

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 for Heart Research, Slovak Academy of Sciences, Dúbravská cesta 9,
840 05 Bratislava, Slovakia

1.2. URL of the institute web site

<http://www.usrd.sav.sk>

1.3. Executive body of the institute and its composition

Directoriat	Name	Age	Years in the position
Director	RNDr. Miroslav Barančík, DrSc.	54	6
Deputy director	RNDr. Ľudmila Okruhlicová, CSc.	60	6
Scientific secretary	Ing. Monika Ivanová, PhD.	41	4

1.4. Head of the Scientific Board

MUDr. Tatiana Ravingerová, DrSc. – from 2012 until November 2014

Ing. Miroslav Ferko, PhD. – from November 2014

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	20,0	17,700	21,0	19,310	23,0	19,350	22,0	20,700	86,0	21,5	19,265
Number of PhD students	8,0	0,800	9,0	0,900	10,0	1,000	9,0	0,900	36,0	9,0	0,900
Total number	28,0	18,500	30,0	20,210	33,0	20,350	31,0	21,600	122,0	30,5	20,165

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	26,0	17,700	30,0	19,310	33,0	19,350	31,0	20,700	30,0	19,265
Department of Cardiac physiology and pathophysiology	8,0	6,200	8,0	5,800	10,0	5,200	11,0	6,300	9,3	5,875
Department of Histochemistry and electron microscopy	8,0	3,300	9,0	4,300	10,0	6,200	10,0	6,200	9,3	5,000
Department of Biochemistry	7,0	5,490	10,0	6,110	9,0	4,950	7,0	4,500	8,3	5,263
Laboratory of protein chemistry	3,0	3,000	3,0	3,000	4,0	4,000	3,0	3,000	3,3	3,250

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>	247,952	248,983	236,476	257,764	247,794
Other Salary budget <i>[thousands of EUR]</i>	18,855	40,124	36,276	41,076	34,083

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

- The Institute is concerned about the following research:
 - basic medical and pharmaceutical sciences - discipline normal and pathological physiology
 - biological sciences – discipline physiology of animals
 - chemical sciences – discipline biochemistry and bioorganic chemistry
- The Institute is concerned with the study of basic properties and regulatory mechanisms of cardiac membrane systems that transport cations and biological signals at both physiological and pathological conditions.

3. The Institute investigates (deals with) the mechanisms involved in the regulation of metabolism and function of hypoxic, ischemic and reperfused myocardium, as well as in adaptation of the heart to different pathological situations at the subcellular, cellular and organ level. Biological, histochemical, morphological and physiological approaches are used.
4. The Institute designs new methods and looks for possibilities to influence and improve the protection of myocardium against damage induced by hypoxia, ischemia, calcium overload, oxygen free radicals, reperfusion-induced changes and against influence of other factors.
5. The Institute is concerned with the study and development of new strategies in the management of consequences of heart failure after volume and pressure overloaded using mechanical supporting systems.
6. The Institute realizes an organisation of PhD studies which are in accordance with the rules given in legislation.
7. The Institute develops national and international cooperation with scientific institutions and Universities dealing with related (similar) topics (objectives) of research.
8. The Institute ensures the publication of results of research and developing activities by means of periodical and non-periodical press. Editing of periodical and non-periodical press is performed according to the rules given by orders of the Presidium of Slovak Academy of Sciences.
9. The Institute provides consulting and expertise services which are related to the main activities of the Institute.

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)

The main interest of the Institute for Heart Research, Slovak Academy of Sciences (IHR SAS) is the basic research in the area of cardiovascular system diseases. The research programs are oriented on elucidation of factors and mechanisms that participate in pathogenesis of the heart and vessels in different acute and chronic pathological settings mimicking human disease conditions. The aim of this research is to expand the knowledge and understanding of regulatory mechanisms of the heart function affected by main civilization diseases on cellular, subcellular and molecular levels. Emphasis is placed on myocardial ischemia, hypoxia, hypertension, diabetes mellitus, and heart injury caused by ionizing radiation, bacterial endotoxin, dyslipidemia, and cardiotoxicity. Within this scope, mechanisms of ischemic adaptation, the role of intracellular and intercellular signaling, mechanisms including function of membrane transport systems, connexin channels (in occurrence of malignant arrhythmias) and novel principles of cardioprotection utilizing selected drugs and non-pharmacological compounds are studied.

Experimental research at IHR SAS was during the assessment period performed in three Departments (Department of Cardiovascular Physiology and Pathophysiology, Department of

Biochemistry, Department of Histochemistry and Electron Microscopy) and in the Laboratory of Protein Chemistry. In the period from January 2012 to December 2015, the research activities of the IHR SAS were focused on several interrelated fields of basic cardiovascular research and included the following topics:

- structure-function relations in myocardial tissue and vessels under normal and pathological conditions
- molecular and subcellular mechanisms involved in the pathogenesis of malignant arrhythmias and vessels remodelling and prevention of cardiovascular damage
- heart and vessel protection against ionizing radiation
- protection of the heart muscle and vessels against injury *via* modulation of gap junction connexin channels
- cardiac adaptation - molecular mechanisms of endogenous cardioprotection
- gender-related differences and response to myocardial ischemia
- ischemic and reperfusion myocardial injury, arrhythmias and sudden death – prevention and protection
- regulatory proteins (protein kinases, metalloproteinases) - role in the mechanisms of myocardial adaptation
- risk factors of cardiovascular diseases related to lifestyle
- molecular mechanisms of pleiotropic (other than primary) effects of various drugs
- function of mitochondria at physiological and pathological conditions (ischemia, hypoxia, hypertension, diabetes)
- substrate and energetic metabolism in the myocardium
- membrane transport systems (Na,K-ATPase) – the role in civilization diseases (hypertension, diabetes, dyslipidemia) – gender-related differences
- prevention of cardiovascular diseases and malignant arrhythmias using natural as well as endogenous compounds

The research was carried out on molecular and cellular level, as well as on the levels of the organ and of the integrated organism. Various experimental models and techniques employing physiological, biochemical, histochemical and morphological approaches were used.

The research program of the IHR SAS during the assessed period was done in the frames of several grant projects. In the year 2015 Institute for Heart Research SAS was a coordinator of the project of EU Structural Funds „Completion of infrastructure for modern research of civilization diseases“. As a partner, the IHR SAS participated in years 2012-2013 also in the realization of another project of EU Structural Funds „Centre of Excellence for Glycomics“.

At the national level, in the years 2012-2015 the research program of the IHR SAS was realized through coordination of three projects of the Slovak Research and Development Agency (APVV): i) “The effect of the lifestyle-related risk factors on the adaptive processes in the ischemic myocardium“, ii) “Proton radiation-induced cardiovascular toxicity - pathophysiology and prevention“, and iii) “Study of regulation of radical and cellular signaling

during hypertension and influence of novel therapies on this signaling". In years 2012-2013, the project of APVV-LPP "Activation of cell signaling mechanisms as a potential target of cardiac protection against ischemic injury" was also realized at the IHR SAS. During the assessed period, research workers from the IHR SAS during the assessed period operated as principal investigators of 15 projects of the Scientific Grant Agency of the Slovak Academy of Sciences and the Ministry of Education (VEGA grants) and two researchers were principal investigators of projects of Slovak Society of Cardiology.

During the assessed period 2012-2015, IHR SAS actively participated as a partner organization in the realization of other five APVV projects: „Sex differences in etiopathogenesis of social stress-related cardiovascular and behavioral disorders in individuals with predisposition to hypertension“, „Calcium channels in neuronal excitability“, „The effect of aliskerin loaded nanoparticles in experimental hypertension“, „Alterations in cell metabolism associated with drug transporter P-glycoprotein overexpression in leukemia cells“, „Chemoenzymatic synthesis and evaluation of biological activities of natural glycophenols and their analogues“. As a partner, the IHR SAS participated in the Centre of excellence of SAS: "Centre of excellence of SAS for Research of regulatory role of nitric oxide in civilization diseases".

Several principally new findings were achieved by the realization of the above projects and some of the obtained results may be potentially applied in clinically oriented research and in clinical practice. The most important results of this research were presented in the Annual Reports of the Organisation of the Slovak Academy of Sciences for years 2012-2015 in the following form:

Report 2012 - *Effect of lifestyle-related risk factors on the mechanisms of myocardial adaptation, energetics and their modulation*

Investigation of molecular processes involved in pathophysiological mechanisms of ischemia/reperfusion (I/R) injury and protective adaptive processes in healthy and pathologically altered rat myocardium revealed possibilities of their pharmacological simulation and utilization in protection of ischemic myocardium. The results have shown that activation of apoptotic processes (manifested by decreased levels of anti-apoptotic Bcl-2 protein and increased expression of pro-apoptotic Bax) play a role in the development of lethal I/R injury. Enhanced arrhythmogenesis and contractile dysfunction in postischemic myocardium are related to activation of calcium transport systems, in particular, Na⁺/Ca²⁺ exchanger and Ca²⁺/calmodulin-dependent protein kinase II (CaMKII), increased production of free radicals and dysregulation of nuclear receptors PPAR responsible for energy production and lipid metabolism. Presence of other comorbidities related to lifestyle including chronic hypertension and hypercholesterolemia suppressed the efficiency of endogenous protective mechanisms in the normal and diabetic heart with respect to their positive effects on parameters of ischemic injury, and exerted negative influence on the mitochondrial function and activity of kidney Na,K-ATPase. Antiischemic, preconditioning-like protection was conferred by hypolipidemic drugs

(simvastatin, WY14643) within their pleiotropic (cholesterol-independent) effects, such as anti-oxidative and anti-apoptotic effects. Attenuation of I/R injury (size of infarction, contractile dysfunction and ventricular arrhythmias) after application of WY14643 was associated with increased gene expression of PPAR-alpha isoform of PPAR and its „downstream“ metabolic genes PDK4 and mCPT1. Pretreatment of rats with this hypolipidemic compound as well as pretreatment with stress hormone oxytocin resulted in activation of „pro-survival“ cellular cascade of PI3-kinase/Akt. An important factor contributing to induction of adaptive processes and increased ischemic tolerance in the myocardium of healthy and diseased (diabetic) animals appeared to be an enhanced fluidization of mitochondrial membranes.

(Outputs of projects VEGA-SR 2/0054/11, 2/0101/12, 1/0638/12, 2/0115/10, APVV-LPP-0393-09, APVV-0102-11)

Report 2013 – *The effect of ionizing radiation on the cardiovascular system and the possibility of preventing the negative effects*

Damage to the heart and blood vessels induced by irradiation of cancer patients in thoracic and mediastinal areas are significant source of morbidity and mortality. In our study molecular markers and mechanisms of radiation injury to healthy tissue were studied that could bring relevant data for the study of new preventive and protective interventions were assessed. It was found that gene expression of PPAR-alpha was significantly lower in the left ventricle of irradiated hearts. The expression of miRNA-21 was increased almost 10-fold. The ultrastructural studies suggest that early changes may be associated with degeneration of the endothelial cells, but at the same time also by activation and or proliferation of endothelial cells and angiogenesis. The results of selected indicators suggest that radiation in an early stage can cause not only negative effect, but also initiates the start of adaptive cascade directed against the injurious effects of radiation that protects the general function of the heart.

(Outputs of projects VEGA SR 2/0207/11, APVV-0241-11)

Report 2014 - *The mechanisms of radiation damage to the heart and potentially protective procedures.*

Chronic injury of the myocardium is increasingly recognized as an undesired side effect of irradiation after thoracic/mediastinal radiation therapy of malignancies. The beneficial effects of Aspirin, Atorvastatin, Sildenafil and Enbrel on cardiac function and selected molecular markers of injury following 6 weeks of exposure to a single dose radiation (10 and 25 Gy), applied to the mediastinal area of normal adult Wistar rats were investigated. Ultrastructural signs of endothelial cell degeneration/regeneration, activated fibroblasts and monocytes were observed. Gene expression of PPAR α was significantly lower in left ventricle (LV) of irradiated rats indicating a shift in substrate preferences from fatty acids to glucose. Expression of miRNA-1 was significantly decreased while microRNA-21 was increased nearly 10-fold in these hearts. miRNA-15b was downregulated 42% and Bax protein decreased, indicating triggered adaptive mechanisms manifested by a reduction of injury. Myocardial Cx43 was upregulated possibly via reduced miRNA-1. Furthermore, irradiation caused a decrease in IL-10 and TNF- α

as well. The IL-10/TNF- α ratio in the LV was significantly increased in the Enbrel treated group. Treatment of rats with Aspirin caused a significant increase in IL-10 in LV and irradiation blunted this increase significantly. Enbrel caused a significant decrease in the TNF- α level in the LV. All drugs showed some protection against the negative impact of radiation on healthy tissue as demonstrated by changes in miRNA, IL-10 and TNF- α values. Activity of circulating 72kDa MMP-2 was significantly increased. MMP-2 is an enzyme whose activation is closely associated with the development of pathological changes induced by stress stimuli. In plasma of rats exposed to radiation activation of 72 kDa MMP-2 was observed. Acetylsalicylic acid and atorvastatin reduced the adverse effects of radiation on MMP-2. The enzyme kinetics and properties of the binding site of Na, K-ATPase of the heart in rats irradiated at a dose of 25 Gy were also characterized. Decrease in affinity of the sodium binding site of the enzyme, together with a decrease of number of molecules of Na, K-ATPase were observed, which may be responsible for the impaired excretion of excess sodium from the intracellular compartment in the hearts of irradiated rats.

(Outputs of projects APVV-0241-11, VEGA SR 2/0141/13, VEGA SR 2/0046/12).

Report 2015 - *Study of mechanisms of clinically relevant forms of preconditioning in healthy myocardium and in organism challenged with lifestyle-related risk factors*

Response to ischemia in healthy animals and in those challenged with lifestyle-related risk factors (hypertension, hyperglycemia, chronic social stress) was associated with a negative impact on the mechanisms of adaptive processes. Study of the age and gender-related differences on the parameters of I/R injury revealed distinct responses with respect to the effects on irreversible and reversible myocardial injury (size of infarction vs. occurrence of ventricular arrhythmias). Application of non-invasive remote preconditioning (RPC) using short-term pressure cuff occlusion of a. femoralis conferred a remarkable improvement of all postischemic parameters, in particular, a significant reduction in the size of infarction, not only in the hearts of healthy animals, but in the hearts of the hypertensive rats as well. Study of the mechanisms of cardioprotective effects of RPC revealed functional remodeling of the mitochondrial membranes (increased mitochondrial membrane fluidity and activity of mitochondrial Mg²⁺-ATPase) that could compensate increased myocardial energy requirement during ischemia. Up-regulation of gene expression of PPAR- α in combination with increased protein levels of PKC- ϵ and PI3K/Akt, as well as with an enhanced levels of Bcl-2 may point out to the anti-apoptotic effect of RPC as one of the potential mechanisms of cardioprotection, similar to the effects of natural antioxidants.

(Outputs of projects VEGA-SR 2/0201/15, 2/0133/15, APVV-0102-11)

Cardiovascular diseases represent a serious problem not only in Slovakia and thus research activities of the IHR SAS were connected with the research realized within the European Research Area. During the assessed period, the Institute for Heart Research has been involved and intends to further participate in an international scientific cooperation with several European research institutions and universities in Germany (Max-Delbruck Center

Berlin), Czech Republic (Institute of Physiology, Academy of Sciences of the Czech republic, Prague), Greece (Aristotle University of Thessaloniki, Thessaloniki), Hungary (Semmelweis University, Budapest), and Ukraine (Bogomoletz Institute of Physiology, NAS of Ukraine, Kiev). Moreover, there was an intensive scientific cooperation with research institutions in Canada (St. Boniface General Hospital Research Centre in Manitoba), Japan (Fukuoka University, School of Medicine Fukuoka and Jikei University, Division of Cardiology, Tokyo), South Africa (Cape Peninsula University of Technology, Bellville), and Argentina (Universidad Nacional de Cuyo).

During the assessed period, the international scientific cooperation of the IHR SAS was realized through multilateral and bilateral international scientific cooperations. The most significant results of international scientific projects and research cooperation were presented in the Annual Reports of the Organisation of the Slovak Academy of Sciences for years 2012-2015 in the following form:

Report 2012 - *Study of endogenous cardioprotective mechanisms against myocardial ischemia*

Study was focused on the investigation of cardiac tolerance to ischemia in normal and pathologically altered myocardium, with particular regards to gender-dependence. Molecular mechanisms of adaptation involved in modulation of ischemia/reperfusion injury with respect to development of lethal injury (myocardial infarction), postischemic contractile dysfunction and incidence of lethal rhythm disorders were investigated. It was found that myocardium of adult female rats is more resistant to ischemia than myocardium of age-matched male rats, in which infarct size, occurrence of arrhythmias and functional disorders were increased. Comorbidities, such as chronic hypertension and dyslipidemia, not only had a negative impact on the myocardial response to ischemia, but interfered with the mechanisms of heart's own protection induced by short-term ischemic stress (preconditioning) and suppressed ischemic tolerance in the diabetic myocardium. Development of ischemia/reperfusion injury was correlated with dysregulation of genes responsible for myocardial lipid metabolism and energy production that pointed out to the possibilities of their pharmacological modulation.

*(Outputs of projects in the frames of international collaboration with **Institute of Physiology, Academy of Sciences of the Czech Republic** (APVV-SK-CZ-0199-11, MAD SR-ČR), and with **Aristotle University in Thessaloniki, Thessaloniki, Greece**)*

Report 2013 - *Adaptive mechanisms in the myocardium and their modulation under pathological conditions*

Study of molecular processes involved in pathophysiological mechanisms of Ischemia/reperfusion (I/R) injury and adaptive mechanisms of protection in the rat myocardium (including age- and gender-related changes) pointed out that comorbidities (hypertension, diabetes) have a negative impact on the cardiac response to ischemia, and attenuate endogenous protective mechanisms of the heart (preconditioning, PC). On the other hand, possibilities of its pharmacological simulation and utilization in the protection of ischemic myocardium were found.. Increased resistance of the heart to I/R was observed as a part of

pleiotropic (nonlipid) effects of hypolipidemic drugs and in the „diseased“ (early phase of diabetes) myocardium. These PC-like effects were coupled with up-regulation of metabolic genes involved in energy production in the mitochondria, as well as with non-genomic effects, such as activation of „pro-survival“ cascades and anti-apoptotic and anti-oxidative effects. Increased fluidization of mitochondrial membranes appeared to be an important event contributing to the induction of adaptive processes and enhanced ischemic tolerance in the myocardium of healthy and diseased (diabetic) animals.

*(Outputs of the projects of international collaboration with **Institute of Physiology, Academy of Sciences of the Czech Republic** (MAD SR-ČR, APVV-SK-CZ-0199-11), and **Aristotle University of Thessaloniki, Thessaloniki, Greece**)*

Report 2014 - *Protection of the heart from malignant arrhythmias by modulation of myocardial connexin-43.*

Phosphorylated status of myocardial connexin-43 (Cx43) affect intercellular channels function. It has been demonstrated that hyperthyroid and hypertensive rats exhibit decreased while hypothyroid and diabetic rat heart increased levels of phosphorylated Cx43. Reduced Cx43 phosphorylation was associated with higher susceptibility of the heart to lethal arrhythmias. In contrast, enhanced Cx43 phosphorylation was linked with lower propensity of the heart to severe arrhythmias. Supplementation of hyperthyroid and hypertensive rats with omega-3 fatty acids resulted in increased of phosphorylated forms of Cx43 that might be implicated in their antiarrhythmic effects.

*(Outputs of the projects of international collaboration with **Institute of Physiology, Academy of Sciences of the Czech Republic** (MAD SR-ČR, APVV-SK-CZ-0027-11, APVV SK-CZ 2013-0256), and **Bogomoletz Institute of Physiology, NAS of Ukraine, Kiev, Ukraine** (MAD SR-Ukraine))*

Report 2015 - *Pharmacological and nonpharmacological modulation of cardiac connexin-43.*

Cardiac connexin-43 channels mediate intercellular communication that is crucial for electrical and metabolic signal propagation resulting into synchronized myocardial function. We have demonstrated that cardiac disease related down-regulation of connexin-43 and its abnormal cellular localisation can be attenuated by treatment with pharmacological (atorvastatin, aspirin) as well as non-pharmacological compounds (melatonin, omega-3 fatty acids). Findings support our hypothesis that myocardial connexin-43 is a target molecule for protection of the heart from life-threatening arrhythmias and maintenance its function.

