithiocyanate (AITC), causing the release of vasoactive neuropeptides like calcitonin-gene-related-peptide (CGRP). H<sub>2</sub>S is suggested to act on capsaicin-sensitive sensory neurons. We investigated the involvement of TRPA1 receptors in H<sub>2</sub>S-evoked CGRP-release from sensory nerves in vitro and microcirculatory changes in vivo.

Sensory nerve terminals of the isolated rat tracheae were stimulated by AITC or the H<sub>2</sub>S-donor NaHS, CGRP-release was measured by radioimmunoassay. The TRPA1 antagonist HC-030031 or TRPV1 antagonist BCTC were tested on this response. AITC- or NaHS-evoked vasodilatation in the mouse ear was measured by laser Doppler imaging in

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TRPA1 (TRPA1<sup>-/-</sup>) and TRPV1 gene-deleted (TRPV1<sup>-/-</sup>) mice compared to their wildtypes. Pharmacological inhibition was performed with HC-030031.

NaHS evoked a concentration-dependent CGRP-release, which was inhibited by HC-030031, but not by BCTC. NaHS also increased cutaneous circulation, which was ameliorated by HC-030031. Blood flow of TRPA1<sup>-/-</sup>, but not the TRPV1<sup>-/-</sup> mice showed significantly smaller increase in response to NaHS compared to the wildtypes.

It is concluded that H<sub>2</sub>S induces CGRP-release from sensory nerves and induces cutaneous vasodilation via TRPA1 receptor activation. In contrast, TRPV1 receptors are not involved in these processes.

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*Key words: TRPA1 receptor, hydrogen-sulphide, CGRP*

### O-08

#### **Immobility stress – How has the health-related fitness status changed in the Hungarian young adults in the last decades?**

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Extrapolating the negative trend observed in the performance of college/university students in the recent years, serious social problems can be expected in terms of health status in adult Hungarian population.

The aim of this study was to test the physical fitness of undergraduate students, and to compare the results to the data of representative nationwide research (N=8345) carried out by MEFS in 1995 focusing on the changes in the last fifteen years.

A total of 432 student volunteers (mean age: 21.19±2.19 years) have performed 9 tests of Eurofit Fitness Test Battery. Based on the anthropometric results mean height and weight are greater by men and women as well (181.2±6.41cm, 78.27±16.02 kg and 168.1±6.86 cm, 61.58±10.43 kg, respectively) as a consequence of the secular trend, while the body fat percentages are less in both sexes (16.16±6.51% and

25.31±5.77%).

The better performance in the Eurofit tests (handgrip strength:  $R^2=0.829$   $p<0.001$ ; functional arm strength:  $R^2=0.511$   $p<0.001$ ) might be explained with the increased bone and muscle mass and the reduced body fat percentages. However the results in all other motor tests worsened despite significant positive correlation ( $p<0.001$ ) between the better performance and the observed anthropometric changes in the consecutive generations.

*Key words: physical fitness, university students, Eurofit*

### O-09

#### **Polarity and single cell anatomy of peptidergic CCAP neurons in the *Drosophila melanogaster* larva**

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For understanding neural organisation the basic idea presently is that the brain's wiring is somewhat similar to the wiring in an electronic device, i.e. information exchange takes place at the site of physical contacts, and the specificity of these contacts defines the network. Underlying these studies revealing synaptic connectivity in the nervous tissue is a major goal right in neuroscience. Peptidergic circuits represent a limited number of neurochemically similar but functionally different cells, therefore in the precise control all the single neurons have its own importance. As to these putative "synchronizer" neurons, a clear polarity is implicitly assumed, it is easy to predict the direction of information flow once pre- and postsynaptic compartments are identified. To analyse distribution of these compartments, genetically expressed various dendritic and vesicle markers were mapped on a selected peptidergic neuron population using CLSM. Though this approach is suitable for studying small groups of neurons, in our case overlapping structures involved in a circuit made it impossible to identify the polarity of individual cells. Applying a novel genetic tool (flip-out) we could control the expression of the reporter protein in the investigated neurons.

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Thus, we could refine morphological identification for further physiological studies.

### O-10

#### **MAdCAM-1 independent lymphocyte homing to GALT of Nkx2.3<sup>-/-</sup> mice**

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Nkx2.3 transcription factor is involved in the regulation of mucosal addressin cell adhesion molecule-1 (MAdCAM-1) expression, which plays a pivotal role in lymphocyte homing to gut-associated lymphoid tissues (GALT). Also, Nkx2.3 sequence variants have been identified as susceptibility trait for inflammatory bowel diseases. Although Nkx2.3<sup>-/-</sup> mice have no endothelial MAdCAM-1, Peyer's patches (PP) and mesenteric lymph nodes (mLN) still develop. We investigated the molecular components of homing to the GALT in Nkx2.3<sup>-/-</sup> mice.

