

Questionnaire
Summary of the main activities of a research institute of
the Slovak Academy of Sciences

Period: January 1, 2012 - December 31, 2015



1. Basic information on the institute:

- 1.1. Legal name and address: Institute of Normal and Pathological Physiology
Slovak Academy of Sciences
Sienkiewiczova 1
813 71 Bratislava, Slovakia**
- 1.2. URL of the institute web site: <http://www.unpf.sav.sk>**
- 1.3. Executive body of the institute and its composition**

Directoriat	Name	Age	Years in the position
Director	doc. RNDr. Oľga Pecháňová, DrSc.	53	9
Deputy director	RNDr. Iveta Bernátová, DrSc.	49	1
Scientific secretary	RNDr. Martina Cebová, PhD., RNDr. Soňa Čáčányiová, PhD.	37 45	1 1

- 1.4. Head of the Scientific Board**
RNDr. Iveta Bernátová, DrSc.

1.5. Basic information on the research personnel

1.5.1. Number of employees with university degrees (PhD students included) engaged in research projects, their full time equivalent work capacity (FTE) in 2012, 2013, 2014, 2015, and average number of employees in the assessment period

	2012		2013		2014		2015		total		
	number	FTE	number	FTE	number	FTE	number	FTE	number	averaged number per year	averaged FTE
Number of employees with university degrees	28,0	26,250	28,0	27,460	29,0	28,330	33,0	29,480	118,0	29,5	27,880
Number of PhD students	17,0	15,600	15,0	12,600	13,0	10,600	11,0	8,100	56,0	14,0	11,725
Total number	45,0	41,850	43,0	40,060	42,0	38,930	44,0	37,580	174,0	43,5	39,605

1.5.2. Institute units/departments and their FTE employees with university degrees engaged in research and development

Research staff	2012		2013		2014		2015		average	
	No.	FTE	No.	FTE	No.	FTE	No.	FTE	No.	FTE
Institute in whole	45,0	26,250	43,0	27,460	42,0	28,330	44,0	29,480	43,5	27,880
Laboratory of Neuro-Cardiovascular Interactions	11,0	7,860	11,0	7,210	10,0	8,900	13,0	8,660	11,3	8,158
Laboratory of Neurohumoral Regulation of Hemodynamics	9,0	4,710	8,0	4,780	6,0	5,600	7,0	6,300	7,5	5,348
Laboratory of Vascular Disorders Etiopathogenesis	7,0	3,800	7,0	3,580	7,0	3,500	6,0	4,500	6,8	3,845
Laboratory of Cognitive Neuroscience	9,0	5,340	9,0	5,220	11,0	5,330	10,0	6,020	9,8	5,478
Laboratory of Motor Control	9,0	4,540	8,0	4,470	8,0	5,000	8,0	4,000	8,3	4,503

1.6. Basic information on the funding of the institute

Institutional salary budget and others salary budget

Salary budget	2012	2013	2014	2015	average
Institutional Salary budget <i>[thousands of EUR]</i>	341,583	338,695	330,966	361,872	343,279
Other Salary budget <i>[thousands of EUR]</i>	23,975	14,986	28,459	23,784	22,801

1.7. Mission Statement of the Institute as presented in the Foundation Charter

1. The mission of the Institute of Normal and Pathological Physiology SAS (hereafter, INPP SAS, or “the Institute”) is to conduct basic research in the field of experimental medicine oriented mainly towards the cardiovascular and nervous systems under both normal and pathological conditions.
2. The research in the field of cardiovascular physiology is oriented towards the physiological, behavioural, biochemical, molecular biological, and morphological aspects of blood pressure regulation; towards the regulatory mechanisms of heart function and vasomotor activity; and towards heart electric field changes in relation to various pathological conditions. Particular attention is paid to prevention and therapy regarding hypertension and certain other cardiovascular diseases by means of traditional and potential antihypertensive drugs administered in the form of commonly used substances, or bound to nanoparticles. The research is focused on biocompatibility of nanoparticles, venous, and other prostheses made from composite materials in cooperation with material engineering specialists.
3. The research in the field of neurophysiology is oriented towards the regulatory mechanisms that control movements and postural-motor coordination in humans. The brain research conducted by the Institute is oriented towards the cognitive neuroscience of human higher brain functions. Attention is paid to information processing in relation to behavioural reactions programming, as well as the use of new approaches in analysis of electrophysiological correlates of brain activity and mental processes. Translation of knowledge into clinical research, elucidation of pathophysiological mechanisms, and developing new diagnostic methods and therapeutic approaches for several diseases and disorders of the human brain are embedded in the research programmes.

4. The Institute provides consultations and other expert services associated with its main activities.
5. The Institute offers two PhD study programmes: Normal and Pathological Physiology and Animal Physiology.
6. The Institute ensures the publication of the results achieved by its researchers in the periodic and non-periodic scientific journals. Editing of the periodic and non-periodic scientific literature of the Institute is performed in line with the decisions of the Presidium of the Slovak Academy of Sciences.

1.8. Summary of R&D activity pursued by the institute during the assessment period in both national and international contexts, (recommended 5 pages, max. 10 pages)

Overview

Since its establishment, the Institute of Normal and Pathological Physiology, Slovak Academy of Sciences has been continually focused on investigation of the cardiovascular and the nervous systems under both normal, and pathological conditions. Over the last three decades – from the discovery of the physiological function of nitric oxide (NO), the research at INPP SAS has been oriented towards molecular mechanisms of NO signaling and its role at the systemic level. Research by INPP SAS has contributed significantly to findings that most of the so-called “diseases of civilisation“ are associated with disturbances in NO signaling, and has also revealed diverse mechanisms of NO-dependent pathologies.

The period of assessment (from 2012 to 2015) can be characterised by a strong emphasis on research approaches based on modern molecular strategies and techniques, the use of up-to-date methods of experimental biomedicine and cell biology, and by an institutional focus on applied and transdisciplinary research. This attitude was supported by INPP SAS’s success in securing national and international grants, including EU Structural Funds, which helped build progressive infrastructure, improve availability of consumables for experimental work, and attract foreign experts and young researchers.

The Institute of Normal and Pathological Physiology SAS includes five research groups:

Laboratory of Neuro-Cardiovascular Interactions: This laboratory focuses on signaling pathways that may affect different mechanisms of the cardiovascular system through central autonomic and peripheral regulations. In particular, it is oriented towards monitoring NO-dependent signaling that leads to increased blood pressure and subsequent hypertension, dyslipidaemia, and obesity. The assessment period can be characterised by (i) the development of a new laserinduced myocardial infarction model; (ii) the study of new mechanisms leading to cardiovascular protection; (iii) the preparation, analysis, and monitoring of active antihypertensive and antilipidemic agents bound to

various polymeric nanoparticles; and (iv) the analysis, from a transdisciplinary point of view, of magnesium nanocomposites for biodegradable medical implants.

Laboratory of Neurohumoral Regulation of Hemodynamics: Current research in this laboratory is focused on the regulatory mechanisms of blood pressure and vascular function in various experimental models of human primary hypertension, as well as during aging. The assessed period can be characterised by determination of the sex- and age-dependent impact of chronic social stress produced by crowding on endothelial function, and oxidative load of rats with various genetic predispositions to hypertension (i.e. offspring of two normotensive parents, one normotensive and one hypertensive, as well as of two hypertensive parents).

Laboratory of Vascular Disorders Etiopathogenesis: The laboratory focuses on investigation of functional, molecular, and structural changes in the cardiovascular system in different pathological conditions, mainly high blood pressure conditions. The assessed period can be characterised by (i) the study of new signal pathways triggered by NO alone, and by mutual interaction of NO with hydrogen sulfide (H₂S); (ii) the study of paracrine vasoactive functions of perivascular adipose tissue; and (iii) the analysis of vasoactivity of human arteries under different conditions, and exploring correlations between findings from humans and animal models.

Laboratory of Cognitive Neuroscience: This laboratory focuses on exploring the relationship between brain processes and the human mind, particularly brain mechanisms of perception, attention, memory, emotions, and motor processes, and their contribution to mental health and dysfunction in major mental disorders, such as schizophrenia, affective, and anxiety disorders. The assessed period (from 2012 to 2015) can be characterised by the use of human electrophysiological methods in the study of visual-spatial and sensorimotor brain processing, as well as in the neural mechanisms of social cognition. The laboratory began research in endophenotypes of mental disorders by combining methods of behavioural genetics and animal models of human psychopathology.

Laboratory of Motor Control: This laboratory focuses on the sensory control of human posture and gait. Mechanisms of human static and dynamic balance during upright stance, the transition from sitting to standing, and during walking are investigated through the analysis of postural responses to sensory stimulation in healthy subjects and patients with vestibular, neurological, cardiovascular and metabolic disorders. The assessed period can be characterised by (i) the development of a new method using sensory biofeedback for balance improvement; (ii) the study of sensory/brain stimulation to enhance postural performance in healthy elderly humans and patients with neurological movement disorders; and (iii) analyses of postural mechanisms and kinematics during step initiation in obese subjects and in healthy aging subjects.

Research Highlights

Over the last four years, research by INPP SAS has followed the most progressive trends in cardiovascular and brain research, using cell-cultures, various animal models of human diseases,

and human studies. Based on INPP SAS's extensive knowledge and experience with NO research, special attention has been paid to select research directions, in particular to:

1. Developing a new laser-induced myocardial infarction model and searching for molecular cardioprotective mechanisms
2. The analysis and monitoring of active antihypertensive agents bound to different polymeric and magnetic nanoparticles, and the study of their biocompatibility
3. The investigation of cross-talk of various endothelium-derived factors during aging, social stress, and the development of hypertension
4. The analysis of new NO-dependent signaling pathways and their interactions with other gasotransmitters, such as hydrogen sulfide and carbon monoxide
5. The investigation of an imbalance between NO and reactive oxygen species, and the discovery of natural antioxidants with pleiotropic cardioprotective function
6. The investigation of vasoactive responses in human renal arteries isolated after nephrectomy of normotensive and hypertensive patients, and perivascular adipose tissue function in animal models
7. Determining the role of NO in mental disorders, especially in schizophrenia
8. The investigation of postural mechanisms during stance and gait initiation in obese and aging subjects using an optoelectronic camera motion capture system for a 3D analysis of human movement.

International Projects and Networking

To promote these research activities, INPP SAS has developed a rich network of international collaboration. In particular, INPP SAS would like to highlight the activities listed below:

1. COST projects: The Institute of Normal and Pathological Physiology SAS has been involved in (i) COST BM-1005, entitled *Gasotransmitters: from basic science to therapeutic applications* (ENOG: *European Network on Gasotransmitters*), project leader: *Andreas Papapetropoulos* (University of Athens), project leader at INPP SAS: *Ol'ga Pecháňová*, duration: 1.5.2011 - 1.5.2015; and (ii) COST BM-1203 - EU-ROS: *The European Network on Oxidative Stress and Redox Biology Research* - with a leader: *Andreas Daibner* (Johannes Gutenberg-Universität Mainz) and *Ol'ga Pecháňová* as the leader for INPP SAS, duration: 1.6.2013 - 31.5.2016. Notably, in COST BM-1005, INPP SAS was part of the Member Committee. This COST projects allowed INPP SAS to cooperate with world leaders in researching NO and reactive oxygen species. Activities included research stays and training courses for scientists and PhD students. One of the results of this collaboration was a common publication in the prestigious *British Journal of Pharmacology* (Br J Pharmacol. 2015 Mar; 172(6):1415-33).

2. The SAS-CONICET programme: Since 2010, INPP SAS has collaborated with the School of Pharmacy and Biochemistry, at the University of Buenos Aires. From 2013-2015 this collaboration was covered by the project *Metabolic syndrome: inflammation in hypertension and the effect of polyphenols*, project leader: *Ol'ga Pecháňová*, duration: 1.1.2013 - 31.12.2015. The project enabled bilateral exchange of researchers and resulted in two well-cited publications (Curr Pharm Biotechnol. 2010 Dec; 11(8):837-48; IUBMB Life. 2013 Aug; 65(8):710-5).

3. The SAS-Taiwan programme: The Institute of Normal and Pathological Physiology SAS participated in the bilateral project *SAS-NSC JRP 2010/01, Study of interactions between reactive oxygen species and nitric oxide in search for novel mechanisms of hypertension, project leader: Ima Dovinová, duration: 1.1.2011 - 31.12.2013*, with the Centre for Translational Research in Biomedical Sciences, Chang Gang Memorial Hospital, Kaohsiung, Taiwan. The project included mutual visits, common experiments, and resulted in a valuable publication in the journal *Hypertension* (Hypertension. 2014 Oct; 64(4):815-24; PPAR Res. 2013; 2013: 541871).

4. European Network for Workplace Health Promotion (ENWHP): The Institute of Normal and Pathological Physiology SAS has participated as part of the *EU program: Promoting healthy work for employees with chronic illness - public health and work: Executive Agency of Health and Consumers, project no.: EAHC No 20101208, coordinating institution: Prevent (Belgium), coordinator at INPP SAS: Fedor Jagla, duration: 1.9.2011 - 31.8.2013*. INPP SAS was selected as the National Contact Office of the ENWHP, and was responsible for the coordination of ENWHP activities and projects in Slovakia. During the assessed period INPP SAS coordinated a project financed by DG SANCO Public Health and Work (PHWork), which began in 2011.

5. Joint laboratories and cooperation agreements: The Institute of Normal and Pathological Physiology SAS has established a joint research laboratory with (i) Charité – Universitätsmedizin in Berlin, Germany; and (ii) the Faculty of Medical Sciences at University of Kragujevac, Serbia. Furthermore, INPP SAS has signed a cooperation agreement with the Faculty of Psychology at University of Vienna in Austria. A research collaboration agreement has also been signed with the Balance Disorders Laboratory in the Department of Neurology, School of Medicine at Oregon Health and Science University, in Portland, USA. These cooperations have resulted in several high-impact publications (see 2.1.2 List of selected publications).

National Projects and Networking

NO molecule and its role in diseases of civilisation represent the thematic umbrella covering all the projects of INPP SAS. During the years 2011-2015, INPP SAS received the status of “*Centre of Excellence for Examination of Regulatory Role of Nitric Oxide in Civilisation Diseases (NOREG)*.” The aim of the centre was to identify common NO-regulated (patho)mechanisms, which play a role in the development of hypertension, obesity, dyslipidaemia, diabetes mellitus, metabolic syndrome, social stress-related disorders, mental and movement disorders. Above mentioned research highlights (1-8) have been involved in the following national projects initiated by NOREG:

Highlight 1: This highlight, devoted to cardioprotection by studying an experimental model of myocardial infarction, is represented by the projects: (i) *Participation of HMGB1 in experimental myocardial infarction: cardioprotection vs. cardiac depression, project no.: VEGA 2/0144/14, project leader: Martina Cebová, duration: 1.1.2014 - 31.12.2016*; and (ii) *Protective effect of NO and CO donors in experimental myocardial infarction with hypertensive complications, project no.:*

VEGA 2/0195/15, project leader: *Oľga Pecháňová*, duration: 1.1.2015 - 31.12.2018, with the Faculty of Medicine at Comenius University as a partner.

Highlight 2: This highlight, which involves targeted delivery of drugs under hypertensive and dyslipidaemic conditions, is represented by the projects: (i) *Effects of nanoencapsulated simvastatin on cardiovascular system in experimental metabolic syndrome*, project no.: APVV-140932, duration: 1.7.2015 - 30.6.2019; and (ii) *The effect of aliskiren-loaded nanoparticles in experimental hypertension*: APVV-0742-10, duration: 1.5.2011 - 31.10.2014, project leader of both: *Oľga Pecháňová*. The projects represent transdisciplinary research, for which INPP SAS cooperated with the Polymer Institute SAS and the Institute of Physics SAS.

Highlight 3: This highlight, involving investigations of cross-talk of various endothelium-derived factors during aging, stress, and hypertension, was carried out primarily within the following projects: (i) *Gender differences in etiopathogenesis of social stress-related cardiovascular and behavioural disorders in individuals with predisposition to hypertension*, APVV-0523-10, duration: 1.5.2011 - 30.10.2014; and (ii) *Social stress as a risk factor of early development of hypertension in predisposed individuals*, VEGA 2/0084/10, duration 1.1.2010 - 31.12.2013, project leader of both: *Iveta Bernátová*. Both projects involved other institutes of SAS (the Institute for Heart Research, the Institute of Experimental Pharmacology and Toxicology), the Comenius University, and the Slovak University of Technology, both in Bratislava. A project devoted to aging has been supported by *the Slovak Society of Cardiology*, project leader: *Angelika Púzserová*, duration: 17.4.2014 - 17.4.2017, project title: *Effect of aging on the endothelial function in experimental hypertension*.

Highlight 4: This highlight has been studied as part of the projects: (i) *Signal pathway of nitric oxide and hydrogen sulfide, its disturbances and participation in development of hypertension and atherosclerosis*, funded by Ministry of Health of the Slovak Republic, project no.: 2012/51-SAV-1, project leader: *František Kristek*, duration: 19.7.2013 - 30.6.2016; and (ii) *Study of molecular mechanisms of H₂S biological effects*, APVV-0074-11, project leader: *Karol Ondriaš*, project leader at INPP SAS: *Soňa Čačányiová*, duration: 1.7.2012 - 31.12.2015.

Highlight 5: This highlight has been studied as part of the projects: (i) *Study of regulation of radical and cellular signaling during hypertension and influence of novel therapies on this signaling*, project no.: APVV-0348-12, project leader: *Miroslav Barančík*, project leader at INPP SAS: *Ima Dovinová*, duration: 1.10.2013 - 30.9.2017; and (ii) *Effect of PPAR gamma agonists on antioxidant response and on regulation of radical and cell signaling in hypertension*, project no.: VEGA 2/0129/14, project leader: *Ima Dovinová*, duration: 1.1.2014 - 31.12.2016.

Highlight 6: This highlight began to be studied within the APVV project (APVV-15-0565) *New regulatory effects of nitric oxide and their role in the development of essential hypertension*, which represents a successful connection of pre-clinical research with clinical praxis. Project leader: *Soňa Čačányiová*.

Highlight 7: From the national projects oriented towards the investigation of schizophrenia mechanisms, the most important include: (i) *The influence of variability of NOS1 and DAT1 genes on sensorimotor gating in humans: the implications for the pathophysiology of schizophrenia: Ministry of Health of the Slovak Republic, project no.: 2012/52-SAV-2, project leader: Igor Riečanský, duration: 19.7.2013 - 30.6.2016;* and (ii) the APVV project *Interaction of nitroergic, neurotrophic and endocrine signaling in the etiopathogenesis of schizophrenia: APVV-14-0840, project leader: Igor Riečanský, duration: 1.7.2015 - 30.6.2019.*

Highlight 8: Projects devoted to this highlight are thematically linked to a successful project of the Sixth Framework Programme entitled: “*SENSing and ACTION to support mobility in Ambient Assisted Living (SENSACTION-AAL)*” and are as follows: (i) *Kinematic analysis of posture and gait in healthy subjects and patients with balance impairment: VEGA 2/0138/13, project leader: František Hlavačka, duration: 1.1.2013 - 31.12.2015;* and (ii) *Postural and core stability in association with respiratory functions in healthy and lung transplant individuals: APVV SK-AT-2015-0031, principal investigator: Erika Zemková (Comenius University), project leader at INPP SAS: František Hlavačka, duration: 1.1.2016 - 31.12.2017.* In addition to Comenius University, INPP SAS's Austrian partners, Medical University of Vienna and Vienna General Hospital, participate in this project.

The Institute of Normal and Pathological Physiology SAS has enjoyed long-term cooperation with the Faculty of Medicine at Comenius University in Bratislava under the framework of the Centre of Experimental Medicine, which is a joint research centre that aims to develop a theoretical and infrastructural basis for the field of experimental medicine and translate that knowledge for use in basic clinical research and broader medical praxis.

In addition, INPP SAS has cooperation agreements with several faculties, other institutes of SAS, and clinics (e.g. the Slovak University of Technology in Bratislava, the Faculty of Natural Sciences and Faculty of Medicine at Comenius University in Bratislava; the University Children's Hospital in Bratislava), which allow INPP SAS to expand the range of studied topics and solve problems together with other institutions under joint projects.

PhD Study and Foreign Students

Currently, INPP SAS has two PhD study programmes: Normal and Pathological Physiology in cooperation with the Faculty of Medicine, and Animal Physiology in cooperation with the Faculty of Natural Sciences, both of which are part of Comenius University in Bratislava. Within the PhD programmes INPP SAS has been able to accept PhD students from different faculties, including the Faculty of Natural Sciences Comenius University, the Faculty of Mathematics, Physics and Informatics at Comenius University, the University of Veterinary Medicine and Pharmacy in Košice, and others.

Within the Slovak Academic Information Agency (SAIA) programme INPP SAS hosted Dr. Vladimír

Zivkovič from the Faculty of Medical Sciences at the University of Kragujevac, who conducted experiments within the Institute as part of his PhD study.

The Institute of Normal and Pathological Physiology SAS also hosted master's students from the University of Vienna's Faculty of Psychology, who collected data for their master's theses and were supported by the Austria – Slovakia Action: (i) Johanna Raffaseder, project title: *The effect of estradiol on sensorimotor gating*; and (ii) Jan Seidel, project title: *The role of sex hormones in fear processing*. Reciprocally, PhD students from INPP SAS utilised the Austria – Slovakia Action in order to stay at the University of Vienna.

In addition to PhD study programmes, INPP SAS is currently hosting Dr. Jasminka Majdandžić, previously appointed by the University of Vienna, within the programme *SASPRO - Mobility Programme of the Slovak Academy of Sciences*, which began in May 2015.

