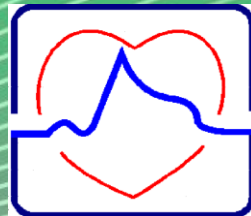


Institute for Heart Research Slovak Academy of Sciences

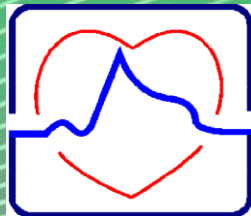
2011-2014 partner organization in

**„Centre of excellence of SAS for Research of regulatory
role of nitric oxide in civilization diseases“**

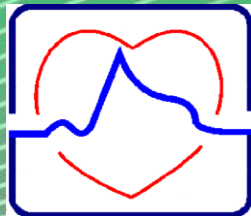


The main interest of the IHR SAS

- basic research in the area of cardiovascular diseases
- elucidation of mechanisms that participate in disorders of the heart and vessels in different acute and chronic pathological conditions

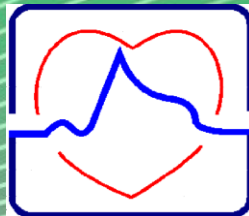


- myocardial ischemia
- hypoxia
- hypertension
- diabetes mellitus
- dyslipidemia
- inflammation
- altered thyroid status
- ionizing radiation



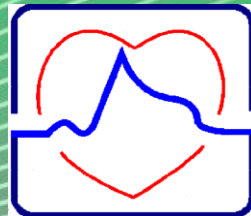
The research activities are focused on the **ischemic heart and adaptation**

- prevention and protection against ischemic and reperfusion myocardial injury, arrhythmias and sudden death
- molecular mechanisms of endogenous cardioprotection
- risk factors of cardiovascular diseases related to lifestyle and gender
- novel principles of cardioprotection utilizing selected drugs
- prevention of cardiovascular diseases using natural as well as endogenous compounds

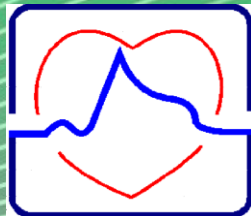


Within this scope was studied on the molecular level

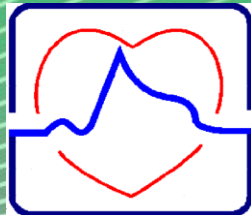
- role of **intracellular** (protein kinases, transcription factors) and **intercellular signaling** (connexin channels)
- **remodelation** of myocardium (matrix metalloproteinases)
- function of **membrane transport systems** (Na,K-ATPase)
- function and signaling role of **mitochondria**
- **substrate and energetic metabolism** in the myocardium
- subcellular detection of **cardiovascular alterations**



- Department of Cardiac Physiology and Pathophysiology
- Department of Biochemistry
- Department of Histochemistry and Electron Microscopy
- Laboratory of Protein Chemistry
(in May 2016 included into Department of Biochemistry)

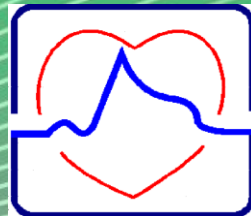


Results of the research activities



Cellular mechanisms involved in ischemic and reperfusion myocardial injury and arrhythmogenesis

- enhanced arrhythmogenesis and contractile dysfunction in postischemic myocardium are related to:
 - activation of **calcium transport systems** ($\text{Na}^+/\text{Ca}^{2+}$ exchanger, Ca^{2+} /calmodulin-dependent protein kinase II)
 - increased production of **free radicals**
 - dysregulation of nuclear **receptors PPAR** (energy production and lipid metabolism)
 - abnormalities in intercellular communication (**connexin channels**)



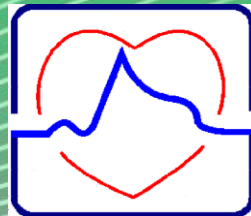
The presence of comorbidities related to lifestyle (hypertension, diabetes, hypercholesterolemia):