The phenotype of PP HEVs in Nkx2.3<sup>-/-</sup> and wild-type mice were studied by immunofluorescence. The kinetics of homing to GALT was tested by adoptive cell transfer. The expression of mRNA for addressin proteins and the posttranslational glycosylation enzymes was determined by qPCR. The involvement of MAdCAM-1 or PNA<sub>d</sub> in the GALT homing was studied in vivo using antibody-mediated blockade.

PPs and mLNs of mutant mice showed an enhanced staining for luminal PNA<sub>d</sub>, and also increased production of mRNA for several PNA<sub>d</sub> backbone proteins and modifying enzymes. Adoptively transferred lymphocytes could effectively home to PNA<sub>d</sub><sup>+</sup> GALT HEVs, which process could be blocked by MECA-79 anti-PNA<sub>d</sub> mAb injection. Although the gut and GALT in Nkx2.3 deficient mice at neonatal age contain MAdCAM-1-positive vessels, in the gut mucosa with organized lymphoid tissues HEVs gradually replace MAdCAM-1 with PNA<sub>d</sub>.

These data indicate that in the absence of endothelial MAdCAM-1 in Nkx2.3<sup>-/-</sup> mice PNA<sub>d</sub> controls homing to GALT, thus HEV function is maintained, although with different adhesion molecule expression patterns.

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*Regional University Competitiveness*

*Key words: Nkx2.3, MAdCAM-1, HEV*

**O-11**

### **Fabrication of a new, solid contact Mg<sup>2+</sup> ion-selective electrode, and its application in Scanning Electrochemical Microscopic corrosion studies**

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A new type of magnesium ion-selective microelectrode and its application as potentiometric tip in Scanning Electrochemical Microscopy (SECM) will be reported. Instead of the conventional liquid internal contact, the new electrode uses a solid contact. A stable contact potential was achieved by covering a  $d=33\ \mu\text{m}$  carbon fibre with PEDOT conducting polymer. Because of this, the resistance is considerably lower than that of a conventional electrode. Owing to the low resistance, micro-spatial distribution of Mg<sup>2+</sup> ions from a corroding metal source in aqueous environments can be monitored at adequate scanning speeds. Using the new electrode as SECM tip, galvanic corrosion of a Mg/Fe galvanic pair was studied. As it is well known, in such a galvanic pair, magnesium acts as a sacrificial anode, preventing iron from undergoing oxidation, while being dissolved in the electrolyte. Magnesium ion concentration distribution in two dimensions was recorded over the corroding magnesium anode. Resistance, response time, sensitivity, and the overall quality of the images recorded with the two types of electrodes were compared. The solid contact electrode outperforms the liquid contact electrode in every aspect, making it a better tool for corrosion studies.

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*Research Programme between Hungary and Spain.*

### O-12

#### **Wnt signalling in non-small cell lung cancer**

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Lung cancer is the leading cancer type and the most frequent cause of cancer-related mortality worldwide. Statistics show that Hungary is considered the world leader in lung cancer related mortality. Unfortunately, current therapy is still inadequate, and the 5-year survival rate for lung cancer remains poor. In order to develop more effective therapies, it is important to obtain a better understanding of molecular biology of lung cancer. The role of Wnt signalling in cancer was first suggested 20 years ago with the discovery of Wnt-1 as an integration site for mouse mammary tumour virus (MMTV) in mouse mammary carcinoma. Wnt signalling plays a crucial role in developmental processes of the lung and also in lung tumorigenesis. Focusing on the role of Wnt signalling in lung cancer development the aim of this study was to determine the expression level changes of non-canonical Wnts in lung carcinomas and morphologically normal lung tissue samples.

### O-13

#### **Receptive field properties of colour selective neurones in the cat lateral geniculate nucleus**

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Colour vision in non-primate mammals is based on two types of cone photoreceptors: the medium-long wavelength sensitive "green"- and short wavelength sensitive "blue" cones. Accordingly, several non-primate mammals show dichromatic colour vision. However, the neural pathway carrying "blue-yellow" chromatic opponent responses has been unknown in

these animals. In search of such a pathway, we characterised a population of colour opponent blue-ON cells in neuronal recordings from the dorsal lateral geniculate nucleus (LGN) of anaesthetised cats (n=7). We found several points of similarity to previous descriptions of primate blue-ON cells. In particular, they showed co-extensive "blue"- and "green"-cone driven receptive field centres often with additional surround inhibition from both cone types. Compared to non-colour opponent cells, blue-ON receptive fields were about 2.7 times larger and preferred lower temporal frequencies. Finally, cat blue-ON cells were found in layers of the LGN thought to be homologous to the primate koniocellular system. Our results imply that these cells are part of a "blue-yellow" colour opponent channel that is the evolutionary homologue of the blue-ON division of the koniocellular pathway in primates.