In addition to information mentioned in this questionnaire, we would like to rivet attention of the expert panel to financial situation of the Institute. During the assessment period, the Institute was rejuvenated and we have successfully integrated several young people (our former PhD student) to research personnel of the Institute (Fig 5). This however resulted in the decrease of the average gross income of all researchers with PhD. title, as depicted in the Fig 6. In the last three years (2013-2015) average gross income of research personnel was lower than the average gross income in Slovak economy. Data about the average gross income in Slovak economy in 2012-2015 were taken from the official web site of the Statistical Office of the Slovak Republic.

Key Figures

Fig. 1.

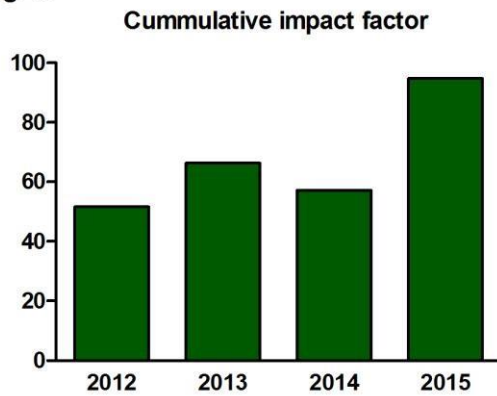


Fig. 2.

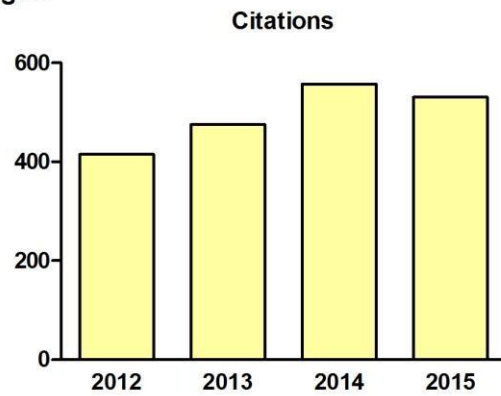


Fig. 3.

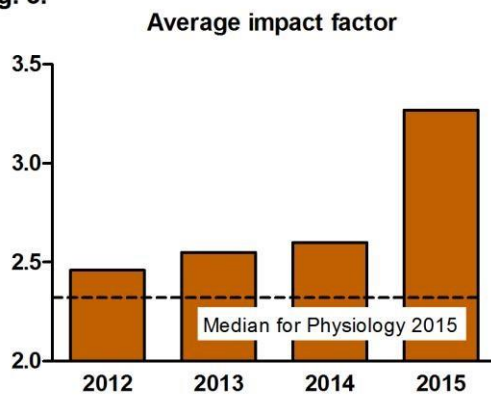


Fig. 4.

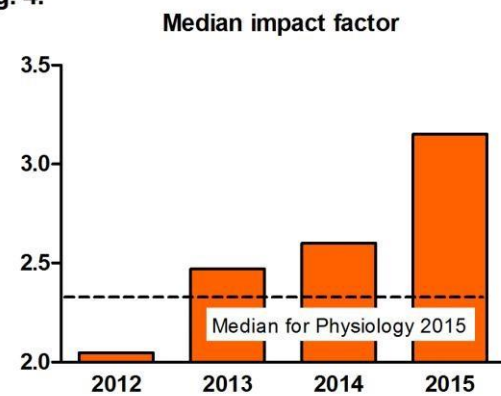


Fig. 5.

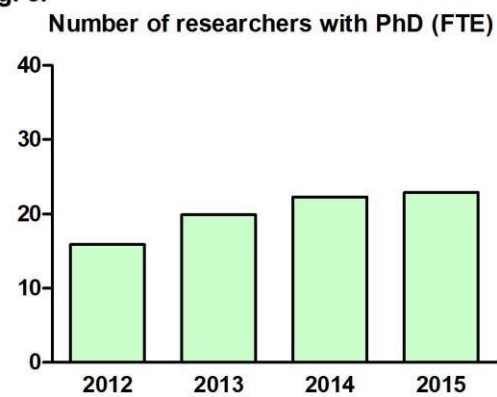


Fig. 6.

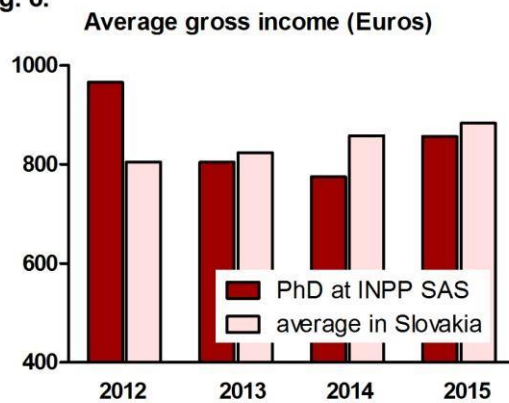


Figure legend: Cumulative impact factor (Fig.1), Number of citations (Fig.2), Average impact factor (Fig.3), Median impact factor (Fig.4), Number of researchers with PhD in FTE (Fig.5) and Average gross income of PhD at INPP SAS and in Slovakia for each year of the assessment period.

2. Partial indicators of main activities:

2.1. Research output

2.1.1. Principal types of research output of the institute: basic research/applied research, international/regional (ratios in percentage)

basic research/applied research: 90/10

international/regional (ratios in percentage): 90/10

2.1.2. List of selected publications documenting the most important results of basic research. The total number of publications listed for the assessment period should not exceed the average number of employees with university degrees engaged in research projects. The principal research outputs (max. 5, including Digital Object Identifier - DOI) should be underlined

2012

PAULIS, Ľudovít - BECKER, S. - LUCHT, K. - SCHWENGEL, K. - SLAVIC, S. - KASCHINA, E. - THONE-REINEKE, C. - DAHLÖF, B. - BAULMANN, J. - UNGER, Thomas - STECKELINGS, U.M. Direct angiotensin II type 2 receptor stimulation in N ω -nitro-L-arginine-methyl ester-induced hypertension: the effect on pulse wave velocity and aortic remodeling. In *Hypertension*, 2012, vol. 59, no. 2, p. 485-492. (6.207 - IF2011). (2012 - Current Contents). ISSN 0194-911X. doi: 10.1161/HYPERTENSIONAHA.111.185496.

KRUŤLIAK, Peter - KOVÁČOVÁ, Gabriela - PECHÁŇOVÁ, Oľga. Therapeutic potential of nitric oxide donors in the prevention and treatment of angiogenesis-inhibitor-induced hypertension. In *Angiogenesis*, 2012, p. 1-7. (6.063 - IF2011). (2012 - Current Contents). ISSN 0969-6970. doi: 10.1007/s10456-012-9327-4.

PAULIS, Ľudovít - ŠIMKO, Fedor - LAUDON, M. Cardiovascular effects of melatonin receptor agonists. In *Expert Opinion on Investigational Drugs*, 2012, vol. 21, no.11, p. 1661-1678. (5.274 - IF2011). (2012 - Current Contents). ISSN 1354-3784.

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KONDRASHOV, Alexey - VRANKOVÁ, Stanislava - DOVINOVA, Ima - ŠEVČÍK, Rudolf - PAROHOVÁ, Jana - BARTA, Andrej - PECHÁŇOVÁ, Oľga - KOVÁCSOVÁ, Mária. The effects of new Alibernet red wine extract on nitric oxide and reactive oxygen species production in spontaneously hypertensive rats. In *Oxidative medicine and cellular longevity*, 2012, vol. 2012, article ID 806285, 8 p. (2.841 - IF2011). ISSN 1942-0900.

KOPINCOVÁ, Jana - PÚZSEROVÁ, Angelika - BERNÁTOVÁ, Iveta. L-NAME in the cardiovascular system - nitric oxide synthase activator? In *Pharmacological Reports*, 2012, vol. 64, p. 511-520. (2.445 - IF2011). ISSN 1734-1140.

2013

ŠIMKO, Fedor - PAULIS, Ľudovít. Antifibrotic effect of melatonin - Perspective protection in hypertensive heart disease. In *International Journal of Cardiology*, 2013, vol. 168, no. 3, p. 28762877. (5.509 - IF2012). (2013 - Current Contents). ISSN 0167-5273.

SLAVIC, S. - LAUER, D. - SOMMERFELD, M. - KEMNITZ, R.U. - GRZESIAK, A. - TRAPPIEL, M. - THONE-REINEKE, C. - BAULMANN, J. - PAULIS, Ľudovít - KAPPERT, K. - KINTSCHER, U. - UNGER, Thomas - KASCHINA, E. Cannabinoid receptor 1 inhibition improves cardiac function and remodelling after myocardial infarction and in experimental metabolic syndrome. In *Journal of Molecular Medicine*, 2013, vol. 91, p. 811-823. (4.768 - IF2012). (2013 - Current Contents). ISSN 0946-2716.

MINÁR, Michal - VALKOVA, Patricia - VALKOVIČ, Peter. Prevalence and impact of restless legs syndrome in university students. In *Movement Disorders*, 2013, vol. 28, no. 8, p. 1157-1158. (4.558 - IF2012). (2013 - Current Contents). ISSN 0885-3185.

KUČEROVÁ, Lucia - FEKETEOVÁ, Lucia - MATÚŠKOVÁ, Miroslava - KOZOVSKÁ, Zuzana - JANEGA, Pavol - BABAL, Pavel - POTURNAJOVÁ, Martina. Local bystander effect induces dormancy in human medullary thyroid carcinoma model in vivo. In *Cancer Letters*, 2013, vol. 335, no. 2, p. 299-305. (4.258 - IF2012). (2013 - Current Contents). ISSN 0304-3835

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2.1.3 List of monographs/books published abroad none

2.1.4. List of monographs/books published in Slovakia

KRISTEK, František - ČAČANYIOVÁ, Soňa. *Štruktúra a funkcia cievnej steny v normotenzii a hypertenzii*. Bratislava: Petrus, 2015. 130 pp. ISBN 978-80-89233-79-3.

2.1.5. List of other scientific outputs specifically important for the institute, max. 10 items

1. One valuable output was achieved by the research team of Dr. O. Pecháňová, which has been included in a selection of excellent research teams of the SAS by the Academic Ranking and Rating Agency (ARRA). This agency independently identifies Slovak leaders and personalities from all academic institutions.
2. Another highly valuable result is a chapter in a monograph (Macho et al.) that summarises space research in life sciences in Czechoslovakia and the Slovak Republic. Space research was carried out at the Institute under the framework of the project Senso-asymetria, which was devoted to effects of microgravity on vestibular function, particularly sensory motor adaptation to microgravity and readaptation to Earth conditions after spaceflight.

MACHO, Ladislav - KVETŇANSKÝ, Richard - AHLERS, I. - MIŠUROVÁ, E. - HLAVAČKA, František. Life science space research in Czechoslovakia and Slovak Republic. In *History of Rocketry and Astronautics. AAS History Series*. Vol. 41. - San Diego, California: American Astronautical Society, 2014, p. 413-430. ISBN 978-087703-607-4.

3. On the basis of her scientific output, Dr. I. Bernátová was invited to serve as a Lead Guest Editor (with co-editors R. Andriantsitohaina, V. Matchkov, and S. Arribas) in the BioMed Res International, special issue entitled “*Endothelium in Diseased States*”, <http://www.hindawi.com/journals/bmri/si/792605/>.

4. The Institute of Normal and Pathological Physiology, SAS, is highly honoured by the fact that several of its research grants were recognised by grant agencies as being “accomplished with excellent results,” or selected among the best results of the SAS:

Title: *The participation of neuronal NO synthase in the regulation of function and structure in cardiovascular system of normotensive and spontaneously hypertensive rats*

Principal investigator: RNDr. Soňa Čačányiová, PhD.

Registration number of the project: VEGA 2/0111/10

accomplished with excellent results

Title: *Etiopatogenesis of compromise blood pressure control: manifestation on structure and function of cardiovascular system*

Principal investigator: RNDr. František Kristek, DrSc.

Registration number of the project: VEGA 2/0019/09

accomplished with excellent results

Title: *Gender differences in etiopathogenesis of social stress-related cardiovascular and behavioural disorders in individuals with predisposition to hypertension*

Principal investigator: RNDr. Iveta Bernátová, DrSc. Registration number of the

project: APVV-0523-10 accomplished with excellent results, see

<http://online.anyflip.com/qjgt/jxnm/#p=1> p. 56

Title: *Social stress as a risk factor of early development of hypertension in predisposed individuals*

Principal investigator: RNDr. Iveta Bernátová, DrSc.

Registration number of the project: VEGA 2/8400/10

accomplished with excellent results

Title: The effect of aliskiren loaded nanoparticles in experimental hypertension

Principal investigator: doc. RNDr. Oľga Pecháňová, DrSc.
Registration number of project: APVV-0742-10 accomplished
with excellent results

Title: Effect of (pro)renin antagonist (RER-24) loaded nanoparticles in experimental hypertension
Principal investigator: doc. RNDr. Oľga Pecháňová, DrSc.
Registration number of project: VEGA 2/0183/12
accomplished with excellent results

Title: *Changes in redox balance in neuronal hypertension connected with metabolic syndrome. The role of uncoupled NO synthase*

Principal investigators: RNDr. Ima Dovinová, PhD. and Prof. Julie Y.H. Chan, PhD.

Registration number of the project: SAS-NSC JRP

Selected among the most important international scientific result of Slovak Academy of Sciences, Section II, see SAS Annual Report 2014, p. 25, see http://www.sav.sk/?lang=sk&doc=docsann&lang_change=en

2.1.6. List of patents, patent applications, and other intellectual property rights registered abroad, incl. revenues

none

2.1.7. List of patents, patent applications, and other intellectual property rights registered in Slovakia, incl. revenues

none

2.1.8. Table of research outputs (as in annual reports).

Papers from international collaborations in large-scale scientific projects (Dwarf team, ALICE Collaboration, ATLAS collaboration, CD Collaboration, H1 Collaboration, HADES Collaboration, and STAR Collaboration) have to be listed separately.

Scientific publications	2012			2013			2014			2015			total			
	number	No. / FTE	No. / salary budget	number	No. / FTE	No. / salary budget	number	No. / FTE	No. / salary budget	number	No. / FTE	No. / salary budget	number	averaged number per year	av. No. / FTE	av. No. / salary budget
Scientific monographs and monographic studies in journals and proceedings published abroad (AAA, ABA)	0,0	0,000	0,000	0,0	0,000	0,000	0,0	0,000	0,000	0,0	0,000	0,000	0,0	0,0	0,000	0,000
Scientific monographs and monographic studies in journals and proceedings published in Slovakia (AAB, ABB)	0,0	0,000	0,000	0,0	0,000	0,000	0,0	0,000	0,000	1,0	0,027	0,003	1,0	0,3	0,006	0,001
Chapters in scientific monographs published abroad (ABC)	0,0	0,000	0,000	0,0	0,000	0,000	1,0	0,026	0,003	0,0	0,000	0,000	1,0	0,3	0,006	0,001
Chapters in scientific monographs published in Slovakia (ABD)	0,0	0,000	0,000	0,0	0,000	0,000	0,0	0,000	0,000	5,0	0,133	0,014	5,0	1,3	0,032	0,004
Scientific papers published in journals registered in Current Contents Connect (ADCA, ADCB, ADDA, ADEB)	17,0	0,406	0,050	19,0	0,474	0,056	14,0	0,360	0,042	22,0	0,585	0,061	72,0	18,0	0,454	0,052
Scientific papers published in journals registered in Web of Science Core Collection and SCOPUS (ADMA, ADMB, ADNA, ADNBB)	8,0	0,191	0,023	18,0	0,449	0,053	13,0	0,334	0,039	14,0	0,373	0,039	53,0	13,3	0,335	0,039
Scientific papers published in other foreign journals (not listed above) (ADEA, ADEB)	1,0	0,024	0,003	0,0	0,000	0,000	4,0	0,103	0,012	3,0	0,080	0,008	8,0	2,0	0,050	0,006
Scientific papers published in other domestic journals (not listed above) (ADFA, ADFB)	4,0	0,096	0,012	0,0	0,000	0,000	3,0	0,077	0,009	3,0	0,080	0,008	10,0	2,5	0,063	0,007
Scientific papers published in foreign peerreviewed proceedings (AEC, AECA)	6,0	0,143	0,018	1,0	0,025	0,003	3,0	0,077	0,009	0,0	0,000	0,000	10,0	2,5	0,063	0,007
Scientific papers published in domestic peerreviewed proceedings (AED, AEDA)	5,0	0,119	0,015	3,0	0,075	0,009	32,0	0,822	0,097	3,0	0,080	0,008	43,0	10,8	0,271	0,031
Published papers (full text) from foreign and international scientific conferences (AFA, AFC, AFBA, AFDA)	1,0	0,024	0,003	0,0	0,000	0,000	1,0	0,026	0,003	1,0	0,027	0,003	3,0	0,8	0,019	0,002

Published papers (full text) from domestic scientific conferences (AFB, AFD, AFBB, AFDB)	2,0	0,048	0,006	0,0	0,000	0,000	0,0	0,000	0,000	6,0	0,160	0,017	8,0	2,0	0,050	0,006
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□ **Supplementary information and/or comments on the scientific outputs of the institute.**

The publication strategy of INPP SAS was designed to both improve the quality of papers (based on impact factor) as well as to increase the number of articles (Figs 1 and 2). The number of full-length publications in journals with an impact factor per year was during the assessment period 2012-2015 in the range of 21 to 29, and the impact factor of these articles was gradually increased). The average impact factor of the journals, in which we have published our results in the assessment period, was 2.46, 2.55, 2.60, and 3.27, which is above the median value for physiology (2.34). Most importantly, median value was significantly increased since 2013, which proves the increasing quality of our results (Figs. 3 and 4). The publications, which represent the “principal scientific output” of INPP SAS include original research articles as well as important review articles, reviewing our own results. This is promising for the future, as it will result in an accelerated increase in citation numbers during the next assessment period.

An indirect, but highly valuable response to improving the international position of the Institute in the field of physiology and pathophysiology is the selection of INPP SAS to organise the “8th International Congress of Pathophysiology,” which will be held in Bratislava in 2018 (web site www.icp2018.com).

2.2. Responses to the research outputs (citations, etc.)

2.2.1. Table with citations per annum.

Citations of papers from international collaborations in large-scale scientific projects (Dwarf team, ALICE Collaboration, ATLAS collaboration, CD Collaboration, H1 Collaboration, HADES Collaboration, and STAR Collaboration) have to be listed separately.

Citations, reviews	2011		2012		2013		2014		total		
	number	No. / FTE	number	No. / FTE	number	No. / FTE	number	No. / FTE	number	averaged number per year	av. No. / FTE
Citations in Web of Science Core Collection (1.1, 2.1)	339,0	8,100	364,0	9,086	418,0	10,737	415,0	11,043	1536,0	384,0	9,696

Citations in SCOPUS (1.2, 2.2) if not listed above	57,0	1,362	91,0	2,272	119,0	3,057	87,0	2,315	354,0	88,5	2,235
Citations in other citation indexes and databases (not listed above) (3.2,4.2,9,10)	0,0	0,000	0,0	0,000	0,0	0,000	4,0	0,106	4,0	1,0	0,025
Other citations (not listed above) (3, 4, 3.1, 4.1)	19,0	0,454	20,0	0,499	20,0	0,514	24,0	0,639	83,0	20,8	0,524
Reviews (5,6)	0,0	0,000	0,0	0,000	0,0	0,000	0,0	0,000	0,0	0,0	0,000

2.2.2. List of 10 most-cited publications, with number of citations, in the assessment period (2011 – 2014).

1. PILŠÁKOVÁ, Ludmila - RIEČANSKÝ, Igor - JAGLA, Fedor. The physiological actions of isoflavone phytoestrogens. In *Physiological Research*, 2010, vol. 59, no. 5, p. 651-664. (1.430 - IF2009). (2010 - Current Contents). ISSN 0862-8408.
Citations: 52
2. PAULIS, Ľudovít - UNGER, Thomas. Novel therapeutic targets for hypertension. In *Nature Reviews Cardiology*, 2010, vol. 7, p. 431-441. (2010 - Current Contents). ISSN 1759-5002. Citations: 52
3. TÖRÖK, Jozef. Participation of nitric oxide in different models of experimental hypertension. In *Physiological Research*, 2008, vol. 57, no. 6, p. 813-825. (1.505 - IF2007). (2008 - Current Contents). ISSN 0862-8408.
Citations: 45
4. HORAK, F. B. - HLAVAČKA, František. Somatosensory loss increases vestibulospinal sensitivity. In *Journal of Neurophysiology*, 2001, vol. 86, no. 2, p. 575-585. (3.855 - IF2000). (2001 - Current Contents). ISSN 0022-3077.
Citations: 41
5. ŠIMKO, Fedor - PAULIS, Ľudovít. Melatonin as a potential antihypertensive treatment. In *Journal of Pineal Research*, 2007, vol. 42, pp. 319-322. (4.228 - IF2006). (2007 - Current Contents). ISSN 0742-3098.
Citations: 41
6. ABRAHÁMOVÁ, Diana - HLAVAČKA, František. Age-related changes of human balance during quiet stance. In *Physiological Research*, 2008, vol. 57, no. 6, p. 957-964. (1.505 - IF2007). (2008 - Current Contents). ISSN 0862-8408. Citations: 37
7. REGECOVÁ, Valéria - KELLEROVÁ, Eva. Effects of urban noise-pollution on blood-pressure and heart-rate in preschool-children. In *Journal of Hypertension*, 1995, vol. 13, no. 4, p. 405-412. ISSN 0263-6352.
Citations: 35
8. UNGER, Thomas - PAULIS, Ľudovít - SICA, Domenic A. Therapeutic perspectives in hypertension: novel means for renin-angiotensin-aldosterone system modulation and emerging device-based approaches. In *European Heart Journal*, 2011, vol. 32, p. 2739-2747. (10.046 - IF2010). (2011 - Current Contents). ISSN 0195-668X.
Citations: 33
9. PAULIS, Ľudovít - ŠIMKO, Fedor. Blood pressure modulation and cardiovascular protection by melatonin: Potential mechanisms behind. In *Physiological Research*, 2007, vol. 56, no. 6, pp. 671-684. (2.093 - IF2006). (2007 - Current Contents). ISSN 0862-8408. Citations: 32
10. GALLEANO, Monica - PECHÁŇOVÁ, Oľga - FRAGA, César G. Hypertension, nitric oxide, oxidants, and dietary plant polyphenols. In *Current Pharmaceutical Biotechnology*, 2010, vol. 11, no. 8, p. 837-848. (3.404 - IF2009). ISSN 1389-2010. Citations: 31

2.2.3. List of most-cited authors from the Institute (at most 10 % of the research employees with university degree engaged in research projects) and their number of citations in the assessment period (2011– 2014).