*(Outputs of the projects of international collaboration with **Institute of Physiology, Academy of Sciences of the Czech Republic** (APVV-SK-CZ-2013-0256 a MAD SR-ČR), and **Universidad Nacional de Cuyo, Argentina**)*

One part of indicators of scientific activities is the presentation of results of research work in the form of publications. In the period 2012-2015 the results of basic research of employees with university degree (average – 22, FTE - 19) from the IHR SAS were presented in the form of

45 scientific papers in journals registered in Current Contents with IF (impacted), 6 scientific papers in other peer-reviewed journals with IF not registered in Current Contents, 3 scientific papers in foreign impacted journals registered in Web of Sciences or Scopus, 9 scientific papers in non-impacted journals registered in Web of Sciences or Scopus, and 15 scientific papers in domestic peer-reviewed proceedings, monographs. Other scientific outputs of the Institute for Heart Research include 3 edited proceedings from international scientific conferences, 2 scientific monographs published in Slovak publishing houses as well as 2 chapters written by research workers of the IHR SAS and published in monographs/books in Slovakia and 5 chapters published in monographs/books published abroad. Presentation of the results of experimental work at national and international conferences belongs to the research activities of the IHR SAS. Its significance is documented by the fact that in the assessed period several scientists from the IHR SAS presented 27 invited lectures at international conferences. Moreover, the research activities of the Institute for Heart Research included also organization of scientific conferences. IHR SAS organized 3 international conferences in the assessed period. Several employees of the IHR were members of organizing and program committees at both national and international conferences. They were invited to organize national and international scientific symposia, to chair sessions of the meetings in Slovakia and abroad, as well as to present their own research results.

Participation of the IHR in national and international research activities may be also documented by the membership of scientists of the IHR SAS in several national and international research bodies and elected functions in these organizations, as well as by their functions in editorial boards of national and international scientific journals. The national and international status of the IHR SAS is also documented by the fact that employees of the Institute received several national and international awards and distinctions during the assessed 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)

Principal types of research output of the institute:

1. Scientific publications
2. Citations
3. Projects
4. Pedagogical activities (pregradual and postgradual training)
5. Popularization activities

Basic research – 95 %

Applied research – 5 %
International research – 95 %
Regional research – 5 %

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

1. **BARTEKOVÁ, M. - ŠIMONČÍKOVÁ, P. - FOGARASSYOVÁ, M. - IVANOVÁ, M. - OKRUHLICOVÁ, Ľ. - TRIBULOVÁ, N. - DOVINOVÁ, I. - BARANČÍK, M.** Quercetin Improves Postischemic Recovery of Heart Function in Doxorubicin-Treated Rats and Prevents Doxorubicin-Induced Matrix Metalloproteinase-2 Activation and Apoptosis Induction. In International Journal of Molecular Sciences, 2015, vol. 16, no. 4, p. 8168-8185. (2.862 - IF2014). (2015 - Current Contents). ISSN 1422-0067.
doi: 10.3390/ijms16048168
2. **BEŇOVÁ, T. - KNEZL, V. - VICZENCZOVÁ, C. - BAČOVÁ, B. - RADOŠINSKÁ, J. - TRIBULOVÁ, N.** Acute anti-fibrillating and defibrillating potential of atorvastatin, melatonin, eicosapentaenoic acid and docosahexaenoic acid demonstrated in isolated heart model. In Journal of Physiology and Pharmacology: formerly Acta Physiologica Polonica, 2015, vol. 66, no. 1, p. 83-89. (2.386 - IF2014). (2015 - Current Contents). ISSN 0867-5910.
3. **KALOČAYOVÁ, B. - MÉZEŠOVÁ, L. - BARTEKOVÁ, M. - VLKOVÍČOVÁ, J. - JENDRUCHOVÁ, V. - VRBJAR, N.** Effect of duration of diabetes mellitus type 1 on properties of Na, K-ATPase in cerebral cortex. In Molecular and Cellular Biochemistry, 2015, vol. 405, iss. 1-2, p. 41-52. (2.393 - IF2014). (2015 - Current Contents). ISSN 0300-8177.
doi: 10.1007/s11010-015-2394-2
4. **RAVINGEROVÁ, T. - LEDVÉNYIOVÁ-FARKAŠOVÁ, V. - FERKO, M. - BARTEKOVÁ, M. - BERNÁTOVÁ, I. - PECHÁŇOVÁ, O. - ADAMEOVÁ, A. - KOLÁŘ, F. - LAZOU, A.** Pleiotropic preconditioning-like cardioprotective effects of hypolipidemic drugs in acute ischemia-reperfusion in normal and hypertensive rats. In Canadian Journal of Physiology and Pharmacology, 2015, vol. 93, p. 495–503. (1.770 - IF2014). (2015 - Current Contents). ISSN 0008-4212.
doi: 10.1139/cjpp-2014-0502
5. **TRIBULOVÁ, N. - EGAN BEŇOVÁ, T. - SZEIFFOVÁ BAČOVÁ, B. - VICZENCZOVÁ, C. - BARANČÍK, M.** New aspects of pathogenesis of atrial fibrillation: remodeling of intercalated

- discs. In Journal of Physiology and Pharmacology : formerly Acta Physiologica Polonica, 2015, vol. 66, no. 5, p. 625-634. (2.386 - IF2014). (2015 - Current Contents). ISSN 0867-5910
6. SZOBI, A. - RAJTÍK, T. - **ČARNICKÁ, S.** - **RAVINGEROVÁ, T.** - ADAMEOVÁ, A. Mitigation of postischemic cardiac contractile dysfunction by CaMKII inhibition: effects on programmed necrotic and apoptotic cell death. In Molecular and Cellular Biochemistry, 2014, vol. 388, no.1-2, p.269-276. (2.388 - IF2013). (2014 - Current Contents). ISSN 0300-8177.
doi: 10.1007/s11010-013-1918-x
 7. **MÉZEŠOVÁ, L.** - **VLKOVIČOVÁ, J.** - **KALOČAYOVÁ, B.** - **JENDRUCHOVÁ, V.** - **BARANČÍK, M.** - FULOP, M. - **SLEZÁK, J.** - BABÁL, P. - JANEKA, P. - **VRBJAR, N.** Effects of γ -irradiation on Na,K-ATPase in cardiac sarcolemma. In Molecular and Cellular Biochemistry, 2014, vol. 388, no.1-2, p. 241-247. (2.388 - IF2013). (2014 - Current Contents). ISSN 0300-8177.
doi: 10.1007/s11010-013-1915-0
 8. **FRIMMEL, K.** - **VLKOVIČOVÁ, J.** - SOTNÍKOVÁ, R. - NAVAROVÁ, J. - BERNÁTOVÁ, I. - **OKRUHLICOVÁ, L.** The effect of omega-3 fatty acids on expresion of Connexin-40 in Wistar rat aorta after lipopolysaccharide administration. In Journal of Physiology and Pharmacology : formerly Acta Physiologica Polonica, 2014, vol. 65, no. 1, p. 83-94. (2.720 - IF2013). (2014 - Current Contents). ISSN 0867-5910.
 9. SOTNÍKOVÁ, R. - **OKRUHLICOVÁ, L.** - **VLKOVIČOVÁ, J.** - NAVAROVÁ, J. - GAJDÁČOVÁ, B. - PIVÁČKOVÁ, L. - FIALOVÁ, S. - KŘENEK, P. Rosmarinic acid administration attenuates diabetes-induced vascular dysfunction of the rat aorta. In Journal of Pharmacy and Pharmacology, 2013, vol. 65, no. 5, p. 713-723. (2.033 - IF2012). (2013 - Current Contents). ISSN 0022-3573.
doi: 10.1111/jphp.12037
 10. **LEDVÉNYIOVÁ, V.** - **PANCZA, D.** - **MATEJÍKOVÁ, J.** - **FERKO, M.** - BERNÁTOVÁ, I. - **RAVINGEROVÁ, T.** Impact of age and sex on response to ischemic preconditioning in the rat heart: differential role of the PI3K-AKT pathway. In Canadian Journal of Physiology and Pharmacology, 2013, vol. 91, no. 8, p. 640-647. (1.556 - IF2012). (2013 - Current Contents). ISSN 0008-4212.
doi: 10.1139/cjpp-2012-0414
 11. **EGAN BEŇOVÁ, T.** - **VICZENCZOVÁ, C.** - **RADOŠINSKÁ, J.** - **SZEIFFOVÁ BAČOVÁ, B.** - KNEZL, V. - DOSENKO, V. - WEISMANN, P. - ZEMAN, M. - NAVAROVÁ, J. - **TRIBULOVÁ, N.** Melatonin attenuates hypertension-related proarrhythmic myocardial

- maladaption of connexin-43 and propensity of the heart to lethal arrhythmias. In Canadian Journal of Physiology and Pharmacology, 2013, vol. 91, p. 633-639. (1.556 - IF2012). (2013 - Current Contents). ISSN 0008-4212.
doi: 10.1139/cjpp-2012-0393
12. **RADOŠINSKÁ, J. - SZEIFFOVÁ BAČOVÁ, B. - KNEZL, V. - EGAN BEŇOVÁ, T. - ŽURMANOVÁ, J. - SOUKUP, T. - ARNOŠTOVÁ, P. - SLEZÁK, J. - GONCALVESOVÁ, E. - TRIBULOVÁ, N.** Dietary omega-3 fatty acids attenuate myocardial arrhythmogenic factors and propensity of the heart to lethal arrhythmias in a rodent model of human essential hypertension. In Journal of Hypertension, 2013, vol. 31, no. 9, p. 1876-1885. (3.806 - IF2012). (2013 - Current Contents). ISSN 0263-6352.
doi: 10.1097/HJH.0b013e328362215d
 13. **MÉZEŠOVÁ, L. - JENDRUCHOVÁ, V. - VLKOVIČOVÁ, J. - OKRUHLICOVÁ, Ľ. - FRIMMEL, K. - NAVAROVÁ, J. - KYSEĽOVÁ, Z. - VRBJAR, N.** Supplementation with n-3 polyunsaturated fatty acids to lipopolysaccharide-induced rats improved inflammation and functional properties of renal Na,K-ATPase. In Nutrition Research, 2013, vol. 33, iss. 9, p. 772-779. (2.142 - IF2012). (2013 - Current Contents). ISSN 0271-5317.
doi: 10.1016/j.nutres.2013.06.001
 14. **MAJZÚNOVÁ, M. - DOVINOVÁ, I. - BARANČÍK, M. - CHAN JULIE, Y.H.** Redox signaling in pathophysiology of hypertension. In Journal of Biomedical Science, 2013, vol. 20, p. 69-78. (2.458 - IF2012). (2013 - Current Contents). ISSN 1021-7770.
doi: 10.1186/1423-0127-20-69
 15. **IVANOVÁ, M. - DOVINOVÁ, I. - OKRUHLICOVÁ, Ľ. - TRIBULOVÁ, N. - ŠIMONČÍKOVÁ, P. - BARTEKOVÁ, M. - VLKOVIČOVÁ, J. - BARANČÍK, M.** Chronic cardiotoxicity of doxorubicin involves activation of myocardial and circulating metalloproteinases in rats. In Acta Pharmacologica Sinica, 2012, vol. 33, p. 459-469. (1.953 - IF2011). (2012 - Current Contents). ISSN 1671-4083.
doi: 10.1038/aps.2011.194
 16. **MÉZEŠOVÁ, L. - JENDRUCHOVÁ, V. - VLKOVIČOVÁ, J. - KYSEĽOVÁ, Z. - NAVAROVÁ, J. - BEZEK, Š. - VRBJAR, N.** Antioxidant SMe1EC2 may attenuate the disbalance of sodium homeostasis in the organism induced by higher intake of cholesterol. In Molecular and Cellular Biochemistry, 2012, vol. 366, no. 1-2, p. 41-48. (2.057 - IF2011). (2012 - Current Contents). ISSN 0300-8177.
doi: 10.1007/s11010-012-1281-3
 17. **BAČOVÁ, B. - RADOŠINSKÁ, J. - VICZENCZOVÁ, C. - KNEZL, V. - DOSENKO, V. - EGAN BEŇOVÁ, T. - NAVAROVÁ, J. - GONCALVESOVÁ, E. - VAN ROOYEN, J. -**

- WEISMANN, P. - **SLEZÁK, J. - TRIBULOVÁ, N.** Up-regulation of myocardial connexin-43 in spontaneously hypertensive rats fed red palm oil is most likely implicated in its anti-arrhythmic effects. In Canadian Journal of Physiology and Pharmacology, 2012, vol. 90, p. 1235-1245. (1.953 - IF2011). (2012 - Current Contents). ISSN 0008-4212.
doi: 10.1139/y2012-103
18. **RAVINGEROVÁ, T. - ČARNICKÁ, S. - NEMČEKOVÁ, M. - LEDVÉNYIOVÁ, V. - ADAMEOVÁ, A. - KELLY, T. - BARLAKA, E. - GALATOU, E. - KHANDELWAL, V.K. M. - LAZOU, A.** PPAR-alpha activation as a preconditioning-like intervention in rats in vivo confers myocardial protection against acute ischaemia-reperfusion injury: involvement of PI3K-Akt. In Canadian Journal of Physiology and Pharmacology, 2012, vol. 90, issue 8, p.1135-1144. (1.953 - IF2011). (2012 - Current Contents). ISSN 0008-4212.
doi: 10.1139/y2012-052
19. **ZIEGELHÖFFER, A. - MUJKOŠOVÁ, J. - FERKO, M. - VRBJAR, N. - RAVINGEROVÁ, T. - ULIČNÁ, O. - WACZULÍKOVÁ, I. - ZIEGELHÖFFER, B.** Dual influence of spontaneous hypertension on membrane properties and ATP production in heart and kidney mitochondria in rat: effect of captopril and nifedipine, adaptation and dysadaptation. In Canadian Journal of Physiology and Pharmacology, 2012, vol. 90, issue 9, p. 1311-1323. (1.953 - IF2011). (2012 - Current Contents). ISSN 0008-4212.
doi: 10.1139/y2012-107
20. **ONDREJČÁKOVÁ, M. - BARANČÍK, M. - BARTEKOVÁ, M. - RAVINGEROVÁ, T. - JEŽOVÁ, D.** Prolonged oxytocin treatment in rats affects intracellular signaling and induces myocardial protection against infarction. In General Physiology and Biophysics, 2012, vol. 31, no. 3, p. 261-270. (1.192 - IF2011). (2012 - Current Contents). ISSN 0231-5882.
doi: 10.4149/gpb_2012_030

2.1.3 List of monographs/books published abroad

2.1.4 List of monographs/books published in Slovakia

BREIER, Albert - GIBALOVÁ, Lenka - ŠEREŠ, Mário - BARANČÍK, Miroslav - SULOVÁ, Zdena. P-glycoprotein mediated multidrug resistance of cancer tissue: Implication for cancer chemotherapy. Sedlak J., Bratislava: Petrus, 2012, 100 p. ISBN 978-80-89233-55-7.

ZIGO, František. Vplyv suplementácie selénu a vitamínu E. Editors Ferko M. a Farkaš P. Banská Bystrica: Občianske združenie Preveda, 2015. 40 s. ISBN 978-80-970712-7-1.

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

- [1] OKRUHLICOVÁ, L. - FRIMMEL, K. - WEISMANN, P. - SLEZÁK, J. The effect of hypertriglyceridemia on the integrity of endothelial monolayer structure of rat aorta: electronmicroscopic and immunofluorescent study. In Current microscopy contributions to advances in science and technology. Formatex Research Center, 2012, p. 295-301. ISBN 978-84-939843-5-9.
- [2] ADAMEOVÁ, A. - SZOBI, A. - ČARNICKÁ, S. - RAVINGEROVÁ, T. - RAJTÍK, T. The role of CaM kinase II in cardiac function in health and disease. In Advances in Biochemistry in Health and Disease : Cardiac Adaptations: Molecular Mechanisms. New York: Springer, 2013, vol. 4, p. 447-461.
- [3] BREIER, A. - IMRICHOVÁ, D. - PAULÍKOVÁ, H. - BARANČÍK, M. - SULOVÁ, Z. Vincristine as an Inductor of Drug Resistance Marker Expression in Neoplastic Cells. In COELLO, Juan M. - SABRES, Yolanda D. Vincristine: Clinical Uses, Pharmacokinetics and Impacts on Health. - New York: Nova Science Publishers, Inc., 2013, p. 1-31. ISBN 978-1-62808-886-1.
- [4] RADOŠINSKÁ, J. - BAČOVÁ, B. - VICZENCZOVÁ, C. - EGAN BEŇOVÁ, T. - KNEZL, V. - ŽURMANOVÁ, J. - SOUKUP, T. - GONCALVESOVÁ, E. - SLEZÁK, J. - TRIBULOVÁ, N. Maladaptive myocardial responses to hypertension are attenuated by omega-3 fatty acids and red palm oil intake. In Adaptation Biology and Medicine. Volume 7. New Challenges. New Delhi: Narosa Publishing House, 2014, p. 19-34. ISBN 978-81-8487-214-9.
- [5] RAVINGEROVÁ, T. - NEMČEKOVÁ, M. - LEDVÉNYIOVÁ, V. - ČARNICKÁ, S. - FERKO, M. - ADAMEOVÁ, A. - LAZOU, A. - KHANDELWAL, V. K. M. - KOLÁŘ, F. Lifestyle-Related Risk Factors Alter Myocardial Response to Ischemia via Interference with Cellular Adaptive Mechanisms. In Adaptation Biology and Medicine. Volume 7. New Challenges. New Delhi: Narosa Publishing House, 2014, p. 391-406. ISBN 978-81-8487-214-9.
- [6] ŠIMONČÍKOVÁ, P. - BARANČÍK, M. Regulačné proteíny v hypertenzii - úloha proteínkinázových signálnych dráh a matrixových metaloproteináz. In Regulačné mechanizmy v patofyziológii hypertenzie. - Bratislava : Petrus, 2015, s. 117-128. ISBN 978-80-89233-76-2.
- [7] TRIBULOVÁ, N. - SLEZÁK, J. Hypertenzia ako rizikový faktor vzniku život ohrozujúcich porúch rytmu a možnosti ochrany ovplyvnením srdcového konexínu-43. In Regulačné mechanizmy v patofyziológii hypertenzie. - Bratislava : Petrus, 2015, s. 172-183. ISBN 978-80-89233-76-2.

