

Summary of the main activities of a scientific Organisation of the Slovak Academy of Sciences

Period: January 1, 2003 - December 31, 2006

I. Formal information on the assessed Organisation:

1. Legal name and address

**Institute of Normal and Pathological Physiology, SAS,
Sienkiewiczova 1, 813 71 Bratislava, Slovak Republic**

2. Executive body of the Organisation and its composition

Directoriat	name	age	years in the position
director	Jagla Fedor, MD, CSc.	61	1999 -
deputy director	Szathmáry Vavrinec, RNDr, CSc.	66	1999 -
scientific secretary	Pecháňová Oľga, RNDr., DSc.	44	1997 -

3. Head of the Scientific Board

Hlavačka František, Dipl.Ing, CSc.

4. Basic information about the research personnel

- i. Number of employees with a university degree (PhD students excluded) engaged in research and development and their full time equivalent work capacity (FTE) in 2003, 2004, 2005, 2006 and average number during the assessment period
- ii. Organisation units/departments and their FTE employees with the university degree engaged in research and development

Research staff	2003		2004		2005		2006		average	
	No.	FTE	No.	FTE	No.	FTE	No.	FTE	No.	FTE
organisation in whole	17,9	35,9	19,9	37,8	20,3	38,7	19,6	37,6	19,425	37,5
Dept. of Cardiovascular Physiology	6,50	13	7,1	14,2	8	16	8	16	7,4	14,8
Dept. of Human Cardiovascular Physiology	3,9	7,8	3,9	7,8	3,45	6,9	3	6	3,5625	7,125
Dept. of Neurophysiology	2	4,1	2,6	3,6	2,6	3,6	2,6	3,6	2,45	3,725
Dept. of Biocybernetics	3	6	3	6	3	6	3	6	3	6
Dept. of Brain Physiology	2,5	5	3,1	6,2	3,1	6,2	3	6	2,925	5,85
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5. Basic information on the funding

- i. Total salary budget¹ of the Organisation allocated from the institutional resources of the Slovak Academy of Sciences (SAS) in 2003, 2004, 2005, 2006, and average amount for the assessment period

Salary budget	2003	2004	2005	2006	average
total salary budget (millions of SKK)	8,169	8,216	8,536	8,828	8,437

6. URL of the Organisation's web site

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

¹ Sum of the brutto salaries without the fund contributions.

II. General information on the research and development activity of the Organisation:

1. Mission Statement of the Organisation as presented in its Foundation Charter

The mission of the Institute of Normal and Pathological Physiology SAS is the basic research in the field of the cardiovascular physiology and neurophysiology under the normal and pathologic conditions.

The research in the field of the cardiovascular physiology concerns the study of the physiological, pharmacological, morphological and molecular mechanisms regulating the blood pressure and vascular lumen; computer simulation of the excitation propagation within the heart ventricles; the evaluation of the electric heart field changes in relation to the vectorcardiographic diagnostic; the developmental aspects of the blood pressure, heart rate and vasomotor activity also in relation to pathological changes of the above functions.

The neurophysiological research is concentrated on the study of the neuronal mechanisms of the motor control and sensory control in human upright posture regulations; on the visual and somatosensory information processing; the study of chemical changes in the extracellular space of the brain and their influence upon the neuronal activity and the study of the general mechanisms of coding information within the nervous system by means of the neuronal network simulations.

2. Summary of R&D activity pursued by the Organisation during the assessed period, from both national and international aspects and its incorporation in the European Research Area (max. 10 pages)

As stated above, the mission of the Institute of Normal and Pathological Physiology of the Slovak Academy of Sciences is to obtain new knowledge concerning the systemic and integrative experimental and human physiology of the cardiovascular and nervous systems under the normal and pathological conditions. Cardiovascular diseases (CVD) and mental ill health are the diseases which put the greatest sickness burden on European workers, economies and social security systems. Cardiovascular disease is the main cause of death in the European Union accounting for over 1.9 million deaths each year. Mental ill health is experienced by more than 27% of the adult EU population during any given year. This means that nearly 83 million people suffer from mental disorders every year. Almost every second person in the EU has been affected by mental disorders at some point in his or her lifetime. Finally, it is well known that mental disorders can be risk factors for CVDs and that CVDs increase the risk of mental disorders. According to various sources the situation in the Slovak

republic is even worse. From this point of view the mission of the Institute is actual and demanding as well.