Pecháňová O. - 579 cit.
Bernátová I. - 330 cit.
Paulis Ľ. - 308 cit. Hlavačka
F. - 251 cit.
Kristek F. - 188 cit.

□ **Supplementary information and/or comments on responses to the scientific output of the institute.**

As shown in the Table 2.2.1, the number of citation references to articles published by INPP SAS is increasing. In addition, the number of WoS citations is also rising. INPP SAS believes that this successful trend will continue over the next assessment period, because the number and quality of articles published by INPP SAS in the last four years has also increased. Moreover, articles published during this assessment period have strong potential to yield more citations, leading INPP SAS to believe that the overall number of citations achieved by the Institute will continue to grow in future.

In addition, articles published by INPP SAS have been cited in high impact journals, including top medical journals such as *Lancet*, *Physiological Reviews*, *Nature Medicine*, *Circulation*, *Journal of the American College of Cardiology*, and others:

UNGER, Thomas - PAULIS, Ľudovít - SICA, Domenic A. Therapeutic perspectives in hypertension: novel means for renin-angiotensin-aldosterone system modulation and emerging device-based approaches. In *European Heart Journal*, 2011, vol. 32, p. 2739-2747. (10.046 - IF2010). (2011 - Current Contents). ISSN 0195-668X.

LAURENT, S. - SCHLAICH, M. - ESLER, M. New drugs, procedures, and devices for hypertension. In *LANCET*. ISSN 0140-6736, AUG 11 2012, vol. 380, no. 9841, p. 591-600. **IF 39.060**

XIE, M. - BURCHFIELD, J.S. - HILL, J.A. Pathological Ventricular Remodeling: Therapies: Part 2 of 2. In *CIRCULATION*. ISSN 0009-7322, AUG 27 2013, vol. 128, no. 9, p. 1021-1030. **IF 14.948**

ONDRIAŠ, Karol - STAŠKO, Andrej - ČAČÁNYIOVÁ, Soňa - SULO VÁ, Zdena - KRIŤANOVÁ, Oľga - KRISTEK, František - MÁLEKOVÁ, Ľubica - KNEZL, Vladimír - BREIER, Albert. H₂S and HS- donor NaHS releases nitric oxide from nitrosothiols, metal nitrosyl complex, brain homogenate and murine L1210 leukaemia cells. In *Pflugers Archiv-European Journal of Physiology*, 2008, vol. 457, no. 2, p. 271-279. (3.842 - IF2007). (2008 - Current Contents). ISSN 0031-6768.

WANG, R. Physiological implications of hydrogen sulfide: a whiff exploration that blossomed. In *PHYSIOLOGICAL REVIEWS*. ISSN 0031-9333, 2012, vol. 92, no. 2, p. 791-896., **IF 30.17**
FARRUGIA, G. - SZURSZEWSKI, J. H. Carbon Monoxide, Hydrogen Sulfide, and Nitric Oxide as Signaling Molecules in the Gastrointestinal Tract. In *GASTROENTEROLOGY*. ISSN 0016-5085, 2014, vol. 147, no. 2, p. 303-313. **IF 16.72**

FARAH, V.M. - JOAQUIM, L.F. - BERNÁTOVÁ, Iveta - MORRIS, M. Acute and chronic stress influence blood pressure variability in mice. In *Physiology & Behavior*, 2004, vol. 83, no. 1, p. 135-142.

PURKAYASTHA, S. - ZHANG, G. - CAI, D.S. Uncoupling the mechanisms of obesity and hypertension by targeting hypothalamic IKK-beta and NF-kappa B. In *NATURE MEDICINE*. ISSN 1078-8956, JUL 2011, vol. 17, no. 7, p. 883-U255. **IF 22.462**

PECHÁŇOVÁ, Oľga - BERNÁTOVÁ, Iveta - PELOUCH, Václav - BABÁL, Pavel. L-NAME-induced protein remodeling and fibrosis in the rat heart. In *Physiological Research*, 1999, vol. 48, no. 5, p. 353-362. (0.616 - IF1998).

COELHO-FILHO, Otavio R. - SHAH, Ravi V. - MITCHELL, Richard - NEILAN, Tomas G. - MORENO, Heitor, Jr. - SIMONSON, Bridget - KWONG, Raymond - ROSENZWEIG, Anthony - DAS, Saumya - JEROSCH-HEROLD, Michael. Quantification of Cardiomyocyte Hypertrophy by Cardiac Magnetic Resonance Implications for Early Cardiac Remodeling. In *CIRCULATION*. ISSN 0009-7322; 1524-4539, SEP 10 2013, vol. 128, no. 11, p. 1225-1233. **IF 15.073**

PAULIS, Ľudovít - PECHÁŇOVÁ, Oľga - ZICHA, Josef - BARTA, Andrej - GARDLIK, Roman - CELEC, Peter - KUNEŠ, Jaroslav - ŠIMKO, Fedor. Melatonin interactions with blood pressure and vascular function during L-NAME-induced hypertension. In *Journal of Pineal Research*, 2010, vol. 48, p. 102-108. (5.209 - IF2009). (2010 - Current Contents). ISSN 0742-3098.

RAMOS, L.A.F. - CONCEICAO-VERTAMATTI, A.G. - HENRIQUE-CABRINI, F.P. - REYES, F.G.R. - GRASSI-KASSISSE, D.M. - AREAS, M.A. Melatonin reduces cardiovascular alterations in rats with pulmonary arterial hypertension induced by monocrotaline. In *CIRCULATION*. ISSN 0009-7322, MAY 15 2012, vol. 125, no. 19, p. E768-E768. **IF 15.202**

DLUGOŠOVÁ, Katarína - OKRUHLICOVÁ, Ľudmila - MITAŠÍKOVÁ, Marcela - SOTNÍKOVÁ, Ružena - BERNÁTOVÁ, Iveta - WEISMANN, Peter - SLEZÁK, Ján - TRIBULOVÁ, Narcis. Modulation of connexin-43 by omega-3 fatty acids in the aorta of old spontaneously hypertensive rats. In *Journal of Physiology and Pharmacology : formerly Acta Physiologica Polonica*, 2009, vol. 60, no. 3, p. 63 - 69. (2.631 - IF2008).

MOZAFFARIAN, D. - WU, J.H.Y. Omega-3 Fatty Acids and Cardiovascular Disease Effects on Risk Factors, Molecular Pathways, and Clinical Events. In *JOURNAL OF THE AMERICAN COLLEGE OF CARDIOLOGY*. ISSN 0735-1097, 2011, vol. 58, no. 20, p. 20472067. **IF14.156**

RADOŠINSKÁ, Jana - BAČOVÁ, Barbara - BERNÁTOVÁ, Iveta - NAVAROVÁ, Jana - ZHUKOVSKA, Anna - SHYSH, Angela - OKRUHLICOVÁ, Ľudmila - TRIBULOVÁ, Narcis. Myocardial NOS activity and connexin-43 expression in untreated and omega-3 fatty acids-treated spontaneously hypertensive and hereditary hypertriglyceridemic rats. In *Molecular and Cellular Biochemistry : an international journal for chemical biology in health and disease*, 2011, vol. 347, no.1-2, p. 163-173. (2.168 - IF2010).

MOZAFFARIAN, D. - WU, J.H.Y. Omega-3 Fatty Acids and Cardiovascular Disease Effects on Risk Factors, Molecular Pathways, and Clinical Events. In *JOURNAL OF THE AMERICAN COLLEGE OF CARDIOLOGY*. ISSN 0735-1097, 2011, vol. 58, no. 20, p. 20472067. **IF 14.156**

PAULIS, Ľudovít - BECKER, S. - LUCHT, K. - SCHWENGEL, K. - SLAVIC, S. - KASCHINA, E. - THONE-REINEKE, C. - DAHLÖF, B. - BAULMANN, J. - UNGER, Thomas - STECKELINGS, U.M. Direct angiotensin II type 2 receptor stimulation in Nw-nitro-L-arginine-methyl ester-induced hypertension: the effect on pulse wave velocity and aortic remodeling. In *Hypertension*, 2012, vol. 59, no. 2, p. 485-492. (6.207 - IF2011). (2012 - Current Contents). ISSN 0194-911X.

HUANG, J.B. - YAMASHIRO, Y. - PAPKE, C.L. - IKEDA, Y. - LIN, Y.L. - PATEL, M. - INAGAMI, T. - LE, V.P. - WAGENSEIL, J.E. - YANAGISAWA, H. Angiotensin-Converting Enzyme-Induced Activation of Local Angiotensin Signaling Is Required for Ascending Aortic Aneurysms in Fibulin-4-Deficient Mice. In SCIENCE TRANSLATIONAL MEDICINE. ISSN 1946-6234, MAY 1 2013, vol. 5, no. 183. **IF 14.41**

PRIPFL, Jurgen - TOMOVA, Livia - RIEČANSKÝ, Igor - LAMM, Claus. Transcranial magnetic stimulation of the left dorsolateral prefrontal cortex decreases cue-induced nicotine craving and EEG delta power. In Brain Stimulation, 2014, vol. 7, p. 226-233. (5.432 - IF2013). (2014 - Current Contents). ISSN 1935-861X.

GRALL-BRONNEC, M. - SAUVAGET, A. The use of repetitive transcranial magnetic stimulation for modulating craving and addictive behaviours: A critical literature review of efficacy, technical and methodological considerations. In NEUROSCIENCE AND BIOBEHAVIORAL REVIEWS. ISSN 0149-7634, NOV 2014, vol. 47, p. 592-613. **IF 10.284**

2.3. Research status of the institute in international and national contexts

□ International/European position of the institute

2.3.1. List of the most important research activities demonstrating the international relevance of the research performed by the institute, incl. major projects (details of projects should be supplied under Indicator 2.4). Max. 10 items.

- 1. COST projects:** The Institute of Normal and Pathological Physiology SAS has been involved in (i) COST BM-1005, entitled *Gasotransmitters: from basic science to therapeutic applications (ENOG: European Network on Gasotransmitters)*, project leader: *Andreas Papapetropoulos (University of Athens)*, project leader at INPP SAS: *Oľga Pecháňová*, duration: 1.5.2011 - 1.5.2015; and (ii) COST BM-1203 - *EU-ROS: The European Network on Oxidative Stress and Redox Biology Research* - with a leader: *Andreas Daibner (Johannes Gutenberg-Universität Mainz)* and *Oľga Pecháňová* as the leader for INPP SAS, duration: 1.6.2013 - 31.5.2016. Notably, in COST BM-1005, INPP SAS was part of the Member Committee. This COST projects allowed INPP SAS to cooperate with world leaders in researching NO and reactive oxygen species. Activities included research stays and training courses for scientists and PhD students. One of the results of this collaboration was a common publication in the prestigious *British Journal of Pharmacology* (Br J Pharmacol. 2015 Mar; 172(6):1415-33).
- 2. The SAS-CONICET programme:** Since 2010, INPP SAS has collaborated with the School of Pharmacy and Biochemistry, at the University of Buenos Aires. From 2013-2015 this collaboration was covered by the project *Metabolic syndrome: inflammation in hypertension and the effect of polyphenols*, project leader: *Oľga Pecháňová*, duration: 1.1.2013 - 31.12.2015. The project enabled bilateral exchange of researchers and resulted in two well-cited publications (Curr Pharm Biotechnol. 2010 Dec; 11(8):837-48; IUBMB Life. 2013 Aug; 65(8):710-5).
- 3. The SAS-Taiwan programme:** The Institute of Normal and Pathological Physiology SAS participated in the bilateral project *SAS-NSC JRP 2010/01, Study of interactions between reactive oxygen species and nitric oxide in search for novel mechanisms of hypertension*, project leader: *Ima Dovinová*, duration: 1.1.2011 - 31.12.2013, with the Centre for Translational Research in Biomedical Sciences, Chang Gang Memorial Hospital, Kaohsiung, Taiwan. The project included mutual visits, common experiments, and resulted

in a valuable publication in the journal *Hypertension* (Hypertension. 2014 Oct; 64(4):815-24; PPAR Res. 2013; 2013: 541871).

4. European Network for Workplace Health Promotion (ENWHP): The Institute of Normal and Pathological Physiology SAS has participated as part of the *EU program: Promoting healthy work for employees with chronic illness - public health and work: Executive Agency of Health and Consumers, project no.: EAHC No 20101208, coordinating institution: Prevent (Belgium), coordinator at INPP SAS: Fedor Jagla, duration: 1.9.2011 - 31.8.2013*. INPP SAS was selected as the National Contact Office of the ENWHP, and was responsible for the coordination of ENWHP activities and projects in Slovakia. During the assessed period INPP SAS coordinated a project financed by DG SANCO Public Health and Work (PHWork), which began in 2011.

5. Joint laboratories and cooperation agreements: The Institute of Normal and Pathological Physiology SAS has established a joint research laboratory with (i) Charité

–
Universitätsmedizin in Berlin, Germany; and (ii) the Faculty of Medical Sciences at University of Kragujevac, Serbia. Furthermore, INPP SAS has signed a cooperation agreement with the Faculty of Psychology at University of Vienna in Austria. A research collaboration agreement has also been signed with the Balance Disorders Laboratory in the Department of Neurology, School of Medicine at Oregon Health and Science University, in Portland, USA. These cooperations have resulted in several high-impact publications (see 2.1.2 List of selected publications).

6. INPP SAS received the status of “**Centre of Excellence for Examination of Regulatory Role of Nitric Oxide in Civilisation Diseases (NOREG)**” in period 2011-2015. The aim of the centre was to identify common NO-regulated (patho)mechanisms, which play a role in the development of hypertension, obesity, dyslipidaemia, diabetes mellitus, metabolic syndrome, social stress-related disorders, mental and movement disorders.

7. The Institute of Normal and Pathological Physiology SAS has enjoyed long-term cooperation with the Faculty of Medicine at Comenius University in Bratislava under the framework of the **Centre of Experimental Medicine**, which is a joint research centre that aims to develop a theoretical and infrastructural basis for the field of experimental medicine and translate that knowledge for use in basic clinical research and broader medical praxis.

8. INPP SAS has cooperation agreements with several faculties, other institutes of SAS, and clinics (e.g. the Slovak University of Technology in Bratislava, the Faculty of Natural Sciences and Faculty of Medicine at Comenius University in Bratislava; the University Children’s Hospital in Bratislava), which allow INPP SAS to expand the range of studied topics and solve problems together with other institutions under joint projects.

2.3.2. List of international conferences (co)organised by the institute.

2012:

Symposium "ENDOTHELIUM IN DISEASED STATES," held on September 10, 2012 under the framework of the "Joint FEPS and Spanish Physiological Society Scientific Congress," in Santiago de Compostela, Spain, 8.9. - 11.9.2012. The symposium was organised by Dr. Bernátová in cooperation with prof. Silvia Arribas from the Universidad de Autonoma de Madrid, and focused on the role of endothelium and endothelium-derived factors in diseased states. The symposium was partially sponsored by the Spanish Physiological Society. Invited speakers were: Ramarason Andriantsitohaina (Angers, France), Nicole Lüneburg (Hamburg, Germany), Josef Zicha (Prague, Czech Republic), and Julio Brito (Iquique, Chile).

INTERNATIONAL C.I.A.N.S. CONFERENCE 2012, held in the Congress Centre of the SAS, Stará Lesná, Slovakia, 10.10. - 12.10.2012, with chairman Dr. Jagla and 80 participants from 7 European countries. The programme of the conference focused on autism research, neuropsychology, experimental psychophysiology, and electrophysiology of higher brain functions. It was the fifth C.I.A.N.S. event organised in Slovakia by INPP SAS since 2000. The next C.I.A.N.S. event will be held in Bratislava in September 2016.

INTERNATIONAL SYMPOSIUM: LIFESTYLE AND RISK FACTORS IN DISEASES OF CIVILISATION, held in the Congress Centre of the SAS, Stará Lesná, Slovakia, 12.10. - 14.10.2012, with chairperson Dr. Pecháňová and 60 participants from 7 European countries. The programme of the symposium was divided into five sessions: Introductory workshop: risk factors; Ischemia as a cardiovascular risk factor; Nitric oxide and cardiovascular risk factors; Physiological and clinical aspects; and Free communications.

2013:

INTERNATIONAL SYMPOSIUM: EXPLORING THE BIOLOGICAL MECHANISMS OF DECISION MAKING BY BRAIN STIMULATION, an international symposium in the 55th Conference of Experimental Psychologists TeaP 2013, 26.3.2013, Vienna, Austria, convenors: Jürgen Pripfl (University of Vienna) and Igor Riečanský. The symposium focused on recent research on brain mechanisms of decision-making, using novel techniques of non-invasive brain stimulation in humans, in particular transcranial magnetic and electric current stimulation. The audience included about 100 conference participants.

COST SYMPOSIUM focused on THE MECHANISMS AND EFFECTS OF USE OF CLINICAL TRANSMITTERS GASES, such as nitric oxide, hydrogen sulfide, and carbon monoxide, held in the Congress Centre SAS, Smolenice, 10.4. - 12.4.2013, with chairperson Dr. Pecháňová and 70 participants from 16 European countries and prof. Jon Fukuto from Sonoma State University. Particularly pleasing was the participation of young scientists and PhD students. The symposium confirmed further international cooperation, including the exchange of PhD students.

Bilateral Slovak – Czech symposium MODULATION OF VASCULAR WALL FUNCTION AS A THERAPEUTIC TARGET IN HYPERTENSION, held in Bratislava on November 26, 2013. The symposium was organised by Dr. Bernátová in cooperation with Dr. Zicha from the Institute of Physiology, Academy of Sciences of Czech Republic.

NEUROTRANSMITTERS AND THEIR ROLE – an invited international symposium within the XIIIth Psychopharmacological Symposium, 29.11.2013, Congress Centre of the SAS, Smolenice, Slovakia, chairman: Igor Riečanský. The symposium focused on neurotransmitter mechanisms of reward processing, investigated by psychopharmacological manipulations, functional neuroimaging, event-related potentials European, and behavioural methods in humans. The audience included about 50 conference participants.

2014:

INTERNATIONAL SYMPOSIUM: RENIN INHIBITOR–ALISKIREN: PRESENT KNOWLEDGE PROMISING FOR FUTURE organised on 5.9.2014 during the 7th International Congress of Pathophysiology of the International Society for Pathophysiology 4.9. - 7.9.2014, Rabat, Morocco, 20 participants, chairperson Dr. Pecháčková. Participants from INPP SAS, as the winner of the international competition and organiser of the next 8th International Congress of Pathophysiology, presented Slovakia, the Institute of Normal and Pathological Physiology SAS, and the Slovak Physiological Society to the congress participants. Dr. Pecháčková was elected as the presidentelect of the International Society for Pathophysiology (ISP).

JOINT MEETINGS OF THE 8th INTERNATIONAL SYMPOSIUM NITRIC OXIDE: FROM BASIC REGULATIONS TO LIFESTYLE-RELATED DISEASES AND 2ND SYMPOSIUM GENETIC AND ENVIRONMENTAL FACTORS IN HYPERTENSION 2014, Croatia, Vrsar, 40 participants, 15.9. - 19.9.2014. The programme of the symposium was centred on the following sessions: NO modulation, inflammation and toxicity, Interactions between NO and H₂S, NO and reninangiotensin system, NO in the reaction to stress, Endothelial function and reactive oxygen species, and Nutrition and neuro-cardio-metabolic risk. Thirty-one selected contributions were presented. Chairperson: Dr. Bernátová.

The international NO symposia were founded by INPP SAS in 1999 in Bratislava, and from 2001 have been regularly organised (the next 9th NO symposium will be held in September 2016).

2015:

THE 7th INTERNATIONAL POSTURE SYMPOSIUM: POSTURE AND GAIT IN RESEARCH, CLINIC AND SPORT, Congress Centre of the SAS, Smolenice Castle, 6.9. - 9.9.2015, 65 participants from 16 countries. The scientific programme consisted of seven sessions with lectures focused on the physiological mechanism of posture and gait control, computer modelling of motor control in healthy subjects and patients with postural disabilities, the deterioration of postural control in the elderly and patients with neurodegenerative diseases (Parkinson's disease, Multiple sclerosis, vestibular loss patients), and techniques designed for assessing postural control in athletes in relation with different training sets. Chairpersons: Drs. Hlavačka and Lobotková.