- has negative impact on the cardiac response to ischemia
- attenuate endogenous protective mechanisms of the heart
- has negative influence on the mitochondrial function and activity $\text{Na}^+, \text{K}^+ \text{-ATPase}$



Molecular mechanisms of endogenous cardioprotection involve:

- moderately increased production of ROS as a „trigger“
- increased fluidization of the mitochondrial membranes
- activation of the enzyme system of PI3K/Akt
- activation of transcription factors - nuclear receptor PPAR-alpha
- cell-to-cell communication mediated by Cx43 channels



The effect of ionizing radiation on the cardiovascular system

- 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
 - selected indicators (**ultrastructure of endothelial cells, responses to ischemia/reperfusion**)
- Aspirin, Atorvastatin, Sildenafil and Enbrel showed some protection against the negative impact of radiation on healthy tissue as demonstrated by changes in **miRNA, IL-10** and **TNF- α** values



Scientific publications in period 2012-2015

RESEARCH PAPERS

- **57** in journals indexed in **WOS database**
(the average number per year was 14.3)
- **12** in journals indexed in **other databases**

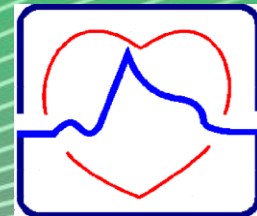
SCIENTIFIC MONOGRAPHS AND PROCEEDINGS

- **2** published in **Slovakia**

CHAPTERS IN BOOKS

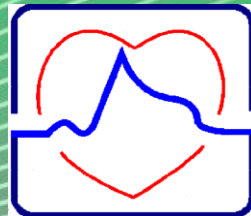
- **2** published in **Slovakia**
- **5** published **abroad**

Papers published by approximately 16 scientists with PhD, DSc. and with participation of PhD. students.

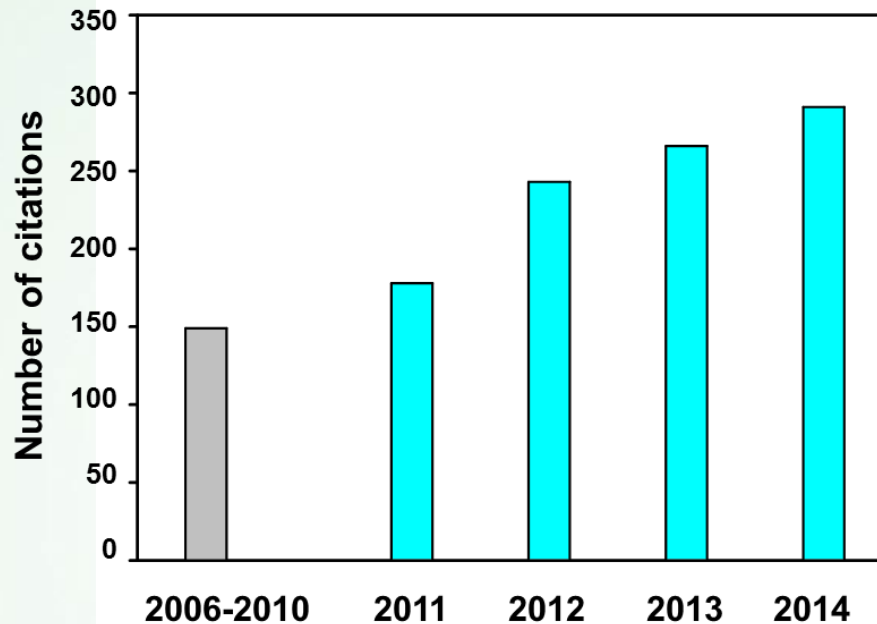


57 WOS publications published in period 2012-2015

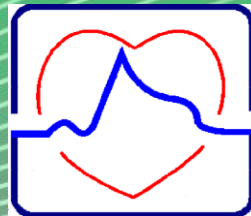
- 31.5 % impact factor over 2.0 (range 2.033 - 3.806)
- 33.3 % impact factor in range 1.5 - 2.0
- medium IF of top 20 papers → **2.38**
- median IF in Subject categories:
 - Medicine, Research and Experimental → **2.349**
 - Physiology → **2.186**
 - Biochemistry and Molecular Biology → **2.670**
 - Cardiac and Cardiovascular Systems → **2.186**