- [8] GEROMICHALOU, E. - SAYYAD, N. - KYRIAKOU, E. - CHATZIKONSTANTINO, A. V. - GIANNOPOULOU, E. - VRBJAR, N. - KALOFONOS, H. P. - STAMATIS, H. - TZAKOS, A. G. Regioselective chemical and rapid enzymatic synthesis of a novel redox - Antiproliferative molecular hybrid. In European Journal of Medicinal Chemistry, 2015, vol. 96, p. 47-57. (3.447 - IF2014). (2015 - Current Contents). ISSN 0223-5234.
- [9] RAVINGEROVÁ, T. - ČARNICKÁ, S. - LEDVÉNYIOVÁ, V. - BARLAKA, E. - GALATOU, E. - CHYTILOVÁ, A. - MANDÍKOVÁ, P. - NEMČEKOVÁ, M. - ADAMEOVÁ, A. - KOLÁŘ, F. - LAZOU, A. Upregulation of Genes Involved in Cardiac Metabolism Enhances Myocardial Resistance to Ischemia/Reperfusion in the Rat Heart. In Physiological Research, 2013, vol. 62, suppl. 1, p. S151-S163. (1.531 - IF2012). (2013 - Current Contents). ISSN 0862-8408.
- [10] BARANČÍK, M. - BOHÁČOVÁ, V. - GIBALOVÁ, L. - SEDLÁK, J. - SULOVÁ, Z. - BREIER, A.t. Potentiation of Anticancer Drugs: Effects of Pentoxifylline on Neoplastic Cells. In International Journal of Molecular Science, 2012, vol. 13, no. 1, p. 369-382. (2.598 - IF2011). (2012 - Current Contents). ISSN 1422-0067

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

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)	1,0	0,054	0,004	0,0	0,000	0,000	0,0	0,000	0,000	1,0	0,046	0,004	2,0	0,5	0,025	0,002
Chapters in scientific monographs published abroad (ABC)	1,0	0,054	0,004	2,0	0,099	0,008	2,0	0,098	0,008	0,0	0,000	0,000	5,0	1,3	0,062	0,005
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	2,0	0,093	0,008	2,0	0,5	0,025	0,002
Scientific papers published in journals registered in Current Contents Connect (ADCA, ADCB, ADDA, ADEB)	11,0	0,595	0,044	11,0	0,544	0,044	7,0	0,344	0,030	16,0	0,741	0,062	45,0	11,3	0,558	0,045
Scientific papers published in journals registered in Web of Science Core Collection and SCOPUS (ADMA, ADMB, ADNA, ADNB)	3,0	0,162	0,012	3,0	0,148	0,012	2,0	0,098	0,008	4,0	0,185	0,016	12,0	3,0	0,149	0,012
Scientific papers published in other foreign journals (not listed above) (ADEA, ADEB)	0,0	0,000	0,000	7,0	0,346	0,028	0,0	0,000	0,000	3,0	0,139	0,012	10,0	2,5	0,124	0,010
Scientific papers published in other domestic journals (not listed above) (ADFA, ADFB)	1,0	0,054	0,004	0,0	0,000	0,000	0,0	0,000	0,000	0,0	0,000	0,000	1,0	0,3	0,012	0,001
Scientific papers published in foreign peer-reviewed proceedings (AEC, AECA)	0,0	0,000	0,000	0,0	0,000	0,000	1,0	0,049	0,004	0,0	0,000	0,000	1,0	0,3	0,012	0,001
Scientific papers published in domestic peer-reviewed proceedings (AED, AEDA)	1,0	0,054	0,004	1,0	0,049	0,004	11,0	0,541	0,047	2,0	0,093	0,008	15,0	3,8	0,186	0,015
Published papers (full text) from foreign and international scientific conferences (AFA, AFC, AFBA, AFDA)	1,0	0,054	0,004	0,0	0,000	0,000	0,0	0,000	0,000	0,0	0,000	0,000	1,0	0,3	0,012	0,001
Published papers (full text) from domestic scientific conferences (AFB, AFD, AFBB, AFDB)	5,0	0,270	0,020	0,0	0,000	0,000	0,0	0,000	0,000	1,0	0,046	0,004	6,0	1,5	0,074	0,006

- **Supplementary information and/or comments on the scientific outputs of the institute.**

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)	165,0	8,919	211,0	10,440	238,0	11,695	257,0	11,898	871,0	217,8	10,798
Citations in SCOPUS (1.2, 2.2) if not listed above	13,0	0,703	32,0	1,583	28,0	1,376	34,0	1,574	107,0	26,8	1,327
Citations in other citation indexes and databases (not listed above) (3.2,4.2,9,10)	1,0	0,054	0,0	0,000	0,0	0,000	0,0	0,000	1,0	0,3	0,012
Other citations (not listed above) (3, 4, 3.1, 4.1)	8,0	0,432	19,0	0,940	18,0	0,885	11,0	0,509	56,0	14,0	0,694
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] RAVINGEROVÁ, Táňa - BARANČÍK, Miroslav - STRNISKOVÁ, Monika. Mitogen-activated protein kinases: A new therapeutic target in cardiac pathology. In Molecular and Cellular Biochemistry, 2003, vol. 247, s. 127-138. (1.548 - IF2002). (2003 - Current Contents). ISSN 0300-8177.

35 citations

- [2] EITENMULLER, I. - VOLGER, O. - KLUGE, A. - TROIDL, K. - BARANČÍK, Miroslav - CAI, W. J. - HEIL, M. - PIPP, F. - FISCHER, S. - HORREVOETS, A. J. G. - SCHMITZ-RIXEN, T. - SCHAPER, W. The range of adaptation by collateral vessels after femoral artery occlusion. In Circulation research, 2006, vol. 99, issue 6, p. 656-662. (9.408 - IF2005). (2006 - Current Contents). ISSN 0009-7330.

34 citations

- [3] BREIER, Albert - GIBALOVÁ, Lenka - ŠEREŠ, Mário - BARANČÍK, Miroslav - SULOVÁ, Zdena. New Insight into P-Glycoprotein as a Drug Target. In Anti-cancer Agents in Medicinal Chemistry, 2013, vol.13, no. 1., p. 159-170. (2.610 - IF2012). ISSN 1871-5206.

28 citations

- [4] BARANČÍK, Miroslav - BOHÁČOVÁ, Viera - KVACKAJOVA, J. - HUDEC OVÁ, Soňa - KRIŽANOVÁ, Oľga - BREIER, Albert. SB203580, a specific inhibitor of p38-MAPK pathway, is a new reversal agent of P-glycoprotein-mediated multidrug resistance. In EUROPEAN JOURNAL OF PHARMACEUTICAL SCIENCES, 2001, vol. 14, iss. 1, p. 29-36. ISSN 0928-0987.

25 citations

- [5] BREIER, Albert - BARANČÍK, Miroslav - SULOVÁ, Zdena - UHRÍK, Branislav. P-glycoprotein - Implications of metabolism of neoplastic cells and cancer therapy. In Current Cancer Drug Targets, 2005, vol. 5, iss. 6, p. 457-468. ISSN 1568-0096.

24 citations

- [6] BARANČÍK, Miroslav - BOHÁČOVÁ, Viera - SEDLÁK, Ján - SULOVÁ, Zdena - BREIER, Albert. LY294,002, a specific inhibitor of PI3K/Akt kinase pathway, antagonizes P-glycoprotein-mediated multidrug resistance. In European Journal of Pharmaceutical Sciences, 2006, vol. 29, no. 5, p. 426-434. ISSN 0928-0987.

24 citations

- [7] ONDREJČÁKOVÁ, Mária - RAVINGEROVÁ, Táňa - BAKOŠ, Ján - PANCZA, Dezider - JEŽOVÁ, Daniela. Oxytocin exerts protective effects on in vitro myocardial injury induced by ischemia and reperfusion. In Canadian Journal of Physiology and Pharmacology, 2009, vol. 87, no. 2, p. 137-142. (1.763 - IF2008). (2009 - Current Contents). ISSN 0008-4212.

23 citations

- [8] DHINGRA, Sanjiv - SHARMA, Anita K. - ARORA, Rakesh C. - SLEZÁK, Ján - SINGAL, Pawan K. IL-10 attenuates TNF-alpha-induced NF kappa B pathway activation and cardiomyocyte apoptosis. In Cardiovascular Research, 2009, vol. 82, issue 1, p. 59-66. (5.947 - IF2008). (2009 - Current Contents). ISSN 0008-6363.

22 citations

- [9] ANDELOVÁ, Eva - BARTEKOVÁ, Monika - PANCZA, Dezider - STYK, Ján - RAVINGEROVÁ, Táňa. The role of NO in ischemia/reperfusion injury in isolated rat heart. In General Physiology and Biophysics, 2005, vol. 24, č. 4, s. 411-426. (0.694 - IF2004). (2005 - Current Contents). ISSN 0231-5882.

21 citations

- [10] ADAMEOVÁ, Adriana - HARČÁROVÁ, Anna - MATEJÍKOVÁ, Jana - PANCZA, Dezider - KUŽELOVÁ, Magdaléna - ČARNICKÁ, Slávka - ŠVEC, Pavel - BARTEKOVÁ, Monika - STYK, Ján - RAVINGEROVÁ, Táňa. Simvastatin alleviates myocardial contractile dysfunction and lethal ischemic injury in rat heart independent of cholesterol-lowering effects. In Physiological Research, 2009, vol. 58, issue 3, p. 449-454. (1.653 - IF2008). (2009 - Current Contents). ISSN 0862-8408.

19 citations

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).

- [1] MUDr. **Tatiana Ravingerová**, DrSc. Number of citations (WOS, SCOPUS) – **326**
[2] RNDr. **Miroslav Barančík**, DrSc. Number of citations (WOS, SCOPUS) – **319**
[3] RNDr. **Narcisa Tribulová**, DrSc. Number of citations (WOS, SCOPUS) – **247**

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

Publications of the following eight researchers from the IHR SAS were in the assessment period (2011 – 2014) cited more than 100-times: T. Ravingerová, J. Slezák, N. Tribulová, A. Ziegelhoffer, M. Barančík, I. Okruhlicová, J. Styk, D. Pancza.

During the assessed period 2011-2014 (four years), the number of citations in WOS and SCOPUS databases was 978 (245 per year). In the previous assessed period 2006-2010 (five years) was the number of WOS and SCOPUS citations 745 (149 per year).

This substantial increase in number of citations per year also clearly indicates that the quality of scientific paper published by the research workers from IHR SAS increases.

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.

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

[1] *Advances in Cardiovascular Research. From bench to bedside. International symposium.* Smolenice, **23.05.-26.05.2013**

Members of Organizing Committee: Slezák, Ravingerová, Barančík, Okruhlicová, Ziegelhoffer, Styk, Ferko, Mezešová, Vlkovičová, Carnická, Ledvényiová, Benová, Frimmel, Barteková, Báčová, Muráriková

[2] *New Frontiers in Basic Cardiovascular Research, 11th Meeting of France – New EU Members*, Smolenice, **15.06.-18.06.2014**

Member of Organizing Committee – J. Slezák (President of Meeting), Ravingerová (Scientific Secretary), Ferko (Chair of Organizing Committee), Báčová, Barančík, Barteková, Beňová, Carnická, Frimmel, Gablovský, Jašová, Kaločayová, Kancírová, Ledvényiová, Mezešová, Okruhlicová, Styk, Tribulová, Viczenczová, Vrbjar, Zálešák, Ziegelhöffer

[3] *Advances in Cardiovascular Research. From the bench to the patient's bed. International symposium.* Smolenice, **02.09.-05.09.2015**

Member of Organizing Committee – Slezák (Honorary President), Barančík (President), Ravingerová (Scientific Secretary), Barteková (chair), Ledvényiová-Farkašová, Graban, Mezešová, Ferko, Frimmel, Szeiffová, Báčová, Griecsová, Beňová, Okruhlicová, Tribulová

2.3.3. List of edited proceedings from international scientific conferences.

[1] *Advances in Cardiovascular Research. From bench to bedside. International symposium.* Smolenice, International symposium, May 23-26, 2013, Smolenice Castle – Congress Centre of the Slovak Academy of Sciences Bratislava, Slovakia. Program & Book of Abstracts. Edited by T. Ravingerová and J. Slezák. Bratislava, Slovak Republic: VEDA, Publishing House of The Slovak Academy of Sciences, 2013, 80 pages. ISBN 978-80-224-1294-0, ISBN 978-80-224-1295-7 (e-book)

[2] *New Frontiers in Basic Cardiovascular Research, 11th Meeting of France – New EU Members*, June 15-18, 2014. Smolenice Castle – Congress Centre of the Slovak Academy

of Sciences Bratislava, Slovakia. Program & Book of Abstracts. Edited by T. Ravingerová, J. Slezák, and M. Ferko. DALI-BB, s.r.o. Publishing & Printing House, Banská Bystrica, Slovak Republic, June 2014, 104 pages. ISBN 978-80-8141-063-5, ISBN 978-80-8141-064-2

- [3] Advances in Cardiovascular Research. From the bench to the patient's bed. International symposium. Smolenice, International symposium, September 2-5, 2013, Smolenice Castle – Congress Centre of the Slovak Academy of Sciences Bratislava, Slovakia. Program & Book of Abstracts. Edited by T. Ravingerová and J. Slezák. Bratislava, Slovak Republic: VEDA, Publishing House of The Slovak Academy of Sciences, September 2015, 100 pages. ISBN 978-80-224-1452-4, ISBN 978-80-224-1453-1 (e-book)

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)**
- 2.3.4.2. SCOPUS**
- 2.3.4.3. other databases**
- 2.3.4.4. not included in databases**

No journals were published (edited) by the Institute for Heart Research SAS during the assessed period.

- **National position of the institute**

2.3.5. List of selected projects of national importance

- [1] **Type of project, grant agency:** EU Structural Funds, Research Agency (VA)

Title: Completion of infrastructure for modern research of civilization diseases.

Grant number: ITMS: 26230120006

Duration: 10/2015 – 12/2015

Coordinator (principal investigator): Institute for Heart Research SAS

Responsible person in the Organization: M. Barančík

- [2] **Type of project, grant agency:** Slovak Research and Development Agency (APVV)

Title: The effect of the lifestyle-related risk factors on the adaptive processes in the ischemic myocardium.

Grant number: APVV-0102-11

Duration: 07/2012 – 12/2015

Coordinator (principal investigator): Institute for Heart Research SAS

Responsible person in the Organization: T. Ravingerová

- [3] **Type of project, grant agency:** Slovak Research and Development Agency (APVV)

Title: Proton radiation-induced cardiovascular toxicity - pathophysiology and prevention.

Grant number: APVV-0241-11

Duration: 07/2012 – 12/2015

Coordinator (principal investigator): Institute for Heart Research SAS

Responsible person in the Organization: J. Slezák

[4] **Type of project, grant agency:** Slovak Research and Development Agency (APVV)

Title: Study of regulation of radical and cellular signaling during hypertension and influence of novel therapies on this signaling.

Grant number: APVV-0348-12

Duration: 10/2013 – 09/2017

Coordinator (principal investigator): Institute for Heart Research SAS

Responsible person in the Organization: M. Barančík

[5] **Type of project, grant agency:** Slovak Research and Development Agency (APVV)

Title: Activation of cell signaling mechanisms as a potential target of cardiac protection against ischemic injury.

Grant number: APVV-LPP-0393-09

Duration: 09/2009 – 09/2013

Coordinator (principal investigator): Institute for Heart Research SAS

Responsible person in the Organization: T. Ravingerová

[6] **Type of project, grant agency:** Project of Slovak Society of Cardiology

Title: Effects of melatonin, omega-3 fatty acids and aliskiren on myocardial connexin-43 and heart function in rats with CVD.

Duration: 10/2012 – 12/2014

Coordinator (principal investigator): Institute for Heart Research SAS

Responsible person in the Organization: N. Tribulová

[7] **Type of project, grant agency:** Project of Slovak Society of Cardiology

Title: Study of molecular mechanisms involved in cardioprotective effects of melatonin and Omacor in metabolic syndrome development under experimental condition.

Duration: 02/2015 – 02/2017

Coordinator (principal investigator): Institute for Heart Research SAS

Responsible person in the Organization: T. Egan Beňová

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

- [1] **Type of project, grant agency:** Slovak Research and Development Agency (APVV)
Title: The effect of the lifestyle-related risk factors on the adaptive processes in the ischemic myocardium.
Grant number: APVV-0102-11
Duration: 07/2012 – 12/2015
Coordinator (principal investigator): Institute for Heart Research SAS
Responsible person in the Organization: T. Ravingerová
- [2] **Type of project, grant agency:** Slovak Research and Development Agency (APVV)
Title: Proton radiation-induced cardiovascular toxicity - pathophysiology and prevention.
Grant number: APVV-0241-11
Duration: 07/2012 – 12/2015
Coordinator (principal investigator): Institute for Heart Research SAS
Responsible person in the Organization: J. Slezák
- [3] **Type of project, grant agency:** Slovak Research and Development Agency (APVV)
Title: Study of regulation of radical and cellular signaling during hypertension and influence of novel therapies on this signaling.
Grant number: APVV-0348-12
Duration: 10/2013 – 09/2017
Coordinator (principal investigator): Institute for Heart Research SAS
Responsible person in the Organization: M. Barančík
- [4] **Type of project, grant agency:** Slovak Research and Development Agency (APVV)
Title: Activation of cell signaling mechanisms as a potential target of cardiac protection against ischemic injury
Grant number: APVV-LPP-0393-09
Duration: 09/2009 – 09/2013
Coordinator (principal investigator): Institute for Heart Research SAS
Responsible person in the Organization: T. Ravingerová
- [5] **Type of project, grant agency:** Slovak Research and Development Agency (APVV)
Title: Calcium channels in neuronal excitability
Grant number: APVV-0212-10
Duration: 05/2011 – 10/2014
Coordinator (principal investigator): Institute of Molecular Physiology and Genetics SAS
Responsible person in the Organization: N. Vrbjar

- [6] **Type of project, grant agency:** Slovak Research and Development Agency (APVV)
Title: Sex differences in etiopathogenesis of social stress-related cardiovascular and behavioral disorders in individuals with predisposition to hypertension
Grant number: APVV-0523-10
Duration: 05/2011 – 10/2014
Coordinator (principal investigator): Institute of Normal and Pathological Physiology SAS
Responsible person in the Organization: L. Okruhlicová
- [7] **Type of project, grant agency:** Slovak Research and Development Agency (APVV)
Title: The effect of aliskerin loaded nanoparticles in experimental hypertension
Grant number: APVV-0742-10
Duration: 05/2011 – 10/2014
Coordinator (principal investigator): Institute of Normal and Pathological Physiology SAS
Responsible person in the Organization: T. Ravingerová
- [8] **Type of project, grant agency:** Slovak Research and Development Agency (APVV)
Title: Alterations in cell metabolism associated with drug transporter P-glycoprotein overexpression in leukemia cells
Grant number: APVV-0290-10
Duration: 05/2011 – 10/2014
Coordinator (principal investigator): Institute of Molecular Physiology and Genetics SAS
Responsible person in the Organization: M. Barančík
- [9] **Type of project, grant agency:** Slovak Research and Development Agency (APVV)
Title: Chemoenzymatic synthesis and evaluation of biological activities of natural glycophenols and their analogues
Grant number: APVV-846-12
Duration: 10/2013 – 09/2017
Coordinator (principal investigator): Institute of Chemistry SAS
Responsible person in the Organization: M. Barančík
- [10] **Type of project, grant agency:** Slovak Research and Development Agency (APVV)
Title: Possible dual function of P-glycoprotein in leukemia cells: efflux pump and regulatory protein
Grant number: APVV-14-0334

Duration: 07/2015 – 07/2018

Coordinator (principal investigator): Institute of Molecular Physiology and Genetics
SAS

Responsible person in the Organization: M. Barančík

[11] **Type of project, grant agency:** Slovak Research and Development Agency (APVV)

Title: The effect of lifestyle-related risk factors on the intrinsic defensive mechanisms in the myocardium

Grant number: APVV SK-CZ-0199-11

Duration: 01/2012 – 12/2013

Coordinator (principal investigator): Institute for Heart Research SAS

Responsible person in the Organization: T. Ravingerová

[12] **Type of project, grant agency:** Slovak Research and Development Agency (APVV)

Title: Investigation of the cardioprotection from injury and malignant arrhythmias induced by altered thyroid statuses

Grant number: APVV-SK-CZ-0027-11

Duration: 01/2012 – 12/2013

Coordinator (principal investigator): Institute for Heart Research SAS

Responsible person in the Organization: N. Tribulová

[13] **Type of project, grant agency:** Slovak Research and Development Agency (APVV)

Title: Study of clinically applicable novel forms of preconditioning as an alternative method of cardiac protection against acute ischemia in the organism challenged with civilization diseases

Grant number: APVV-SK-CZ-2013-075

Duration: 01/2014 – 12/2015

Coordinator (principal investigator): Institute for Heart Research SAS

Responsible person in the Organization: T. Ravingerová

[14] **Type of project, grant agency:** Slovak Research and Development Agency (APVV)

Title: Investigation of the cardioprotection against injury and malignant arrhythmias induced by altered thyroid status

Grant number: APVV- SK-CZ-2013-0256

Duration: 01/2012 – 12/2013

Coordinator (principal investigator): Institute for Heart Research SAS

Responsible person in the Organization: N. Tribulová

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

- [1] **Type of project, grant agency:** Scientific Grant Agency of the Slovak Academy of Sciences and the Ministry of Education (VEGA)
Title: Cardiac connexins as a novel target for the prevention of malignant arrhythmias
Grant number: 2/0046/12
Duration: 01/2012 – 12/2015
Coordinator: Institute for Heart Research SAS
Principal investigator: N. Tribulová
- [2] **Type of project, grant agency:** Scientific Grant Agency of the Slovak Academy of Sciences and the Ministry of Education (VEGA)
Title: Influence of chronic stress on proliferation of cardiac cells
Grant number: 2/0140/12
Duration: 01/2012 – 12/2015
Coordinator: Institute for Heart Research SAS
Principal investigator: M. Barteková
- [3] **Type of project, grant agency:** Scientific Grant Agency of the Slovak Academy of Sciences and the Ministry of Education (VEGA)
Title: The role of mitochondria in adaptation of cardiac energetics to various pathological stimuli and noxae: ischemia, diabetes, hypertension
Grant number: 2/0101/12
Duration: 01/2012 – 12/2014
Coordinator: Institute for Heart Research SAS
Principal investigator: M. Ferko
- [4] **Type of project, grant agency:** Scientific Grant Agency of the Slovak Academy of Sciences and the Ministry of Education (VEGA)
Title: Yeasts in protection of endothelial intercellular connections against inflammation-induced injury.
Grant number: 2/0065/13
Duration: 01/2012 – 12/2015
Coordinator: Institute for Heart Research SAS
Principal investigator: Ľ. Okruhlicová
- [5] **Type of project, grant agency:** Scientific Grant Agency of the Slovak Academy of Sciences and the Ministry of Education (VEGA)