ANIMAL MODELS IN PSYCHIATRY – an international symposium in the 5th Conference on Biological Psychiatry, 11.6.2015, Piešťany, Slovakia, convenors: Igor Riečanský and Nataša Hlaváčová (Institute of Experimental Endocrinology BMC SAS). The symposium was devoted to the problems of using experimental animals in the research on neuronal mechanisms of mental disorders. The audience included about 100 conference participants.

2.3.3. List of edited proceedings from international scientific conferences.

Abstracts from INTERNATIONAL C.I.A.N.S. CONFERENCE 2012 were published in the international journal published by the Institute - *Activitas Nervosa Superior Rediviva*, Vol. 54, No. 2 and 3, 2012, ISBN 1337-933X, e-ISSN 1338-4015, EV 2869/09, pp. 82-93, reviewed, edited by Dr. Jagla

The abstracts from the INTERNATIONAL SYMPOSIUM: LIFESTYLE AND RISK FACTORS IN DISEASES OF CIVILISATION were published in the international journal published by the Institute - *Activitas Nervosa Superior Rediviva*, Vol. 54, No. 2 and 3, 2012, ISBN 1337-933X, e-ISSN 1338-4015, EV 2869/09, pp. 93 – 101, reviewed, edited by Dr. Pecháčková.

Proceedings of THE JOINT MEETING OF THE 8th INTERNATIONAL SYMPOSIUM NITRIC OXIDE: FROM BASIC REGULATIONS TO LIFESTYLE-RELATED DISEASES and THE 2nd

SYMPOSIUM GENETIC AND ENVIRONMENTAL FACTORS IN HYPERTENSION, published by INPP SAS, 2014, ISBN 978-80-971699-0-9, EAN 9788097169909, 175 pp, reviewed, edited by Dr. Bernátová.

Abstract Book from THE 7TH INTERNATIONAL POSTURE SYMPOSIUM: POSTURE AND GAIT IN RESEARCH, CLINIC AND SPORT published by the INPP SAS, 2015, ISBN 978-80-971699-2-3, 90 pages, reviewed, edited by Dr. Hlavačka.

2.3.4. List of journals edited/published by the institute:

2.3.4.1. WOS (IF of journals in each year of the assessment period) none

2.3.4.2. SCOPUS

ACTIVITAS NERVOSA SUPERIOR REDIVIVA, the official journal of the C.I.A.N.S. (Collegium Internationale Activitatis Nervosae Superioris), one of the oldest associations of national societies engaged in the neurobiology of behaviour, integrative physiology, and psychosomatic relations. Editors in chief [2009-2015]: P.G. Fedor-Freybergh, F. Jagla, J. Horáček; honorary editor V. Zikmund. Bratislava. Published by the Institute of Normal and Pathological Physiology, Slovak Academy of Sciences (since 2009).

From 1959-1990, the journal was published by the Czechoslovak Medical Association in Prague as the *Activitas Nervosa Superior (ANS)*, and was the most valuable Czechoslovak medical journal indexed in Current Contents with regards to impact factor. In the year 1991 it was privatised and the title was changed to *Homeostasis in Health and Disease*, published in Prague. In 2007, it returned to its original title "ANS," and was published in Brno as a journal owned by a group of scientists. In 2008, the owners terminated the relationship to C.I.A.N.S. Since 2009, the journal has again been published by INPP SAS as the official journal of C.I.A.N.S., under the title *Activitas Nervosa Superior Rediviva* (Vol. 51). The journal is currently indexed in Scopus, Index Copernicus, Google Scholar, and other databases, as well as in Elsevier Products. The journal is open for public access on the web (<http://www.rediviva.sav.sk/>).

2.3.4.3. other databases

none

2.3.4.4. not included in databases

none

- **National position of the institute**

2.3.5. List of selected projects of national importance SASPRO

project coordinated by the Institute:

- How synchrony shapes human social bonding: mechanisms and neural pathways
Number of project: 0101/01/02
Duration of the project: 1.5.2015 / 30.4.2018

Ministry of Health projects coordinated by the Institute:

- Signal pathway of nitric oxide and hydrogen sulfide, its disturbances and participation in development of hypertension and atherosclerosis
Number of project: 2012/51-SAV-1
Duration of the project: 19.7.2013 - 31.12.2015

- The influence of variability of NOS1 and DAT1 genes on sensorimotor gating in humans: the implications for the pathophysiology of schizophrenia
Number of project: 2012/52-SAV-2
Duration of the project: 1.1.2013 - 31.12.2015

Slovak Society of Cardiology projects coordinated by the Institute:

- Effect of aging on the endothelial function in experimental hypertension
Number of project: SKS grant
Duration of the project: 17.4.2014 - 17.4.2017
- Cardiovascular effects of nanoencapsulated simvastatin and coenzyme Q10 in experimental hyperlipidemia
Number of project: SKS grant
Duration of the project: 27.11.2015 - 26.11.2018

National Programme for Prevention of Cardiovascular Disease coordinated by the Institute:

- Zdravé srdce pre Slovensko - časť pre deti a dorast
Duration of the project: 1.12.2011 - 1.12.2016

Slovak psychiatric society project:

- The effect of variability in NOS-1 gene on sensorimotor gating: implications for pathophysiology of schizophrenia
Duration of the project: 16.10.2012 - 15.9.2013
Society:

2.3.6. Projects of the Slovak Research and Development Agency (APVV)

APVV projects coordinated by the Institute:

- Effects of nanoencapsulated simvastatin on cardiovascular system in experimental metabolic syndrome
Number of project: APVV-14-0932
Duration of the project: 1.7.2015 - 30.6.2019
- Interaction of nitroergic, neurotrophic and endocrine signaling in the etiopathogenesis of schizophrenia
Number of project: APVV-14-0840
Duration of the project: 1.7.2015 - 30.6.2019
- Gender differences in etiopathogenesis of social stress-related cardiovascular and behavioral disorders in individuals with predisposition to hypertension
Number of project: APVV-0523-10
Duration of the project: 1.5.2011 - 30.10.2014
- The effect of aliskiren loaded nanoparticles in experimental hypertension
Number of project: APVV-0742-10
Duration of the project: 1.5.2011 - 31.10.2014

APVV projects - the Institute participates at:

- Study of regulation of radical and cellular signaling during hypertension and influence of novel therapies on this signaling
Number of project: APVV-0348-12
Duration of the project: 1.10.2013 - 30.9.2017

- Study of molecular mechanisms of H₂S biological effects
Number of project: APVV-0074-11
Duration of the project: 1.7.2012 - 31.12.2015
- The effect of lifestyle-related factors on the adaptive processes in ischemic myocardium
Number of project: APVV-0102-11
Duration of the project: 1.7.2012 - 31.12.2015
- Measuring, communication and information systems for monitoring of cardiovascular risk in hypertension patients
Number of project: APVV-0513-10
Duration of the project: 1.5.2011 - 30.6.2014

2.3.7. Projects of the Scientific Grant Agency of the Slovak Academy of Sciences and the Ministry of Education (VEGA)

VEGA projects coordinated by the Institute:

- Epicatechin in prevention of early development of primary hypertension: mechanisms of action in the cardiovascular and central nervous systems
Number of project: VEGA 2/0084/14
Duration of the project: 1.1.2014 - 31.12.2016
- Participation of HMGB1 in experimental myocardial infarction: cardioprotection vs. cardiac depression
Number of project: VEGA 2/0144/14
Duration of the project: 1.1.2014 - 31.12.2016
- NO and H₂S signal pathways and their interaction in the control of vascular tone during early developmental stage of experimental hypertension
Number of project: VEGA 2/0074/14
Duration of the project: 1.1.2014 - 31.12.2017
- Effect of PPAR gamma agonists on antioxidant response and on regulation of radical and cell signaling in hypertension
Number of project: VEGA 2/0129/14
Duration of the project: 1.1.2014 - 31.12.2016
- Kinematic analysis of posture and gait in healthy subjects and patients with balance impairment
Number of project: VEGA 2/0138/13
Duration of the project: 1.1.2013 / 31.12.2015
- Sensory information filtering in persons with genetic risk of schizophrenia
Number of project: VEGA 2/0093/14
Duration of the project: 1.1.2014 - 31.12.2016
- The effect of nitric oxide and hydrogen sulfide on structure and function of cardiovascular system in normotensive and hypertensive rats
Number of project: VEGA 2/0067/13
Duration of the project: 1.1.2013 - 31.12.2016
- Protective effect of NO and CO donors in experimental myocardial infarction with hypertensive complications
Number of project: VEGA 2/0195/15

Duration of the project: 1.1.2015 - 31.12.2018

- The influence of genetic control of nitric oxide production and dopamine re-uptake on sensorimotor gating in humans Number of project: VEGA 2/0080/13
Duration of the project: 1.1.2013 - 31.12.2015
- Nitric oxide and brain redox status in an experimental neurodevelopmental model of schizophrenia
Number of project: VEGA 2/0165/15
Duration of the project: 1.1.2015 - 31.12.2017
- The role of perivascular adipose tissue in the regulation of vascular tone in rats with cardiovascular dysfunction Number of project: VEGA 2/0202/15
Duration of the project: 1.1.2015 - 31.12.2017
- Effect of (pro)renin antagonist (RER-24) loaded nanoparticles in experimental hypertension
Number of project: VEGA 2/0183/12
Duration of the project: 1.1.2012 - 31.12.2014
- Characterization of cardiovascular and metabolic changes in fructose-induced metabolic syndrome in the rat
Number of project: VEGA 2/0188/12
Duration of the project: 1.1.2012 - 31.12.2014
- Social stress as a risk factor of early development of hypertension in predisposed individuals
Number of project: VEGA 2/0084/10
Duration of the project: 1.1.2010 - 31.12.2013
- The participation of neuronal NO synthase in the regulation of function and structure in cardiovascular system of normotensive and spontaneously hypertensive rats
Number of project: VEGA 2/0111/10
Duration of the project: 1.1.2010 - 31.12.2013
- Can polyphenolic substances from red wine affect the higher brain functions?
Number of project: VEGA 2/0173/11
Duration of the project: 1.1.2011 - 31.12.2013
- The role of nuclear factor kappa B in experimental hypertension
Number of project: VEGA 2/0190/11
Duration of the project: 1.1.2011 - 31.12.2013
- Improvement of balance in stance and gait by feedback from body sway
Number of project: VEGA 2/0186/10
Duration of the project: 1.1.2010 - 31.12.2012
- Etiopathogenesis of compromise blood pressure control: manifestation on structure and function of cardiovascular system Number of project: VEGA 2/0019/09
Duration of the project: 1.1.2009 - 31.12.2012
- Neurocognitive mechanisms of selective and sustained attention
Number of project: VEGA 2/0023/10
Duration of the project: 1.1.2010 - 31.12.2012

VEGA projects - the Institute participates at:

- Functional tests in diagnostics of postural stability and strength of core muscles
Number of project: VEGA 1/0373/14
Duration of the project: 1.1.2014 - 31.12.2016
- Development of SQUID Gradiometric and Susceptometric Methods for Iron Homeostasis Related Bio-Applications
Number of project: VEGA 2/0152/13
Duration of the project: 1.1.2013 - 31.12.2016
- Protection of hypertensive and failure heart by I(f) channel blocker ivabradin: comparison with ACE inhibition and melatonin
Number of project: VEGA 1/0071/15
Duration of the project: 1.1.2015 - 31.12.2018
- New model of experimental hypertension, left ventricular remodeling and heart failure induced by nuclear factor kappaB inhibition: protection by melatonin and captopril
Number of project: VEGA 1/0227/12
Duration of the project: 1.1.2012 - 31.12.2014
- Performance tests of postural stability in functional diagnosis of sportmen and individuals with motor disorders
Number of project: VEGA 1/0070/11
Duration of the project: 1.1.2011 - 31.12.2013

2.3.8. Projects of SAS Centres of Excellence

The Institute was a coordinator of the project:

- Centre of excellence for examination of regulatory role of nitric oxide in civilization diseases
Number of project: NOREG
Duration of the project: 1.8.2011 - 31.12.2014

2.3.9. National projects supported by EU Structural Funds

The Institute participates at the following projects financed by the EU Structural Funds:

- Centre of Excellence for Research and Development of Constructive Composite Materials II (CEKOMAT II)
Number of project: ITMS NFP26240120006
Duration of the project: 1.1.2011 - 31.12.2014
- BIOMED PARK
Number of project: ITMS 26240220087
Duration of the project: 1.1.2013 - 31.12.2015

2.3.10. List of journals (published only in the Slovak language) edited/published by the institute:

- 2.3.10.1. WOS (IF of journals in each year of the assessment period)** none
- 2.3.10.2. SCOPUS** none
- 2.3.10.3. Other databases** none
- 2.3.10.4. Not included in databases**
none

- **Position of individual researchers in an international context**
2.3.11. List of invited/keynote presentations at international conferences, as documented by programme or invitation letter

2012

- HLAVAČKA, F. Vliv věku na senzoryckou regulaci stoje. Konferencia Posturografie a možnosti jejího využití v klinické praxi. 12 October 2012, Olomouc, Czech Republic.
- KOZMANN, G. - TARJÁNYI, Z. - TUBOLY, G. - SZATHMÁRY, V. - ŠVEHLÍKOVÁ, J. - TYŠLER, M. Model interpretation of non-dipolar integral body surface QRST maps randomly appearing in arrhythmia patients. 8th IFAC Symposium on Biological and Medical Systems, 29-31 August 2012, Budapest, Hungary.

2013

- HLAVAČKA, F. Postural response to muscle vibration and galvanic vestibular stimulation. Symposium - Postural and Motor Perspectives in Portland, 1-2 February 2013, Portland, Oregon, USA.
- JAGLA, F. - RIEČANSKÝ, I. - CIMROVÁ, B. - PECHÁŇOVÁ, O. Effects of natural polyphenols upon the higher brain functions. International Integrated Clinical Neuroscience Forum – 2013, 14-15 September 2013, New Delhi, India.
- PECHÁŇOVÁ, O. Central effects of angiotensin converting enzyme inhibitors, captopril and enalapril on hypertension and motor activity. International Integrated Clinical Neuroscience Forum – 2013, 14-15 September 2013, New Delhi, India.
- REGECOVÁ, V. - ŠIMURKA, P. Analýza referenčných hodnôt indexu telesnej hmotnosti v Celoštátnych antropometrických prieskumoch detí a mládeže na Slovensku. X. Slovak Pediatric Congress with International Participation, 25-27 April 2013, Bratislava, Slovakia.
- TOMOVA, L. - PRIPFL, J. - RIEČANSKÝ, I. - LAMM, C. Using transcranial magnetic stimulation to treat smoking addiction: behavioral and neural effects. XIIIth Psychopharmacological Symposium, 28-30 November 2013, Smolenice, Slovakia.

2014

- BERNÁTOVÁ, I. - PÚZSEROVÁ, A. - BALIŠ, P. Sex-related differences in cardiovascular action of crowding stress in young normotensive and hypertensive rats. Physiology 2014, 30 June - 2 July 2014, The Queen Elizabeth II Conference Centre, London, UK.
- BERNÁTOVÁ, I. - PÚZSEROVÁ, A. - BALIŠ, P. - KLUKNAVSKÝ, M. Sex related differences in cardiovascular action of chronic social stress in young rats. 11th Meeting of France - New EU Members, New Frontiers in Basic Cardiovascular Research 2014, 15-18 June 2014, Smolenice, Slovakia.
- JAGLA, F. Objective and subjective factors affecting the oculomotor response. 3rd Congress of Physiological Sciences of Serbia with International Participation, Molecular, Cellular and Integrative Basis of Health and Disease: Transdisciplinary Approach, 29-31 October 2014, Belgrade, Serbia.
- LEDVÉNYIOVÁ, V. - BERNÁTOVÁ, I. - ČARNICKÁ, S. - BARTEKOVÁ, M. - RAVINGEROVÁ, T. Gender-related response to ischemia in young SHR rats exposed to crowding. In Current Research: Cardiology: The Journal of the International Academy of Cardiovascular Sciences, 2014, vol. 1, no. 1, p. 45 - 46. 2nd Cardiovascular Forum for Promoting Centres of Excellence and Young Investigators: 4-6 September 2014; Winnipeg, Manitoba, Canada.
- LEDVÉNYIOVÁ, V. - BERNÁTOVÁ, I. - SLEZÁK, P. - GABLOVSKÝ, I. - ČARNICKÁ, S. - BARTEKOVÁ, M. - RAVINGEROVÁ, T. Distinct cardiac adaptation to crowding stress in

young hypertensive male and female rats: intrinsic mechanisms. In European Section Meeting of the International Academy of Cardiovascular Sciences (IACS), Programme and Abstract Book, 8-11 October 2014, Balatonyörök (Lake Balaton), Hungary.

ONDRIAŠ, K. - KRISTEK, F. - STAŠKO, A. - GRMAN, M. - NAGY, P. - MIŠÁK, A. - FEELISCH, M. H₂S induced decomposition of nitroso-compounds and consequent biological effect. Third International Conference on H₂S Biology and Medicine, 4-6 June 2014, Kyoto, Japan.

PECHÁŇOVÁ, O. Disorders of nitric oxide pathway in metabolic syndrome. 3rd Congress of Physiological Sciences of Serbia with International Participation, Molecular, Cellular and Integrative Basis of Health and Disease: Transdisciplinary Approach, 29-31 October 2014, Belgrade, Serbia.

PECHÁŇOVÁ, O. Red wine polyphenols: beneficial effects in the cardiovascular, renal and gastrointestinal systems. Nutrition Winterschool 2014. Gut wellbeing - Expanding the Horizon, 27 - 30 January 2014, Ylläs, Finland.

2015

BERNÁTOVÁ, I. - PÚZSEROVÁ, A. - BALIŠ, P. - HORVÁTHOVÁ, M. - MUCHOVÁ, J. - ŤITŇANOVÁ, I. Endothelial dysfunction and oxidative stress in hypertension: Chicken-and-egg problem. International symposium Advances in Cardiovascular Research: From the bench to the patient's bed, 2-5 September 2015, Smolenice, Slovakia.

BERNÁTOVÁ, I. - PÚZSEROVÁ, A. - BALIŠ, P. - KLUKNAVSKÝ, M. - ŠESTÁKOVÁ, N. - BUŠOVÁ, D. Differences in delayed stress-induced behavioural and vascular effects in young normotensive and borderline hypertensive rats. In Eleventh Symposium on Catecholamines and Other Neurotransmitters in Stress, 20-25 June 2015, Smolenice, Slovakia.

PECHÁŇOVÁ, O. Effects of nanoparticle-loaded antihypertensive drugs on the cardiovascular system. 2nd European Section Meeting of the International Academy of Cardiovascular Sciences "Heart Diseases: How New Research May Lead to New Treatments", 7-11 October 2015, Belgrade, Serbia.

REGECOVÁ, V. Stanovenie noriem krvného tlaku a pulzovej frekvencie pre detskú a dospelú populáciu na Slovensku vo vzťahu k veku a vybraným somatickým ukazovateľom – sledovanie vplyvu KV rizikových faktorov a životného prostredia. XX. Slovak Society of Cardiology Congress with International Participation, 8-10 October 2015, Bratislava, Slovakia.

ŠPAJDEL, M. - JARIABKOVÁ, K. Metodika dichotickej stimulácie v neuropsychologickej diagnostike. The Conference: Psychological assessment Brno 2015, 22-23 October 2015, Faculty of Social Studies, Masaryk University, Brno, Czech Republic.

PECHÁŇOVÁ, O. Nanoparticle-loaded antihypertensive drugs: effects in cardiovascular system and kidney. The National Congress of the Romanian Pathophysiology Society with international participation, New and Old in Pathophysiology: An Integrated Approach in Education and Research, 7-10 May 2015, Iasi, Romania.

2.3.12. List of researchers who served as members of the organising and/or programme committees

2012

PECHÁŇOVÁ, O., JAGLA, F., RIEČANSKÝ, I. - members of the Programming committee, International conference: *International C.I.A.N.S. Conference*, 10-12 October 2012, Stará Lesná, High Tatras, Slovakia.

- PECHÁŇOVÁ, O., JAGLA, F., RIEČANSKÝ, I., CIMROVÁ, B. - members of the Organising committee, International conference: *International C.I.A.N.S. Conference*, 10-12 October 2012, Stará Lesná, High Tatras, Slovakia.
- PECHÁŇOVÁ, O. - member of the Programming committee, International symposium: *Lifestyle and risk factors in diseases of civilisation*, 12-14 October 2012, Stará Lesná, High Tatras, Slovakia.
- PECHÁŇOVÁ, O., JAGLA, F., VRANKOVÁ, S., BARTA, A., KOVÁČSOVÁ, M., PAROHOVÁ, J. - members of the Organising committee, International symposium: *Lifestyle and risk factors in diseases of civilisation*, 12-14 October 2012, Stará Lesná, High Tatras, Slovakia.
- BERNÁTOVÁ, I. - member of the Programming committee, International symposium: *Endothelium in Diseased States*, 10 September 2012; within *Joint FEPS and Spanish Physiological Society Scientific Congress* (8-11 September 2012), Santiago de Compostela, Spain.