Citations (without autocitations)



- **period 2011-2014:** citations in WOS and SCOPUS databases – **978**
245 per year
- **period 2006-2010** (the previous assessed period) citations – **745**
149 per year



Increase in number of citations



indicator of increased quality of scientific paper published by the research workers from IHR SAS

Eight researchers from the IHR SAS had in the assessed period (2011 – 2014) more than 100 citations

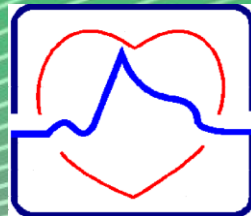
(Styk, Barančík, Okruhlicová, Ravingerová, Slezák, Tribulová, Ziegelhöffner, Pancza)



Projects

Research workers from the IHR SAS during the assessed period (2012-2015) 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**)
- **8 projects** of the Slovak Research and Development Agency (**SRDA - APVV**)
 - 3 projects in grant scheme „General Call“
 - 1 project in grant scheme „Program for Human Potential Support“ (2012)
 - 4 projects in grant scheme „Bilateral cooperation“
- **2 projects** of Slovak Society of Cardiology
- **1 project** of EU Structural Funds



Projects 2012-2015

	VEGA	SRDA (APVV)	SRDA (partner)
number of projects	15	8	8
total funding (EUR)	244 361	469 515	126 423

Total resources from VEGA and SRDA \approx 840 300 EUR

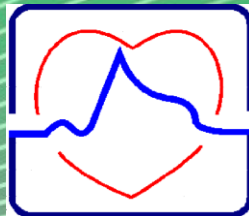
\approx 40% of total institutional budget (with salaries)

\approx 500 % of budget without salaries

Project of EU Structural Funds

Total funding: 8 604 000 EUR

IHR SAS: 3 426 212 EUR

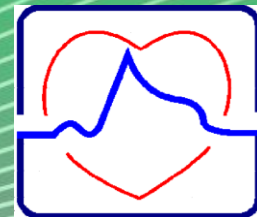


New projects

From 4 projects applied in 2015 in grant scheme „General Call 2015“ of SRDA (APVV) **2 projects** were succesfull during the evaluation process and have a financial support from July 2016.

Funding for the years 2016 – 2020

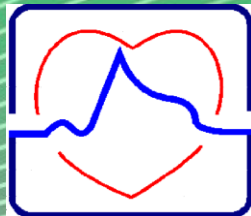
480 000 EUR



Scientific collaboration with research teams from other scientific Institutions in Slovakia

Slovak Academy of Sciences

- Institute of Normal and Pathological Physiology SAS
- Institute of Molecular Physiology and Genetics SAS
- Institute of Experimental Endocrinology SAS
- Institute of Chemistry SAS
- Institute of Experimental Pharmacology & Toxicology SAS



Scientific collaboration with research teams from other scientific Institutions in Slovakia

Universities

Comenius University, Bratislava

- Faculty of Natural Sciences,
- Faculty of Medicine
- Faculty of Pharmacy
- Faculty of Mathematics, Physics and Informatics

Slovak University of Technology, Bratislava

Slovak Medical University

- Faculty of Medicine



International scientific cooperation with

- **scientific Institutions within the European Research Area**

- Institute of Physiology, Academy of Sciences of the Czech Republic, **Czech Republic**
- Max-Delbrück Center Berlin, **Germany**
- Bogomoletz Institute of Physiology, **Ukraine**
- Aristotle University of Thessaloniki, **Greece**
- Semmelweis University Budapest, **Hungary**