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### O-14

#### **The functional test of Wnt proteins**

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The Wnt molecules regulate many signaling pathways including proliferation, tumour suppression, tumour promotion and ageing. Although they are highly investigated, their specific function is still elusive. In previous experiments the physiological, and dexamethasone (steroid) induced thymus ageing were examined in vivo, and in vitro using TEP1 cells. In our studies it was demonstrated that Wnt4 mRNA expression is downregulated during both physiological and steroid induced ageing. Simultaneously, the pre-adipocyte differentiation marker such as PPAR $\gamma$  is upregulated. Wnt4, in our experiments was however, able to reduce PPAR $\gamma$  upregulation.

To test the specific function of Wnt4, an experimental test system was set up in collaboration with Professor Karl Willert in UCSD. As there is still no Wnt specific test system available to distinguish the effects of various

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Wnt molecules, our quantitative real time PCR and luciferase based assay system has a great commercial potential and aids clarification of the ageing process.

### O-15

#### **Effect of the molecular environment on the complex formation of a crown ether derivative with alkali metal ions**

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Crown ethers are a kind of host molecules which are capable of binding metal cations selectively. To get deeper insights about the complexation mechanism at molecular level, in our recent work complex formation of 'flexible' dimethyl-pyridino-18-crown-6 ( $M_2P18C6$ ) or 'rigid' dimethyl-diketopyridino-18-crown-6 ( $M_2K_2P18C6$ ) host molecules with potassium ions in methanol were investigated by UV spectroscopy. Results show the formation of stable complexes of the flexible or rigid crown ether derivatives with potassium ion. However, negative entropy change has been detected when  $M_2P18C6$  forms complexes with potassium ions while entropy increasing was obtained when  $M_2K_2P18C6$  associates with potassium ions. The results suggest that enthalpy value hardly changes, while the entropy increases with decreasing the permittivity of the solvents. This may be attributed to the change of organized structure of alcohol molecules around the crown ether-cation complexes. Results are applicable in the development and design sensitive and selective chemical sensors.

### O-16

#### **Vitamin D status in Hungary – novel evidence for supplementation**

dr. Szimonetta Lohner, dr. Tamás Decsi  
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The prevalence of vitamin D deficiency has recently been recognized in different parts of the world, even affecting healthy populations. Vitamin D is necessary for maintaining appropriate calcium and phosphate homeostasis in the body and for ensuring appropriate functioning of many tissues, organs and cells. Therefore in adults, deficiency of vitamin D can lead not only to osteomalacia, but is also associated with higher risk of cardiovascular diseases, diabetes or cancer.

Possible causes of vitamin D deficiency in a healthy population include decreased cutaneous synthesis and an inadequate intake of vitamin D.

The aim of this presentation is to review the available literature in connection with nutritional supply (6 studies, 8428 participants) and status (4 studies, 6659 participants) of vitamin D in Hungarian subjects of different age groups and to evaluate the epidemiology of vitamin D deficiency in Hungary.

We would like to point out, that vitamin D supplementation is not only important in infancy, it is essential also in later life, especially in the period from late autumn to early spring, when skin synthesis is considered as not effective. The goal of supplementation should be to reach and maintain the recommended ranges (30-80ng/ml) of total 25(OH)D concentration.

### O-17

#### **Do we have evidence that the prevalence of childhood overweight and obesity is plateauing?**

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During the last decades a rapid growth of the prevalence of obesity has been experienced worldwide. Numerous large-scaled international intervention studies aimed to reduce the prevalence of childhood obesity. Hungary has also participated in several such epidemiological studies.

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The aims of the present review are the following: 1.) to give an overview of the trend of obesity during the recent years, 2.) to examine what are the possible causes of this trend.

We reviewed electronic online database (Pubmed) with the search term prevalence/trend/epidemiology of childhood obesity.

We found relevant data of eight countries. In 4 countries there is a continuing increase in the prevalence, but in 4 countries a decrease or plateauing was observed. Explaining this new and unexpected phenomenon, presently there are 3 main hypotheses: beside the saturation equilibrium-, and self selection hypothesis the third one considers it as a result of intervention success.

In favour of maintaining and reinforcing this favourable tendency in the prevalence of obesity there is an urgent need to clarify underlying factors, in order to reduce the consequent non-communicable diseases either in childhood or in adulthood.

*Keywords: prevalence, overweight, obesity, intervention studies*

### O-18

#### **Influence of hyperbaric oxygen treatment on vascular gene expression in healthy Sprague-Dawley rats**

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Hyperbaric oxygen treatment (HBOT) involves exposure to 100% oxygen under high pressure (higher than 1 bar). It is well established treatment in many conditions including wound healing, burnings, multiply sclerosis, gangrene, sepsis and others. The mechanism of hyperbaric oxygen therapy is yet unknown. The aim of this pilot study was to determine the influence of HBOT on expression of several genes important in vasomotor function in aorta and cerebral blood vessels of 14 weeks old healthy male Sprague Dawley rats. Rats were not treated (control) or treated with 100% oxygen pressurized to 2 bars, for two hours consecutively for 4 days. On 5<sup>th</sup> day rats were sacrificed. The relative expression of mRNA was determined by real time PCR. Results showed

significant upregulation of CYP4A1 gene in aortas, and CYP4A3 gene in cerebral blood vessels in treated group, compared to controls. Also, the tendency of increased expression in iNOS, eNOS, COX and CYP450-epoxygenase and other CYP450 hydroxylase genes in aortas and cerebral blood vessels were noticed. The tendency of decreased expression in aortal PGI2 and cerebral blood vessel TA2 mRNA was present. These results suggest that HBOT led to upregulation of genes that are important in production of vasodilators and vasoconstrictors.