2013

- PECHÁŇOVÁ, O. - member of the Programming committee, International symposium: *COST Action BM1005 meeting: Gasotransmitters: from basic science to therapeutic applications*, 10-12 April 2013, Smolenice, Slovakia.
- PECHÁŇOVÁ, O., CEBOVÁ, M. - members of the Organising committee, International symposium: *COST Action BM1005 meeting: Gasotransmitters: from basic science to therapeutic applications*, 10-12 April 2013, Smolenice, Slovakia.
- DOVINOVÁ, I. - member of the Programming and the Organising committee, International symposium: *20th SFRBM annual meeting*, 20-24 November 2013, San Antonio, TEXAS, USA.
- RIEČANSKÝ, I. - member of the Programming and the Organising committee, International symposium: *Exploring the biological mechanisms of decision making by brain stimulation; TeaP 2013: 55th Conference of Experimental Psychologists*, 24-27 March 2013, Vienna, Austria.
- RIEČANSKÝ, I. - member of the Programming and the Organising committee, International symposium: *Neurotransmitters and their role*, 29 November 2013; within *XIIIth Psychopharmacological Symposium* (28-30 November 2013), Smolenice, Slovakia.

2014

- PECHÁŇOVÁ, O., BERNÁTOVÁ, I. - members of the Programming committee, International symposium: *New Frontiers in Basic Cardiovascular Research*, 15-18 June 2014, Smolenice, Slovakia.
- CEBOVÁ, M. - member of the Organising committee, International symposium: *New Frontiers in Basic Cardiovascular Research*, 15-18 June 2014, Smolenice, Slovakia.
- PECHÁŇOVÁ, O., BERNÁTOVÁ, I., DOVINOVÁ, I. - members of the Programming committee, International symposium: *The 8th International Symposium Nitric Oxide: From Basic Regulations to Lifestyle-Related Diseases and 2nd Genetic and Environmental Factors in Hypertension*, 15-19 September 2014, Vrsar, Croatia.
- PECHÁŇOVÁ, O., BERNÁTOVÁ, I., DOVINOVÁ, I., BALIŠ, P., KLUKNAVSKÝ, M., REGEČOVÁ, V. - members of the Organising committee, International symposium: *The 8th International Symposium Nitric Oxide: From Basic Regulations to Lifestyle-Related Diseases and 2nd Genetic and Environmental Factors in Hypertension*, 15-19 September 2014, Vrsar, Croatia.
- PECHÁŇOVÁ, O. - member of the Programming committee, International symposium: *Renin inhibitor – aliskiren: present knowledge promising for future*, 5 September 2014; within *7th International Congress of Pathophysiology* (4-7 September 2014), Rabat, Morocco.
- PECHÁŇOVÁ, O., JAGLA, F. - members of the Programming committee, International symposium: *3rd Congress of Physiological Sciences of Serbia with International Participation: Molecular, cellular, and Integrative Basis of Health and Disease*, 29-31 October 2014, Belgrade, Serbia.

JAGLA, F. - member of the Programming committee, International conference: *International C.I.A.N.S. Conference*, 28-30 March 2014, Venice, Italy.
JAGLA, F. - member of the Programming committee, International symposium: *90. Physiological days*, 4-6 February 2014, Bratislava, Slovakia.
DOVINOVÁ, I. - member of the Programming and the Organising committee, International conference: *21th SFRBM annual meeting*, 19-23 November 2014, Seattle, WA, USA.

2015

HLAVAČKA, F., HIRJÁKOVÁ, Z., VALKOVIČ, P., BUČKOVÁ, K., LOBOTKOVÁ, J. - members of the Organising committee, International symposium: *7th International Posture Symposium*, 6-9 September 2015, Smolenice, Slovakia.
HLAVAČKA, F. - member of the Programming committee, International symposium: *7th International Posture Symposium*, 6-9 September 2015, Smolenice, Slovakia.
PECHÁŇOVÁ, O. - member of the Programming and the Organising committee, International symposium: *2nd European Section Meeting of the International Academy of Cardiovascular Sciences (IACS)*, 8-11 November 2015, Belgrade, Serbia.
PECHÁŇOVÁ, O. - member of the Programming and the Organising committee, International symposium: *Advances in Cardiovascular Research - From the bench to the patient's bed*, 2-5 September 2015, Smolenice, Slovakia.
PECHÁŇOVÁ, O. - member of the Programming committee, International congress: *Fapronatura 2015*, 20-25 September 2015, Trinidad, Cuba.
PECHÁŇOVÁ, O. - member of the Programming committee, *The National Congress of the Romanian Pathophysiology Society with international participation, New and Old in Pathophysiology: An Integrated Approach in Education and Research*, 7-10 May 2015, Iasi, Romania.

□ Position of individual researchers in a national context

2.3.13. List of invited/keynote presentations at national conferences, as documented by programme or invitation letter

2012

PECHÁŇOVÁ, O. Effects of nuclear factor kappaB inhibition in experimental hypertension. *Conference of Faculty of Pharmacy, Comenius University*, 8-9 June 2012, Bratislava, Slovakia.

2015

REGECOVÁ, V. - ŠIMURKA, P. - BARÁKOVÁ, A. - MAŠURA, J. Charakteristika pacientov v registri primárnej hypertenzie detí a mládeže evidovaných v Národnom centre zdravotníckych informácií. (Characterisation of patients in registry of primary hypertension of children evidenced by National Health Information Centre). *XXI. Memorial of Irena Jakubcova*. 19-20 November 2015, The National Institute of Cardiovascular Diseases, Bratislava, Slovakia.

2.3.14. List of researchers who served as members of organising and programme committees of national conferences

2012

JAGLA, F. - member of the Organising committee, National symposium: III. *Slovak Neuropsychiatric Congress*, 26-27 April 2012, Tále, Slovakia.

JAGLA, F. - member of the Organising committee, National conference: *Evening of Institute of Normal and Pathological Physiology SAS*, 30 March 2012, Bratislava, Slovakia.

JANEGA, P. - member of the Organising and Programming committee, National conference: *51. conference ŠVOČ and VII. Conference of postgradual students of Faculty of Medicine, Comenius University*, 19 April 2012, Bratislava, Slovakia.

JANEGA, P. - member of the Organising and Programming committee, National conference: *Lojd's histochemical day*, 11 December 2012, Bratislava, Slovakia.

2013

PECHÁŇOVÁ, O. - member of the Organising and Programming committee, National conference: *INPP SAS: 60 years of the experimental medicine research*, 30 October 2013, Bratislava, Slovakia.

2014

JAGLA, F. - member of the Organising committee, National congress: *IV. Slovak Neuropsychiatric Congress*, 15-16 May 2014, Jasná, Slovakia.

2015

CIMROVÁ, B. - member of the Organising committee, Slovak-Czech conference: *Cognition and Artificial Life 2015*, 25-28 May 2015, Trenčianske Teplice, Slovakia.

VALKOVIČ, P. - member of the Programming and the Organising committee, Slovak-Czech conference: *29. Slovak and Czech Neurological Summit*, 21-24 October 2015, Košice, Slovakia.

JANEGA, P. - member of the Organising and Programming committee, National conference: *54. Conference ŠVOČ and X. Scientific conference of postgradual students LF UK*, 16 April 2015, Bratislava, Slovakia.

□ Supplementary information and/or comments documenting the international and national status of the Institute

1. List of invited/keynote presentations at international and national Research Institutes

2012

BERNÁTOVÁ, I. - PÚZSEROVÁ, A. Behavioral and physiological aspects of (pre)hypertension. Faculty of Medical Sciences, University of Kragujevac, Serbia, 22 August 2012.

BERNÁTOVÁ, I. - PÚZSEROVÁ, A. Behavioural and cardiovascular alterations associated with borderline hypertension. Invited lecture at School of Pharmacy and Biochemistry, University of Buenos Aires-CONICET, Buenos Aires, Argentina, 11 June 2012.

DOVINOVÁ, I. Antioxidant response and radical signaling in cardiovascular diseases. Faculty of Medical Sciences, University of Kragujevac, Serbia, 22 August 2012.

- JAGLA, F. The difference between neurobehavioural (or psychosomatic) and neurobiological approaches to basic knowledge about the etiopathogenesis of certain diseases from civilisation. Faculty of Medical Sciences, University of Kragujevac, Serbia, 24 May 2012.
- JAGLA, F. Effects of polyphenolic compounds on human brain activation and spatial memory task. Yong Loo Lin School of Medicine, National University of Singapore, Republic of Singapore, 21 September 2012.
- JAGLA, F. Higher brain functions changes and blood pressure after unrepeated manipulation of NO syntase activation. The Cairns Institute, James Cook University, Cairns, Australia, 24 September 2012.
- KATINA, S. International Society for Clinical Biostatistics Seminar; 3D statistical shape analysis - identification and analysis of anatomical curves. Institute of Informatics, The Czech Academy of Sciences, Prague, Czech Republic, 20 September 2012.
- KATINA, S. CAHS Seminar; Recent developments in 2D/3D geometric morphometrics: shape analysis of landmarks, curves, and surfaces. University of York, Hull York Medical School, York, UK, 2 July 2012.
- PECHÁŇOVÁ, O. Effects of different polyphenolic compounds on blood pressure and metabolic parameters. Yong Loo Lin School of Medicine, National University of Singapore, Republic of Singapore, 21 September 2012.
- PECHÁŇOVÁ, O. Protective effects of polyphenolic compounds in experimental hypertension and metabolic syndrome. Faculty of Medical Sciences, University of Kragujevac, Serbia, 24 May 2012.
- PECHÁŇOVÁ, O. Contribution of central nervous system to nitric oxide deficient hypertension. The Cairns Institute, James Cook University, Cairns, Australia, 24 September 2012.
- REGECOVÁ, V. Porovnanie referenčných hodnôt indexu telesnej hmotnosti detí a mládeže na Slovensku a v zahraničí. Second Department of Pediatrics, Faculty of Medicine, Comenius University, University Children's Hospital, Bratislava, 12 December 2012.

2013

- PECHÁŇOVÁ, O. Hypertension as a part of metabolic syndrome. University of Seville, Seville, Spain, 3 June 2013.
- PECHÁŇOVÁ, O. Pathogenesis of hypertension from the experimental point of view. University of Sao Paulo, Sao Paulo, Brazil, 14 October 2013.
- PECHÁŇOVÁ, O. Hypertension: disorder of balance. Faculty of Medical Sciences, University of Kragujevac, Kragujevac, Serbia, 6 November 2013.

2014

- BERNÁTOVÁ, I. - PÚZSEROVÁ, A. - BALIŠ, P. - KLUKNAVSKÝ, M. Sex-related and delayed effects of crowding stress in young normotensive and (pre)hypertensive rats. Universidade Federal de Ciências da Saúde de Porto Alegre, RS, Brazil, 9 August 2014.
- CEBOVÁ, M. The effect of nanoencapsulated aliskiren on nitric oxide production in cardiovascular system of spontaneously hypertensive rats. Mukogawa University, Japan, 11 October 2014.
- PECHÁŇOVÁ, O. Beneficial effects of red wine polyphenols on experimental hypertension and metabolic syndrome, Universidad de Costa Rica, San Jose, Costa Rica, 12 March 2014.

2015

- DOVINOVÁ, I. - BARANČÍK, M. - MAJZÚNOVÁ, M. - KVANDOVÁ, M. - GREŠOVÁ, L. Aberrant redox regulation in hypertension and cardiovascular diseases. University of Catania, Department of Biomedical and Biotechnological Sciences, Catania, Italy, 17 December 2015.
- CEBOVÁ, M. - PECHÁŇOVÁ, O. The effects of aliskiren loaded nanoparticles in spontaneous hypertension. Semmelweis University, Faculty of Medicine, Department of Pharmacology and Pharmacotherapy, Budapest, Hungary, 19 March 2015.

2. List of employees who served as members of important international and national scientific bodies (e.g. boards, committees, editorial boards of scientific journals)

Eva Kellerová - Československá fyziologie (member of Editorial board), Neuroendocrinology Letters (member of Board of associate editors), Scripta Medica (member of International Advisory Board), Slovak Society of Hypertension (Honorary member), Slovak Society of Cardiology (Honorary member)

Fedor Jagla - Collegium Internationale Activitatis Nervosae Superioris (Councillor, member of Executive Committee, President), Activitas Nervosa Superior Rediviva (Editor-in-chief, Coeditor-in-chief), Slovak Physiological Society (Cash Keeper), Slovak Neuropsychiatric Society (member of Committee), Slovak Society for Higher Brain Functions (President), European network for workplace health promotion (national delegate), Accreditation committee member of The Ministry of Education, Science, Research and Sport of the Slovak Republic, Scientific grant agency of the Ministry of Education, Science, Research and Sport of the Slovak Republic and of Slovak Academy of Sciences (committee member for medical and pharmaceutical sciences)

František Kristek - International Journal of Cardiovascular Medicine and Science (member of Editorial board), Committee member of the Slovak Academy of Sciences for evaluating international projects (committee member 2012-2015)

Igor Riečanský - Activitas Nervosa Superior Rediviva (member of Editorial board), Slovak Society for Higher Brain Functions (member of the committee and scientific secretary), Faculty of Medicine, Masaryk University Brno, Czech Republic (Member of the Committee for Psychiatry), Member of the Assembly of the Slovak Academy of Sciences

Iveta Bernátová - Interdisciplinary Toxicology (member of Editorial board), ISRN Physiology (member of Editorial board by 2012), Research and Reviews in BioScience (member of Editorial board), Scientific grant agency of the Ministry of Education, Science, Research and Sport of the Slovak Republic and of Slovak Academy of Sciences (committee member for biological sciences)

Jozef Török - Slovak Physiological Society (President of Advisory board), Slovak Society of Pathological and Clinical Physiology (member of Committee), Slovak Society of Hypertension (Honorary member)

Ľudovít Paulis - European Council for Cardiovascular Research (Executive committee member), Frontiers in Bioscience (Managing editor), World Journal of Hypertension (member of Editorial board)

Marián Špajdel - Journal for Perspectives of Economic, Political and Social Integration (member of Editorial board)

Martina Cebová - International Journal of Cardiovascular and Cerebrovascular Disease (member of Editorial board)

Ol'ga Pecháňová - Blood Pressure Society (Committee member), Activitas Nervosa Superior Rediviva (Deputy Chief Editor), Current Vascular Pharmacology (member of Editorial board), Datasets Papers in Medicine (member of Editorial board), General Physiology and Biophysics (member of Editorial board), International Journal of Chronic Diseases (member of Editorial board), Journal of Geriatric Cardiology (member of Editorial board), Physiological Research (member of Editorial board), World Hypertension (member of Editorial board), Serbian Journal of Experimental and Clinical Research (member of Editorial board), Slovak Physiological Society (member of Committee), C.I.A.N.S. (member of Committee), European Council for Cardiovascular Research (member of Executive committee), International Society for Pathophysiology (President-elect), European network for workplace health promotion (member of Committee), Scientific grant agency of the Ministry of Education, Science, Research and Sport of the Slovak Republic and of Slovak Academy of Sciences (committee member for medical and pharmaceutical sciences), Scientific colleges for medical sciences of the Slovak Academy of Sciences (member of Committee), Committee member of the Slovak Academy of Sciences for foreign relations (committee member 2009-2013), European Academy of Sciences and Arts (member), European Commission, DG Research & Innovation (member), Working group of the Ministry of Education, Science, Research and Sport of the Slovak Republic for

biomedicine and biotechnology RIS3 (member), Faculty of Medicine and Faculty of Natural Sciences, Comenius University, Bratislava (member of the Scientific Board)

Stanislav Katina - International Society for Clinical Biostatistics (Executive committee member, Subcommittee Member – National Groups), Slovak Biometrical Society (member of Committee), Slovak Statistical and Demographic Society (member of Committee), Forum Statisticum Slovacum (member of Editorial board), Slovak Anthropology (member of Editorial board), Masaryk University Brno, Czech Republic (member of the Scientific Board)

Vavrínek Szathmáry - Slovak Society of Medical Physics and Biophysics (member of Advisory board)

3. List of international and national scientific awards and distinctions

2012

Angelika Púzserová

- Best poster presentation – International Society of Hypertension, 2nd ISH New Investigators' Symposium, University of Sydney, Australia, 29 September 2012.
- Travel Award – 24th Meeting of the International Society of Hypertension. The Future of Cardiovascular Protection, Sydney, Australia, 30 September - 4 October 2012.
- European Investigators Accommodation grant – European Society of Hypertension, 22nd European Meeting on Hypertension and Cardiovascular Protection, London, UK, 26-29 April 2012.

Oľga Pecháňová

- Honorary plaque of SAS – J. Jessenius for the merit in medical sciences.
- Bronze medal of Slovak Medical Association for the merit in Slovak Medical Association. □
Memory medal of Faculty of Medicine of Comenius University.

Jozef Török

- Important person of SAS for whole-life scientific work.

František Kristek

- Best publication (1st place) – award of Slovak Society of Physiology.

Valéria Regecová

- Best original publication (2nd place) in Cardiology Letters, Slovak Society of Cardiology.

2013

INPP SAS

- Memory medal of Faculty of Medicine of Comenius University on the occasion of 60. anniversary of Institute creation.
- Silver medal of Faculty of Natural Sciences of Comenius University on the occasion of 60. anniversary of Institute creation.

Oľga Pecháňová

- Honorable member of University of Kragujevac for international cooperation support, Serbia.
- Invitation to serve as a Visiting Professor, University of Kragujevac, Serbia.
- Medal of SAS – leader of the Excellent research team.

Angelika Púzserová

- Travel Award – VI. International Conference on Polyphenols and Health, VI International Conference on Polyphenols and Health, Buenos Aires, Argentina, 16-19 October 2013.
- Young Investigator Award – Society for Free Radical Research-Europe, VIII International Congress of the Society for Free Radical Biology and Medicine South American Group, Buenos Aires, Argentina, 14-17 October 2013.

Martina Cebová, Jana Klimentová

- European Investigators Accommodation grant – AIM Group International, 23rd European Meeting on Hypertension and Cardiovascular Protection, Milan, Italy, 14-17 June 2013.

Jozef Török

- Awarded by INPP SAS for whole-life scientific work on the occasion of 60. anniversary of Institute creation.

2014

Iveta Bernátová

- Lead Guest Editor of Special Issue of Biomed Research International.

Fedor Jagla

- President of C.I.A.N.S. – Collegium Internationale Activitatis Nervosae Superioris.

Oľga Pecháňová

- President-elect ISP - International Society for Patophysiology.
- Member of Executive committee of European Council for Cardiovascular Research (ECCR)
 - Member of Executive committee of C.I.A.N.S.

Valéria Regecová

- ISH International Forum Poster Prize – International Society of Hypertension, Joint Meeting of the European Society of Hypertension (ESH) and International Society of Hypertension (ISH), Athens, Greece, 13-17 June 2014.
- Important person of Slovak Society of Hypertension

Peter Bališ

- Recipient of the *Supportive Fund of Štefan Schwarz* – financial support of post-gradual student position.
- Best poster presentation (3rd place) – Slovak Physiological Society, 90. Physiological Days, 4-6 February 2014.

František Hlavačka

- Important person of SAS in 2014.

2015

Martina Cebová

- Best poster presentation (1st place) – European Council for Cardiovascular Research (ECCR), 19th Annual ECCR Meeting 2015, Poiano Resort, Lake Garda, Italy, 23-25 October 2015.

Radoslava Reháková

- Training Course on Redox Biology in Health and Disease – *EU-ROS COST*, Alicante, Spain, 2-8 October 2015.

- Best poster presentation (3rd place) – Slovak Physiological Society, 91. Physiological Days, Brno, Czech Republic, 3-5 February 2015.

Igor Riečanský

- Best poster presentation (1st place) – Psychiatric Society of Czech Medical Society, 16th Czech-Slovak Psychiatric Congress, Brno, Czech Republic, 21-24 October 2015.

Fedor Jagla

- Medal of SAS for support of the research.
- Important person of SAS in 2015.
- Honorary Member of Slovak Medical Association

Peter Bališ

- Best presentation – Interactive conference of young scientists, Preveda 2015, 5 May – 6 June 2015, Bratislava

Michal Kluknavský

- Best presentation – Interactive conference of young scientists, Preveda 2015, 5 May – 6 June 2015, Bratislava

Andrea Berényiová

- Best original publication (3rd place) in Cardiology Letters – Slovak Society of Cardiology.

Magdaléna Drobná

- Best original publication (2nd place) in Cardiology Letters – Slovak Society of Cardiology.

Oľga Pecháňová

- Important person of Ružinov – awarded on the occasion of 25. anniversary of creation of the town section Ružinov in Bratislava.

Angelika Púzserová

- Prize of the rector for excellent graduation thesis – Rector of Comenius University, Bratislava.
- Best poster presentation (1st place) – Medirex Group Academy Conference, Bratislava, 15-16 May 2015.
- Special award – diploma for merit – Interactive conference of young scientists, Preveda 2015, 5 May – 6 June 2015.

The INPP SAS has also collaboration with several national research laboratories/facilities. Common research laboratories and cooperation with universities are listed in part 2.5.6.