- **other scientific Institutions**

- St. Boniface General Hospital Research Centre, Manitoba, **Canada**
- Universidad Nacional de Cuyo, **Argentina**
- Fukuoka University and Jikei University, Tokyo, **Japan**
- Cape Peninsula University of Technology, Bellville, **South Africa**

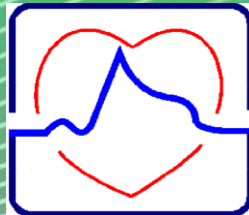


Organisation of PhD studies

The IHR SAS is accredited for supervising of PhD students in the programme of doctoral studies “Animal Physiology” (4.2.10). The accreditation has been valid since July 2008.

PhD students

	internal	defended theses	employed at the IHR SAS
2012 -	8	1	1
2013 -	9	2	1
2014 -	10	2	2
2015 -	9	2	2



Dr. Szeiffová Bačová – defended PhD thesis in 2013

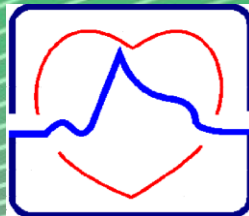
- **principal investigator of Project** of Scientific Grant Agency of the Slovak Academy of Sciences and the Ministry of Education (VEGA)
- in 2013 received **award**: „Memory letter of the Ministry of Education, Science, Research and Sport of the Slovak Republic for young research workers under 35 years.“

Dr. Egan Beňová – defended PhD thesis in 2014

- since June 2015 has Postdoctoral position supported from the **SAS Supporting Fund of Stefan Schwarz**
- **principal investigator of Project** of the Slovak Society of Cardiology

Dr. Farkašová – defended PhD thesis in 2015

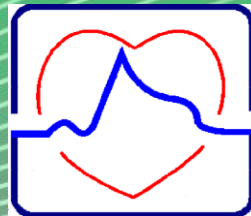
- since January 2016 has Postdoctoral position supported from the **SAS Supporting Fund of Stefan Schwarz**



Other educational activities

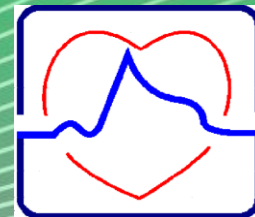
	2012	2013	2014	2015	total
Lectures (hours)	28	24	30	28	110
Practicum courses (hours)	284	243	264	304	1095
<u>Supervised</u>					
Diploma thesis	10	13	9	8	36
Bachelor thesis	4	2	6	11	23

These educational activities were realized with students of the **Comenius University**, **Slovak Medical University** and of the **Slovak Technical University**.



Popularization activities

	2012	2013	2014	2015	
Public popularization lectures	4	3	3	4	14
Activities at the IHR SAS	2	2	2	3	9
Press conferences	1	1	1	2	5
<i>Telecommunication media</i>					
Appearances	-	-	1	-	1
Documents	2	-	5	2	9



“Open Door Day” organized on occasion of the “Week of Science and Technique”
2012-2015

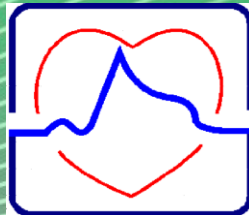
Presentation of the Institute for Heart Research SAS on the occasion of the Science Festival European Researchers’ Night, 2015



Informations documenting international and national status of the IHR SAS

Scientists of the IHR SAS have been invited to national and international conferences to present their lectures.