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*Key words: hyperbaric oxygen treatment, gene expression, vasomotor function*

### O-19

#### **Transient Receptor Potential Vanilloid 1 (TRPV1), but not Ankyrin 1 (TRPA1) ion channels mediate mustard oil-induced hyperalgesia in mice**

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TRPV1 and TRPA1 are calcium-permeable non-selective cation channels predominantly expressed on primary sensory neurones. Besides capsaicin and mustard oil (allylisoithiocyanate, AITC), TRPV1 is stimulated by noxious heat, while TRPA1 by cold. We investigated thermo- and mechanosensation, as well as AITC-induced hyperalgesia using gene-deficient mice.

Acute inflammatory response was induced by immersing the paw or the tail into AITC. The plantar heat threshold was determined with the

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increasing-temperature hot plate and of the tail with increasing-temperature water bath. The plantar mechanonociceptive threshold was determined with aesthesiometry.

There was no difference between the plantar thermo and mechanonociceptive thresholds. In contrast, on the tail significantly higher thermonociceptive threshold was detected in TRPV1<sup>-/-</sup>, but not in TRPA1<sup>-/-</sup> mice. AITC-evoked thermal hyperalgesia was significantly diminished in TRPV1<sup>-/-</sup>, but not in TRPA1<sup>-/-</sup> mice. Tail withdrawal latency to acute AITC stimulation was significantly longer in both gene-deleted strains.

It is important to investigate TRPV1 function in thermosensation on different body regions, since it regulates heat sensation in tail, but not in the paw. AITC was shown to be a potent TRPA1 agonist, but we showed its involvement only in nocifensive behaviour. However, TRPV1 is essential in both its nociceptive and hyperalgesia-inducing actions.

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*Key words: TRPV1 and TRPA1 receptor, noxious heat threshold, thermal and mechanical hyperalgesia, mustard oil, AITC*

## O-20

### **Aging-induced structural changes in arteries. Role of collagen and laminin isoforms**

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Aging greatly affects the structure of the blood vessels in order to adapt to - among other things - the changes in the hemodynamic environment. Thus, we investigated rat carotid arteries from young and old rats regarding the changes in their structural components.

That aging induces substantial changes in the morphology and components of the arterial wall.

Carotid arteries were isolated from young (1 month: 1m), adult (12 months: 12m) and senescent (29 months: 29m) rats. Cryosections were taken from different age groups and immunofluorescence staining for cellular and extracellular matrix components of the vessel wall was employed to determine the structural characteristics of vessels. Measurements were divided in two groups: biomechanical and morphological measurements. All measurements and analyses were performed using the Volocity image analysis program.

Changes in the biomechanical characteristics of carotid arteries from young to old: wall thickness (1m:  $33 \pm 1.63 \mu\text{m}$ , 12m:  $46 \pm 1.89$ , 29m:  $66.72 \pm 3.19 \mu\text{m}$ ,  $p > 0.05$ ), number of nuclei per section (1m:  $128.18 \pm 9.89$ , 12m:  $193 \pm 8.30$ , 29m:  $268 \pm 19.85$ ,  $p > 0.05$ ), artery volume surface (1m:  $209.33 \pm 3.47 \times 10^4 \mu\text{m}^2$ , 12m:  $296 \pm 4.35 \times 10^4 \mu\text{m}^2$ , 29m:  $317.204 \pm 8.76 \times 10^4 \mu\text{m}^2$ ,  $p > 0.05$ ), artery wall surface (1m:  $79.154 \pm 3.94 \times 10^4 \mu\text{m}^2$ , 12m:  $144.65 \pm 7.65 \times 10^4 \mu\text{m}^2$ , 29m:  $201.88 \pm 7.26 \times 10^4 \mu\text{m}^2$ ,  $p > 0.05$ ) increased significantly with age. Changes in the intensity of extracellular matrix components of carotid arteries from young to old: smooth muscle actin (1m:  $2.79\text{E}^{+07} \pm 4.94\text{E}^{+06}$ , 12m:  $4.52\text{E}^{+07} \pm 9.95\text{E}^{+05}$ , 29m:  $6.96\text{E}^{+07} \pm 9.48\text{E}^{+0}$ ), elastin (1m:  $1.45\text{E}^{+07} \pm 9.22\text{E}^{+05}$ , 12m:  $.35\text{E}^{+07} \pm 9.95\text{E}^{+05}$ , 29m:  $2.80\text{E}^{+07} \pm 1.01\text{E}^{+06}$ ), Meca32 (1m:  $1.85\text{E}^{+07}$ , 12m:  $2.53\text{E}^{+07}$ , 29m:  $3.09\text{E}^{+07}$ ), Nuclei (1m:  $1.50\text{E}^{+07} \pm 1.12\text{E}^{+06}$ , 12m:  $1.40\text{E}^{+07} \pm 9.54\text{E}^{+05}$ , 29m:  $1.32\text{E}^{+07} \pm 8.24\text{E}^{+05}$ ), Laminin Pan (1m:  $1.53\text{E}^{+07}$ ,