4. Collaboration and realisation of common research projects with other Institutes of SAS

- [1] Institute of Materials and Machine Mechanics SAS, Bratislava, **Pecháňová O.** (2009 – until now)
- [2] Institute of Measurement Science SAS, Bratislava, **Szathmáry V., Bernátová I.** (2011 – until now)
- [3] Institute for Heart Research SAS, Bratislava, (2000 – until now)
- [4] Institute of Experimental Pharmacology & Toxicology SAS, Bratislava, (2000 – until now)
- [5] Institute for Clinical and Translational Research BMC SAS and Institute of Molecular Physiology and Genetics SAS, Bratislava, **Čáčányiová S., Kristek F., Drobná M., Berényiová A.** (2009 – until now)
- [6] Institute of Zoology SAS, Bratislava **Pecháňová O.** (2001 – until now)

5. Collaboration and realisation of common research projects with important organisations and hospitals out of universities

- [1] Faculty Hospital in Trenčín, **Regecová V.** (2009 – until now)
- [2] Regional Public Health Authority with the seat in Rimavská Sobota, **Regecová V.** 2009 – 2012)
- [3] Ministry of Health of the Slovak Republic, National Health Information Centre (NHIC), National Programme for Prevention of Cardiovascular Disease, **Regecová V.** (2011 – until now)
- [4] SWAN a.s. IT company, Bratislava, **Pecháňová O.** (2012 - until now)

2.4. Tables of project structure, research grants and other funding resources

□ International projects and funding

2.4.1. Major projects within the European Research Area and other important project – Framework Programmes of the EU, ERA-NET, European Science Foundation, NATO, COST, INTAS, etc. (here and in items below please specify: type of project, title, grant number, duration, total funding and funding for the institute, responsible person in the institute and his/her status in the project, e.g. coordinator “C”, work package leader “W”, investigator “I”),

	Project title	Typ / Project number	Duration in months	Funding for the Institute (EUR)	Role of the Institute / Responsible person
2012	COST: Gasotransmitters: from basic science to therapeutic applications	COST BM 1005	40	17256	W
	ENWHP - PHWork	EAHC No 20101208	20	17782	W
2013	EU-ROS: The European Network on Oxidative Stress and Redox Biology	COST BM 1203	31	1800	I
2014					
2015					

2.4.2. Other international projects, incl. total funding and funding for the institute

- **Governmental agreement Slovakia – Turkey**

Project title: Magnesium Nanocomposites for Biodegradable Medical Implants

Responsible person in the Organisation: Oľga Pecháňová

Duration of the project: 1.11.2014 - 31.10.2017

Grant number: JRP 2014/5

The Institute is a participant
Funding for the Organisation: 8800 € (y. 2015)

- **Governmental agreement Slovakia – Taiwan**

Project title: Study of interactions between reactive oxygen species and nitric oxide in search for novel mechanisms of hypertension

Responsible person in the Organisation: Ima Dovinová

Duration of the project: 1.1.2011 - 31.12.2013

Grant number: SAS-NSC JRP 2010/01

The Institute is a Coordinator

Funding for the Organisation: 25000 €

- **SAS-CONICET**

Project title: Metabolic syndrome: inflammation in hypertension and effect of polyphenols

Responsible person in the Organisation: Oľga Pecháňová

Duration of the project: 1.1.2011 - 31.12.2013

The Institute is a Coordinator

Funding for the Organisation: 3000 €

- **Slovak-Serbian Cooperation**

Project title: Effect of renin and (pro)renin receptor inhibition on cardiovascular system with special focus on gasotransmitters

Responsible person in the Organisation: Oľga Pecháňová

Duration of the project: 1.3.2012 - 31.12.2013

Grant number: SK-SRB-0038-11

The Institute is a Coordinator

Funding for the Organisation: 7000 €

2.4.3. Other important, international projects and collaborations without direct funding (max. 10 projects)

- **Sensory Integration for stance and gait in healthy people and neurological patients.**

Responsible person in the Organisation: František Hlavačka

Duration: 1.2.2013 - 31.12.2015

Coordinator: Inst norm pathol physiol, SAS

Participants: USA

- **Effects of antioxidants on metabolic syndrome: reactive oxygen species/nitric oxide balance**

Responsible person in the Organisation: Oľga Pecháňová

Duration: 1.1.2007 - 31.12.2015

Coordinator: Inst norm pathol physiol, SAS

Participants: Japan, Czech Republic

- **Effect of natural polyphenols on the development and maintenance of experimental hypertension and remodelling of cardiovascular system**

Responsible person in the Organisation: Oľga Pecháňová

Duration: 1.10.2004 - 30.9.2013

Coordinator: Inst norm pathol physiol, SAS

Participants: France

- **Cooperation agreement between INPP SAS and Faculty of Psychology, University of Vienna**

Responsible person in the Organisation: Igor Riečanský
 Duration: 15.5.2011 - 31.12.2013
 Coordinator: Inst norm pathol physiol, SAS Participants:
 Austria

- **Metabolic syndrome: inflammation in hypertension and effect of polyphenols**

Responsible person in the Organisation: Oľga Pecháňová
 Duration: 15.6.2010 - 31.12.2015
 Coordinator: University of Buenos Aires, Argentina

- **National projects and their funding**

2.4.4. Projects supported by the Slovak Research and Development Agency (APVV)

Role of the Institute e.g. coordinator "C", investigator "I".

	Project title	Typ / Project number	Duration in months	Funding for the Institute (EUR)	Role of the Institute / Responsible person
2012	Gender differences in etiopathogenesis of social stress-related cardiovascular and	APVV-0523-10	34	111848	C
	The effect of aliskiren loaded nanoparticles in experimental hypertension	APVV-0742-10	34	150800	C
	The effect of lifestyle-related factors on the adaptive processes in ischemic myocardium	APVV-0102-11	42	15000	I
	Study of molecular mechanisms of H2S biological effects	APVV-0074-11	42	3953	I
	Measuring, communication and information systems for monitoring of cardiovascular	APVV-0513-10	30	16201	I
2013	Study of regulation of radical and cellular signaling during hypertension and influence	APVV-0348-12	27	27504	I
2014					
2015	Effects of nanoencapsulated simvastatin on cardiovascular system in experimental APVV-14-0932		12	20430	C
	Interaction of nitroergic, neurotrophic and endocrine signaling in the etiopathogenesis	APVV-14-0840	12	15774	C

2.4.5. Projects supported by the Scientific Grant Agency of the Slovak Academy of Sciences and the Ministry of Education (VEGA) for each year, and their funding

VEGA	2012	2013	2014	2015
Number	11	11	13	14
Funding in the year (EUR)	52071	76303	77999	83308

1

□ **Summary of funding from external resources**

2.4.6. List of projects supported by EU Structural Funds

Centre of Excellence for Research and Development of Constructive Composite Materials I and II (ITMS NFP262 40120006 and 40120020)

BIOMED PARK BIOMED PARK (ITMS 26240220087)

2.4.7. Summary of external resources of the EU Structural Funds (ERDF/ESF)

Role of the Institute in the project, e.g. coordinator “C”, work package leader “W”, investigator “I”.

¹ Excluding projects for the popularisation of science

Year	Project title	Project number	Duration in months	Funding for the Institute (EUR)	Role of the Institute
2012	CEKOMAT I	ITMS NFP262 40120006	6	62076	participant
	CEKOMAT II	ITMS 26240120020	12	2000	participant
2013	CEKOMAT II	ITMS 26240120020	12	258288	participant
2014	CEKOMAT II	ITMS 26240120020	6	2460	participant
	BIOMED	ITMS 26240220087	12	3527	participant
2015	BIOMED	ITMS 26240220087	12	4254	participant

External resources	2012	2013	2014	2015	total	average
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External resources (milions of EUR)	0,189	0,484	0,199	0,193	1,065	0,266
External resources transferred to cooperating research institute (milions of EUR)	0,000	0,075	0,035	0,028	0,138	0,035

□ Supplementary information and/or comments on research projects and funding sources

2.5. PhD studies and educational activities

2.5.1. List of accredited programmes of doctoral studies, period of validity

[1] Study programme 7.1.3 Normal and Pathological Physiology, Ministry of Education, Science, Research and Sport of the Slovak Republic Decree No. 2016-12677/12292:1-15A0, in cooperation with the Faculty of Medicine, Comenius University, Bratislava (period of validity: 2004 - continually).

[2] Study programme 4.2.10 Animal Physiology, Ministry of Education, Science, Research and Sport of the Slovak Republic Decree No. 2012-3583/5869:1-071, in cooperation with the Faculty of Natural Sciences, Comenius University, Bratislava (period of validity: 2012 - continually)

2.5.2. Summary table on doctoral studies (number of internal/external PhD students; number of foreign PhD students, number of students who successfully completed their theses, number of PhD students who quit the programme)

PhD study	31.12.2012			31.12.2013			31.12.2014			31.12.2015		
Number of potential PhD supervisors	13			16			16			16		
PhD students	number	defended thesis	students quitted	number	defended thesis	students quitted	number	defended thesis	students quitted	number	defended thesis	students quitted
Internal	9,0	1,0	0,0	9,0	3,0	0,0	9,0	2,0	0,0	9,0	1,0	0,0
External	9,0	1,0	0,0	7,0	1,0	1,0	5,0	1,0	1,0	3,0	2,0	0,0
Other supervised by the research employees of the institute	0,0	0,0	0,0	3,0	0,0	0,0	5,0	0,0	0,0	10,0	0,0	0,0

2.5.3. Summary table on educational activities

Teaching	2012	2013	2014	2015
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Lectures (hours/year) ¹	360	323	402	358
Practicum courses (hours/year) ²	396	517	512	316
Supervised bachelor theses (in total)	11	12	12	11
Supervised diploma theses (in total)	24	26	28	33
Supervised PhD theses (in total)	18	19	19	22
Members in PhD committees (in total)	8	10	10	14
Members in DrSc. committees (in total)	1	1	3	3
Members in university/faculty councils (in total)	1	1	2	3
Members in habilitation/inauguration committees (in total)	1	2	0	2

2

2.5.4. List of published university textbooks

HALAMA, Peter - ŠPAJDEL, Marián - ŤITNÝ, Peter. Štatistika pre psychológov s využitím softvéru SPSS - I. Deskriptívna štatistika [Statistics for psychologists using SPSS statistical software: I]. Descriptive statistics. Trnava: Rapos, 2013. 125 pp. ISBN 978-80-89658-05-3.

CIMROVÁ, Barbora. Neuroveda - strategická oblasť výskumu v kognitívnej vede [Neuroscience – a strategic research field in cognitive science]. In Sborník studijních materiálov ke kurzu Kognitívna veda a umělá inteligencia. - Hradec Králové: Gaudeamus, 2013, pp. 22-35. ISBN 978-80-7435272-0.

PECHÁŇOVÁ, Oľga. Nitric Oxide in Cardiovascular Physiology and Pathophysiology: teaching text. Bratislava, 2014. 1 CD-ROM. ISBN 978-80-971699-1-6.

JAGLA, Fedor. Participation at the Fourth Edition of the Medical Physiology – textbook for students of medical faculties edited by prof. Javorka Kamil. Fyziológia špeciálnych zmyslov [Physiology of special senses]. pp. 522 -545. In Lekárska fyziológia: učebnica pre lekárske fakulty, 4. edition, Osveta, Martin, 2014, 770 pp. ISBN 978-80-8063-407-0.

2.5.5. Number of published academic course books

KRISTEK, František - ČAČÁNYIOVÁ, Soňa – TÖRÖK, Jozef (Editors). Regulačné mechanizmy v patofyziológii hypertenzie [Regulatory mechanisms in the pathophysiology of hypertension]. Reviewers: M. Bernadič, P. Švorc. Bratislava: Petrus, 2015. 183 pp. ISBN 978-80-89233-76-2.

2.5.6. List of joint research laboratories/facilities with universities

¹ Do not include time spent with bachelor, diploma or PhD students during their supervising

The INPP SAS has rich collaboration with several universities, scientific organisations, and hospital clinics at home and abroad.

National Joint Research Laboratories with the universities:

[1] **The Centre of experimental medicine** (2007 – present) is a joint research centre with the Faculty of Medicine (Institute of Physiology, Institute of Medical Chemistry, Biochemistry and Clinical Biochemistry, Institute of Pathological Anatomy, Institute of Pathological Physiology, Second Department of Neurology) at the Comenius University in Bratislava. The centre aims to develop a theoretical and infrastructural basis for the field of experimental medicine and translate that knowledge for use in basic clinical research and broader medical praxis. The cooperation in PhD studies and education of young researchers within the framework of common projects, and combining finances for new experimental devices and the more effective use of infrastructure are central to the Centre of Experimental Medicine's activities as well.

International Joint Research Laboratories with the universities:

- [1] **Charité - Universitätsmedizin Berlin**, Berlin, Germany, **Pecháňová O.** (2011 – until now): The mission is focused on the analysis of mechanisms of the renin-angiotensin-aldosterone pathway.
- [2] **University of Kragujevac**, Faculty of Medical Sciences, Department of Physiology, Kragujevac, Serbia, **Pecháňová O.** (2011 – until now): The cooperation is intended to research in the field of physiology and pathophysiology of cardiovascular and nervous system. Cooperation also includes educational activities.

National joint cooperations with the universities:

- [1] Faculty of Physical Education and Sports, Comenius University in Bratislava, Department of Sport Kinanthropology, **Hlavačka F.** (2011 – until now)
- [2] 2nd Department of Neurology, Faculty of Medicine, Comenius University and University Hospital Bratislava, Academician's Derer Hospital in Bratislava, **Hlavačka F.** (2008 – until now)
- [3] University of Trnava, Faculty of Philosophy and Arts, Department of Psychology, Trnava, **Špajdel M., Cimrová B.** (2010 – until now)
- [4] Slovak Medical University in Bratislava, Faculty of Medicine, **Pecháňová O., Jagla F., Riečanský I., Cebová M.** (2009 – until now)
- [5] Faculty of Natural Sciences, Comenius University in Bratislava, Department of Animal Physiology and Ethology, **Pecháňová O., Török J., Bernátová I., Cebová M., Dovinová I., Riečanský I.** (2013 – until now)
- [6] Faculty of Arts, Comenius University in Bratislava, Department of Psychology, **Jagla F.** (1995 – until now)
- [7] Slovak University of Technology in Bratislava, Faculty of Electrical Engineering and Information Technology, Institute of Robotics and Cybernetics, **Bernátová I., Bališ P.** (2012 – until now)
- [8] Department of Urology, Faculty of Medicine, Comenius University and University Hospital Bratislava, Academician's Dérer Hospital in Bratislava, **Čáčányiová S., Kristek F., Berényiová A.** (2014 – until now)
- [9] Pavol Jozef Šafárik University in Košice, Faculty of Medicine, 1st Department of Psychiatry, Košice, **Riečanský I.** (2013 – until now)
- [10] Slovak University of Technology in Bratislava, Faculty of Chemical and Food Technology, Institute of Biochemistry and Microbiology, **Dovinová I., Čáčányiová S.** (2008 – until now).

International joint cooperations with the universities/institutions:

- [1] University of Buenos Aires, School of Pharmacy and Biochemistry, CONICET, Buenos Aires, Argentina, **Pecháňová O., Bernátová I.** (2010 – 2015)
- [2] Cape Peninsula University of Technology, Cape Town, South Africa, **Bernátová I.** (2012 – until now)
- [3] Kaohsiung Chang Gung Memorial Hospital, Center for Translational Research in Biomedical Sciences, Kaohsiung, Taiwan, **Dovinová I., Majzúnová M., Čáčányiová S., Kristek F., Bališ P.** (2010 – until now)
- [4] Masaryk University, Faculty of Medicine, Department of Psychiatry and Department of Neurology (shared with the Faculty Hospital Brno - Adult Age Medicine), **Riečanský I.** (2009 – until now)
- [5] University of Vienna, Faculty of Psychology, Department of Basic Psychological Research and Research Methods, Social, Cognitive and Affective Neuroscience Unit, Vienna, Austria, **Riečanský I.** (2007 – until now)
- [6] Stellenbosch University, South Africa, **Bernátová I.** (2012 – until now)
- [7] Oregon Health and Science University, Department of Neurology, Balance Disorders Laboratory, Portland, USA, **Hlavačka F.** (2004 – 2015)
- [8] University of Catania, Department of Biomedical and Biotechnological Sciences, Catania, Italy, **Dovinová I., Majzúnová M.** (2013 – until now)
- [9] Osaka City University, Faculty of Medicine, Department of Biochemistry and Molecular Pathology, Osaka, Japan, **Pecháňová O.** (2004 – until now)
- [10] Universidad Autonoma de Madrid, Faculty of Medicine, Madrid, Spain, **Bernátová I.** (2008 – until now)
- [11] The Czech Academy of Sciences, Institute of Physiology, Prague, Czech Republic, **Bernátová I., Pecháňová O., Bališ P.** (2005 – until now).
- [12] L'Université Nantes Angers Le Mans (L'UNAM) and INSERM U1063, Angers, France, **Pecháňová O.** (2004 – until now).

□ **Supplementary information and/or comments on doctoral studies and educational activities**

Several scientists from INPP SAS supervise bachelor's, diploma and PhD students. Scientists also give lectures, seminars, and courses for several universities in the field of normal and pathological physiology, animal physiology, normal and pathological anatomy, biochemistry, pharmacology, psychology, psychiatry, neurology, neurosciences, biocybernetics, and biostatistics. Human and infrastructure resources are sufficient for projections of the following years, including the participation of PhD students on all scientific projects coordinated by and/or participated by INPP SAS. Each PhD student is involved in one or more research projects. The Institute of Normal and Pathological Physiology SAS regularly organises seminars for PhD and undergraduate students.

PhD students routinely give lectures at INPP SAS on topics of their research area and scientific results. PhD students also take part in the educational activities of INPP SAS's partner faculties at Comenius University, as well as contributing to the organisation of scientific events, including international meetings and conferences. The Institute of Normal and Pathological Physiology SAS firmly encourages the attendance of PhD students at domestic and international conferences, as well as study stays at universities and institutions abroad. Students are also encouraged to apply for travel grants and fellowships to participate in international congresses or study stays in universities. Moreover, a rich history of cooperation allows INPP SAS to ensure the possibility for PhD students to participate in study stays at our partner institutions, and to learn new experimental methods or methodical approaches.

Supplementary information on educational activities of scientists abroad:

Bernátová I. was once (2012) a reviewer and member of committee for defense of PhD thesis at Stellenbosch University in South Africa.

Riečanský I. was twice a reviewer (2014, 2015) in the Junior Chamber International - Student Personality competition.

Pecháňová O. is a Visiting Professor at the University of Kragujevac, Serbia from 2013.

Pecháňová O. was once (2014) a reviewer and member of committee for defense of PhD thesis at University of Kragujevac, Faculty of Medical Sciences, Department of Physiology, Kragujevac, Serbia.

List of PhD student's study stays abroad:

Bališ P., study stay at The Czech Academy of Sciences, Institute of Physiology, Prague, Czech Republic, 25 May – 8 June, 2012.

Bališ P., study stay at The Czech Academy of Sciences, Institute of Physiology, Prague, Czech Republic, 29 April – 10 May, 2013.

Bučková K., study stay at the Oregon Health and Science University, Department of Neurology, Balance Disorders Laboratory, Portland, USA, 29 April – 1 August, 2013.

Klimentová J., study stay at the Nutrition Winterschool, 27 - 30 January, 2014, Ylläs, Finland.

Kluknavský M., study stay at The Czech Academy of Sciences, Institute of Physiology, Prague, Czech Republic, 25 August – 5 September, 2014.

Lobotková J., study stay at the Oregon Health and Science University, Department of Neurology, Balance Disorders Laboratory, Portland, USA, 29 April – 1 August, 2013.

Majzúnová M., study stay at the Kaohsiung Chang Gung Memorial Hospital, Center for Translational Research in Biomedical Sciences, Kaohsiung, Taiwan, 19 November – 2 December, 2012.

Majzúnová M., study stay at The Czech Academy of Sciences, Institute of Physiology, Prague, Czech Republic, 25 May – 8 June, 2012.

Majzúnová M., study stay at The Czech Academy of Sciences, Institute of Physiology, Prague, Czech Republic, 29 April – 10 May, 2013.

Majzúnová M., study stay at the University of Catania, Department of Biomedical and Biotechnological Sciences, Catania, Italy, 19 September – 20 October, 2013 and 5 December, 2013 – 28 January, 2014.

Matúšková Z., study stay at the University of South Carolina, Hypertension Summer School, Columbia, South Carolina, USA, 27 – 31 July, 2013.

Matúšková Z., study stay at the Institute of Cardiovascular Sciences, St. Boniface Hospital Research Centre in Winnipeg, Winnipeg, Canada, 24 April – 11 May, 2015.

Matúšková Z., study stay at the Nutrition Winterschool, 27 - 30 January, 2014, Ylläs, Finland.

Roháriková V., study stay at the University of Vienna, Faculty of Psychology, Department of Basic Psychological Research and Research Methods, Social, Cognitive and Affective Neuroscience Unit, Vienna, Austria, Project title: Modulation of sensorimotor gating by transcranial direct current stimulation, 1 October, 2014 – 31 March, 2015.

2.6. Social impact

2.6.1. List of the most important results of applied research projects. Max. 10 items

1. Specifically important for INPP SAS at the national level is research devoted to the investigation of the developmental trends in blood pressure and somatic parameters in the young Slovak population aged 3 – 20 years with respect to their gender, family history of hypertension, and influences of environmental factors. This research is conducted in cooperation with the Ministry of Health of the Slovak Republic. Results of this research were included in the National Programme of Prevention of Overweight and Hypertension, Part Children and Juveniles, as well as in the Programme Healthy Heart for Slovakia. Selected results were published in national journals, and they are freely available for paediatricians and other physicians, meaning results are directly transferred to broader medical practice.

2. Based on data from 33,000 subjects from Slovakia, a draft reference of blood pressure values for children and adolescent populations was prepared (excluding the impact of excessive weight) that takes into account the dynamics of age changes. Results were published in:

REGECOVÁ V., ŠIMURKA P., BARÁKOVÁ A. Overweight and cardio-metabolic risk markers in adolescents of Slovakia. In Slovenská Antropológia: bulletin Slovenskej antropologickej spoločnosti pri SAV, 2012, roč. 15, č.2, s.58-62. ISSN 1336-5827.