The field of the cardiovascular physiology:

Hypertension is estimated to account for 6% of deaths worldwide and it is the most common risk factor for CVD. Thus, hypertension remains one of the leading causes of morbidity and mortality in the most countries, Slovak Republic including. Since many hypertensive patients suffer from concomitant diseases or conditions associated with high blood pressure, the new guidelines issued by the “*Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7)*” emphasize that blood pressure control is essential to reducing morbidity and mortality. Additionally, guidelines issued by the “*World Health Organization-International Society of Hypertension (WHO-ISH)*” and the “*American Diabetes Association (ADA)*” emphasize the critical need for lowering blood pressure levels. Complex analysis is required to pick the initial and additional antihypertensive agents that are simultaneously beneficial in the management of hypertension and associated diseases. Much data have been now accumulated on the safety and value of diuretics, beta blockers, calcium-channel blockers, angiotensin-converting enzyme inhibitors, and angiotensin receptor blockers in reducing blood pressure and preventing diseases.

While studying the effects of different antihypertensives, it seems to be substantially important to analyse their interference with the L-arginine – nitric oxide pathway, renin-angiotensin-aldosterone system, sympathetic nervous system and oxidative status. The modulation of these systems may reduce left ventricular hypertrophy, myocardial fibrosis and renal damage. Therefore the complementation of clinical studies with basic experimental investigations is crucially important for the complex analysis of antihypertensive agents. Experimental models of diseases belong to the useful tools for investigation of the pathophysiology of diseases as well as the mechanisms of therapeutic action. Experimental studies of hypertensive disease are performed in rat models. The most frequently used models are spontaneous hypertension and nitric oxide deficient hypertension which are considered to be the most appropriate animal models of essential hypertension. They are widely accepted in medical research because of the features they share with human hypertension.

Since discovery of nitric oxide (NO) as a signalling molecule in the cardiovascular system, we oriented our studies on the new model of experimental hypertension developed by long-lasting inhibition of NO production. As the first research group in the world we have demonstrated that chronic NO deficiency leads to the myocardial fibrosis enlargement and vascular hypertrophy. Moreover, we demonstrated that NO deficiency rather than hemodynamic overload is responsible for cardiac and vascular alterations during NO synthase inhibition. Consequently, on the basis of our results, we have published several studies describing preventive and therapeutic effects of selected antihypertensive and antioxidant agents on NO deficient hypertension. Along with the analysis of the effects of vasoactive substances on NO deficient hypertension, we have studied their effects on the development and treatment of spontaneous hypertension. Such comparison led to new original results recently published in CC journals.

According to the “*European hypertension specialist program*”, the goal of antihypertensive therapy is the prevention of target organ damage and events such as stroke, ischemic heart disease, heart failure and renal failure. Therefore the arrangement of our study is very complex process. Studying the effect of any antihypertensive drug we have always analysed the biochemical and molecular-biological markers as well as functional and morphological parameters of the organs, vessels particularly. We have also studied behavioural activities like locomotor activity and habituation. Institute of Normal and Pathological Physiology is the only Institute in Slovak Republic studying experimental hypertension as the complex process.

Scientists worldwide have recently focused on oxidative damage as a possible early step in the development of cardiovascular diseases, diabetes, brain disease, as well as premature cell aging. In January 2005 “*OXIS – International designs worldwide oxidative-stress biomarker program*” was created. The aim of this Program is to design an oxidative stress paradigm to diagnose the early onset of potentially fatal diseases. Thus, besides analysis of antihypertensive effects of various substances on experimental hypertension, we have studied the efficiency of various antioxidants on development and treatment of hypertension as well as on the vasoactivity *in vitro*.

Briefly, we have demonstrated that several antihypertensives, besides their main effect, are able to increase production of nitric oxide, improve its bioavailability and to decrease oxidative stress. These activities of various antihypertensives may also significantly contribute to their beneficial effects, i.e. blood pressure reduction and prevention of target organ damage. Furthermore we have documented that chronic effect of different antioxidants on blood pressure in experimental hypertension is dependent on the stage of hypertension development. While chronic administration of antioxidants partially attenuated the blood pressure increase occurring in young spontaneously hypertensive rats, the same antioxidants were less effective in adult spontaneously hypertensive rats with fully developed hypertension. Concerning NO deficient hypertension, it is hypothesized that scavengers with activating effect on NO synthase and/or stabilizing effect on NO molecule are able to interfere successfully with this form of hypertension. Decreasing reactive oxygen species generation without simultaneous improvement of NO synthase activity has no beneficial effect on nitric oxide deficient hypertension.