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12m:  $2.35E^{+07}$ , 29m:  $2.92E^{+07}$ ), Laminin g1 (1m:  $2.33E^{+07}$ , 12m:  $8.41E^{+07}$ , 29m:  $1.19E^{+08}$ ), Laminin a2 (1m:  $1.90E^{+07} \pm 1.41E^{+06}$ , 12m:  $2.75E^{+07} \pm 1.23E^{+05}$ , 29m:  $2.79E^{+07} \pm 7.99E^{+04}$ ), Laminin a5 (1m:  $1.50E^{+07} \pm 2.23E^{+06}$ , 12m:  $6.02E^{+07} \pm 8.46E^{+06}$ , 29m:  $6.88E^{+07} \pm 9.74E^{+06}$ ), Laminin b2 (1m:  $2.01E^{+07}$ , 12m:  $3.15E^{+07}$ , 29m:  $3.56E^{+07}$ ), Collagen I (1m:  $3.30E^{+07}$ , 12m:  $4.01E^{+07}$ , 29m:  $8.71E^{+07}$ ), collagen III (1m:  $3.01E^{+07} \pm 2.43E^{+06}$ , 12m:  $8.12E^{+07} \pm 2.57E^{+06}$ , 29m:  $9.78E^{+07} \pm 2.66E^{+06}$ ), Collagen IV (1m:  $1.52E^{+07} \pm 9.45E^{+05}$ , 12m:  $2.58E^{+07} \pm 1.56E^{+06}$ , 29m:  $4.38E^{+07} \pm 1.57E^{+06}$ ), Fibronectin (1m:  $1.95E^{+07}$ , 12m:  $4.01E^{+07}$ , 29m:  $4.64E^{+07}$ ), Integrin b1 (1m:  $1.55E^{+07}$ , 12m:  $1.86E^{+07}$ , 29m:  $2.54E^{+07}$ ), Integrin b3 (1m:  $2.38E^{+07}$ , 12m:  $4.32E^{+07}$ , 29m:  $5.64E^{+07}$ ), Integrin a7 (1m:  $2.16E^{+07}$ , 12m:  $2.25E^{+07}$ , 29m:  $2.80E^{+07}$ ), increased significantly with age. The most substantial change was found in collagen III, Laminin g1 and SMC.

The data suggest that aging results in substantial structural changes in the vascular wall. Vessels size increases with age and is associated with increases in extracellular matrix components, especially the fibrillar collagen content (collagen type III), which is several times higher than that of the laminins which increase evenly with age.

*(Support: FP7-Marie Curie-SmART, Hungarian Natl. Sci. Res. Found (OTKA) K71591 and T67984, MHT 2010/2011).*

### P-01

#### **Cocaine- and amphetamine-regulated transcript (CART) peptide immunoreactivity in feeding- and reward-related brain areas of CCK-1 receptor-deficient rats**

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Cocaine- and amphetamine regulated transcript (CART) peptide is expressed in brain areas involved in the control of appetite, drug reward and homeostatic regulation and it has an overall anorexigenic effect. Recently, we have shown that CART peptide immunoreactivity was significantly reduced in the rostral part of the nucleus accumbens and in the rostro-medial nucleus of the solitary tract in adult CCK-1 receptor deficient obese diabetic Otsuka Long Evans Tokushima Fatty (OLETF) rats compared to Long Evans Tokushima Otsuka (LETO) lean controls. It has remained to be unclear, however, whether altered CART expression is caused by the primary deficiency in CCK-1 signaling or is related to the obese and diabetic phenotype of the OLETF strain which develops at a later age. Therefore, in the present study, CART-immunoreaction in feeding-related areas of the brain was compared in age-matched (6-7 weeks old) non-obese, non-diabetic OLETF rats and in LETO controls. Intensity of CART immunoreaction was unchanged in the areas related to control of food-intake and reward in the young OLETFs compared to young LETO rats. Our findings suggest that factors secondary to obesity and/or diabetes rather than impaired CCK-1 receptor signaling may contribute to altered CART expression in the OLETF strain.