Title: Response of the Na,K-ATPase, representing one of the crucial systems in maintaining the sodium homeostasis, to civilization diseases namely: hypertension, diabetes and hypertriglyceridemia

Grant number: 2/0141/13

Duration: 01/2013 – 12/2016

Coordinator: Institute for Heart Research SAS

Principal investigator: N. Vrbjar

- [6] **Type of project, grant agency:** Scientific Grant Agency of the Slovak Academy of Sciences and the Ministry of Education (VEGA)

Title: Molecular mechanisms involved in the effects of doxorubicin in rats with developed hypertension and ways of modulation of these effects of doxorubicin by quercetin

Grant number: 2/0108/15

Duration: 01/2015 – 12/2017

Coordinator: Institute for Heart Research SAS

Principal investigator: M. Barančík

- [7] **Type of project, grant agency:** Scientific Grant Agency of the Slovak Academy of Sciences and the Ministry of Education (VEGA)

Title: Bioenergetic aspects of myocardial protection by means of remote ischemic preconditioning. The role of cardiac mitochondria

Grant number: 2/0133/15

Duration: 01/2015 – 12/2017

Coordinator: Institute for Heart Research SAS

Principal investigator: M. Ferko

- [8] **Type of project, grant agency:** Scientific Grant Agency of the Slovak Academy of Sciences and the Ministry of Education (VEGA)

Title: Study of the clinically relevant forms of preconditioning as an alternative method of myocardial protection against acute ischemia in the organism challenged with civilization diseases

Grant number: 2/0201/15

Duration: 01/2015 – 12/2017

Coordinator: Institute for Heart Research SAS

Principal investigator: T. Ravingerová

- [9] **Type of project, grant agency:** Scientific Grant Agency of the Slovak Academy of Sciences and the Ministry of Education (VEGA)

Title: Protection of the heart from maladaptive extracellular matrix remodeling and searching the mechanisms of its regression

Grant number: 2/0167/15

Duration: 01/2015 – 12/2018

Coordinator: Institute for Heart Research SAS

Principal investigator: B. Szeiffová Bačová

[10] **Type of project, grant agency:** Scientific Grant Agency of the Slovak Academy of Sciences and the Ministry of Education (VEGA)

Title: New molecular mechanisms of injury of cardiovascular system by ionizing irradiation and possibilities of site directed medicamentous prevention

Grant number: 2/0021/15

Duration: 01/2015 – 12/2017

Coordinator: Institute for Heart Research SAS

Principal investigator: J. Slezák

2.3.8. Projects of SAS Centres of Excellence

[1] **Type of project, grant agency:** Centre of excellence of SAS

Title: Centre of excellence of SAS for „Research of regulatory role of nitric oxide in civilization diseases“ - NOREG

Duration: 08/2011 – 06/2015

Coordinator (principal investigator): Institute of Normal and Pathological Physiology SAS (O. Pecháňová)

Responsible person in the Organization: T. Ravingerová

2.3.9. National projects supported by EU Structural Funds

[1] **Type of project, grant agency:** EU Structural Funds, Research Agency (VA)

Title: Completion of infrastructure for modern research of civilization diseases

Grant number: ITMS: 26230120006

Duration: 10/2015 – 12/2015

Coordinator (principal investigator): Institute for Heart Research SAS

Responsible person in the Organization: M. Barančík

[2] **Type of project, grant agency:** EU Structural Funds, ASFEU

Title: Centre of Excellence for Glycomics

Grant number: ITMS: 26240120031

Duration: 09/2010 – 08/2013

Coordinator (main partner principal investigator): Institute of Chemistry SAS

Responsible person in the Organization: M. Barančík – principal investigator at the IHR SAS

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)

2.3.10.2. SCOPUS

2.3.10.3. Other databases

2.3.10.4. Not included in databases

No national journals were published (edited) by the Institute for Heart Research SAS during the assessed period.

- **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

- [1] BREIER A., GIBALOVÁ L., ŠEREŠ M., BARANČÍK M., SULOVÁ Z. New insight into P-glykoprotein as a drug target. XXIII. Biochemický sjezd České společnosti pro biochemii a molekulární biologii a Slovenskej spoločnosti pre biochemiu a molekulárnu biológiu, 26.-29.8. **2012**, Brno, Czech Republic
- [2] RAVINGEROVÁ T., ČARNICKÁ S., LEDVÉNYIOVÁ V., NEMČEKOVÁ M., ADAMEOVÁ A., FERKO M., BARTEKOVÁ M., LAZOU A., KOLÁŘ F. Hypertension and dislipidemia increase a risk of cardiac death due to acute ischemia via interference with endogenous protective mechanisms. Conference and advanced research workshop "Sudden cardiac death & cardioprotection", 6-9 September, **2012**, Timisoara, Romania
- [3] RAVINGEROVÁ T., ČARNICKÁ S., LEDVÉNYIOVÁ V., NEMČEKOVÁ M., ADAMEOVÁ A., FERKO M., LAZOU A., KOLÁŘ F. Risk factors of modern lifestyle exacerbate myocardial response to ischemia via interference with cellular adaptive mechanisms. New Frontiers in Basic Cardiovascular Research 2012: 10th Meeting of France-New EU Countries. From Basic Cardiovascular Research Towards Effective Therapeutics. Hradec Králové, June 12-15, **2012**, Czech Republic
- [4] RAVINGEROVÁ T., ČARNICKÁ S., NEMČEKOVÁ M., LEDVÉNYIOVÁ V., ADAMEOVÁ A., ZÁLEŠÁK M., LAZOU A., KOLÁŘ F. Lifestyle-related risk factors of cardiovascular diseases alter myocardial response to ischemia via interference with cellular adaptive mechanisms. The 10th World Congress of the International Society for Adaptive Medicine. June 7-10, **2012**, Bucharest, Romania
- [5] SLEZÁK J., TRIBULOVÁ N., IVANOVÁ M., STYK J., FRIMMEL K., RAVINGEROVÁ T., FULOP M., OKRUHLICOVÁ L. Chronic ischemic cardiomyopathy induced by mediastinal

- irradiation: pathology and prevention. Conference and advanced research workshop "Sudden cardiac death & cardioprotection", 6-9 September, **2012**, Timisoara, Romania
- [6] SLEZÁK J., TRIBULOVÁ N., IVANOVÁ M., STYK J., FRIMMEL K., RAVINGEROVÁ T., FULOP M., OKRUHLICOVÁ L.. Chronic myocardial ischemia and mediastinal irradiation injury. The 10th World Congress of the International Society for Adaptive Medicine. June 7-10, **2012**, Bucharest, Romania
- [7] TRIBULOVÁ N., BEŇOVÁ T., RADOŠINSKÁ J., VICZENCZOVÁ C., BAČOVÁ B., KNEZL V., ZEMAN M., SLEZÁK J., VACHULOVÁ A. Fascicular ventricular tachycardia and ventricular myocardial maladaptation of connexin-43 to hypertension increases a risk for arrhythmic sudden death that can be attenuated by melatonin and omega-3 fatty acids. Conference and advanced research workshop "Sudden cardiac death & cardioprotection", 6-9 September, **2012**, Timisoara, Romania
- [8] TRIBULOVÁ N., RADOŠINSKÁ J., BAČOVÁ B., BEŇOVÁ T., VICZENCZOVÁ C., KNEZL V., SLEZÁK J. Myocardial connexin-43 is implicated in adaptation and maladaptation to hypertension as well as in cardioprotective effects of the treatment The 10th World Congress of the International Society for Adaptive Medicine. June 7-10, **2012**, Bucharest, Romania
- [9] TRIBULOVÁ N., RADOŠINSKÁ J., BAČOVÁ B., BEŇOVÁ T., KNEZL V., SLEZÁK J. Cellular mechanisms involved in antiarrhythmic effects of omega-3 fatty acids in spontaneously hypertensive rats. 22nd National Conference of the Indian Society of Hypertension, 2nd – 4th November, **2012**, Mumbai, India
- [10] RADOŠINSKÁ J. Omega-3 fatty acids attenuate propensity of the heart to lethal arrhythmias in a rodent model of human essential hypertension. China Heart Congress 2013, August 8th - 11th, **2013**, Beijing, China.
- [11] RAVINGEROVÁ T. - ČARNICKÁ S. - LEDVÉNYIOVÁ V. - BARLAKA E. - GALATOU E. - CHYTILOVÁ A. - MANDÍKOVÁ P. - NEMČEKOVÁ M. - KOLÁŘ F. - LAZOU A. Delayed protection against ischemia/reperfusion injury in the rat heart is associated with PPAR-alpha-mediated changes in metabolic genes. VII. International Symposium on Myocardial Cytoprotection: From Basic Science to Clinical Perspectives: 26-28 September, **2013**, Pécs, Hungary
- [12] SLEZÁK J. - BARANČÍK M. - RAVINGEROVÁ T. - ČARNICKÁ S. - FRIMMEL K. - FERKO M. - ZIEGELHÖFFER A. - KALOČAYOVÁ B. - VRBJAR N. - LAZOU A. - KUKREJA R.C. - FULOP M. - TRIBULOVÁ N. - OKRUHLICOVÁ L. Novel mechanisms involved in early phase of cardiovascular injury after mediastinal region irradiation. VII. International Symposium on Myocardial Cytoprotection: From Basic Science to Clinical Perspectives: 26-28 September, **2013**, Pécs, Hungary
- [13] TRIBULOVÁ N. Modulation of Myocardial Connexin-43 Channels: Prevention of Malignant Arrhythmias and Heart Failure. China Heart Congress 2013, August 8th - 11th, **2013**, Beijing, China.

- [14] ZIEGELHÖFFER, A. - FERKO, M. - MUJKOŠOVÁ, J. - WACZULÍKOVÁ, I. - CAGALINEC, M. - PASTOREKOVÁ, S. - MURÁRIKOVÁ, M. - JAŠOVÁ, M. - KANCÍROVÁ, I. - RAVINGEROVÁ, T. Mechanisms of endogenous protection of cell energetics in ischemic, hypoxic and diabetic myocardium: sarcolemma, mitochondria, calcium movements and membrane fluidity. VII. International Symposium on Myocardial Cytoprotection: From Basic Science to Clinical Perspectives: 26-28 September, **2013**, Pécs, Hungary
- [15] BARTEKOVÁ, M. - IVANOVÁ, M. - ŠIMONČÍKOVÁ, P. - OKRUHLICOVÁ, L. - BARANČÍK, M. Effects of quercetin on hearts isolated from normal and doxorubicin-treated rats. 2nd Cardiovascular Forum for Promoting Centres of Excellence and Young Investigators: September 4 to 6, **2014**; Winnipeg, Manitoba, Canada
- [16] LEDVÉNYIOVÁ, V. - BERNÁTOVÁ, I. - ČARNICKÁ, S. - BARTEKOVÁ, M. - RAVINGEROVÁ, T. Gender-related response to ischemia in young SHR rats exposed to crowding. 2nd Cardiovascular Forum for Promoting Centres of Excellence and Young Investigators: September 4 to 6, **2014**, Winnipeg, Manitoba, Canada
- [17] RAJTÍK, T. - SZOBI, A. - ČARNICKÁ, S. - GIRICZ, Z. - ŠVEC, P. - FERDINANDY, P. - RAVINGEROVÁ, T. - ADAMEOVÁ, A. CAMKII oxidative activation and its influence on pathogenesis of ischemic/reperfused heart: the role of AT1 receptors. 2nd Cardiovascular Forum for Promoting Centres of Excellence and Young Investigators: September 4 to 6, **2014**, Winnipeg, Manitoba, Canada
- [18] RAVINGEROVÁ, T. - LEDVÉNYIOVÁ, V. - MURÁRIKOVÁ, M. - GRIECISOVÁ, L. - ČARNICKÁ, S. - ZÁLEŠÁK, M. - ADAMEOVÁ, A. Lifestyle-related cardiovascular disregulations are associated with loss of innate antiischemic protection. 2nd Cardiovascular Forum for Promoting Centres of Excellence and Young Investigators: September 4 to 6, **2014**, Winnipeg, Manitoba, Canada
- [19] RAVINGEROVÁ, T. - ČARNICKÁ, S. - LEDVÉNYIOVÁ, V. - FERKO, M. - RAJTÍK, T. - BARLAKA, E. - CHYTILOVÁ, A. - MANDÍKOVÁ, P. - GABLOVSKÝ, I. - ADAMEOVÁ, A. - KOLÁŘ, F. - LAZOU, A. Cardioprotective potential of hypolipidemic drugs in acute ischemia/reperfusion: molecular mechanisms of pleiotropic preconditioning-like effects. European Section Meeting of the International Academy of Cardiovascular Sciences (IACS), October 8-11, **2014**, Balatongyörök (Lake Balaton), Hungary
- [20] RAVINGEROVÁ, T. - ČARNICKÁ, S. - ADAMEOVÁ, A. - LEDVÉNYIOVÁ, V. - RAJTÍK, T. - BARLAKA, E. - GABLOVSKÝ, I. - NEMČEKOVÁ, M. - LAZOU, A. Antiarrhythmic potential of hypolipidemic drugs in acute ischemia/reperfusion: molecular mechanisms of lipid-independent effects. 3rd Congress of Physiological Sciences of Serbia with International Participation, October 29-31, **2014**, Belgrade, Republic of Serbia
- [21] SLEZÁK, J. Cardiovascular radiation injury and potential targets for prevention. 2nd Cardiovascular Forum for Promoting Centres of Excellence and Young Investigators: September 4 to 6, **2014**, Winnipeg, Manitoba, Canada

- [22] SLEZÁK, J. - BARANČÍK, M. - RAVINGEROVÁ, T. - TRIBULOVÁ, N. - KURA, B. - LAZOU, A. - KUKREJA, R.C. - FULOP, M. - VICZENCZOVÁ, C. - OKRUHLICOVÁ, L'. Response of the rat heart and vessels 6 weeks after irradiation of the mediastinum and lungs. Molecular mechanisms and the potential options to minimize the injurious effect. European Section Meeting of the International Academy of Cardiovascular Sciences (IACS), October 8-11, **2014**, Balatongyörök (Lake Balaton), Hungary
- [23] BARTEKOVÁ, M. - BARANČÍK, M. - POKUSA, M. - BABIC, S. - RADOŠINSKÁ, J. - JEŽOVÁ, D. Effect of prolonged intermittent restraint stress on molecular signalization in heart tissue. 2nd European Section Meeting of the International Academy of Cardiovascular Sciences, "Heart Diseases:How New Research May Lead to New Treatments", Hotel Crowne Plaza, October 7th-11th, **2015**, Belgrade, Serbia
- [24] RAVINGEROVÁ, T. - LEDVÉNYIOVÁ-FARKAŠOVÁ, V. - GRIECISOVÁ, L. - GABLOVSKÝ, I. - ZÁLEŠÁK, M. - RAJTÍK, T. - SZOBI, A. - ADAMEOVÁ, A. - KOLÁŘ, F. Metabolic age- and gender-related cardiovascular alterations as a potential cause of blunted innate cardioprotection. The 11th World Congress of the International Society for Adaptive Medicine, Yonago Convention Center, May 27-30, **2015**, Yonago, Japan
- [25] RAVINGEROVÁ, T. - LEDVÉNYIOVÁ-FARKAŠOVÁ, V. - GRIECISOVÁ, L. - ČARNICKÁ, S. - MURÁRIKOVÁ, M. - NECKÁŘ, J. - KOLÁŘ, F. Novel "conditioning" approaches to repair the broken heart: from bench to a patient. 2nd European Section Meeting of the International Academy of Cardiovascular Sciences, "Heart Diseases:How New Research May Lead to New Treatments", Hotel Crowne Plaza, October 7th-11th, **2015**, Belgrade, Serbia
- [26] SLEZÁK, J. - BARANČÍK, M. - RAVINGEROVÁ, T. - TRIBULOVÁ, N. - KURA, B. - LAZOU, A. - KUKREJA, R.C. - YIN, CH. - VICZENCZOVÁ, C. - OKRUHLICOVÁ, L'. - BAGCHI, A.K. - BERNARDES, N. - SINGAL, P. Molecular mechanisms and adaptive cardiovascular changes after mediastinal irradiation in rats: potential targets to minimize the adverse effect. The 11th World Congress of the International Society for Adaptive Medicine, Yonago Convention Center, May 27-30, **2015**, Yonago, Japan
- [27] SLEZÁK, J. - BARANČÍK, M. - RAVINGEROVÁ, T. - TRIBULOVÁ, N. - KURA, B. - LAZOU, A. - KUKREJA, R.C. - YIN, CH. - VICZENCZOVÁ, C. - OKRUHLICOVÁ, L'. - BAGCHI, A.K. - BERNARDES, N. - SINGAL, P. Myocardial changes after mediastinal irradiation in rats: molecular mechanisms and potential targets to minimize the adverse effect. 2nd European Section Meeting of the International Academy of Cardiovascular Sciences, "Heart Diseases:How New Research May Lead to New Treatments", Hotel Crowne Plaza, October 7th-11th, **2015**, Belgrade, Serbia

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

[1] **MUDr. T. Ravingerová, DrSc.**

- *New Frontiers in Basic Cardiovascular Research – 10th Meeting of France - New EU Countries*. Hradec Králove, Czech Republic, **12.06.-15.06.2012** - Member of Scientific Committee
- *Advances in Cardiovascular Research. From bench to bedside*. International symposium. Smolenice, **23.05.-26.05.2013** - Member of Organizing Committee (Scientific Secretary of Conference)
- *VII. International Symposium on Myocardial Cytoprotection: From Basic Science to Clinical Perspectives*. Pécs, Hungary, **26.09-28.09, 2013** - International Scientific Board
- *European Section Meeting of the International Academy of Cardiovascular Sciences (IACS)*, Lake Balaton, Hungary, **08.10.-11.10.2014** – International Scientific Board, Member of Poster Award Committee
- *New Frontiers in Basic Cardiovascular Research, 11th Meeting of France – New EU Members*, Smolenice, **15.06.-18.06.2014** - Member of Organizing/Programme Committee (Scientific Secretary of Conference)
- *2nd Cardiovascular Forum for Promoting Centers of Excellence and Young Investigators*. Winnipeg, Manitoba, Canada, **4.09-6.09, 2014** – International Faculty member
- *2nd European Section Meeting of the International Academy of Cardiovascular Sciences. “Heart Diseases: How new research may lead to new treatments.”* Belgrade, Serbia, **08.10-10.10.2015** - Member of International Program Committee
- *Advances in Cardiovascular Research. From the bench to the patient’s bed*. Smolenice, **02.09.-05.09, 2015** - Member of Organizing Committee (Scientific Secretary of Conference)
- *The 11th World Congress of the International Society for Adaptive Medicine*, Yonago, Japan, **27.05-30.05.2015** - International Faculty member

[2] **MUDr. J. Slezák, DrSc.**

- *Advances in Cardiovascular Research. From bench to bedside*. International symposium. Smolenice, **23.05.-26.05.2013** - Member of Organizing Committee (President of Conference)
- *New Frontiers in Basic Cardiovascular Research, 11th Meeting of France – New EU Members*, Smolenice, **15.06.-18.06.2014** - Member of Organizing Committee (President of Conference)
- *European Section Meeting of the International Academy of Cardiovascular Sciences (IACS)*, Lake Balaton, Hungary, **08.10.-11.10.2014** – Member of advisory committee, Member of International Program Committee
- *2nd Cardiovascular Forum for Promoting Ceners of Excellence and Young Investigators*, Winnipeg, Manitoba, Canada, **04.09.-06.09.2014** - International Faculty member