From antihypertensives we have studied the best effect on the hypertensive alterations, besides decreasing blood pressure, had spironolactone, indapamide and ACE inhibitors. NO-donors like molsidomine and pentaerythryl tetranitrate had no effect in spontaneous hypertension, while they completely blocked development of NO-deficient hypertension. From antioxidants, melatonin and polyphenolic compound (ProvinolsTM) seem to be the most efficient in the prevention and regression of hypertension and associated alterations. Moreover, they improve endothelium-dependent relaxation of various arteries. Our results obtained, by means of the co-operation with University Louis Pasteur in Strasbourg, help substantially the “*Société Française de Distillerie*“ commercialise ProvinolsTM as a food supplement. The significance of polyphenolic compounds in nutrition was emphasize by the

"International Union of Nutritional Sciences" which assess these substances as a leading topic of the *10th European Nutrition Conference* held in Paris this year.

Besides oxidative stress, social stress is also considered to be a significant risk factor for the development of arterial hypertension in humans. Additionally to cardiovascular problems, stress may result in other diseases of civilization such as psychosocial disorders, metabolic disorders and cancer. However, the relation between stress and mental and physical disorders is far from being fully understood. In the last years, one of the research programs of the *US Department of Defence* was focused on the investigation of the influence of interaction of stress with other environmental factors (mainly chemical toxicity) on behaviour and cardiovascular system. Another example of military supported activity was NATO advanced research workshop *"Stress-induced biochanges in the heart: from genes to bedside"* (Turkey, 2005). However, societal and economic burden of, stress-related illnesses is enormous also in civil population. Thus, it is of great importance to come to a better understanding of stress influence on health. One of the new *EUROCORES programs of the European Science Foundation* called *EuroSTRESS* has been announced for the period 2008-2010. This program is focused on the role of stress in mental health, with significant inter-disciplinary approach, with the aim to prevent or ameliorate negative consequences of stress exposure.

The Institute of Normal and Pathological Physiology is the only institute in the Slovak Republic dealing with the effect chronic social stress on the cardiovascular function, especially to vascular reactivity. Two national grants have been obtained to investigate the effect of chronic social stress on central and vascular NO synthesis and its relation to regulation of cardiovascular function and blood pressure in rats with a various family history of hypertension. We have found that a relatively mild stressor, chronic crowding, differently affected vascular function and NO production in rats depending on family history of hypertension. Stress-exposed rats with negative family history of hypertension were able to cope with chronic crowding by improvement of vascular function and elevation of NO synthesis. On the other hand, chronic stress led to the reduction of vascular NO synthesis in offspring of spontaneously hypertensive mothers resulting in their disability to adapt their vascular function in altered environmental conditions. Because various epidemiological reports indicate that consumption of foods rich in polyphenols, including those contained in red wine, is associated with lower incidence of cardiovascular diseases, as mentioned above, we investigated the effect of red wine polyphenols on cardiovascular function and structure in rats during chronic social stress. We have demonstrated that they may maintain equilibrium between endothelial derived vasoconstrictor and vasodilator factors in chronic social stress.

The knowledge concerning our recent scientific activities were summarised in the monographs: *"Experimental hypertension and ischaemic heart disease"* and *"Mechanisms of blood pressure regulation and their disorders"*, latter edited by I. Bernátová, F. Kristek, O. Pecháňová and J. Török last year. All the abovementioned studies were supported by different international (COST, DAAD, Blood Pressure Association, Japan Society for the Promotion of Science), national (VEGA, APVT, APVV and also by cooperation with entrepreneurs grants

and programmes). Concerning international relationship, on Provinols™ topic we cooperate mainly with University Louis Pasteur in Strasbourg and UMR INSERM, School of Medicine, Angers. In cooperation with University of Brescia in Italy we study the effects of Provinols™ on renal function and kidney damage. Department of Biochemistry and Molecular Pathology Osaka City University in Japan is well equipped for study of oxidative stress. Thus, we cooperate with this Department mainly in the questions of oxidative stress, but we will also focussed on metabolic syndrome from this year. We have a long time cooperation with Institute of Physiology, Academy of Sciences of Czech Republic in Prague. The main topic of our cooperation represents vasoactive balance in experimental hypertension. Our national relations represent predominantly the cooperation with different Institutes of Medical Faculty in Bratislava and Martin as well as several Institutes of Slovak Academy of Sciences. Last year we edited the special issue of the *Physiological Research* as the representative publication of the international cooperations of the Institute of Normal and Pathological Physiology, Slovak Academy of Sciences in Bratislava.