- **Invited/keynote presentations** - **29**
 - at international conferences – 27 lectures
 - at national conferences – 2 lectures
- **Members of the organizing and/or programme committees for national and international conferences**
 - international conferences – 26 scientists
 - national conferences – 4 scientists



International travel grants

young scientific workers or PhD students

Travel grant awards from International Society for Heart Research (ISHR)

- participation at the ISHR meeting, Beograd, Serbia, 2012 – **S. Čarnická**
- participation at the ISHR World Congress, San Diego, USA, 2013 – **S. Čarnická, M. Ferko, M. Muráriková**

Travel grant from the International Academy of Cardiovascular Sciences

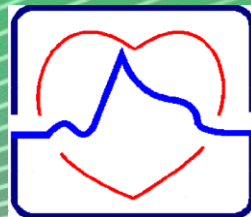
- participation at the conference „2nd Cardiovascular Forum for Promoting Centres of Excellence and Young Investigators, Winnipeg, Canada, 2014 - **V. Farkašová**

Travel grant award from European Society of Hypertension

- participation at conference „Frontiers in Cardiovascular Biology", Barcelona, Spain, 2014 – **B. Szeiffová Bačová**
- participation at conference "ESH-ISH Hypertension, Athen, Greece, 2014 - **C. Viczenczová**

European Society of Cardiology (ESC)

- award to attend "ESC Basic Science Summer School 2015", Sophia-Antipolis, France, 2015, **C. Viczenczová, T. Egan Beňová**



Awards and distinctions at international conferences

young scientific workers or PhD students

Symposium „Advances in Cardiovascular Research. From bench to bedside“, 2013

- 1st place in a poster competition - **S. Čarnická**
- award in the poster competition - **V. Ledvényiová, C. Viczenczová**

European Section Meeting of the International Academy of Cardiovascular Sciences, 2014

- 3rd Prize in „Erzsébet Röth Poster Award Competition,, - **V. Farkašová**

International conference "New Frontiers in Cardiovascular Research“, 2014.

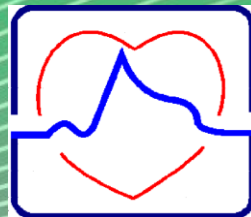
- best poster award - **M. Zálešák**

11th Annual Congress of the European Cardiac Arrhythmia Society, 2015

- best poster award - **T. Egan-Beňová**

International symposium „Advances in Cardiovascular Research“, 2015

- „Pavel Braveny Poster Competition Award“ of the European Section of International Academy of Cardiovascular Sciences –
C. Viczenczová, M. Jašová, J. Križák

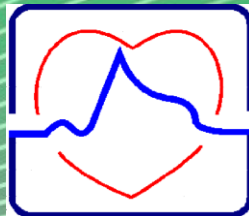


International conferences organized by the IHR SAS – 3

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

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

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



Application of results

Cooperation with *National Institute of Cardiovascular Diseases, Bratislava*

Topic:

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

Cooperation with *National Institute for Oncology, Bratislava*

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

Topic:

Influence of proton ionizing radiation on cardiovascular system.

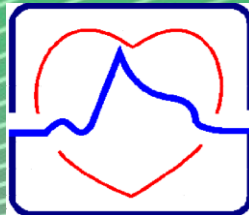


Future perspectives of the Institute

Institute will develop maximal efforts to be successful in getting financial support from grant schemes.

The IHR SAS will extend collaboration and exchange programs with scientific institutions in Slovakia and abroad.

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.



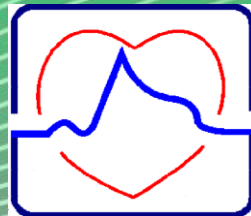
The Institute is recognized at both national and international level and plays an important role in the research related to the mechanisms of cardiac adaptation.

It is a need of concentrated research and development provided by **larger compact scientific centers** within the Slovak Academy of Sciences.

IHR SAS signed „Memorandum of Understanding“ with Institute of Experimental Pharmacology and Toxicology SAS and Institute of Normal and Pathological Physiology SAS:

- creation of center focused on research of **lifestyle-related diseases**
- concentration of multidisciplinary and interdisciplinary research in the field of **medical and life sciences**

Anticipated transformation of SAS into public research institutions.



Thank you for your attention