REGECOVÁ V., ŠIMURKA P., BARÁKOVÁ A. Rizikové faktory kardiometabolických chorôb u adolescentov na Slovensku v období dekády 2001-2010. (Risk factors of cardiometabolic diseases in adolescents in Slovakia during the decade 2001-2010) In Lekárske listy: príloha Zdravotníckych novín. Prevencia. Diagnostika. Terapia. Starostlivosť. Teória. Prax., 2012, roč. 1, č. 21, s. 9-13.

REGECOVÁ V., ŠEVČÍKOVÁ L., HAMADE J., JANECHOVÁ H. Klasifikácia hodnôt indexu telesnej hmotnosti u detí a adolescentov (Classification of the values of body mass index in children and adolescents). In Informačný bulletin hlavného hygienika Slovenskej republiky, 2015, č. 5, s. 88-97.

REGECOVÁ V., KELLEROVÁ E. Ambulatory blood pressure monitoring in relation to daily routine activities (Ambulantné monitorovanie krvného tlaku vo vzťahu k bežným denným aktivitám). In Cardiology Letters, 2015, vol. 24, no. 4, p. 251-259. ISSN 1338-3655.

REGECOVÁ V., BERESOVÁ J., KELLEROVÁ E. Oscillometric recordings of blood pressure in children - the arguments for new standards. (in Slovak). Cardiology Letters, 2013, 22, suppl. 2, 32S-33S.

3. INPP SAS participated in a study the results of which suggest that high frequency transcranial magnetic stimulation of the left dorsolateral prefrontal cortex might be useful for the treatment of cigarette cravings.

PRIPFL J., TOMOVA L., RIEČANSKÝ I., LAMM C. Transcranial magnetic stimulation of the left dorsolateral prefrontal cortex decreases cue-induced nicotine craving and EEG delta power. In *Brain Stimulation*, 2014, 7: 226-233.

4. In collaboration with neurologists and physicians, measurement procedures for early detection of motor control disorders were developed, which may help detect early stages of neurological diseases, e.g. Parkinson's disease, in clinical practice. Moreover, rehabilitation and training methods based on additional visual and vibrotactile biofeedback for human balance improvement, or for restoration of impaired motor functions, e.g. in patients suffering from stroke were also designed.

HALICKÁ Z., LOBOTKOVÁ J., BUČKOVÁ K., HLAVAČKA F. Effectiveness of different visual biofeedback signals for human balance improvement. In *Gait & Posture*, 2014, vol.39, p. 410-414.

5. Also in collaboration with chemists and physics, the study aimed to reduce degradation and increase the bioavailability of aliskiren, ensuring that its maximum impact on the structure of the cardiovascular system and kidneys was carried out. To this end, we have prepared, tested, and applied nanoencapsulated aliskiren with sustained release, which was preferably accumulated in the blood vessels of the kidney, where the effect was most needed. This research showed that nanoparticles must be prepared at a specific size in order to reach endothelial cells without damaging their membrane.

ANTAL I., KUBOVČÍKOVÁ M., ZÁVIŠOVÁ V., KONERACKÁ M., PECHÁŇOVÁ, O. BARTA A., CEBOVÁ M. et al. Magnetic poly(D, L-lactide) nanoparticles loaded with aliskiren: a promising tool for hypertension treatment. *Journal of Magnetism and Magnetic Materials*, 2015, 380: 280-284.

2.6.2. List of the most important studies commissioned for the decision-making authorities, the government and NGOs, international and foreign institutes

(a) Since INPP SAS is one of the few institutes oriented towards organ, system and integrative physiology, and has a long tradition of research in the so-called "diseases of civilisation." The Institute of Normal and Pathological Physiology SAS has cooperated for more than 20 years with several international organisations in this field of health research. For this reason, INPP SAS was asked to join *the European network for workplace health promotion (ENWHP)*, and in 2005 began to act as the ENWHP's NCO (national contact office, Drs. Jagla and Pecháňová). As such, it coordinates the activities and projects of the ENWHP in Slovakia and takes part in its business meetings, preparing proposals for the research programme and some decisions of the DG SANCO of the European Commission. In 2011-2013 INPP SAS coordinated the ENWHP's 9th initiative in Slovakia: *PH Work – Promoting healthy work for people with chronic illness*. The Institute successfully proposed a model of good practice concerning the creation of a suitable work environment for employees diagnosed with chronic illnesses, employees with specific health limitations or pregnant women who cannot work in their original position. This proposal was accepted as the so-called *Model of Good Practice (MOGP)* from Slovakia. MOGP is defined as a comprehensive workplace health promotion strategy, providing suitable jobs for people with chronic illnesses and disabilities, in cooperation with health professionals, service providers and other stakeholders. The whole initiative was co-funded by the European Commission under the *Public Health Programme*.

This MOGP entitled *The Centre for Ancillary Works and Activities* can be found at http://www.enwhp.org/fileadmin/user_upload/pdf/PH_Work_Podbrezova_Slovakia.pdf.

(b) Physiological research oriented towards integrative aspects was one of the reasons that INPP SAS has its own representative (Dr. Jagla) in the *Standing Task Force* for medical, pharmaceutical and non-medical health sciences of the *Accreditation Commission* of the Ministry of Education, Science, Research and Sport of the Slovak Republic. More than 200 hundred expert reports concerning the study programs at medical faculties and medical research institutes in Slovakia were evaluated by Dr. Jagla during the assessment period.

(c) Very close cooperation between INPP SAS and the International Society for Pathophysiology (ISP) led to the membership of Dr. Pecháňová on the ISP Committee, and in 2014 she was nominated as the president-elect for the period 2014-2018. The Institute of Normal and Pathological Physiology SAS was authorised to organise the 8th International Congress of ISP in Bratislava (2018).

(d) The Institute of Normal and Pathological Physiology SAS repeatedly organised various scientific events aimed at connecting clinical and non-clinical researchers in the field of cardiovascular diseases, not only in Slovakia, but also in other European countries and in the USA. The scientific results and the scientific-organisational activities of Dr. Pecháňová were appreciated, and she was elected as a member of the Executive committee of the European Council for Cardiovascular Research (<http://www.eccr.org/society/executivecommittee/>).

(e) Very close, long lasting cooperation between INPP SAS and the Collegium Internationale Activitatis Nervosae Superioris led to the membership of Dr. Jagla in the Executive Committee of the Collegium (from 2000) and the second term of his presidency of the Collegium for the period 2015-2017 (<http://www.cians.org/executive-commitee/>). The Institute regularly organises the C.I.A.N.S symposia and conferences. The International C.I.A.N.S. Conference in 2012 was held in the Conference Centre of the SAS in Stará Lesná, and INPP SAS will organise a similar conference in 2016.

2.6.3. List of contracts and research projects with industrial and other commercial partners, incl. revenues

none

2.6.4. List of licences sold abroad and in Slovakia, incl. revenues

none

2.6.5. List of most important social discourses under the leadership or with significant participation of the institute (max. 10 items)

none

2.6.6. Summary of relevant activities, max. 300 words

2.7. Popularisation of Science (outreach activities)

2.7.1. List of the most important popularisation activities, max. 20 items

Articles in press media/ internet:

1. Article "*Importance of the vascular system*" in the magazine QUARK, No. 4/2012, RNDr. František Kristek, DrSc.

2. Online article "*In healthy Europe - healthy economics*", 17.9. 2012, MUDr. Fedor Jagla, CSc.
<http://www.ietotak.sk/ekonomika/vzdravej-europe-zdrava-ekonomika>
3. Documentary film about the Centre of Excellence for Research and Development of Structural Composite Materials for Engineering, Construction and Medical Applications (CEKOMAT), 2013, Ing. František Hlavačka, CSc., MVDR. Andrej Barta, PhD.
4. Article "Science can deal with the silent killers once" in Slovak daily journal PRAVDA, 3.3. 2013, RNDr. Oľga Pecháňová, DrSc.
<http://spravy.pravda.sk/domace/clanok/272698-veda-si-raz-poradi-aj-s-tichymi-zabijakmi/>
5. Online article "*Blood pressure and chocolate*", 29.10. 2014, MUDr. RNDr. Angelika Púzszerová, PhD.
<http://www.posterus.sk/?p=17510>
6. Article "*Special exercises can improve our balance*" in Slovak daily journal Denník N, 13.5. 2015
<http://science.dennikn.sk/clanky-a-rozhovory/ziva-priroda-a-chemicke-vedy/lekarstvo/5724specialne-cvicenia-mozu-zlepsit-nasu-rovnovahu>
7. Online report "*Dulling pain may also reduce empathy*", 28.9. 2015, MUDr. Igor Riečanský, PhD.
<http://www.sciencemag.org/news/2015/09/dulling-pain-may-also-reduce-empathy>
8. Online article "Diseases of civilization are connected with the small molecule of nitric oxide" , 24.11. 2015, RNDr. Oľga Pecháňová, DrSc.
<http://www.teraz.sk/zdravie/choroby-z-civilizacie-prepaja-mala-molek/167817-clanok.html>

Appearances in telecommunication media:

9. Interview about the 1st Joint Meeting of the Slovak and Serbian National Physiological Societies in Serbian TV station Televizija OK, 21.6.2013, RNDr. Oľga Pecháňová, DrSc.
10. Interview in the Hungarian TV station TV2, 18.7.2013, RNDr. Oľga Pecháňová, DrSc.
http://tv2.hu/musoraink/aktiv/131310_aktiv_-_2013.07.18._-2._rez.html
11. Interview in the broadcast of Rádio Slovensko, program Portréty, 26.1.2014, RNDr. Vavrínek Szathmáry, CSc.
<http://www.rtvsk.sk/radio/archiv/1648/103336>
12. Interview in the broadcast of Rádio Slovensko, program Nočná pyramída, 16.2.2015, RNDr. Oľga Pecháňová, DrSc.
<https://www.rtvsk.sk/radio/archiv/1106/155637>
13. Interview in the broadcast of Rádio Regina, "10 myths about the brain", 29.4.2015, MUDr. Fedor Jagla, CSc.
14. Reportage in Slovak TV station TV MARKÍZA, "Slovak scientists proved that red wine heals", 25.11.2015, RNDr. Oľga Pecháňová, DrSc., RNDr. Iveta Bernátová, DrSc.
http://www.tvnoviny.sk/my-zeny/1812086_slovenski-vedci-potvrdili-ze-cervene-vino-lieci
15. Interview in the broadcast of ČRo, 11.12.2015, MUDr. Igor Riečanský, PhD.

Public lectures:

16. Open-door day in the Institute of Normal and Pathological Physiology, annually - lectures given by the researchers from the Institute to the students and general public, presentations of all laboratories with practical illustration of experiments and methods used in each laboratory
17. Public discussion "*Emotions and cognition*", Kognitivna čajanka (Cognitive Tea Party), Ljubljana, 8.5.2014, RNDr. Barbora Cimrová, PhD.
http://www.pef.uni-lj.si/kognitivna/novice_kognitivnecajanke.html
18. Lecture and discussion for seniors "*Prevention of cardiovascular diseases*" in nursing home Dom seniorov, Bratislava, 12.11.2014, RNDr. Valéria Regecová
19. Public discussion "*Explosive as a medicine, or how to protect our heart*" in Science in the Centre, National centre for popularisation of science and technics in society, Slovakia, 27.11. 2014, RNDr. Oľga Pecháňová, DrSc.
http://ncpvat.cvtisr.sk/sk/multimedialna-galeria/videoarchiv/veda-v-centre/rndr.-olga-pechanovadrsc.-27.11.2014.html?page_id=4080
20. Public lecture and discussion "*Stress and civilization diseases - how to protect your health*", Limbach, 20.3.2015, RNDr. Iveta Bernátová, DrSc.

2.7.2. Table of outreach activities according to institute annual reports

Outreach activities	2012	2013	2014	2015	total
Articles in press media/internet popularising results of science, in particular those achieved by the Institute	8	4	10	33	55
Appearances in telecommunication media popularising results of science, in particular those achieved by the Institute	3	3	3	11	20
Public popularisation lectures	3	1	9	4	17

□ Supplementary information and/or comments on popularisation activities, max. 300 words

Outreach activities were realised in all forms for popularisation and effective communication of findings discovered by INPP SAS to general public. The most frequently used communication channels were the Internet and press reports (e.g. Pravda 2013, Quark 2014, Monitor medicíny 2015, SME 2015). Research in which INPP SAS participated was also disseminated by foreign media (e.g. Wiener Zeitung, ORF, Der Standard; Austria 2015). Researchers from the Institute personally appeared on Slovak, Czech, Hungarian, and Serbian radio and television programs to inform the public of scientific results, current activities of INPP SAS, and awards the Institute has received. Open-door days with lectures for students and other members of the general public were held annually on the premises of the Institute. Many discussions at schools, senior clubs, clinics, training centres, and in the National Centre for the Popularisation of Science and Technology in Society were held. Scientific work and novel findings were also popularised,

during the 7th International Congress of Pathophysiology in Rabat, Morocco (2014) and on other occasions abroad (e.g. Cognitive Tea Party, Slovenia 2014). The CEKOMAT documentary film (2013) was created with the aim of familiarising the public with projects realised by INPP SAS. The researchers from INPP SAS have a long-term interest in presenting the results of their work not only to scientific community, but also to general public, and thus increasing the awareness of their scientific work.

2.8. Background and management. Human resources and implementation of recommendations from previous assessment

2.8.1. Summary table of personnel

Personnel	2012	2013	2014	2015
All personnel	63,0	59,0	60,0	63,0
Research employees from Tab. Research staff	45,0	43,0	42,0	44,0
FTE from Tab. Research staff	26,250	27,460	28,330	29,480
Average age of research employees with university degree	41,3	39,2	40,0	40,1

2.8.1.1. Professional qualification structure (as of 31.12. 2015) FEMALE

FEMALE	AGE								
	< 30	31 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	> 65
Number of									
DrSc. / prof.					1	1			
II.a / Assoc. prof.		1	2	1		1			
Other researchers PhD./CSc.	7	3	1						
doc. / Assoc. prof.									

2.8.1.2. Professional qualification structure (as of 31.12. 2015) MALE

MALE	AGE								
	< 30	31 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	> 65
Number of									
DrSc. / prof.									1
II.a / Assoc. prof.		1	2	1					4

Other researchers PhD./CSc.	1		2		1				1
doc. / Assoc. prof.			1				1		

2.8.2. Postdoctoral and mobility scheme

2.8.2.1. Postdoctoral positions supported by national and international resources

Angelika Púzserová 2009 –2013 (2009-2013: 50%)

Barbora Cimrová 2009-2014

Ľudmila (Pilšáková) Tóbiková 2010-2012

Andrej Barta 2012-2015

Peter Bališ 2013-2015 (50%)

Zuzana (Halická) Hirjaková 2013-2015

Miroslava Majzúnová 2014-2015

Andrea Berényiová 2015

2.8.2.2. Postdoctoral positions supported by external funding

Study stays:

Andrej Barta: Department of Physiology, Faculty of Medical Sciences of University of Kragujevac, Kragujevac, Serbia, 4-8 November 2013.

Peter Bališ: Department of Physiology, Faculty of Medical Sciences of University of Kragujevac, Kragujevac, Serbia, 2-6 December 2013.

Peter Bališ: Institute of Physiology, Czech Academy of Sciences, Prague, Czech Republic, 25 August – 5 September, 2014.

Angelika Púzserová: European Society of Hypertension Summer School, Dublin, Ireland, 15-21 September 2012.

Zuzana (Halická) Hirjaková: Faculty of Physical Culture, Palacký University of Olomouc, Olomouc, Czech Republic, 7 September – 6 October 2014 (100% SAS).

Barbora Cimrová: CEEPUS Teacher Mobility, Ljubljana, Slovenia, 4-19 May 2014.

Barbora Cimrová: University of California, Los Angeles, USA, 20 April – 25 May 2015.

2.8.2.3. SAS stipends and SASPRO stipends

Jasminka Majdandžić: 2015 – present SASPRO

2.8.2.4. Internal funding - the Slovak Academy of Sciences Supporting Fund of Stefan Schwarz

Angelika Púzserová: 2009 –2013

Peter Bališ: 2013-2015

2.8.3. Important research infrastructure (max. 2 pages)

With regard to integrative physiology, INPP SAS is able to combine new, state-of-art methods of molecular biology with different procedures and devices to conduct behavioural, functional, and morphological analyses. INPP SAS believes that optimally, research, human resources, and infrastructure should be developed together. Thus, the equipment of INPP SAS is fully utilised by researchers since acquisition and does not require additional human resources to be set in use. Research infrastructure of INPP SAS includes all necessary equipment for:

Biochemical analysis

- Assays for enzyme activity
- Measurement of NO/ROS production
- Determination of plasma/serum profile
- Electrochemical methods

Bioanalysis of DNA, RNA and proteins

- Electrophoretic analysis and DNA / RNA / protein quantification
- Western blotting
- Gene expression
- Quantitative PCR analysis of nucleic acids

Microscopy /histology /immunohistochemistry

- Light microscopy
- Fluorescent microscopy
- Confocal microscopy
- Transmission electron microscopy
- Histological preparations
- Immunohistochemistry staining

Cell culture system

Cardiovascular physiology

- Direct measurement of blood pressure, heart rate and other biological signals
- Equipment for tail-cuff plethysmography
- Analysis of vasoactivity *in vitro* (multi-channel vascular organ bath systems and Mulvany's wire myographs)

- Electrocardiography for small animals
- Langendorff perfusion apparatus

Behavioural analysis in rodents

- Equipment for various behavioural studies (open-field box, elevated-plus maze apparatus, prepulse inhibition and startle reflex apparatus)
- Any-maze software for analyses of animal behaviour

Analysis of brain activity

- Electroencephalography
- Electrooculography
- Electromyography and measurement of electrodermal activity
- Equipment for non-invasive transcranial electric stimulation of the brain

Stabilometric analysis of human posture and movement

- Optoelectronic camera motion capture system for 3D analysis of human movement
- Multi-channels wireless electromyography device
- Biocybernetic approach to data analysis

The Institute has a certified animal facility accredited for breeding of rats (SK PC 2012, thus a majority of rats used in the projects is born in this facility in order to keep the same genetic and environmental background. The Institute received also the consent for using GMO by Ministry of Environment of the Slovak Republic in 2010 (No 53804/2010-2.2-11-PPZ 70+O).

2.8.4. Description of how the results and suggestions of the previous assessment were taken into account

Comment 1: Research outputs

The Institute follows positive trends after the previous evaluation, its members published many papers, a promising trend for the future. However, the papers had been published in journals with moderate impact factor or in supplements, so it is recommended to publish in journals with higher impact factor. The Evaluation Panel recommendation is to publish more complex work that would be competitive in higher impact journals. On a positive note, work of most of the papers had been done in Slovakia.

Here we would like to note that the average impact factor of institute's publications has been steadily increasing (2012: 2.46, 2013: 2.55, 2014: 2.60, 2015: 3.27), reflecting the Institute's achievement to publish in journals with higher impact factor as recommended by the Evaluation Panel in 2012. The increased quality of our papers is evident also from the increasing average as well as median of the impact factor of journals where the papers are published (see also Chapter 2.1.8 – Supplementary information and/or comments on the scientific output of the institute and figures 1, 3 and 4).

Comment 2: Response to the scientific outputs

While the output of scientific papers is high, the citation per paper seems to be less impressive. One way how to handle this would be to publish smaller number of papers, but with higher quality.

Apparently the Institute is following this trend and Evaluation Panel appreciates this development.

Average annual number of citations increased from 296/year in 2007-2010 (2006: 244, 2007: 198, 2008: 346, 2009: 309, 2010: 384) to 494/year in 2011-2014 (2011: 415, 2012: 475, 2013: 557, 2014: 530). We note that to achieve this positive trend we did not need to decrease the number of publications (see figure 2).

Comment 3: Research status of the organisation within international and national context

The panel acknowledges that Dr. Pecháňová's team was recognized as one of the above average in comparison with international research teams. The recommendation for her is to lead other teams within the Institute to acquire this level of excellence. The Panel sees the good international position of the Institute, nevertheless it recommends revising the number of collaborations and choosing the most productive ones to continue.

In reply to this comment, we would like to highlight achievements and progress in scientific outputs of other laboratories (teams), apart from the laboratory of Dr. Pecháňová (Laboratory of Neurocardiovascular Interactions). For instance, work and collaboration of the Laboratory of Cognitive

Neuroscience (head Dr. Riečanský) resulted in a publication in the prestigious journal Proceedings of the National Academy of Sciences, which has received considerable media coverage and was also highlighted by a comment in the journal Science. The most cited paper of the Institute in 2015 is also due to scholars from this laboratory. The paper from the Laboratory of Vascular Disorders Etiopathogenesis (head Dr. Čáčányiová) was awarded by the Prize of the Slovak Physiological Society for "The Best publication in year 2013". Also the effort of this team to incorporate the basic into applied research was "rewarded" by the grant of Ministry of health of SR (2013-2016). Two projects of the Laboratory of Neurohumoral Regulation of Hemodynamics (head Dr. Bernátová) were identified by the grant agencies as "accomplished with excellent results" (APVV-523-10 and VEGA 2/0084/10). Also number of international and home awards document the quality of individual researchers (see Chapter 2.1.5. List of other scientific outputs and Chapter 2.3.14, part "Supplementary information and/or comments documenting the international and national status of the Institute").

Comment 4: Projects structure, research grants, and other external funding resources

The Institute has a unique opportunity to unify different approaches to one topic. The plan for this should be formulated, presented to an external advisory board and evaluated by it. Since the Institute is organizing several scientific meetings, experts may be gathered and form this advisory board.