- *2nd European Section Meeting of the International Academy of Cardiovascular Sciences.*
"Heart Diseases: How new research may lead to new treatments." Belgrade, Serbia,
08.10-10.10.2015 - Member of International Program Committee
- *Advances in Cardiovascular Research. From the bench to the patient's bed.*
Smolenice, 02.09.-05.09.2015 - Member of Organizing Committee (Honorary President
of Conference)
- *The 11th World Congress of the International Society for Adaptive Medicine,* Yonago,
Japan, **27.05-30.05.2015** - International Faculty member

[3] **RNDr. M. Barteková, PhD.**

- *Advances in Cardiovascular Research From bench to bedside.* International
symposium. Smolenice, **23.05.-26.05.2013** - Member of Organizing Committee
- *New Frontiers in Basic Cardiovascular Research, 11th Meeting of France – New EU
Members,* Smolenice, **15.06.-18.06.2014** - Member of Organizing Committee
- *2nd European Section Meeting of the International Academy of Cardiovascular Sciences.*
"Heart Diseases: How new research may lead to new treatments." Belgrade, Serbia,
08.10-10.10.2015 - Member of International Program Committee
- *Advances in Cardiovascular Research. From the bench to the patient's bed.*
Smolenice, 02.09.-05.09.2015 - Member of Organizing Committee (Chair of Organizing
Committee)

[4] **Ing. M. Ferko, PhD.**

- *Advances in Cardiovascular Research. From bench to bedside.* International
symposium. Smolenice, **23.05.-26.05.2013** - Member of Organizing Committee
- *New Frontiers in Basic Cardiovascular Research, 11th Meeting of France – New EU
Members,* Smolenice, **15.06.-18.06.2014** - Member of Organizing Committee (Chair of
Organizing Committee)
- *Advances in Cardiovascular Research. From the bench to the patient's bed.*
Smolenice, 02.09.-05.09.2015 - Member of Organizing Committee

[5] **RNDr. Ľ. Okruhlicová, CSc.**

- *Advances in Cardiovascular Research. From bench to bedside.* International
symposium. Smolenice, **23.05.-26.05, 2013** - Member of Organizing Committee
- *New Frontiers in Basic Cardiovascular Research, 11th Meeting of France – New EU
Members,* Smolenice, **15.06.-18.06, 2014** - Member of Organizing Committee
- *Advances in Cardiovascular Research. From the bench to the patient's bed.*
Smolenice, 02.09.-05.09, 2015 - Member of Organizing Committee

[6] **RNDr. N. Tribulová, DrSc.**

- *New Frontiers in Basic Cardiovascular Research, 11th Meeting of France – New EU Members*, Smolenice, **15.06.-18.06, 2014** - Member of Organizing Committee
- *41st International Congress on Electrophysiology*, **04.-07.06. 2014**, Bratislava – Member of Organizing Committee
- *Advances in Cardiovascular Research. From the bench to the patient's bed. Smolenice*, **02.09.-05.09, 2015** - Member of Organizing Committee

[7] **RNDr. M. Barančík, DrSc.**

- *Advances in Cardiovascular Research. From bench to bedside*. International symposium. Smolenice, **23.05.-26.05, 2013** - Member of Organizing Committee
- *New Frontiers in Basic Cardiovascular Research, 11th Meeting of France – New EU Members*, Smolenice, **15.06.-18.06, 2014** - Member of Organizing Committee
- *Advances in Cardiovascular Research. From the bench to the patient's bed. Smolenice*, **02.09.-05.09, 2015** - Member of Organizing Committee (President of Conference)

[8] **MUDr. J. Styk, CSc.**

- *Advances in Cardiovascular Research. From bench to bedside*. International symposium. Smolenice, **23.05.-26.05, 2013** - Member of Organizing Committee (Scientific Secretary of Conference)
- *New Frontiers in Basic Cardiovascular Research, 11th Meeting of France – New EU Members*, Smolenice, **15.06.-18.06, 2014** - Member of Organizing Committee (Scientific Secretary of Conference)

[9] **Ing. A. Ziegelhöffer, DrSc.**

- *Advances in Cardiovascular Research. From bench to bedside*. International symposium. Smolenice, **23.05.-26.05, 2013** - Member of Organizing Committee (Scientific Secretary of Conference)
- *New Frontiers in Basic Cardiovascular Research, 11th Meeting of France – New EU Members*, Smolenice, **15.06.-18.06, 2014** - Member of Organizing Committee (Scientific Secretary of Conference)

[10] **Mgr. V. Ledvényiová-Farkašová, PhD.**

- *Advances in Cardiovascular Research. From bench to bedside*. International symposium. Smolenice, **23.05.-26.05, 2013** - Member of Organizing Committee
- *New Frontiers in Basic Cardiovascular Research, 11th Meeting of France – New EU Members*, Smolenice, **15.06.-18.06, 2014** - Member of Organizing Committee
- *Advances in Cardiovascular Research. From the bench to the patient's bed. Smolenice*, **02.09.-05.09, 2015** - Member of Organizing Committee

[11] **RNDr. T. Egan Benová, PhD.**

- *Advances in Cardiovascular Research. From bench to bedside.* International symposium. Smolenice, **23.05.-26.05, 2013** - Member of Organizing Committee
- *New Frontiers in Basic Cardiovascular Research, 11th Meeting of France – New EU Members,* Smolenice, **15.06.-18.06, 2014** - Member of Organizing Committee
- *Advances in Cardiovascular Research. From the bench to the patient's bed.* Smolenice, **02.09.-05.09, 2015** - Member of Organizing Committee

[12] **RNDr. B. Szeiffová Bačová, PhD.**

- *Advances in Cardiovascular Research. From bench to bedside.* International symposium. Smolenice, **23.05.-26.05, 2013** - Member of Organizing Committee
- *New Frontiers in Basic Cardiovascular Research, 11th Meeting of France – New EU Members,* Smolenice, **15.06.-18.06, 2014** - Member of Organizing Committee
- *Advances in Cardiovascular Research. From the bench to the patient's bed.* Smolenice, **02.09.-05.09, 2015** - Member of Organizing Committee

[13] **RNDr. S. Čarnická, PhD.**

- *Advances in Cardiovascular Research. From bench to bedside.* International symposium. Smolenice, **23.05.-26.05, 2013** - Member of Organizing Committee
- *New Frontiers in Basic Cardiovascular Research, 11th Meeting of France – New EU Members,* Smolenice, **15.06.-18.06, 2014** - Member of Organizing Committee

[14] **Ing. K. Frimmel, PhD.**

- *Advances in Cardiovascular Research. From bench to bedside.* International symposium. Smolenice, **23.05.-26.05, 2013** - Member of Organizing Committee
- *New Frontiers in Basic Cardiovascular Research, 11th Meeting of France – New EU Members,* Smolenice, **15.06.-18.06, 2014** - Member of Organizing Committee
- *Advances in Cardiovascular Research. From the bench to the patient's bed.* Smolenice, **02.09.-05.09, 2015** - Member of Organizing Committee

[15] **RNDr. N. Vrbjar, CSc.**

- *New Frontiers in Basic Cardiovascular Research, 11th Meeting of France – New EU Members,* Smolenice, **15.06.-18.06, 2014** - Member of Organizing Committee

[16] **RNDr. L. Mezešová**

- *Advances in Cardiovascular Research. From bench to bedside.* International symposium. Smolenice, **23.05.-26.05, 2013** - Member of Organizing Committee

- *New Frontiers in Basic Cardiovascular Research, 11th Meeting of France – New EU Members*, Smolenice, **15.06.-18.06, 2014** - Member of Organizing Committee
- *Advances in Cardiovascular Research. From the bench to the patient's bed.* Smolenice, **02.09.-05.09, 2015** - Member of Organizing Committee

[17] **Mgr. C. Viczenczová**

- *New Frontiers in Basic Cardiovascular Research, 11th Meeting of France – New EU Members*, Smolenice, **15.06.-18.06, 2014** - Member of Organizing Committee

[18] **RNDr. J. Víkovičová, PhD.**

- *Advances in Cardiovascular Research From bench to bedside.* International symposium, Smolenice, 23.05.-26.05, 2013 - Member of Organizing Committee

[19] **Mgr. M. Muráriková**

- *Advances in Cardiovascular Research. From bench to bedside.* International symposium. Smolenice, **23.05.-26.05, 2013** - Member of Organizing Committee

[20] **Ing. I. Gablovský**

- *New Frontiers in Basic Cardiovascular Research, 11th Meeting of France – New EU Members*, Smolenice, **15.06.-18.06, 2014** - Member of Organizing Committee

[21] **Mgr. B. Kaločayová**

- *New Frontiers in Basic Cardiovascular Research, 11th Meeting of France – New EU Members*, Smolenice, **15.06.-18.06, 2014** - Member of Organizing Committee

[22] **Mgr. M. Jašová**

- *New Frontiers in Basic Cardiovascular Research, 11th Meeting of France – New EU Members*, Smolenice, **15.06.-18.06, 2014** - Member of Organizing Committee

[23] **Mgr. I. Kancírová**

- *New Frontiers in Basic Cardiovascular Research, 11th Meeting of France – New EU Members*, Smolenice, **15.06.-18.06, 2014** - Member of Organizing Committee

[24] **MUDr. M. Zálešák, PhD.**

- *New Frontiers in Basic Cardiovascular Research, 11th Meeting of France – New EU Members*, Smolenice, **15.06.-18.06, 2014** - Member of Organizing Committee

[25] **RNDr. J. Graban, PhD.**

- *Advances in Cardiovascular Research. From the bench to the patient's bed.* Smolenice, **02.09.-05.09, 2015** - Member of Organizing Committee

[26] **Mgr. L. Griecsová**

- *Advances in Cardiovascular Research. From the bench to the patient's bed.* Smolenice, **02.09.-05.09, 2015** - Member of Organizing Committee

- **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

- [1] ČARNICKÁ S., ADAMEOVÁ A., KELLY T., NEMČEKOVÁ M., FERKO M., MUJKOŠOVÁ J., GALATAU E., BARLAKA E., LAZOU A., RAVINGEROVÁ T. Ochranné účinky hypolipidemika WY14643 na ischemicko-reperfúzne poškodenie v izolovanom srdci potkana: Úloha PI3K/Akt a ROS. „Trendy v kardiovaskulárnom výskume“, 21.6. 2012, Bratislava, Slovakia
- [2] FERKO M., MUJKOŠOVÁ J., WACZULÍKOVÁ I., JAŠOVÁ M., KANCÍROVÁ I., MURÁRIKOVÁ M., ZIEGELHOFFER A. Remodelácia mitochondriových membrán - prirodzený prostriedok na podporu bunkovej energetiky diabetického srdca myokardu. „Trendy v kardiovaskulárnom výskume“, 21.6. 2012, Bratislava, Slovakia

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

[1] **MUDr. T. Ravingerová, DrSc.**

- *43th Conference of the Commission of Experimental Cardiology* (43. Pracovná konferencia Komisie Experimentálnej Kardiológie (KEK) Buchlov, Czech Republic, **21.10-23.10.2015** - Member of Program Committee
- *42th Conference of the Commission of Experimental Cardiology* (42. Pracovná konferencia Komisie Experimentálnej Kardiológie (KEK) Deštné v Orlických horách, Czech Republic, **15.10.-17.10.2014** - Member of Program Committee
- *41th Conference of the Commission of Experimental Cardiology* (41. Pracovná konferencia Komisie Experimentálnej Kardiológie (KEK) Martin, Slovak Republic, **16.10.-18.10.2013** - Member of Program Committee
- *40th Conference of the Commission of Experimental Cardiology* (40. Pracovná konferencia Komisie Experimentálnej Kardiológie (KEK) Vranovská Ves, Czech Republic, **17.10.-19.10.2012** - Member of Programme Committee

[2] **Ing. M. Ferko, PhD.**

- *Interactive Conference of Young Scientists*. Bratislava - Member of Organizing Committee (President of Conference):
 - **01.03.-09.06.2012**
 - **01.03.-09.06.2013**
 - **01.03.-09.06.2014**
 - **01.03.-09.06.2015**
- *43th Conference of the Commission of Experimental Cardiology* (43. Pracovná konferencia Komisie Experimentálnej Kardiológie (KEK) Buchlov, Czech Republic, **21.10-23.10.2015** - Member of Program Committee
- *42th Conference of the Commission of Experimental Cardiology* (42. Pracovná konferencia Komisie Experimentálnej Kardiológie (KEK) Deštné v Orlických horách, Czech Republic, **15.10.-17.10.2014** - Member of Program Committee
- *41th Conference of the Commission of Experimental Cardiology* (41. Pracovná konferencia Komisie Experimentálnej Kardiológie (KEK) Martin, Slovak Republic, **16.10.-18.10.2013** - Member of Program Committee
- *40th Conference of the Commission of Experimental Cardiology* (40. Pracovná konferencia Komisie Experimentálnej Kardiológie (KEK) Vranovská Ves, Czech Republic, **17.10.-19.10.2012** - Member of Programme Committee

[3] **MUDr. J. Styk, CSc.**

- *40th Conference of the Commission of Experimental Cardiology* (40. Pracovná konferencia Komisie Experimentálnej Kardiológie (KEK) Vranovská Ves, Czech Republic, **17.10.-19.10, 2012** - Member of Program Committee

[4] **MUDr. J. Radošinská, PhD.**

- *Physiological Days*, Bratislava, **04.-06.02. 2014** - Member of Organizing Committee

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

During the assessed period, the IHR SAS had an important role in implementing cardiovascular research on the national level and had an important impact on the international level. The research teams from IHR SAS had a number of collaborations with many scientific institutions in Slovakia and abroad. Research workers of the IHR SAS have been invited to collaborate with the international research institutions and as a result, scientific papers were published in prestigious international journals.

Scientists of the IHR SAS have been invited to international conferences – to present their lectures or chair the scientific sections.

One of the important parts of scientific workers' activities was participation as reviewers and/or editors in both national and international journals.

Employees of the IHR SAS also served as the members of grant agencies and often served as reviewers for evaluation of national and international scientific projects.

Scientists from IHR SAS were involved in reviewing of PhD and DSc theses, habilitation studies in Slovakia. Moreover, some scientists reviewed PhD theses abroad and served as the members of the international PhD committees (Dr. Ravingerová).

Another informations documenting the international and national status of the IHR SAS:

i) Employees of the IHR SAS served as members of important scientific bodies (e.g. boards, committees, editorial boards of scientific journals):

[1] Prof. MUDr. J. Slezák, DrSc.

Member of Editorial Boards of Scientific Journals:

- Experimental and Clinical Cardiology (2012, 2013)
- Journal of Molecular Histology (2012-2015)
- Advanced Management Systems (2012, 2013)
- General Physiology and Biophysics (2012-2015)
- Bratislavské Lekárske Listy (BLL) (2012, 2013)
- Current Research: Cardiology (2014-2015)

Member of Advisory Board of scientific journals:

- The Canadian Journal of Cardiology (2012)

International and National Scientific Societies:

- International Academy of Cardiovascular Sciences – fellow and member of board of directors (2012-2015), member of advisory committee (2012-2015),
- International Federation of Societies for Histochemistry and Cytochemistry – council member (2012, 2013)
- Foreign Member of Russian Academy of Natural Sciences

[2] MUDr. T. Ravingerová, DrSc.

Member of Editorial Boards of Scientific Journals:

- Heart News and Views (2012-2015)
- Physiological Research (2012-2015)
- CV Network (2012-2015)
- General Physiology and Biophysics (2012-2015)
- Current Research: Cardiology (2014-2015)

International and National Scientific Societies:

- International Academy of Cardiovascular Sciences (IACS) – elected fellow and Scientific Secretary of European Section of IACS (**2012-2015**), council member of European Section of IACS (**2013-2015**), Vice-President of European Section of IACS (**2014-2015**)
- Slovak Physiological Society – council member (**2012-2015**)
- Commission of Experimental Cardiology of Czech and Slovak Physiological Society – joint council member (**2012-2015**)
- ESC Working Group Pharmacology and Drug Therapy – member (**2012-2015**)

[3] **RNDr. M. Barančík, DrSc.**

Member of Editorial Boards of Scientific Journals:

- General Physiology and Biophysics (**2012-2015**)

[4] **RNDr. M. Barteková, PhD.**

Member of Editorial Boards of Scientific Journals:

- Molecular and Cellular Biochemistry (**2015**)
- CV Network (**2015**)

International and National Scientific Societies:

- European Section of International Academy of Cardiovascular Sciences - council member (**2014-2015**)

[5] **Ing. A. Ziegelhoffer, DrSc.**

Member of Editorial Boards of Scientific Journals:

- Experimental and Clinical Cardiology (**2012, 2013**)

International and National Scientific Societies:

- International Academy of Cardiovascular Sciences (IACS) – fellow (**2012-2015**)

[6] **Ing. M. Ferko, PhD.**

International and National Scientific Societies:

- Commission of Experimental Cardiology by Czech and Slovak Physiological Society – joint council member (**2012-2015**)

[7] **RNDr. S. Čarnická, PhD.**

International and National Scientific Societies:

- Commission of Experimental Cardiology by Czech and Slovak Physiological Society – joint council member (**2012-2015**)

ii) Employees of the IHR SAS received in assessed period 2012-2015 several international and national awards and distinctions:

International:

- [1] ISHR Belgrade meeting travel award from International Society for Heart Research (ISHR) - for the participation at the ISHR meeting, Beograd, Serbia. S. Čarnická **(2012)**
- [2] TOP 9 selected presentations: "Basic Science HIGHLIGHTS of THE CONGRESS HEART FAILURE 2012", Beograd, Serbia. M. Ferko **(2012)**
- [3] Accommodation grant for "23rd scientific meeting of the European Society of Hypertension (ESH) on "Hypertension and Cardiovascular Protection", Milan, 2013. From the Council of the European Society of Hypertension and the Organising Committee. T. Beňová **(2013)**
- [4] Award for the 1st place in a poster competition at the symposium „Advances in Cardiovascular Research. From bench to bedside“. S. Čarnická **(2013)**
- [5] ISHR Travel grant - for the participation at the ISHR World Congress, San Diego, USA. S. Čarnická **(2013)**
- [6] SHR Travel grant - for the participation at the ISHR World Congress, San Diego, USA. M. Ferko **(2013)**
- [7] Award in the poster competition at the symposium „Advances in Cardiovascular Research. From bench to bedside“. V. Ledvényiová **(2013)**
- [8] ISHR Travel grant - for the participation at the ISHR World Congress, San Diego, USA. M. Muráriková **(2013)**
- [9] Award of the International Academy of Cardiovascular Sciences – „Distinguished Service Award in Cardiovascular Science, Medicine and Surgery“. T. Ravingerová **(2013)**
- [10] Award in the poster competition at the symposium „Advances in Cardiovascular Research. From bench to bedside“. C. Viczenczová **(2013)**
- [11] Plaque from Director of the Institute of Cardiovascular Sciences Winnipeg, Canada. - „Commemorating 50 years (1964-2014) of progress in cardiovascular research in the Institute for Heart Research SAS, Bratislava Slovakia and longstanding friendship with the Institute of Cardiovascular Sciences, Winnipeg, Canada“. M. Barančík **(2014)**
- [12] Award of the International Academy of Cardiovascular Sciences – „Distinguished Service Award in Cardiovascular Science, Medicine and Surgery.“ M. Barteková **(2014)**
- [13] Travel grant from the International Academy of Cardiovascular Sciences - for the participation at international conference „2nd Cardiovascular Forum for Promoting Centres of Excellence and Young Investigators, Winnipeg, Canada, 2014“. V. Farkašová **(2014)**
- [14] 3rd Prize in Erzsébet Röth Poster Award Competition - European Section Meeting of the International Academy of Cardiovascular Sciences. V. Farkašová **(2014)**