We suggest that entering the core of the processes leading to hypertension, in particular during development of hypertension, could interrupt the pathogenetic processes in cardiovascular and other systems. The main goal of the studies is highlight the effect of vasoactive substances and due to this decrease morbidity and mortality of patients suffering from cardiovascular diseases. With the aim to expand this mission and to create the basis for cooperations among the scientists and clinicians we have established the association: *Nitric Oxide Club*. This association gives us more opportunities to organize up-to-date presentations of international and national specialists on the topic of nitric oxide and hypertension. Moreover we regularly organize international meetings entitled “*Nitric oxide: from molecular level to clinical implications*”. For the first time such meeting was organized in Bratislava in 1999. Later (2001, 2003, 2005) the meetings took place in Croatia. Within the evaluating period we organized also „*Nitric Oxide Symposium*“ in the framework of *Second Interdisciplinary Conference on Cardiovascular Medicine* in Washington, DC and the COST meeting “*The role of nitric oxide in cardiovascular system*” in Bratislava. We also arranged two international workshops: “*Vasodilatory and antioxidant mechanism in the cardiovascular system*” in 2004 and “*Mechanisms of development and maintenance of hypertension*” in 2006.

The Institute is engaged also in developing the model and experimental studies of electrocardiographic correlates of cardiac ventricles repolarization as well as in analysis of the effect of selected factors, including the blood pressure, upon it. The evaluation of the cardiac repolarization is permanently a relevant problem of the theoretical and practical electrocardiology. Recently the duration and dispersion of the QT intervals are the most frequently used parameters for quantitative evaluation of the ventricular recovery. However, their diagnostic significance is widely discussed, and confronted with results of experimental observations as well as model studies. With respect to the effective prevention and therapy of life threatening cardiac diseases it is expected, that detailed understanding of the ventricular

repolarization would provide suitable ECG markers, for an early identification of the arrhythmogenic regions.

Research of the cardiac electric field is aimed to study the effect of normal variability and selected pathological changes of ventricular repolarization on the ECG parameters. The properties of the human heart repolarization are investigated by computer modeling and in properly designed clinical-physiological experiments.

Modified computer model of ventricular depolarization and repolarization was used to analyze the effect of differently localized zones with potential arrhythmogenicity on ECG parameters (heart vector, VCG vectors, body surface potential maps). Two methods were developed and proved in model experiments, for the first time to determine noninvasively the localization of an arrhythmogenic focus in the ventricular wall, with accuracy up to 10 mm, using the body surface ECG parameters.

Results of the clinical-physiological investigations documented the effect of selected physiological, psycho-emotional and anthropometric factors on the ECG parameters, including also the body surface potential maps. Changes of the ventricular repolarization, typical for an increased sympathetic activation of the ventricular myocardium, were assessed already in the group of subjects with blood pressures (BP) immediately exceeding the limit $\geq 120/80$ mm Hg, set by international guidelines for normal BP. The dissociation of the direct reactive sympathetic activation of the ventricular myocardium, due to common stimuli, and of the heart rate changes, regulated by the complex vago-sympathetic mechanisms was described. Significant gender differences in the pattern of ventricular depolarization and repolarization, as well as differences in their reactive changes and relations to blood pressure and heart rate were documented. The discriminative power of the repolarization izointegral maps was defined, in distinguishing changes in the superficial cardiac electric field, induced by a moderate psycho-emotional stress response in normal subjects.

The above described transient, mainly sympathergic alterations in ventricular recovery may be of importance in subjects at risk for ventricular arrhythmias. For these studies we developed the very tight cooperation with the research teams in Hungary and Russia as well as with theoretical and clinical laboratories of the Medical faculty in Bratislava Institutes of the Slovak Academy of Sciences and local hospitals. All the above cardiac electric field studies were supported by bilateral international programmes of co-operation (Russian and Hungarian Academies of Sciences) and national VEGA grants.

The field of neurophysiology and psychophysiology

The resolution of the European Parliament [2006/2058(INI)] stressed the demands for more emphasis given to research into the mechanisms of neurodegenerative and psychiatric illnesses and it calls for more research into therapeutic and psychological interventions and into determinants of mental disorders as well. The state of art for the neurophysiological and psychophysiological research problems treated in the Institute is based on following presumptions: The primary purpose of higher brain functions is to enable interactions with the environment. Interactions may include walking from one place to another, grasping an object,

talking to a person, or navigating a car. In return, such actions directly affect our perceptions of the world. All interactions between subjects as well as between a subject and his/her environment are subserved by means of sensorimotor integration processes.