In line with this recommendation, INPP SAS succeeded in a grant competition to create the Centre of Excellence for Examination of Regulatory Role of Nitric Oxide in Civilisation Diseases (NOREG), which covered research activities from all institute's laboratories. The aim of the centre was to identify common NO-regulated (patho)mechanisms, which play a role in the development of hypertension,

obesity, dyslipidaemia, diabetes mellitus, metabolic syndrome, social stress-related disorders, mental and movement disorders.

Furthermore, the Institute has created International Scientific Advisory Board which consists of Riitta Korpela (Finland), James B. Lucot (USA), Ramaroson Andriantsitohaina (France), Marko Poglitsch (Austria), Peter Ferdinandy (Hungary) who give the Institute valuable scientific advices. Having this International Scientific Advisory Board helps INPP SAS to receive rapid feedback, criticism, and recommendations from leading international experts. As a relatively small and independent institution, INPP SAS is able to swiftly adjust its course, and take action in response to these suggestions and actual needs.

Comment 5: Organization of PhD education and other pedagogical activities

The panel appreciates that Dr. Puzserová was awarded to attend summer school on cardiovascular research of Royal Physiological Society in the UK and recommends navigation of all students to this kind of activities. Strong feature of the Institute is that both sponsors (senior experts/garants) of PhD studies are younger than fifty years of age and that indicates future stability of the programs.

In the assessment period, several PhD students and young scientists from the Institute awarded grants and international or national scholarships to participate at educational and training courses, workshops etc. (see also Chapter 2.3.14., part Supplementary information and/or comments documenting the international and national status of the Institute).

Comment 6: Socio-economic outputs

The panel recognized several activities in applied outputs and appreciates the collaboration in translation research. The panel suggest that goals of the research are clearly stated as:

- 1. linking the physical output with mental disorders*
- 2. further clarifying the linking with state of the art diagnosis*

As mentioned in many places throughout the document, the Institute's activities are centred at the most important problems of public health. Please, see Chapter 2.6, which provides more information on social impact of the Institute's activities.

Comment 7: Popularisation and outreach activities

Science popularisation activities are generally strong. The panel recommends to expand these activities to internet-based media.

In line with the recommendation, popularisation activities over the internet have increased. (see Chapter 2.7. Popularisation of Science).

Comment 8: Background and management: infrastructure and personal development

The panel appreciates the trend of the mean age of Institute investigators since the last evaluation. The panel also appreciates the plan to purchase state of the art imaging equipment. This is a good trend, however more improvement in infrastructure is needed, namely in specialized physiological experiments and molecular biology.

Still in this assessment period, INPP SAS belongs among the youngest institutes in SAS. As it was already stated, the Institute is able to combine new, state-of-art methods of molecular biology with different procedures and devices to conduct behavioural, functional, and morphological analyses. Even the methods of molecular biology represent an important research tool of the Institute, the substantial experiments are the physiological ones. INPP SAS believes that optimally, research, human resources, and infrastructure should be developed together. Nevertheless, the Institute developed its infrastructure also during this assessment period, mainly by confocal microscopy, special 3D camera system for analysing movement in humans and qRT PCR system, purchased within the project of Structural Funds CEKOMAT. Within the other projects the Institute has purchased equipment for direct measurement of blood pressure, heart rate and other biological signals (PowerLab, ADInstruments, 4-channels), all necessary equipment for experiments in cell cultures, Any-maze software for analyses of animal behaviour, new equipment for various behavioural studies, new 4-channel vascular organ bath system for determination of vascular function, equipment for non-invasive transcranial electric stimulation of the brain, etc. (see also Chapter 2.8.3. Important research infrastructure).

We would like to note that all equipment is fully utilised by researchers since acquisition and does not require additional human and financial resources to be set in use.

□ Supplementary information and/or comments on management, research infrastructure, and trends in personnel development

INPP SAS is currently a stabilised scientific organisation with optimal personnel structure and strong national and international position. To be better prepared for transformation of SAS, the Institute terminated its budgetary form in December 31, 2015 and changed to contributory organisation.

Furthermore, INPP SAS being aware of the need to concentrate multidisciplinary and interdisciplinary research in the field of medical and life sciences and gradually build larger compact scientific units within the Slovak Academy of Sciences decided to sign the „Memorandum of Understanding“ with Institute of Experimental Pharmacology and Toxicology SAS and Institute for Heart Research SAS. In the event of a consensus, the institutes will create a scientific Centre of SAS focused on research of life style diseases. This Centre will deal with integrated research of causes, mechanisms of development, and possibilities to prevent and treat socially significant lifestyle-related diseases, with emphasis on diseases of the cardiovascular and nervous systems, metabolic disorders, as well as diseases that originate in the prenatal and early postnatal period of development.

All other important information is available in this Questionnaire and/or annual reports.

3. Research strategy and future development of the institute for the next five years (2016-2020) (Recommended 3 pages, max. 5 pages)

3.1. Present state of the art in both the national and the international contexts

The Institute of Normal and Pathological Physiology SAS is a well-established institution nationally and internationally, with good, professional infrastructure, both on a personal and technical level. Currently, INPP SAS is the only research institute in Slovakia dealing with integrative physiology at the systemic level (basic and clinical research). Global trends in cardiovascular and neurophysiological research have been concentrated on studies elucidating the etiopathogenesis of

serious civilisation diseases. Therefore, the research groups at INPP SAS will continue with their investigations of their current research project topics, however, this will be done using new, state-of-art techniques and methodological approaches. Research at INPP SAS is also increasingly shifting towards applied and transdisciplinary research, which is reflected by strengthened cooperation with institutions primarily focused on applied and clinical research.

The significance of INPP SAS in both national and international contexts is also clearly documented by the number of awards granted to the Institute in this assessment period (e.g. by Silver medal of Faculty of Natural Sciences of Comenius University, by Memory medal of Faculty of Medicine of Comenius University, Medal of SAS to Oľga Pecháňová as a leader of an excellent research team, and others), as well as by the number of international symposia organised by INPP SAS at which top scientists were present as speakers (see 2.3.2 List of International Conferences). The Institute of Normal and Pathological Physiology SAS, in a competition with Beijing and Saint Petersburg, won the position of organiser for the next International Congress of the International Society for Pathophysiology, which will be held in Bratislava in 2018.

Here, the most important aspects of the present state of the Institute are summarised:

First, we are glad that along with the rejuvenation of the Institute and an increasing number of young researchers, there has simultaneously been an elevated number of CC articles in journals with high impact factors, as is evident from the increasing impact factor of our publications in the last four years. Indeed, 17 articles were published in journals with an impact factor higher than 4, and 38 others were published in journals with an impact factor higher than the median for physiology (2.34 in 2015).

Second, as was mentioned above, INPP SAS is an organisation with a wealth of international relationships. This leads to cooperation in multilateral and bilateral projects, the creation of international joint laboratories, and the acceptance of foreign students and post-doctoral students in international exchange programs in a competitive manner. The Institute of Normal and Pathological Physiology SAS has also played a key role for Slovakia in the ENWHP supported by DG SANCO within the framework of European Commission. As the National Contact Office of the ENWHP and a member of strategically important projects, INPP SAS has had the opportunity to participate in the creation of new European standards relating to health, and to influence the health policy of the European Union. In addition, having an international Scientific Advisory Board helps INPP SAS receive rapid feedback, criticism, and recommendations from leading international experts. As a relatively small and independent institution, INPP SAS is able to swiftly adjust its course, and take action in response to these suggestions and actual needs.

Third, since its establishment, INPP SAS has focused on integrative physiology. The Institute is able to combine new, state-of-art methods of molecular biology with different procedures and devices to conduct behavioural, functional, and morphological analyses. INPP SAS believes that optimally, research, human resources, and infrastructure should be developed together. Thus, INPP SAS has new, but only necessary equipment, which can be fully utilised by most of the Institute's researchers and co-workers without an undue waiting period for additional human resources and consumables for experimental work. This approach has created synergistic and multidisciplinary opportunities that have helped to propel the Institute to a higher level.

Translational research and clinical collaborations are also closely integrated into research activities, and help spread the societal impact of INPP SAS. In close collaboration with the Institute of Materials and Machine Mechanics SAS, INPP SAS participates in the development of new composite materials suitable for the production of spare joints used for improving movement in humans. This cooperation began during the projects of Structural Funds: *Centre of Excellence for Research and Development of Constructive Composite Materials (CEKOMAT I and II)*. *CEKOMAT II*, which aimed to develop new materials for biomedical applications and is now continued in the trilateral project with Turkey,

TUBITAK - SAS: Magnesium Nanocomposites for Biodegradable Medical Implants (Acronym: BIOMAMI, time period: 1.12.2014 – 30.11.2017). The Institute of Normal and Pathological Physiology SAS has also negotiated with the private IT company SWAN, a.s. regarding possible outcomes arising from the utilisation of markers of cardiovascular disease in broader medical practice and eHealth programmes.

Fourth, INPP SAS has always supported team science. Research has been organised around the Centre of Excellence of SAS - NOREG, where many principal investigators, senior researchers, and PhD students have worked together to achieve more than they could have individually. The Institute of Normal and Pathological Physiology SAS has also created an interlinked community of scientists from INPP SAS and the Faculty of Medicine at Comenius University and other SAS institutes with common goals under the joint laboratories. Since the competitive science of today increasingly requires team and consortium approaches to succeed, INPP SAS has also created international joint laboratories with Charité - Universitätsmedizin in Berlin, and the Faculty of Medical Sciences at the University of Kragujevac. However, INPP SAS also needs new models for career development that reward best outputs, international projects, and teamwork. Non-PI senior researchers and technology experts are centrally important, and their career tracks need to be better developed within the SAS. Furthermore, to become more attractive for talented PhD students, it is important to compete for external funding on national and international levels. Closer cooperation with the private sector may also bring additional resources. Importantly, INPP SAS performed well in the competitive SASPRO program, which enabled the Institute to host a foreign post-doctoral student. Other students and researchers have visited INPP SAS through bilateral projects such as SAIA.

Finally, INPP SAS has two PhD study programmes: Normal and Pathological Physiology in cooperation with the Faculty of Medicine at Comenius University in Bratislava, and Animal Physiology in cooperation with the Faculty of Natural Sciences, also at Comenius University. The Institute of Normal and Pathological Physiology success in integrating talented PhD students into research personnel has led to the rejuvenation of the Institute. Moreover, having PhD students from different faculties (e.g. Faculty of Medicine, Faculty of Natural Sciences, Faculty of Philosophy and Arts, Faculty of Chemical and Food Technology, Faculty of Mathematics, Physics and Informatics) gives the Institute a multidisciplinary view of scientific problems solved in laboratories. Similarly, integration of foreign students helps INPP SAS receive complex background information about the topics studied. Additionally, some of the Institute's former PhD students have been appointed by different foreign universities with excellent results, e.g. Csilla Haburčáková (Jenks Vestibular Physiology Laboratory, Massachusetts Eye and Ear Infirmary, Harvard Medical School, Boston, USA), Marián Haburčák (College of Arts and Sciences, Biology Department at Brandeis University, Waltham, USA), Woineshet Zenebe (Davis Heart and Lung Research Institute, Ohio State University), among others.

3.2. Research strategy of the institute in the national and the international contexts, objectives and methods

Cardiovascular diseases are still the number one cause of death globally. An estimated 17.5 million people died from cardiovascular diseases in 2012, representing 31% of all global deaths. Hypertension is a risk factor for coronary heart disease, and the most important risk factor for stroke. Hypertension causes about 50% of ischaemic strokes. Thus, in the field of cardiovascular physiology, INPP SAS plans to further develop our current research concept of complex investigation of functional, structural, and molecular mechanisms associated with the development of hypertension, as well as its prevention and treatment. INPP SAS will focus on the investigation of: (i) new vasoactive signal pathways triggered by vasoactive molecules like NO, hydrogen sulfide, carbon monoxide, and selected endothelium-derived constricting factors; (ii) the role of perivascular nerves, perivascular adipose tissue, and uric acid in modulation of vascular function; (iii) redox status,

alterations of endogenous biomarkers and activities of intracellular signal pathways in the development of hypertension; and (iv) molecular mechanisms of action of selected natural polyphenols in the cardiovascular system.

Concurrently, within three “cardiovascular laboratories” and in the line with current trends in biomedical research field, INPP SAS will begin to investigate new topics, which are described in detail below.

Hypertension is an important constituent of metabolic syndrome. However, the underlying mechanisms for the development of hypertension in metabolic syndrome are very complex and still remain obscure. Thus, the Laboratory of Neuro-Cardiovascular Interactions (LNCI) will focus on investigating signaling pathways leading to high blood pressure in association with obesity and insulin resistance. The LNCI will analyse the effects of different combinations of antihypertensive and/or antilipidemic drugs loading nanoparticles, and study targeted drug delivery. For better analysis of myocardial infarction, a new laser-induced model has begun to be developed. Under the framework of transdisciplinary research, magnesium nanocomposites for biodegradable medical implants will also be studied.

To interconnect basic, applied, and clinical research, the Laboratory of Vascular Disorders Etiopathogenesis (LECP) will enrich the studies performed on animal models with experiments using human arteries in cooperation with the Department of Urology, Faculty of Medicine, at Comenius University and with University Hospital of Academician Dérer in Bratislava. In cooperation with the Institute for Clinical and Translational Research of the Biomedical Centre (BMC) SAS, the LECP will study the vasoactive effects and molecular mechanisms of new signal molecules derived from NO – hydrogen sulfide interaction in the arteries isolated from human kidneys after nephrectomy. The laboratory will investigate various biochemical parameters and redox status in the perivascular adipose tissue and in serum of normotensive and hypertensive patients in cooperation with Second Department of Internal Medicine at University Hospital Bratislava and the Institute of Experimental Endocrinology BMC SAS.

Psychosocial stress is considered a risk factor associated with the development of various civilisation diseases, including cardiovascular diseases, mental disorders, and metabolic syndrome. In the next assessment period, the Laboratory of Neurohumoral Regulation of Hemodynamics (LNRH) will be focused on the investigation of the neuronal and endothelium-related mechanisms involved in pressor responses induced by acute and chronic social stress.

This will be conducted in cooperation with the Institute of Physiology of the Czech Academy of Sciences in Prague. In cooperation with the Slovak University of Technology, data obtained in functional studies will also serve for mathematical modelling of blood pressure regulation in stress. Furthermore, in cooperation with the Institute of Measurement Science, SAS, and the Faculty of Medicine at Comenius University in Bratislava, the exploitation of superparamagnetic iron oxide nanoparticles, which can be used for targeted drug delivery in the intact organism, and their safety or possible nanotoxicity will be determined in aged and hypertensive rats, as well as under the influence of stress.

Mental disorders are one of the conditions that contribute most to the global burden of disease worldwide. Elucidating their neurobiological substrate is of high societal priority. Thus, the research of the Laboratory of Cognitive Neuroscience (LCN) will focus on neurobiological mechanisms of mental processes and their disturbance. Current research projects of the LCN are focused on studying endophenotypes of mental disorders, in particular schizophrenia. Pilot results are very promising, and in the coming years the LCN aims to continue this endeavour by combining knowledge from studies of human subjects and animal models. LCN's success will be strongly determined by the accessibility of modern methods of in vivo recording of human brain activity with high spatial-temporal resolution, as well as advanced methods of molecular biology used to analyse the alteration of brain processes in experimental animal models.

The main scientific program of the Laboratory of Motor Control (LMC) is the sensory control of posture and gait. Each year, one in every three adults aged 65 or older falls, and 2 million are treated in emergency departments for fall-related injuries. As a leading cause of injury, knowledge of how to reduce the risk of falling has begun to become a priority in aging society. The LMC will focus on human balance control mechanisms, implementation of daily physical activities (e.g. standing from a seated position), and gait. It will analyse the behavioural characteristics of movement in healthy subjects of different ages and in patients with vestibular, neurodegenerative, respiratory, and cardiovascular diseases. Using wireless inertial sensors for physical activity recording, the LMC will obtain detailed information about the movement of the body during specific motor tasks. Research in this field is beneficial for elderly people in terms of fall prevention, and the knowledge acquired by this research will be used to design specific test methods for seniors. Additionally, individuals suffering from stroke, which is the most frequent cause of disability in developed countries, often have core stability problems. Through research in this area, the LMC's goal is to develop new equipment for the rehabilitation of patients whose disability does not allow them to stand upright.

INPP SAS has defined eight objectives to fulfil the above research strategy in the coming years:

To be excellent: Based on original and provocative results, prepare quality articles with the ambition to publish them in the leading journals for given scientific disciplines.

To be international: Based on current international projects and cooperations, increase INPP SAS's international impact, involvement in EU projects and consortia, and create an inspiring platform for PhD students and young scientists from abroad.

To be a team: As a community of scientists, post-doctoral students, PhD and diploma students, technicians and administrators, work together to promote an open, inclusive, diverse, and supportive workplace that emphasises the value of the individual while celebrating the accomplishments of the research team.

To be integrative: Based on INPP SAS's long tradition, continue in the development of integrative physiology in strong connection with molecular biology and modern genomic and proteomic approaches, in order to determine molecular mechanisms of diseased states and methods of targeted drug delivery, as well as to integrate a quantitative approach with data analysis, including computer modelling of physiological functions and mechanisms for a more accurate interpretation of scientific results and thus a better understanding of complex systems and their relationships. **To be transdisciplinary:** To continue in the first successful transdisciplinary projects to meet the applied research objectives.

To be competitive: To develop new research methods, models and approaches that will increase INPP SAS's level of specialisation in the field of integrative physiology. Such specialisation would help INPP SAS be more competitive, and make it a more desirable partner for national and international research consortia, EU projects Horizon2020, and others.

To be open to young people and new trends: In cooperation with the Presidium of the SAS, to simplify administration procedures associated with the admission of foreign PhD students and post-doctoral students interested in studying at INPP SAS. As educators, we are committed to mentoring and helping train the next generation of investigators, physicians, and other health professionals. We support the continued research training of post-doctoral fellows who have earned a PhD degree. The goal of our programme is to provide a rigorous, mentored research experience focused on the design, implementation, and completion of a novel research project. **To be beneficial for society:** Based on the current international projects (ENWHP, DG SANCO) and national cooperation with the Ministry of Health of the Slovak Republic and the National Health Information Centre within the *National Programme for Prevention of Cardiovascular Diseases* and the Public Health Authority of the Slovak Republic, to contribute to improving the quality of life.

Project proposals submitted to 7RP or H2020	2012	2013	2014	2015
Institute as coordinator				
Institute as participant	1		8	1

4. Other information relevant for the assessment

On the basis of the Institute's original results, INPP SAS has published more than 3,000 studies to date, which describe haemodynamics and blood pressure regulation, the preventive and therapeutic effects of selected antihypertensive and antioxidants agents on hypertension, the function of the vestibular organ in space, general mechanisms of coding information within the nervous system, studies of computer models that investigate sources of cardiac depolarisation and repolarisation variability, sensory interactions in human posture and movement control, the brain mechanisms involved in processing sensory information, and control of motor activity under the influence of several external and internal factors affecting human brain functions. In the past four years INPP SAS has obtained several original findings not only in the field of basic and clinical research, but also for application purposes.

In celebration of the Institute's **60th anniversary in 2013**, INPP SAS created a short brochure entitled "*Sixty Years of Research in the Field of Experimental Medicine*," documenting the history of INPP SAS and its journey over the past 60 years.

C.I.A.N.S.

Since 1960, the Institute has played an important role in international activities resulting in the foundation of the *Collegium Internationale Activitatis Nervosae Superioris* (C.I.A.N.S.). C.I.A.N.S. was organised in 1958 and formally founded in 1960; it is the oldest international society in the field of behavioural neuroscience, integrative physiology, and psychosomatic medicine. INPP SAS's research studies were successfully presented in international symposia and conferences of C.I.A.N.S. organised by the Institute in the last few years, and our colleague Fedor Jagla, MD., PhD. was elected twice by the international community to be the president of C.I.A.N.S. (2003-2005, 2015-2017). The *25th International C.I.A.N.S. Conference 2016* will be held in Bratislava, Slovakia, September 21-23th, 2016 and will be organised by INPP SAS.

Nitric oxide club

Since the discovery of NO as a signaling molecule in the cardiovascular system, the main goal of our studies is NO research in cardiovascular and nervous systems under different (patho)physiological and disease states. With the aim of expanding this mission, and to create a basis for cooperations between scientists and clinicians, INPP SAS established the association, the "Nitric Oxide Club," in 1999. The NO Club gathers scientists oriented towards the investigation of the role of NO in organisms. This association creates more opportunities to organise up-to-date presentations from international and national specialists on the topic of NO in health and diseased states. Moreover, the NO Club regularly organises international meetings entitled *Nitric oxide: from molecular level to clinical implications*. This meeting was organised for the first time in Bratislava in 1999. Later (bi-annually) the meetings took place in Croatia. The *9th International Symposium, Nitric Oxide: From Basic Regulations to Lifestyle - Related Diseases*, will be held in Vrsar, Croatia, on September 13-16th, 2016.

Academician Juraj Antal Award

The directorate and the scientific board of INPP SAS established the *Award of Academician Juraj Antal* in 2007, named after Prof. Juraj Antal, MD., PhD., DSc., a founder of Slovak national physiology and one of the founders of the Institute and its first director.

In 2012, on the occasion of his 100th birthday, scientists from INPP SAS took part in the unveiling ceremony of his memorial board, which is located on the City Hall in his hometown, Slovany.

Academic Club Barrus Rattus

In May 2010 INPP SAS inaugurated an academic club called *Barrus Rattus*. This club was created to in order to unite science, the artistic sphere, and the popularisation of science. The aim of this project is to combine science and art, transforming science and bringing it to the general public in an accessible form.