- [15] Election for Vice-President of European Section of the International Academy of Cardiovascular Sciences. T. Ravingerová (2014)
- [16] Award of the International Academy of Cardiovascular Sciences – „Distinguished Leadership Award in Cardiovascular Sciences“. J. Slezák (2014)
- [17] Travel grant from the European Society of Hypertension – for the participation at international conference „Frontiers in Cardiovascular Biology“, Barcelona, Spain. B. Szeiffová Bačová (2014)
- [18] Travel grant from the European and International Societies of Hypertension - for the participation at international conference "ESH-ISH Hypertension, Athen, Greece. C. Viczenczová (2014)
- [19] Award of the International Academy of Cardiovascular Sciences – „Margaret P. Meffat award for best poster in biomedical Sciences“. C. Viczenczová (2014)
- [20] Poster award at the international conference "New Frontiers in Cardiovascular Research". M. Zálešák (2014)
- [21] Award of the International Academy of Cardiovascular Sciences – „Distinguished Service Award in Cardiovascular Science, Medicine and Surgery“. A. Ziegelhöffner (2014)
- [22] Award of the International Academy of Cardiovascular Sciences – „Distinguished Leadership Award In Cardiocascular Sciences“. M. Barančík (2015)
- [23] Award of the European Cardiac Arrhythmia Society - Best Abstract on Sudden Cardiac Death - 11th Annual Congress of the European Cardiac Arrhythmia Society, Paris, France. T. Egan-Beňová (2015)
- [24] European Society of Cardiology (ESC) - Award to attend "ESC Basic Science Summer School 2015", Sophia-Antipolis, France. T. Egan Beňová (2015)
- [25] „Pavel Braveny Poster Competition Award“ of the European Section of International Academy of Cardiovascular Sciences – the international symposium „Advances in Cardiovascular Research“. T. Egan-Beňová (2015)
- [26] Pavel Braveny Poster Competition Award“ of the European Section of International Academy of Cardiovascular Sciences – the international symposium „Advances in Cardiovascular Research. C. Viczenczová (2015)
- [27] „Pavel Braveny Poster Competition Award“ of the European Section of International Academy of Cardiovascular Sciences – the international symposium „Advances in Cardiovascular Research. M. Jašová (2015)
- [28] „Pavel Braveny Poster Competition Award“ of the European Section of International Academy of Cardiovascular Sciences – the international symposium „Advances in Cardiovascular Research. J. Križák (2015)
- [29] Fellow of the European Academy of Sciences and Arts. T. Ravingerová (2015)
- [30] Award of the International Academy of Cardiovascular Sciences – „Jan Slezak Award for Excellence in Cardiovascular Sciences“. T. Ravingerová (2015)

- [31] Award of the International Academy of Cardiovascular Sciences - Medal for outstanding contributions to the IACS, ES IACS". J. Slezák (2015)
- [32] Award of the International Academy of Cardiovascular Sciences – „Naranjan Dhalla award for inovations in cardiovascular sciences“. J. Slezák (2015)
- [33] Plaque of the International Academy of Cardiovascular Sciences. J. Slezák (2015)
- [34] European Society of Cardiology (ESC) Award to attend "ESC Basic Science Summer School 2015", Sophia-Antipolis, France. C. Viczenczová (2015)

National:

- [1] Ján Jessenius Honorary Plaque of the SAS, M. Barančík (2012)
- [2] Ján Jessenius Honorary Plaque of the SAS, T. Ravingerová (2012)
- [3] The SAS Medal for Support of Science, J. Styk. (2012)
- [4] 3rd place in poster competition at the XVII. Congress of Slovak Society of Cardiology. B. Bačová: "Supplementation of red palm oil affects heart function and ventricular fibrillation threshold of rats with altered thyroid status". (2012)
- [5] 1st place in poster competition at the XVII. Congress of Slovak Society of Cardiology. T. Beňová: „The cardioprotective effects of melatonin on SHR likely rely on the role of connexin-43“. (2012)
- [6] Award of the Slovak Physiological Society for the 2nd place in poster competition at the 88th Physiological Days. S. Čarnická: "Involvement of ROS in PPAR-induced protection against acute ischemia/reperfusion injury in the rat heart." (2012)
- [7] Award from "Občianske združenie Preveda", organizer of "Interactive Conference of Young Scientists 2012". Section: Cellular metabolism, physiology, molecular biology, and genetics. V. Ledvényiová (2012)
- [8] Memory letter of the Ministry of Education, Science, Research and Sport of the Slovak Republic for young research workers under 35 years. B. Bačová (2013)
- [9] Award from "Občianske združenie Preveda", organizer of "Interactive Conference of Young Scientists 2013" Section: Cellular metabolism, physiology, molecular biology, and genetics. B. Kaločayová (2013)
- [10] Award of the Slovak Physiological Society for the 2nd place in poster competition at the Physiological Days. V. Ledvényiová (2013)
- [11] Price of Mayor of Bratislava for the year 2012. J. Slezák (2013)
- [12] Honour from the Ministry of Education, Science, Research and Sport of Slovak Republic for life-work in area of science and technology „Medal of Samuel Mikovíni“. J. Slezák (2013)

- [13] Award from “Občianske združenie Preveda”, organizer of “Interactive Conference of Young Scientists 2013” Section: Cellular metabolism, physiology, molecular biology, and genetics. C. Viczenczová **(2013)**
- [14] Certificate of merit (Greetings Letter) from the President of the Slovak Academy of Sciences. A. Ziegelhöffner **(2014)**
- [15] The Silver Medal of the Faculty of Natural Sciences, Comenius University in Bratislava. M. Barančík **(2014)**
- [16] Award from “Občianske združenie Preveda”, organizer of “Interactive Conference of Young Scientists 2014” Section: Cellular metabolism, physiology, molecular biology, and genetics. S. Čarnická **(2014)**
- [17] Award from “Občianske združenie Preveda”, organizer of “Interactive Conference of Young Scientists 2014” Section: Cellular metabolism, physiology, molecular biology, and genetics. M. Jašová **(2014)**
- [18] Award from “Občianske združenie Preveda”, organizer of “Interactive Conference of Young Scientists 2014” Section: Cellular metabolism, physiology, molecular biology, and genetics. I. Kancírová **(2014)**
- [19] Award from “Občianske združenie Preveda”, organizer of “Interactive Conference of Young Scientists 2014” Section: Cellular metabolism, physiology, molecular biology, and genetics. J. Križák **(2014)**
- [20] Award of the Slovak Society of Cardiology for the original paper published in journal Cardiology Letters. M. Muráriková **(2014)**
- [21] Medal of the Slovak Medical Society. A. Ziegelhöffner **(2014)**
- [22] The SAS Medal for Support of Science. J. Slezák **(2015)**
- [23] Award of the Slovak Physiological Society for the 2nd place in poster competition at the Physiological Days. V. Ledvényiová **(2015)**
- [24] Award from “Občianske združenie Preveda”, organizer of “Interactive Conference of Young Scientists 2015” Section: Cellular metabolism, physiology, molecular biology, and genetics. M. Jašová **(2015)**
- [25] Award from “Občianske združenie Preveda”, organizer of “Interactive Conference of Young Scientists 2015” Section: Cellular metabolism, physiology, molecular biology, and genetics. I. Kancírová **(2015)**
- [26] The T.R. Nederland Honorary Plaque of the Slovak Medical Society. J. Slezák **(2015)**
- [27] Certificate of merit (Greetings Letter) from the Slovak Society of Cardiology. J. Slezák **(2015)**
- [28] Award from “Občianske združenie Preveda”, organizer of “Interactive Conference of Young Scientists 2015” Section: Cellular metabolism, physiology, molecular biology, and genetics. C. Viczenczová **(2015)**

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					
2013					
2014					
2015					

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

Type of project: *IVF grant New Frontiers in Basic Cardiovascular Research 2014.*

Project number: IVF 11340240.

Duration: 02/2014 – 07/2014

Funding: 6 000 EUR

Coordinator (principal investigator): Institute for Heart Research SAS

Responsible person in the Organization: T. Ravingerová - coordinator

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

[1] Type of project: *Medziakademická dohoda (MAD - Interacademic Exchange Agreement) - Slovak–Czech International Academic Cooperation Agreement*

Title: Study of endogenous cardioprotective mechanisms against myocardial ischemia.

Duration: 01/2012 – 12/2014

International partner: Institute of Physiology, Academy of Sciences of the Czech Republic, Prague, Czech Republic

Responsible person in the Organization: T. Ravingerová - coordinator

- [2] **Type of project:** *Medziakademická dohoda (MAD - (Interacademic Exchange Agreement) - Slovak–Czech International Academic Cooperation Agreement*

Title: Effect of pathological states on cardiac resistance against myocardial ischemia: study of molecular mechanisms and novel approaches to cardioprotection

Duration: 01/2015 – 12/2017

International partner: Institute of Physiology, Academy of Sciences of the Czech Republic, Prague, Czech Republic

Responsible person in the Organization: T. Ravingerová - coordinator

- [3] **Type of project:** *Medziakademická dohoda (MAD - (Interacademic Exchange Agreement) - Slovak–Czech International Academic Cooperation Agreement*

Title: Multidisciplinary analysis of the combined effects of thyroid hormones and n-3 polyunsaturated fatty acids in rats.

Duration: 01/2015 – 12/2017

International partner: Institute of Physiology, Academy of Sciences of the Czech Republic, Prague, Czech Republic

Responsible person in the Organization: N. Tribulová – coordinator

- [4] **Type of project:** *Medziakademická dohoda (MAD - (Interacademic Exchange Agreement) - Slovak–Ukraine International Academic Cooperation Agreement*

Title: Role of membranes mechanisms (omega-3 unsaturated fatty acids and connexin-43) in pathology of cardiovascular diseases

Duration: 01/2008 – 12/2013

International partner: Bogomoletz Institute of Physiology, NAS of Ukraine, Kiev, Ukraine

Responsible person in the Organization: N. Tribulová – coordinator

- [5] **Type of project:** *International collaboration without direct funding*

Title: Intracellular signaling pathways and nuclear transcription factor activation in cardiac adaptation to ischemia/reperfusion injury

Duration: 01/2011 – 12/2015

International partner: Aristotle University of Thessaloniki, Thessaloniki, Greece

Responsible person in the Organization: T. Ravingerová - coordinator

- [6] **Type of project:** *International collaboration without direct funding*

Title: Study of cellular and molecular mechanisms involved in cardioprotective effects of red palm oil

Duration: 01/2010 – 12/2015

International partner: Cape Peninsula University of Technology, Bellville, South Africa

Responsible person in the Organization: N. Tribulová – *coordinator*

[7] **Type of project:** *international collaboration without direct funding*

Title: Investigation of the mechanisms involved in antiarrhythmic effects of melatonin

Duration: 05/2014 – 12/2017

International partner: Universidad Nacional de Cuyo, Argentina

Responsible person in the Organization: N. Tribulová – *coordinator*

[8] **Type of project:** *International collaboration without direct funding*

Title: Chronic ischemic injury of the heart: Influence of ionizing radiation on cardiovascular system and possibilities to minimize its adverse effect

Duration: 01/2007 – 12/2012

International partner: Division of Cardiovascular Sciences, St. Boniface General Hospital Research Centre, Manitoba, Canada

Responsible person in the Organization: J. Slezák – *coordinator*

[9] **Type of project:** *International collaboration without direct funding*

Title: Mechanisms of radiation injury to the heart. Preventive drug treatment.

Duration: 01/2014 – 12/2017

International partners: Aristotle University of Thessaloniki, Thessaloniki, Greece; Virginia Commonwealth University, Richmond, USA.

Responsible person in the Organization: J. Slezák – *coordinator*

[10] **Type of project:** *International collaboration without direct funding*

Title: Heart related miRNAs involved in radiation injury

Duration: 01/2013 – 12/2017

International partners: Virginia Commonwealth University, Richmond, USA.

Responsible person in the Organization: J. Slezák – *coordinator*

- **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	The effect of the lifestyle-related risk factors on the adaptive processes in the ischemic myocardium	APVV-0102-11	42	172 080	Coordinator / Ravingerová
	Proton radiation-induced cardiovascular toxicity - pathophysiology and prevention	APVV-0241-11	42	147 000	Coordinator / Slezák
	Activation of cell signaling mechanisms as a potential target of cardiac protection against ischemic injury	APVV-LPP-0393-09	21	83 000	Coordinator / Ravingerová
	Calcium channels in neuronal excitability	APVV-0212-10	34	30 000	Investigator / Vrbjar
	The effect of aliskerin loaded nanoparticles in experimental hypertension	APVV-0742-10	34	21 220	Investigator / Ravingerová
	Alterations in cell metabolism associated with drug transporter P-glycoprotein overexpression in leukemia cells	APVV-0290-10	34	7 500	Investigator / Barančík
	Sex differences in etiopathogenesis of social stress-related cardiovascular and behavioral disorders in individuals with predisposition to hypertension	APVV-0523-10	34	37 453	Investigator / Okruhlicová
	The effect of lifestyle-related risk factors on the intrinsic defensive mechanisms in the myocardium	APVV SK-CZ-0199-11	24	3 992	Coordinator / Ravingerová
	Investigation of the cardioprotection from injury and malignant arrhythmias induced by altered thyroid statuses	APVV-SK-CZ-0027-11	24	4 000	Coordinator / Tribulová
2013	Study of regulation of radical and cellular signaling during hypertension and influence of novel therapies on this signaling	APVV-0348-12	48	51 543	Coordinator / Barančík
	Chemoenzymatic synthesis and evaluation of biological activities of natural glycophenols and their analogues	APVV-846-12	48	27 250	Investigator / Barančík
2014	Study of clinically applicable novel forms of preconditioning as an alternative method of cardiac protection against acute ischemia in the organism challenged with civilization diseases	APVV-SK-CZ-2013-075	24	3 900	Coordinator / Ravingerová
	Investigation of the cardioprotection against injury and malignant arrhythmias induced by altered thyroid status	APVV-SK-CZ-2013-0256	24	4 000	Coordinator / Tribulová
2015	Possible dual function of P-glycoprotein in leukemia cells: efflux pump and regulatory protein	APVV-14-0334	6	3 000	Investigator / Barančík

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	9	9	7	11
Funding in the year (EUR)	61 441	62 698	51 472	68 750 ¹

- **Summary of funding from external resources**

2.4.6. List of projects supported by EU Structural Funds

[1] **Title:** Completion of infrastructure for modern research of civilization diseases

Grant number: ITMS: 26230120006

Duration: 10/2015 – 12/2015

Total funding: 8 604 000.- Eur

Funding for the Organization (IHR SAS): 3 426 212.-Eur

Coordinator (principal investigator): Institute for Heart Research SAS

Responsible person in the Organization: M. Barančík

[2] **Type of project, grant agency:** EU Structural Funds, ASFEU

Title: Centre of Excellence for Glycomics

Grant number: ITMS: 26240120031

Duration: 09/2010 – 08/2013

Total funding: 3 977 975.- Eur

Funding for the Organization (IHR SAS): 147 818.-Eur

Coordinator (main partner principal investigator): Institute of Chemistry SAS

Responsible person in the Organization: M. Barančík – principal investigator at the IHR SAS

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	Centre of Excellence for Glycomics	ITMS: 26240120031	20	147 818	Investigator (partner) / Barančík
2013					
2014					
2015	Completion of infrastructure for modern research of civilization diseases	ITMS: 26230120006	3	3 426 212	Coordinator / Barančík

External resources	2012	2013	2014	2015	total	average
External resources (millions of EUR)	0,321	0,185	0,185	8,768	9,458	2,364
External resources transferred to cooperating research institute (millions of EUR)	0,014	0,021	0,033	5,210	5,278	1,319

- **Supplementary information and/or comments on research projects and funding sources**

Commission VEGA no. 9 for Medical Sciences and Pharmaceutical Sciences awarded for an excellent successfully completed project, the VEGA project No. 2/0054/11 (2011-2013), project leader: Dr. T. Ravingerová, titled: Modulatory effect of lifestyle-related risk factors on the mechanisms of subcellular adaptation to myocardial ischemia.

Commission VEGA no. 9 for Medical Sciences and Pharmaceutical Sciences awarded for an excellent successfully completed project, the VEGA project No. 2/0101/12 (2012-2014), project leader: Dr. M. Ferko, titled: The role of mitochondria in adaptation of cardiac energetics to various pathological stimuli and noxae: ischemia, diabetes, hypertension.

From four projects applied in 2015 in grant scheme „General Call 2015“ of the Slovak Research and Development Agency two projects were successful during the evaluation process and have a financial support from July 2016 (funding for the years 2016-2020 – 480 000 Eur).

The COST Action Proposal OC-2016-1-20721 "Realising the therapeutic potential of novel cardioprotective therapies" has been successfully submitted (T. Ravingerová).

2.5. PhD studies and educational activities

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

According to §102 SR number 131/2002 and after decision of Accreditation Commission Institute for Heart Research SAS has accreditation for the following programme of doctoral studies:

[1] Animal Physiology (4.2.10) – the accreditation has been valid since July 2008.

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	10			10			13			10		
PhD students	number	defended thesis	students quitted	number	defended thesis	students quitted	number	defended thesis	students quitted	number	defended thesis	students quitted
Internal	8,0	1,0	0,0	9,0	2,0	0,0	10,0	2,0	0,0	9,0	2,0	0,0
External	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Other supervised by the research employees of the institute	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0

International mobility of PhD students from IHR SAS:

- 2012: V. Farkašová (Ledvényiová) – study stay at Aristotle University of Thessaloniki, Thessaloniki, Greece
- 2012: T. Egan Benová - study stay at Institute of Physiology AS of the Czech Republic, Prague, CR
- 2013: C. Viczenczová - study stay at Institute of Physiology AS of the Czech Republic, Prague, CR
- 2014: V. Farkašová - study stay at Institute of Physiology AS of the Czech Republic, Prague, CR
- 2014: V. Farkašová - study stay at St. Boniface Research Centre, University of Manitoba, Winnipeg, Canada

Study stays of foreign PhD students at IHR SAS:

- 2013: Vinoth K. Khandelwal (India) – study stay at IHR SAS (realized through Slovak Academic Information Agency)
- 2014: Kiranj Chaudagar (LM College of Pharmacy, India) – study stay at IHR SAS (realized through Slovak Academic Information Agency)
- 2014: Vinoth K. Khandelwal (India) – study stay at IHR SAS (realized through Slovak Academic Information Agency)
- 2015: A. Chytilová (Institute of Physiology AS of the Czech Republic, Prague, CR) - study stay at IHR SAS
- 2015: J. Hrdlička (Institute of Physiology AS of the Czech Republic, Prague, CR) - study stay at IHR SAS

2.5.3. Summary table on educational activities

Teaching	2012	2013	2014	2015
Lectures (hours/year) ²	28	24	30	28
Practicum courses (hours/year) ²	284	243	264	304
Supervised bachelor theses (in total)	4	2	6	11
Supervised diploma theses (in total)	10	13	9	8
Supervised PhD theses (in total)	9	11	12	11
Members in PhD committees (in total)	4	5	4	4
Members in DrSc. committees (in total)	0	0	0	0
Members in university/faculty councils (in total)	1	1	1	0
Members in habilitation/inauguration committees (in total)	2	2	0	0

2

2.5.4. List of published university textbooks

Chapters in university textbooks:

SLEZÁK, Ján - JAVORKA, M. - JAVORKA, K. Fyziológia kardiovaskulárneho systému. In JAVORKA, K. Lekárska fyziológia. 4. prepr. a dopl. vyd. - Martin : Osveta, 2014, p. 123-224. ISBN 978-80-8063-407-0.