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*Key words: central food intake regulation, cholecystokinin receptor, obesity, type-2 diabetes, reward system*

**P-02**

### **Pituitary adenyate cyclase activating polypeptide (PACAP) decreases locomotor behavior in female rats**

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PACAP is a multifunctional and pleiotropic neuropeptide. Recent studies point to PACAP as an emerging therapeutic agent in various neuropathological conditions, therefore, it is very important to test how PACAP treatment affects general behavior. A few studies have shown that central administration of PACAP alters locomotor behavior. No data are available on the general behavioral effects of systemic PACAP treatment. Furthermore, most studies are performed in male animals. However, there are a few studies showing that certain effects of PACAP are gender-dependent, as we have previously shown in a rat model of Parkinson's disease, where PACAP treatment could significantly decrease behavioral deficits in male animals, but not in females. Therefore, the objective of the present study was to investigate whether PACAP affects the open-field behavior of male and female rats 1 and 10 days after the treatment. Animals were injected a single dose of 100 ug PACAP38 intravenously. Open-field testing was performed 1 day before, 1 and 10 days after the treatment. Five minutes were recorded in the open-field and behavioral parameters were evaluated. We found that systemic PACAP injection did not cause any significant alteration in locomotor behavior of males at either time-point. However, the same PACAP treatment led to a significant decrease in activity in females. Furthermore, the time spent in the center was also decreased in females, indicating increased anxiety. Interestingly, the same altered behavior was observed even 10 days after the treatment. In summary, our results show that a single systemic PACAP administration

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leads to behavioral changes only in female rats. This study also points to the importance of testing the physiological effects of PACAP in both genders, since the effects might be significantly different.

*Support: Ross University Research Grant, Bolyai Scholarship, Richter Gedeon Centenary Foundation, SROP 4.1.2.B-10/2/KONV-20/0-0002, SROP-4.2.2/B-10/1-2010-0029. OTKA K72592, CNK78480, PTE-MTA "Lendület"*

*Key words: PACAP, locomotor activity, gender difference, rat*

### P-03

#### **Actions of PAC1, VPAC1/VPAC2 receptors on cell bodies and peripheral terminals of primary sensory neurons**

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Pituitary adenylate cyclase activating polypeptide (PACAP1-38) acts on G protein-coupled receptors: specific PAC1 receptor and VPAC1/VPAC2 receptors. We used selective agonists (maxadilan for PAC1, Ala<sup>11,22,28</sup>VIP for VPAC1 and BAY 55-9837 for VPAC2 receptor), and PACAP6-38 as PAC1/VPAC2 and MAXA65 as PAC1 receptor antagonist. Our aim was analysing the actions of different forms of PACAP peptides and agonists/antagonists on sensory neural responses *in vitro*.  $[Ca^{2+}]_i$ , as the specific response in cultured rat trigeminal neurons was measured by microfluorimetry, while radioimmunoassay was used to determine the release of calcitonin gene-related peptide (CGRP) from stimulated peripheral sensory nerve terminals of the isolated rat trachea.

Slowly increasing  $[Ca^{2+}]_i$  indicating Gq protein-coupled receptor activation was detected both after PACAP1-38 and PACAP6-38 administration. Maxadilan, MAXA65 and their combination (100 nM, 1  $\mu$ M), as well as BAY 55-9837 addition also had the same effects. Maxadilan, MAXA65 and BAY55-9837 significantly increased its electrical field-stimulation-induced outflow. Ala<sup>11,22,28</sup>VIP had no effect on  $[Ca^{2+}]_i$  and CGRP-outflow.

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Our conclusion is that both PAC1 and VPAC2 receptor agonism stimulates cell bodies and stimulation-evoked response of the terminals of primary sensory neurons, while VPAC1 has no effect in these processes. Interestingly, peptide fragments acting as antagonists in other models, behave as agonists in these systems.

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### P-04

#### **Examination of PACAP38 in different milk and infant formula samples and PAC1-receptors in mammary gland**

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We have provided evidence that pituitary adenylate cyclase activating polypeptide (PACAP) is present in the milk in concentrations much higher than in the respective plasma samples. We showed PACAP38-like immunoreactivity (LI) in sheep mammary gland samples with radioimmunoassay (RIA) and detected PAC1-receptor expression in the lactating udder biopsies by immunohistochemistry. The aim the study was to investigate the changes in PACAP38 levels in human milk during lactation with RIA. In the second part of the study we examined the presence of PACAP38 in cow milk and cow milk-based commercial infant formulas. Finally, we compared the presence of PAC1-receptors in lactating and non-lactating udder biopsies of sheep and normal human mammary

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gland samples with immunohistochemistry. PACAP38-LI did not show significant changes within the examined 10-month-period of lactation after delivery, but a significant increase was observed after that period compared to the levels of the first 6 months. The cow milk and the cow milk-based infant formula showed similar PACAP38-LI. The non-lactating udder biopsies and the human breast samples showed the same PAC1-receptor expression, but it was significantly increased in lactating samples. The increased presence of PAC1-receptors in lactating mammary gland samples also indicates the important roles of PACAP in the lactation.

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*Key words: PACAP, milk, mammary gland, RIA, immunohistochemistry*

### P-05

#### **Quantitative magnetic resonance imaging of intervertebral disc damage by laser irradiation**

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Nearly 70% of the population over age 40 is affected by some lumbar pain or a discus hernia. Percutaneous techniques continue to grow for the various treatment options addressing spinal ailments.. Our aim is thedetection of the impact of percutaneous laser disc decompression by quantitative methods.