2.5.5. Number of published academic course books

2.5.6. List of joint research laboratories/facilities with universities

² Do not include time spent with bachelor, diploma or PhD students during their supervising

- [1] **Department, Faculty, University:** Department of Animal Physiology and Ethology, Faculty of Natural sciences, Comenius University, Bratislava
Kind of cooperation: realization of research projects (VEGA), training of pre-gradual and post-gradual students
Duration of cooperation: from 2007 – continues
- [2] **Department, Faculty, University:** Institute of Physiology, Faculty of Medicine, Comenius University, Bratislava
Kind of cooperation: joint research laboratory, realization of research projects (VEGA)
Duration of cooperation: from 1985 – continues
- [3] **Department, Faculty, University:** Laboratory of pharmaco-biochemistry, 3rd Internal Clinic of Faculty of Medicine, Comenius University, Bratislava
Kind of cooperation: realization of research projects (VEGA)
Duration of cooperation: from 2007 – continues
- [4] **Department, Faculty, University:** Institute of Anatomy, Faculty of Medicine, Comenius University, Bratislava
Kind of cooperation: realization of research projects (VEGA)
Duration of cooperation: from 2008 – continues
- [5] **Department, Faculty, University:** Institute of Pathological Anatomy, Faculty of Medicine, Comenius University, Bratislava
Kind of cooperation: realization of research projects (VEGA)
Duration of cooperation: 2007 – 2008
- [6] **Department, Faculty, University:** Department of Pharmacology and Toxicology, Faculty of Pharmacy, Comenius University, Bratislava
Kind of cooperation: realization of research projects (VEGA, APVV)
Duration of cooperation: from 2007 – continues
- [7] **Department, Faculty, University:** Department of Nuclear Physics and Biophysics, Faculty of Mathematics, Physics and Informatics, Comenius University, Bratislava
Kind of cooperation: realization of research projects (VEGA)
Duration of cooperation: from 2000 – continues

[8] **Department, Faculty, University:** Institute of Biochemistry and Microbiology, Faculty of Chemical and Food Technology, Slovak University of Technology, Bratislava

Kind of cooperation: pre-gradual training, realization of project of EU structural funds

Duration of cooperation: from 2013 – continues

[9] **University:** Slovak Medical University, Faculty of Medicine, Bratislava

Kind of cooperation: realization and preparation of research projects (VEGA, APVV), training of pre-gradual students, and cooperation within the Center of Electron Accelerators in Trencin

Duration of cooperation: from 2008 – continues

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

The IHR SAS is accredited for supervising of PhD students in the programme of doctoral studies “Animal Physiology”. During the assessed period, one PhD student from IHR SAS was funded from APVV-LPP project, other PhD students were supported by internal funding of SAS.

With respect to doctoral studies, two scientists of IHR SAS are in the position of DSc. (aged 65 and 54) and can guarantee PhD studies according to the legislative. Currently, there are two other scientists who fulfil the criteria required to achieve DSc. degree.

The research workers in category IIa and I can train PhD students. At the IHR SAS are at present six persons in category IIa. The number of such scientists can increase within 2-3 years by another four persons.

Scientists as well as PhD students from the Institute for Heart Research of SAS are involved in pre- and post-gradual training predominantly of the students of the Comenius University Bratislava, the Slovak University of Technology Bratislava, and Slovak Medical University Bratislava.

An important fact documenting the quality of pedagogical activities is that PhD students of IHR SAS successfully represent the Institution in both Slovakia and abroad. This is documented by numerous awards for their presentations at national and international conferences (in assessed period over 10 awards), by nomination to attend Basic Science Summer Schools organized by European Society of Cardiology as well as by travel grants awarded by international scientific organizations for the participation at the scientific meetings abroad.

2.6. Social impact

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

- [1] Results obtained in frames of cooperation with the National Institute of Cardiovascular Diseases, Bratislava

Principal investigator from IHR SAS: N. Tribulová

Main results: The intention of common NIAGARA II project is to reveal circulating biomarkers that may predict persistence and recurrence of the most frequent human arrhythmia, atrial fibrillation. Its incidence is rapidly growing with age and it represents a key risk factor for stroke. In the framework of collaboration blood sampling is realized of patients suffering from atrial fibrillation before as well as at early and late period after ablation of arrhythmogenic foci followed by normal rhythm restoration. Frozen blood plasma samples are stored in freezer until using for extracellular matrix and free fatty acids profiles analysis to explore whether changes in the level of these components could stratify individuals in risk. It is expected that new findings provide evidence that might be important for the prevention of stroke due to atrial fibrillation as well as better management of this most frequent arrhythmia in clinic.

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

- [1] Expertise for Cytopathos, s.r.o., Slovakia

L. Okruhlicová - 2013

- [2] Expertise for The Central Controlling and Testing Institute in Agriculture , Slovakia

L. Okruhlicová - 2013

- [3] Expertise for the Electrotechnical Research and Projecting Company, j.s.c. (EVPÚ, a.s.) Nová Dubnica, Slovakia - "Evaluation of medical devices and instruments from the point of medical criteria for certification"

J. Slezák – 2013, 2014, 2015

- [4] Expertise for the Slovak Academic Information Agency

M. Barteková – 2014

- [5] Expertise for the Slovak Medical University, Medical laboratories of clinical microbiology

L. Okruhlicová – 2015

- [6] Expertise for Scientific Grant Agency of the Slovak Academy of Sciences and the Ministry of Education

N. Tribulová - 2012, 2013, 2014, 2015

Accreditation (expertise assesment) of medical laboratories through the Slovak National Accreditation System confirms their independent formal recognition, attestation and

competence by the accreditation body to carry out the standard laboratory services at the highest degree of correctness and confidence. It is done according to the specific legislation (ISO/IEC 15182:2012) accepted in the Slovak Republic as well as abroad.

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

No contracts with industrial partners.

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

No licenses were sold in abroad and in Slovakia.

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

1. *Cooperation with National Institute of Cardiovascular Diseases, Bratislava (2012-2015).*

Guarantees of cooperation from IHR SAS: N. Tribulová, J. Styk, Ľ. Okruhlicová, J. Slezák,

Main topic: Study of circulating biomarkers that may predict persistence and recurrence of the most frequent human arrhythmia, atrial fibrillation.

2. *Cooperation with Cyclotron Center of the Slovak office of standards, metrology and testing, Central Military Hospital SNP Ružomberok (2012)*

Guarantee of cooperation from IHR SAS: J. Slezák

Main topic: Influence of proton ionizing radiation on cardiovascular system.

3. *Cooperation with National Institute for Oncology, Bratislava (2013-2015)*

Guarantee of cooperation from IHR SAS: J. Slezák

Main topic: Effect of ionizing radiation on cardiovascular system.

4. *Cooperation with Electrotechnical Research and Projecting Company, j.s.c. (EVPÚ, a.s.) Nová Dubnica (2013-2015)*

Guarantee of cooperation from IHR SAS: J. Slezák

Main topic: Influence of ionizing radiation on cardiovascular system – realization of common research project “Molecular hydrogen as a scavenger of hydroxyl and nitrosyl radicals”.

5. Membership in advisory bodies

Slovak National Accreditation Service

L. Okruhlicová - external member, expert for Medical laboratories (2012, 2013, 2014, 2015)

The Slovak National Accreditation Service is the sole national independent accreditation body confirmed by the Slovak Government to execute accreditation according to required professional standards in the Slovak Republic and abroad on the basis of Act. No.264/1999, §22 and Art 54 (1) of Commission Regulation (EU) No 600/2012.

Slovak Academic Information Agency

M. Barteková - member of selection committee (2012, 2013)

Ministry of Education, Science, Research and Sport of the Slovak Republic

J. Slezák – 7th Framework Programme of the EU - national delegate for HEALTH, Program Committee (2012, 2013)

– Expert group of Ministry for Biomedicine (2013, 2014, 2015)

Slovak Research and Development Agency

J. Slezák – member of the Council for Medical Sciences (2014, 2015)

6. Other activities with social impact

T. Ravingerová – participation in the educational lectures for broad population focused on the healthy lifestyle and prevention of cardiovascular diseases (2014, 2015). These activities are targeting, in particular, younger generation as well as elder population, who start to better understand the numerous risks of civilization diseases as well as an importance of preventive measures and support of healthy lifestyle.

J. Slezák – realization of popularisation articles in press media and popularisation lectures focused on the prevention of cardiovascular diseases (in frames of Slovak Heart to Heart League) at the occasion of the “World Heart Day” (2012-2015).

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

[1] Public popularization lectures:

2015

J. Styk – public popularisation lecture “ Heart and prevention of cardiovascular diseases”, at the “Open Door Day” organized on the occasion of the “Week of Science and Technique” at Institute for Heart Research SAS, 11.11.2015 and 12.11.2015, Bratislava

T. Ravingerová – public popularisation lecture „Influence of civilization diseases on the heart“ - Vedecká kaviareň Veda v Centre v budove CVTI SR (Coffee-shop „Science in the Center“ – house of Scientific and Technical Informations of SR), 2015, Bratislava

J. Slezák – public popularisation lecture on the occasion of the “World Day of the Heart” – 2015, Hotel Carlton, Bratislava

2014

J. Styk – public popularisation lecture “Function of the Heart”, at the “Open Door Day” organized on the occasion of the “Week of Science and Technique” at Institute for Heart Research SAS, 12.11.2014 and 13.11.2014, Bratislava

J. Slezák – public popularisation lecture on the occasion of the “World Day of the Heart” – 2014, Hotel Carlton, Bratislava

2013

J. Styk – public popularisation lecture “Heart and prevention of cardiovascular diseases”, at the “Open Door Day” organized on the occasion of the “Week of Science and Technique” at Institute for Heart Research SAS, 13.11.2013 and 14.11.2013, Bratislava

J. Slezák – public popularisation lecture on the occasion of the “World Day of the Heart” – 2013, Hotel Carlton, Bratislava

2012

J. Styk – public popularisation lecture “Heart and prevention of cardiovascular diseases”, at the “Open Door Day” organized on the occasion of the “Week of Science and Technique” at Institute for Heart Research SAS, 7.11.2012 and 8.11.2012, Bratislava

N. Tribulová — public popularisation lecture on the occasion of the Science Festival Researchers’ Night in Slovakia 2012, 28.9.2012, Avion Shopping Park, Bratislava

J. Slezák – public popularisation lecture on the occasion of the “World Day of the Heart” – 2012, Hotel Carlton, Bratislava

[2] *Articles in press:*

2015

M. Ferko – „Mladí vedci interaktívne“ – article in Quark (popularisation journal published monthly)

M. Ferko – „VII. ročník Interaktívnej Konferencie Mladých Vedcov pokračuje v znamení noviniek“ – popularisation article in ChemZi (journal of the Slovak Chemical Society)

T. Ravingerová - document „International Symposium Advances in Cardiovascular Research in Smolenice“ – published in CV Network 2015, Vol. 14, no. 4

2014

M. Ferko – „Vynovená interaktívna konferencia“ – article in Quark (popularisation journal published monthly), November 2014

J. Slezák – popularisation activities related to the foundation “Heart to Heart” – several popularization articles in press media

T. Ravingerová - article „Prepojenie základného výskumu s klinickou praxou“ („Interconnection of basic research with clinical practice“) - Správy SAV (Bulletin of SAS), 7-8, 2014, s. 7

T. Ravingerová - article „International Symposium: New Frontiers in Basic Cardiovascular Research 2014.“ – published in CV Network 2014, Vol. 13, No. 3, p. 6-7

[3] ***Popularization activities at the Institute, excursions:***

2015

“Open Door Day” organized on the occasion of the “Week of Science and Technique” at Institute for Heart Research SAS, 11.11.2015 and 12.11.2015 (collective participation of employees of the IHR SAS – M. Barančík, V. Farkašová, M. Ferko, K. Frimmel, M. Jašová, B. Kaločayová, I. Kancírová, J. Križák, L. Mézešová, B. Szeiffová Bačová, C. Viczenczová, T. Ravingerová, J. Styk, N. Vrbjar)

Presentation of the Institute for Heart Research SAS on the occasion of the 9th Science Festival European Researchers’ Night, 25.9.2015, Stará Tržnica, Bratislava (collective participation of employees of the IHR SAS – T. Egan Beňová, V. Farkašová, M. Ferko, M. Jašová, B. Kaločayová, I. Kancírová, J. Križák, L. Mézešová, B. Szeiffová Bačová, C. Viczenczová)

2014

“Open Door Day” organized on occasion of the “Week of Science and Technique” at Institute for Heart Research SAS, 12.11.2014 and 13.11.2014 (collective participation of employees of the IHR SAS - M. Barančík, M. Barteková, T. Beňová, V. Farkašová, M. Ferko, K. Frimmel, M. Jašová, B. Kaločayová, I. Kancírová, L. Mézešová, M. Muráriková, Ľ. Okruhlicová, C. Viczenczová, T. Ravingerová, J. Styk, N. Vrbjar, M. Zálešák)

2013

Open Door Day” organized on occasion of the “Week of Science and Technique” at Institute for Heart Research SAS, 13.11.2013 and 14.11.2013 (collective participation of employees of the IHR SAS – B. Bačová, M. Barančík, M. Barteková, T. Beňová, S. Čarnická, M. Ferko, K. Frimmel, B. Kaločayová, I. Kancírová, V. Ledvényiová, L. Mézešová, M. Muráriková, Ľ. Okruhlicová, C. Viczenczová, T. Ravingerová, J. Styk, N. Tribulová, N. Vrbjar, M. Zálešák)

2012

Open Door Day” organized on occasion of the “Week of Science and Technique” at Institute for Heart Research SAS, 7.11.2012 and 8.11.2012 (collective participation of employees of the IHR SAS – B. Bačová, M. Barančík, M. Barteková, T. Beňová, S. Čarnická, M. Ferko, K. Frimmel, V. Ledvényiová, L. Mézešová, Ľ. Okruhlicová, T. Ravingerová, J. Styk, N. Tribulová, J. Vlkočiová N. Vrbjar, M. Zálešák)

[4] ***Press conference:***

2015

J. Slezák – Organization of the Press Conference for cca 55 representants of media and public popularisation lecture on the occasion of the “World Day of the Heart” – 2015, Slovak Heart to Heart League - hotel Carlton, Bratislava

T. Ravingerová - press conference organized on the occasion of the presentation of the project Centre of Excellence NOREG – presentation of the results obtained at IHR SAS. Venue - Institute of Normal and Pathological Physiology SAS, Bratislava

2014

J. Slezák – Organization of the Press Conference for cca 50 representants of media and public popularisation lecture on the occasion of the “World Heart Day” – 2014, Hotel Carlton, Bratislava

2013

J. Slezák – press conference organized on the occasion of the “World Day of the Heart” – 19.09.2013, hotel Carlton, Bratislava

2012

J. Slezák – Organization of the Press Conference for cca representants of media and public popularisation lecture on the occasion of the “World Heart Day” – 2012, Hotel Carlton, Bratislava

[5] ***Appearances in telecommunication media:***

2014

M. Ferko – „Smart Campus – junge Unternehmer präsentierten sich in Bratislava, Interaktive Konferenz junger Wissenschaftler bietet Plattform für Informationsaustausch“ - radio station RTV: Hallo Freunde, Magazin über die Slowakei in deutscher Sprache, 2.6.2014

[6] ***Documents in telecommunication media and at web:***

2015

M. Ferko - „Noc výskumníkov 2015 predstavila „CESTU K SRDCU““ – document presented at web (press news)

T. Ravingerová - document „Bez základného výskumu je budúcnosť vedy nemysliteľná“ („The future of science is unbelievable without basic science“) presented at Vedecký kaleidoskop (Scientific kaleidoscope) - e-newspaper NC PVaT

2014

“Heart” - document presented on STV (Slovak Television), 1.9.2014 and 2.10.2014 (participation of J. Styk and J. Slezák)

M. Ferko - document „Vynovená interaktívna konferencia“ (“Renewed Interactive conference”)- <http://www.quark.sk/?p=3251>

T. Ravingerová - article „20th year of the meetings NEW FRONTIERS IN BASIC CARDIOVASCULAR RESEARCH“ - www.sav.sk, 4.8.2014

M. Ferko - „Interaktívna Konferencia Mladých Vedcov 2014“ (“Interactive conference of young scientists 2014” – document presented at web (press news)

2012

Ľ. Okruhlicová - document „Bienfaits des omegas-3 et des statines face aux maladies cardiovasculaires“ – bulletin-electronique.com, Ministere des Affaires etrangeres et europeennes, France, 3.7.2012

“Heart”, document presented on STV (Slovak Television), 17.5.2012 (participation of J. Styk and J. Slezák)

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	1	0	7	5	13
Appearances in telecommunication media popularising results of science, in particular those achieved by the Institute	1	0	3	0	4
Public popularisation lectures	4	3	3	4	14

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

At the IHR SAS, in 1992 the Slovak League for the prevention and treatment of cardiovascular diseases „Heart to Heart“ was founded (president in years 1992-2012 was Prof. Slezák). During the year 2012 changes in organisation structure of the League were realized and from this time were the activities covered by Slovak Society of Cardiology.

The Slovak League for the prevention and treatment of cardiovascular diseases „Heart to Heart“ participated very actively in educational and popularisation activities. During the assessed period, Prof. J. Slezák realized in frames of Slovak Heart to Heart League several popularisation articles in press media, popularisation lectures and discussions in TV and radio, and organised together with Sanofi press conferences at the occasion of the “World Heart Day”. The result of each of the existing ten press conferences (with an average attendance of about 50 representatives of various media (dailies, weeklies, monthlies, TV radio, etc.)) was according Sanofi monitor annually more than 100 different contributions in the media, prepared

by the participants of each press conference (as reactions to the popularisation lectures on selected health problems and healthy life topics presented at the press conference).

Ing. M. Ferko, PhD. participated during the assessed period as a member of organizing committee and president of conference „Interactive Conference of Young Scientists“. This conference was organized 1.3.-9.6.2012, 1.3.-9.6.2013, 1.3.-9.6.2014, and 1.3.-9.6.2015.

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	37,0	41,0	42,0	40,0
Research employees from Tab. Research staff	26,0	30,0	33,0	31,0
FTE from Tab. Research staff	17,700	19,310	19,350	20,700
Average age of research employees with university degree	43,7	41,8	42,0	41,1

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

FEMALE	AGE								
Number of	< 30	31 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	> 65
DrSc. / prof.	0	0	0	0	0	0	0	1	1
II.a / Assoc. prof.	0	1	0	1	0	0	1	0	0
Other researchers PhD./CSc.	1	1	3	1	0	0	0	0	0
doc. / Assoc. prof.	0	0	0	0	0	0	0	0	0

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

MALE	AGE								
Number of	< 30	31 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 - 59	60 - 64	> 65
DrSc. / prof.	0	0	0	0	0	1	0	0	1
II.a / Assoc. prof.	0	0	1	0	0	0	0	1	1
Other researchers PhD./CSc.	0	2	0	1	0	0	0	0	0
doc. / Assoc. prof.	0	0	0	0	0	0	0	0	0

2.8.2. Postdoctoral and mobility scheme

2.8.2.1. Postdoctoral positions supported by national and international resources

2.8.2.2. Postdoctoral positions supported by external funding

Postdoctoral positions were not supported by external funding during the assessment period.

2.8.2.3. SAS stipends and SASPRO stipends

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

Postdoctoral positions supported from the Slovak Academy of Sciences Supporting Fund of Stefan Schwarz:

RNDr. T. Egan Beňová, PhD. – received in **May 2015**, funded from **June 2015**

Mgr.V. Farkašová, PhD. – received in **November 2015**, funded from **January 2016**

2.8.3. Important research infrastructure (max. 2 pages)

In the year 2015, Institute for Heart Research SAS was a coordinator of the project of EU Structural Funds „Completion of infrastructure for modern research of civilization diseases“. Through realization of this project IHR SAS significantly improved or enriched its research infrastructure and now is equipped with modern technologies that enable to deal with progressive scientific tasks. Institute is equipped for studies in physiology, biochemistry, morphology, molecular biology, and proteomics. Innovation of the infrastructure significantly improves the quality of the research. Moreover, it offers wide spectrum of collaboration with another institutions of SAS as well as Slovak Universities. Equipment that was obtained in the frames on EU Structural Funds project is available for other institutions participating in this project, as well as for other institutions of SAS and Universities in Slovakia who collaborate with IHR SAS in the frames of national projects. The advanced infrastructure of IHR SAS is also an important factor facilitating development of joint projects with scientific institutions abroad as well as training of foreign students.

Important part of the research infrastructure of IHR SAS represents equipment for the physiological experiments. IHR SAS owns:

- complete setups for perfusion of isolated hearts of small experimental animals (rat, mouse) according to Langendorff - allows the computer-assisted characterization of basic parameters of heart function and arrhythmogenesis in normal and pathological conditions (ADInstruments).
- equipment for the „in vivo“ experiments (artificial ventilation, warming pad, ECG recorder, catheters for invasive monitoring of blood pressure) including cardiac surgery (chest opening and in vivo induction of myocardial infarction) (ADInstruments).

- Millar pressure-volume catheters - intracardial catheters for measurements of intracardial pressure, volume and their relationship (P-V loops) (Millar, USA)
- equipment for measurement of changes of monophasic action potential by means of endo- and epicardial MAP catheters (ADInstruments).
- blood gases analyzer for determination of basic parameters of blood gases, electrolytes and lactate in low volume samples (ABL80 - FLEX analyzer).
- non-invasive blood pressure and heart rate recorder (technique of tail-cuff plethysmography) for small experimental animals (rats) (ADInstruments)
- infusion pump for the application of active substances (Alavis)
- system for determination of distribution and localisation of substances "in vivo" in small experimental animals (Multispectral „in vivo“ imaging system FX Pro - Kodak)
- hypoxic chamber for „in vivo“ studies on small experimental animals (Coy 30 - Coy Lab Products).
- electrocardiographic and ultrasound device for small animals VIVID E9 PRO (GE Healthcare) for measurement of heart structure and function.

For morphological, histochemical, subcellular, and immunocytochemical analysis are available the following instruments:

- transmission electron microscope (Tesla)
- confocal microscope (Eclipse, Nikon)
- fluorescent microscope (Apotom.2, Zeiss)
- cryostats and ultramicrotomes

The instruments mentioned above allow to study the ultrastructure of heart tissue as well as to detect changes in distribution of examined proteins during physiological and pathophysiological conditions.

Departments of the Institute own also other equipment necessary for experimental biochemical and molecular biological laboratory work:

- pH-meters, balances, deep-freezers, homogenizers
- CentriVap DNA vacuum concentrator (Labconco)
- UV/VIS spectrophotometers and microliter spectrophotometer NanoVue Plus (GE Healthcare), ELISA reader
- centrifuges and ultracentrifuge Optima XPN-100 (Beckman)
- equipment for protein and nucleic acid electrophoresis separation
- equipment for electrotransfer and Western blot analysis
- Multiphor II electrophoresis system (2-DIGE, GE Healthcare)
- equipment for real time (qPCR) and RT-PCR, UV transilluminator.

For bio-imaging, Typhoon FLA 9500 (GE Healthcare), Amersham Imager 600 RGB, and Synergy H1 are available.

Important research infrastructure of IHR SAS represents also:

- nano-HPLC chromatograph (Bruker),

- Bruker's amaZon SL - Ion Trap mass spectrometer including an integrated bioinformatics platform for proteome analysis (Proteinscape)
- modular fluorescence spectrofluorometer FluoroLog®-3 (Horiba).

For long-term cell culture, Institute has cell culture laboratory equipped for cultivation of primary and stable cell lines (CO₂ incubators, laminar flow boxes). In addition, IHR SAS owns instruments for study of cells (cellular death) - inverted microscopes (Eclipse Ti-S, Nikon) and flow cytometer Guava easyCyte 8HT (Merck Millipore).

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

In previous assessment the IHR SAS was evaluated in „B“ category. Recommendations of Evaluation Panel:

1. Evaluation Panel recommended to publish in higher ranking journals and to focus on higher scientific quality in order to increase the citations per paper

During the present assessment period (2012-2015), 45 scientific papers were published in impacted journals registered in Current Contents, 6 scientific papers in other peer-reviewed journals with IF not registered in Current Contents, 3 scientific papers in foreign impacted journals registered in Web of Sciences or Scopus, 9 scientific papers in non-impacted journals registered in Web of Sciences or Scopus, and 15 scientific papers in domestic peer-reviewed proceedings, monographs. Other scientific outputs of the Institute for Heart Research include 3 edited proceedings from international scientific conferences, 2 scientific monographs published in Slovak publishing houses as well as 2 chapters written by research workers of the IHR SAS and published in monographs/books in Slovakia and 5 chapters published in monographs/books published abroad.

Among the impacted publications registered in Current Contents, Web of Sciences or Scopus were 18 with impact factor over 2.0 (37.5%) and 19 with impact factor in range 1.5-2.0 (39.6%).

In the previous assessed period 2007-2011 were 22.4% of papers published in journals with impact factor over 2.0 and 46.3 % in journals with impact factor in range 1.5-2.0. This documents that during the present assessment period (2012-2015) increased the ratio of papers published in higher ranking journals (with IF over 2.0)

During the present assessed period increased also the number of citations. The number of citations in WOS and SCOPUS databases was 978 (245 per year). In comparison, in the

previous assessed period 2006-2010 (five years) was the number of WOS and SCOPUS citations 745 (149 per year).

This increase in number of citations per year also clearly indicates that the quality of scientific paper published by the research workers from IHR SAS increases.

2. The Panel suggested several strategies to secure external funds, e.g.:

a) to extend and foster collaboration with the National Institute for Cardiovascular Diseases and National Institute for Endocrinology and Diabetes

b) to seek collaborations with the industry.

During the assessed period continued collaboration with the National Institute of Cardiovascular Diseases (realization of project NIAGARA II) but this cooperation was without direct external funds for the IHR SAS.

From 2013 is an intensive Cooperation with Electrotechnical Research and Projecting Company, j.s.c. (EVPÚ, a.s.). The cooperation with this partner was up to now without direct external funds for the IHR SAS. However, from July 2016 is realized common research project "Molecular hydrogen as a scavenger of hydroxyl and nitrosyl radicals" (coordinator Prof. Slezák from IHR SAS) with external funds obtained from the Slovak Research and Development Agency.

During the assessed period 2012-2015, research workers from the IHR SAS were active in efforts to obtain external resources from grants. This is documented by the fact, that they were principal investigators of three projects of the Slovak Research and Development Agency (APVV) "i) "The effect of the lifestyle-related risk factors on the adaptive processes in the ischemic myocardium", ii) "Proton radiation-induced cardiovascular toxicity - pathophysiology and prevention", and iii) "Study of regulation of radical and cellular signaling during hypertension and influence of novel therapies on this signaling".

Moreover, research workers from the IHR SAS acted as principal investigators of 15 projects of the Scientific Grant Agency of the Slovak Academy of Sciences and the Ministry of Education (VEGA grants). The scientists of IHR SAS actively participated (as coordinators at IHR SAS) in the realization of other five APVV projects and one project of Centre of excellence of SAS. Moreover IHR SAS was a coordinator of the project of EU Structural Funds „Completion of infrastructure for modern research of civilization diseases“ with total funding 8 604 000 Eur.

Research workers of the IHR SAS were trying to apply for international grant projects. However, the efforts to participate in large projects (such as 7th Framework Programme of the EU, COST), were without success during the present assessment period.

3. Comment of Evaluation Panel: Although there is a tradition of social economic output in the past (preconditioning), within the last period no specific clinical applications originated from the Institute.

During the assessed period was realized cooperation with the National Institute of Cardiovascular Diseases, Bratislava. In frames of common NIAGARA II project was goal to reveal circulating biomarkers that may predict persistence and recurrence of the most frequent human arrhythmia, atrial fibrillation. The project continues and the data originated from the IHR SAS have potential clinical applications.

4. Evaluation Panel recommended an improvement of institute infrastructure namely in molecular biology.

Due to realization of project of EU Structural Funds „Completion of infrastructure for modern research of civilization diseases“ IHR SAS significantly improved its research infrastructure in molecular biology, physiology, biochemistry, morphology, and proteomics.

Important research infrastructure of IHR SAS obtained during the assessed period 2012-2015:

- equipment for the „in vivo“ experiments (artificial ventilation, warming pad, ECG recorder, catheters for invasive monitoring of blood pressure) including cardiac surgery (chest opening and in vivo induction of myocardial infarction) (ADInstruments).
- equipment for measurement of changes of monophasic action potential by means of endo- and epicardial MAP catheters (ADInstruments).
- system for determination of distribution and localisation of substances “in vivo” in small experimental animals (Multispectral „in vivo“ imaging system FX Pro - Kodak)
- hypoxic chamber for „in vivo“ studies on small experimental animals (Coy Lab Products).
- electrocardiographic and ultrasound device for small animals VIVID E9 PRO (GE Healthcare)
- confocal microscope (Eclipse, Nikon)
- ultracentrifuge Optima XPN-100 (Beckman)
- Multiphor II electrophoresis system (2-DIGE, GE Healthcare)
- equipment for real time (qPCR)
- biomolecular imager Typhoon FLA 9500 (GE Healthcare)
- Amersham Imager 600 RGB
- nano-HPLC chromatograph (Bruker),
- Bruker's amaZon SL - Ion Trap mass spectrometer including an integrated bioinformatics platform for proteome analysis (Proteinscape)
- modular fluorescence spectrofluorometer FluoroLog®-3 (Horiba).
- flow cytometer Guava easyCyte 8HT (Merck Millipore).

5. The Panel recommended young promising investigators to become independent scientists.

The management of the institution motivated the young workers to extend their qualifications. From the last accreditation, four young workers obtained higher professional qualification degree IIa.

The incorporation of young scientists into research activities is documented by the fact that several young research workers were during assessed period principal investigators of grant projects. Dr. Szeiffová Bačová and Dr. Ferko are coordinators of projects of Scientific Grant Agency of the Slovak Academy of Sciences and the Ministry of Education (VEGA), Dr. Egan Beňová is principal investigator of Project of the Slovak Society of Cardiology, and Dr. Ferko is from July 2016 coordinator of project funded by the Slovak Research and Development Agency (APVV).

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

During the next years attention will be paid on the continuity of research programmes realized at the IHR SAS. From this point the obtaining of external financial and material resources will be of a high priority. In the year 2015, Institute for Heart Research SAS was a coordinator of the project of EU Structural Funds „Completion of infrastructure for modern research of civilization diseases“. Through realization of this project IHR SAS significantly improved or enriched its research infrastructure and now is equipped with modern technologies that enable to deal with progressive scientific tasks. Institute is equipped for studies in physiology, biochemistry, morphology, molecular biology, and proteomics. It will be necessary to continue in development of research infrastructure and laboratory equipment at the IHR SAS.

The Institute supports the workers in their efforts to extend their qualifications. The realization of positive trends of development of qualification structure is also important for the further development of programmes of PhD studies at the IHR SAS. The Institute has an eminent interest to extend the possibilities of education of PhD students and to increase the number of persons who can be guarantees of programmes of doctoral studies and supervisors of PhD students. The positive trends occurred already in the assessed period and it will be necessary to maintain the positive trends also in the next years. For the successful development of the Institute in the future will also be necessary to stabilize the research staff with suitable professional specialization and to increase the incorporation of young scientists into research activities and to prepare conditions for their participation in management structures of the Institute.

During the assessed period, there were not changes in composition of executive body of the IHR SAS. In November 2014 was realized the exchange at the position of the Head of the Scientific Board (Dr. Ravingerová was replaced by Dr. Ferko).

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 research activities of the IHR SAS are focused on elucidation of factors and mechanisms that participate in pathogenesis of cardiovascular diseases (CVD) as well as on possibilities of their prevention and novel approaches in the treatment. Ischemic heart disease and its most serious manifestations, such as myocardial infarction and sudden death due to malignant arrhythmias, represent a major cause of morbidity and mortality in a modern society. CVD belong to the most serious medical problems at present, and, therefore the research in the field of prevention and treatment of CVD is of high priority. Despite of progress in fighting CVD, there is still a need to reveal novel therapeutic targets and to explore the heart's natural attempt to save itself by activation of fundamental endogenous molecules. Further task is to enrich evidence supporting dietary (alone and/or with drug combination) for more efficient and reliable primary and secondary prevention.

Lifestyle associated risk factors including high blood pressure, obesity, hyperglycemia, dyslipidemia and smoking induce heart and coronary artery diseases. Pro-oxidative and anti-oxidative imbalance in the organisms is a common feature of all risk factors of CVD. Excessive production of reactive oxygen species along with cytosolic calcium overload is deleterious to the heart under conditions of acute or chronic ischemia. It can facilitate occurrence of malignant arrhythmias and heart failure.

On the other hand, oxidative stress and some others stressful factors can induce compensatory and adaptive processes in the heart resulting in increase of ischemic tolerance. The adaptative processes involve activation of post-receptor signaling with important role of protein kinase cascades such as PI3K/Akt. Moreover, the links between protein kinase signaling, the remodeling of extracellular matrix and modulation of proteins involved in regulation of apoptosis which are all influenced by ischemia and other pathological stressful conditions have been found.

Mitochondria seem to play an important role in cardioprotective and adaptive signaling. In pathophysiological conditions, cardiac mitochondria exhibit numerous changes in structure, biophysical and biochemical properties of membranes as well as in activities of their membrane-bound functional systems with possible outcome into perturbations in cellular energetic and intracellular homeostasis of Ca^{2+} ions. Mitochondria are suggested to be the target organelle most severely attacked by the lack of oxygen (ischemia, hypoxia or pseudo-hypoxia in diabetes).

Despite recent advances in pharmacotherapy, invasive cardiology and surgery, cardiac protection against ischemic injury, particularly associated with metabolic disorders caused by atherosclerosis, diabetes, etc., still remains the greatest challenge for experimental as well as

clinical cardiologists. Therefore, research in the field of alternative strategies that can lead to the development of novel therapeutic principles is urgently needed.

Myocardial remodeling (MR) such as hypertrophy and fibrosis is one of the main responses of the heart to pathophysiological conditions (hypertension, diabetes, ischemia). It involves changes in distribution of subcellular organelles, cardiomyocytes, extracellular matrix, and cardiac cell-to-cell contacts. MR due to systemic disease (hypertension, dyslipidemia, diabetes, hyperthyroidism) or due to acute myocardial infarction contributes to cardiac dysfunction and occurrence of life-threatening arrhythmias. Disorders in intracellular calcium handling and intercellular electrical coupling and communication *via* connexin (Cx) channels promote contractile dysfunction and occurrence of malignant arrhythmias. In turn, up-regulation of Cx expression and protection of Cx channel function can be a promising way of how to prevent heart failure (HF) and sudden arrhythmic death.

In vascular tissues, Cx channels mediate communication between endothelial cells, as well as between endothelial and smooth muscle cells. They may coordinate the vascular responses and vasomotor tone in arteries and can also mediate other endothelial activities (angiogenesis, cell regeneration). Taking into account the crucial role of intercellular communication in vascular tissues, there is a permanent need to continue the search for communication abnormalities due to various pathophysiological events, as well as to examine effects of diet-based therapy and cardioprotective drugs on vascular intercellular communication.

Endothelial cells are very sensitive to radiation injury. Irradiation of mediastinal area by ionizing radiation will hit the heart and blood vessels with a high probability. Over time it leads to a decreased number of capillaries in the myocardium, insufficient perfusion, chronic ischemic injury and heart failure. Negative effects of ionizing radiation are mediated mostly by nitrogen and oxygen free radicals. Up till now several ways to prevent damage caused by irradiation were tested, however, the ultimate effect is obscure. Preventive measures and protection of normal tissue against radiation damage can greatly enhance the therapeutic potential of radiation. It is necessary to seek for detailed mechanisms of radiation effects on the cardiovascular system, with the ultimate aim of potential sites for reliable prevention.

Various CVD are often accompanied by disturbances of intracellular homeostasis of sodium and potassium ions. One of the main systems contributing to maintenance of intracellular balance of Na^+ and K^+ is the enzyme Na,K-ATPase. By maintaining the gradient of Na^+ , the enzyme regulates the reactivity of the vascular smooth muscle as well as the contractility of the heart. Therefore, deterioration of Na,K-ATPase function is critical during hypertension as well as diabetes, and may result in HF. Alterations of the cardiac Na,K-ATPase contribute directly or indirectly to arrhythmogenesis and to the heart failure.

The privilege of the Institute for Heart Research as unique Slovak research institution is to study the key aspects involved in development of cardiovascular diseases and heart dysfunction that consequently may reveal novel tools and strategies for cardiovascular protection.

The Institute is recognized at both national and international level and plays an important role in the research related to the mechanisms of cardiac adaptation. Significant role of the IHR SAS in these research activities is documented by the intensive scientific collaboration with several research institutions in Slovakia and abroad. Significant role of the IHR SAS in cardiovascular research is documented by an important national and international position of research teams of the Institute in the research focused on i) elucidation of molecular mechanisms of endogenous cardioprotection and cardiac adaptation, ii) study of the role of gap junction connexin channels in arrhythmogenesis or pathogenesis resulting in heart failure.

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

Objectives of the Concept

Main research strategy is further development of the Institute for Heart Research SAS as a modern scientific institution focused on research in the field of cardiovascular diseases. The research projects are oriented on elucidation of factors and mechanisms that participate in pathogenesis of heart and vessels in different acute and chronic experimental settings mimicking human conditions. Emphasis will be placed on further exploration of protective approaches including adaptation of cardiovascular system to acute and chronic pathological conditions. The main goal of research is to expand the knowledge and understanding of regulatory mechanisms of heart function affected by main civilization diseases (myocardial ischemia, hypoxia, hypertension, diabetes mellitus, inflammation, dyslipidemia, and heart injury caused by ionizing radiation). To carry out this research will require multidisciplinary approaches provided by currently existing research groups of the IHR SAS and their support and development. The scientific teams of the Institute will contribute to the understanding of molecular mechanisms of the ischemic deterioration of myocardium and development of heart failure, as well as to mechanisms of cardiac adaptation to various ailments. They will be also involved in solving tasks related to maintenance of healthy lifestyle and prevention of life-threatening cardiovascular diseases.

Elucidation of molecular mechanisms of pathophysiological states could provide an effective tool for the development of potential therapeutic targets. Although the research carried out at the IHR SAS belongs mainly to basic research, it has an ambition of translation into clinical practice in the long-term.

Proposed research strategies and methods to be applied

The research will be carried out on molecular and cellular level, as well as on the levels of the organ and of the integrated organism. Various chronic and acute experimental animal models will be used: hypertension, hypertriglyceridemia, altered thyroid status, aging, ischemia, diabetes mellitus, inflammation, and exposure to ionising radiation

With respect to the methodological and personal potential, the IHR SAS is an institution with multidisciplinary character. For understanding of processes on molecular and subcellular levels,

techniques employing physiological, biochemical, molecular biological, histochemical, and morphological approaches will be used. Due to realization of the project of EU Structural Funds „Completion of infrastructure for modern research of civilization diseases“ IHR SAS significantly improved and enriched its research infrastructure and now is equipped with modern technologies to deal with important scientific tasks. Institute is equipped for the studies in the fields of physiology, biochemistry, morphology, molecular biology, and proteomics. Current technical and methodological equipment of the Institute allows conducting research on contemporary world level. In the near future it is expected to expand the number of highly qualified scientists, allowing to solve multidisciplinary research problems at the highest state of the art.

Management of the Institute realizes the need of concentrated research and development provided by larger compact scientific centers within the Slovak Academy of Sciences and plans to create, together with partner Institutes (Institute of Experimental Pharmacology and Toxicology SAS and Institute of Normal and Pathological Physiology SAS), a center focused on research of lifestyle-related diseases (see Memorandum of Understanding).

.....
Memorandum of Understanding

The Institute for Heart Research (hereafter IHR), the Institute of Experimental Pharmacology and Toxicology (hereafter IEPT), and the Institute of Normal and Pathological Physiology (hereafter INPP) 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 (hereafter SAS) decided to sign the Memorandum.

- 1. After the anticipated transformation of SAS into public research institutions, stabilization of the individual institutes within the new legislature, and assessment of the functioning of the already existing "pilot" scientific centers of SAS, the following institutes, i.e. IHR, IEPT, and INPP, express their willingness to be integrated in a compact unit.*
- 2. In the event of a consensus, the institutes will create a scientific Center of SAS focused on research of lifestyle diseases. This Center will deal with integrated research of causes, mechanisms of development, and possibilities to prevent and treat socially significant lifestyle diseases, with emphasis on diseases of the cardiovascular and nervous system, metabolic disorders, as well as diseases that originate in the prenatal and early postnatal period of development. Research will be carried on in silico, in vitro, ex vivo and in vivo with the aim to transfer the acquired knowledge into clinical practice. An integral part of the scientific efforts of the Center will be the assessment of effects of natural compounds and their derivatives and of original synthetic substances with pharmacotherapeutic potential using animal models of human diseases, as well as the study of adverse side and toxic effects of the substances tested.*
- 3. The process of integration and functioning of the future Center will be a subject of further negotiations after general agreement of the institutes willing to create the Center has been reached.*
- 4. Signing of the Memorandum does not bind any institution to join the planned center.*

.....
Institute will develop maximal efforts to obtain international projects within European grant schemes (Horizon 2020, COST) and to be successful in getting financial support from Structural Funds of European Union, preferably to get finances for research activities realized on research infrastructure obtained from previous EU Structural Funds project.

The IHR SAS will extend collaboration and exchange programs with scientific institutions in Slovakia and abroad (European Research Area, Canada, USA, Japan, Argentina).

We will make effort to extend and foster the collaboration with National Institute of Cardiovascular Diseases, and other research clinical departments, universities, research medical and technical institutions.

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

4. Other information relevant for the assessment