We delivered a laser light energy using 980 nm and 1470 nm beam at the same amount into four freshly butchered, ex-vivo bovine lumbar spine discs (six discs each) for partial vaporization of the nucleus pulposus.

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This modeling of decompression was done with all specimens at room temperature. Quantitative magnetic resonance imaging was performed before and after the laser procedure (T1 weighted, T2 weighted, and ADC-map). Following the imaging studies, histopathological work was conducted to demonstrate morphological tissue changes in the harvested vertebral discs.

There were no significant changes on T1, T2, ADC-map with 1470 nm laser when we considered the surrounding tissue around the laser tip, but the ADC changes were significant when the whole nucleus pulposus was examined. T1 decrease and T2 increase occurred at the vaporization zone. The histopathological examination demonstrated carbonization and steam bubble formation in the background of T1 and T2 changes. No significant ADC changes were observed with 980 nm laser test.

We showed the laser impact foremost by quantitative methods in nucleus pulposus. Our results and the method after further evaluations, may be applied to human procedures, which may help to control the PLDD (Percutaneous Laser Disc Decompression).

*Key words: diode laser, intervertebral disc ablation, MRI, percutaneous laser disc decompression (PLDD)*

### P-06

#### **Differences in physical and psychological performances among male handball players by positions**

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Handball players must have excellent motor abilities, tactical and technical knowledge and psychological parameters to serve efficiently in the field.

Aim of the study was to create a test battery to find possible differences among player positions.

Two elite handball teams participated in this study. We measured the anthropometric characteristics, aerobic capacity (20m shuttle run), running speed (30m dash), throwing strength (medicine ball) and lower limb strength with serial vertical jump test (n=22). Distributive attention, choice reaction time and stability were measured in the second testing session

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(n=15).

Wings reached the best performance in running speed ( $4.33\pm 0.19$ s), aerobic capacity (63.96 ml/kg/min) and serial vertical jump test ( $50.61\pm 4.15$ cm). Significant differences were found between wings and backs in aerobic capacity ( $p=0.008$ ), running speed ( $p=0.008$ ), serial vertical jump ( $p=0.047$ ). Goalkeepers had the best result in throwing test ( $23\pm 0.14$ m). Backs presented excellent results in cognitive functions. There were no significant differences among positions in choice reaction time test. Mean time was the shortest for leg stimuli:  $654.9\pm 52.52$ ms. In stability there was no significant difference between the dominant ( $2.04\pm 0.49$ s) and not dominant legs ( $2.05\pm 0.44$ s) among players.

Data obtained from our study are very useful for coaches in handball training, especially in the preparatory season.

*Key words: handball, motor abilities, cognitive functions*

### P-07

#### **Enzyme- and lectin-histochemical characterization of cellular compartments in the primary and secondary lymphoid organs of the zebrafish (*Danio Rerio*)**

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The thymus, head-kidney and the spleen are haematopoietic organs of zebrafish. Haematopoiesis primarily takes place in the head-kidney of adult fish. Innate (granulocytes, monocytes) and adaptive immune cells (lymphocytes) are produced in this organ.

In the lack of zebrafish leukocyte specific monoclonal antibodies, we decided to investigate zebrafish haematopoietic cells by enzyme- and lectin-histochemical approaches.

Cellular composition of isolated kidney and spleen tissues was further analyzed by flow cytometry and light microscopy. Activity of different enzymes (non-specific esterase, acid phosphatase, alkaline phosphatase) was determined on cytopspins. Isolated haematopoietic cells were characterized with PNA (peanut agglutinin)-lectin staining for flow cytometry. Moreover, lectin histochemistry were performed on spleen and

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kidney sections.

Robust acid phosphatase activity was observed only in myeloid cells. Haematopoietic cells were distributed into erythroid, myeloid and lymphoid populations by flow cytometry. We observed the highest PNA positivity in myeloid cells, less positivity was found in lymphoid population, while erythroid cells were exclusively negative. In addition, PNA-staining of spleen sections confirmed the results obtained by flow cytometry.

Our preliminary data is supportive to characterize zebrafish haematopoietic cells in morphological point of view.

### P-08

#### **The effect of the sympathetic nervous system and dehydration on salivary lactate concentration**

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Measuring of salivary lactate (SL) level is a possible new method to determine training efficiency.

The aim of this study was to investigate the correlation between salivary and blood lactate (BL) concentration in athletes (SG) and non-athletes (NG) after maximal exercise, and to determine the possible differences in RR-variability and total body water on SL.

Sixteen volunteers (22.80±3.18yrs) performed a maximal Astrand treadmill test. Before and after the exercise saliva and blood samples were collected and SL content was assessed with spectrophotometric analyses. BL concentration was measured from fingertips with a portable lactimeter. Anthropometric characteristics, body composition (total body water –TBW-, body fat percent) and physiological parameters (RR-variability, HR) were

assessed before the test.

In SG we registered two SL peaks at different time points (SG: 1 min and 8 min, NG: 4 min and 12 min) in NG group we found high individual differences among subjects. Pearson correlation analyses between BL and SL concentration showed significant correlation in both groups. We noted relationships between several measured parameters (SL - TBW, SL - RR-variability, maximal SL - maximal heart rate during exercise).

According to our results hydration status and the function of autonomic nervous system affect post-exercise salivary secretion.

### P-09

#### **Plant tissue based biosensor with improved sensitivity. Dopamine determination under optimized working conditions.**

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Amperometric enzyme sensor prepared with reaction layer made of banana tissue slice is nicknamed „bananotrode”. Owing to the enzyme content of banana tissue the electrode could be used for selective measurements of polyphenolic compounds, like dopamine. Good stability and cost efficient fabrication would permit broad scale of application in different areas of chemical analysis. The dynamic range of this biosensor, however often does not match the concentration range needed. In our studies efforts were made to increase the sensitivity of bananotrode. A model of the reaction layer of it was made and the concentration profiles of different species involved in catalytic reactions were investigated using scanning chemical microscopy (SECM). Dynamic voltammograms recorded with flow injection analytical (FIA) apparatus were used to find the optimal electrode potential for detection. Considerable enhancement of sensitivity of this biosensor could be achieved using optimal reaction layer thickness, and electrode potential, together with the measuring technique of periodically interrupted amperometry (PIA) worked out in our earlier studies. Local, instantaneous concentrations of dopamine and dopamine quinone were detected vertically moving the micro size measuring tip of the SECM inside the banana tissue, while the model electrode was exposed to stirred sample solution.

*Support: TÁMOP-4.2.1.B-10/2/KONV-2010-0002*

**P-10**

### **Theoretical investigation of the ion diffusion on graphene surface controlled by external electric field**

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Our earlier works related to the investigations of carbon nanomaterials. The non-covalent interactions between carbon nanotubes and aromatic molecules have been described. Furthermore, we have reported a new method, how to generate graphene-CeO<sub>2</sub>-sapphire layer. This system with electrochemical modifications could be a potential surface of ion diffusion controlled by external electric field. In this work the interaction between alkali ions and graphene surface with the absence and the presence of external electric field applied perpendicular to the graphene surface was investigated. Results show, that the electric field push close the positive charged ion to the graphene surface, where the Coulomb repulsion results higher energy barriers on the diffusion pathways. These effects are applicable in the design of electronic devices designed to nanoscale.

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### P-11

#### **We spending money for health with pleasure, but what about expensive food? The price of olive oil and the consumers' opinion**

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A self-administrated questionnaire was used and asked 1000 Hungarian about their patterns of olive oil consumption.

Only 10.2% of the respondents did not agree with the statement “Olive oil consumption is useful to preserve our health, but its price is not appropriate”, 19.8% agreed with it, 70.1% agreed with it absolutely. Nine percent said that the price is appropriate and 56.9% that it is too expensive. “Expensive but it’s worse it” answered 33.5%. There was only one person who said that it is cheap, but his financial situation was “well below the average” – according his own opinion.

The correlation between the financial situation and the statement “olive oil consumption is useful to preserve our health, but its price is not appropriate” was significant and moderately strong ( $r=0.23$ ;  $p<0.001$ ). 67.2% of the people with average or better financial situation agree with this statement.

### P-12

#### **In vivo electrochemical H<sub>2</sub>S detection**

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H<sub>2</sub>S (hydrogen sulfide) is a naturally occurring gas, that is toxic and flammable in high concentration. This gas is a result of bacterial anaerobe digestion or volcanic gas, and can be found in spring water, eg. Hungarian Harkány water. The toxicity of H<sub>2</sub>S is as high as the hydrogen cyanide, so it is very useful to measure the H<sub>2</sub>S concentration in solution, gas.

The human body produces small amount of H<sub>2</sub>S (by the decomposition of sulfur containing proteins, amino acids) and uses it as a signaling

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molecule. In different tissues of living animals sometimes the concentration is about 20  $\mu\text{M}$ .

It is generally accepted, that  $\text{H}_2\text{S}$  has important roles in modulating different, physiologically important biochemical processes similarly to other, fast diffusing molecules like NO, CO or  $\text{H}_2\text{O}_2$ . The electrochemical detection has advantages, like cheapness, portability, robustness. That is why the electrochemical sensors are often gain application in experimental life sciences for measurement or follow of local concentration of important species in vivo.

Our group have been developed hydrogen sulfide sensor for voltammetric electroanalytical measuring method. Using amperometry, on constant potential the change of current intensity is measured in time. The current change is proportional to the concentration change of the material in a sample. Our sensors detect the  $\text{H}_2\text{S}$  in ppm range. Applying it in vivo experiment,  $\text{H}_2\text{S}$  diffusion was detected through the mice skin.

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