The view we take in sensorimotor integration is that in many aspects of behaviour, motor actions and sensory processing are inseparably linked and therefore have to be studied in a closed action/perception loop. Furthermore, even the simplest sensorimotor integration process requires the functional co-ordination of many widely distributed and specialised brain systems. A simple response to sensory stimulus depends upon the co-ordination of the sensory, association and other areas of the brain. It enables brain to register and analyse the stimulus and to prepare the motor program and the motor response execution as well. The planning, organisation and initiation of movement is complex process also. It involves many cortex areas and subcortical structures. They form distributed neuronal circuits which are engaged also in focussing the attention on the stimulus, in deciding how to respond and these circuits take part in the initiation or inhibition of the overall behavioural responses as well.

In essence, there are three sources of experimental information on the sensorimotor integration: examinations with healthy humans, examinations with patients suffering from diseases/disorders of the central nervous system and modelling the information flow and its processing. All the above three approaches we apply in the study of mechanisms of sensory control in human upright posture.

The common and frequent problems in older patients visiting primary health care centres are vertigo and disequilibrium. Vertigo is described as a feeling of rotation when the room or surroundings are spinning around. Disequilibrium can be described as a feeling of unsteadiness or loss of balance and sense of falling. In daily life people are continuously faced with new control tasks and new environmental constraints to which they have to adapt and adjust body position and in many cases the postural control system is providing conflicting information. Increased postural sway in older adults is well documented, and research has linked greater amounts of postural sway to increased risk of falling, which is a serious problem [also](#) for subjects with sensory deficit in balance control.

Sensory control in human upright posture and space orientation is one of the problems treated in the Institute. An important feature of the research activity was the biocybernetic approach to data analysis, including computer models of investigated physiological functions and mechanisms. We investigated mechanisms of human balance control by analysis of postural responses to sensory stimulation (in healthy subjects and patients with vestibular or neurological disorders). The goal of our research was to better understand the influence of vestibular and somatosensory afferentation and its interaction for human upright posture, to improve the assessment and treatment of balance disorders due to deficit of sensory function.

We determined how vestibular information contributes to an internal representation of body vertical during stance under different surface conditions. Postural responses to galvanic vestibular stimulation and postural muscle vibration were quantified by force platform measurement of the body sway (centre of pressure) and by accelerometry of upper parts of body. We found that alterations in somatosensory information by different surface conditions

may reveal vestibulospinal imbalance in subjects with vestibular deficit. The obtained data allowed us to test balance deficit related to back pain and by this way to follow a rehabilitation improvement in subjects with balance disorders and back pain. By means of co-operation with the Departments of the Physical Medicine and Rehabilitation of FNsP and SNOF in Bratislava we tested whether the dynamic condition of sitting on the air pillow (PC pillow) could be a prevention of lower back pain in patients whose sitting position is the most common working posture. The results confirmed the positive influence of rehabilitation and dynamic condition of sitting in patients with the low back pain.

A better understanding of the mechanism underlying compensation for incorrect vestibular and somatosensory interaction was shown as perspective to improve balance assessment and treatment of patients with sensory deficits. All the above human upright posture control mechanisms studies were supported by bilateral international programmes of co-operation (Neurological Science Institute, Portland, USA, Bologna University, Italy) and national VEGA grants. The control mechanisms of the human upright posture were treated in four international symposia on Human Posture Control organized by the Institute in the Congress Centre of the Slovak Academy of Sciences (Smolenice Castle), last one in year 2006. For coming three years this research will be supported within the SIXTH FRAMEWORK PROGRAMME, Priority 2.6.2, Information Society Technologies (IST), Ambient Assisted Living (AAL) in the ageing society as a specific targeted research project: SENSing and ACTION to support mobility in Ambient Assisted Living.

Psychophysiology, behavioural physiology, physiological psychology and human physiology of higher nervous activity have evolved as an interdisciplinary field which appeared at the interface between the psychology and neuroscience. It is aiming to contribute to knowledge and explanation of the mechanisms of higher brain functions. The interaction between subjects as well as between a subject and his/her environment is subserved by means of the processes of sensorimotor integration. Even the simplest sensorimotor integration process requires the functional co-ordination of many widely distributed and specialised brain systems. A presumption of a simple response to sensory stimulus is the co-ordination of the sensory, association and other areas of the brain which prepare it to register and analyse the stimulus and of the motor systems preparing the motor program and the motor response execution as well. These distributed neuronal circuits are engaged also in focussing the attention on the stimulus and they take part in the initiation or inhibition of behavioural responses.

The most common forms of mental ill health in the Europe are anxiety disorders and depression. Another scientific topic treated during last years at the Institute concerns the electrophysiological correlates of the panic disorder (PD). At about 5.3 million people of the European Union suffer from PD. According to recent evidences the pathophysiology of PD involves an imbalance in multiple neurotransmitter systems which interact in a complex neural network. The neurobiological approaches to the PD etiopathogenesis emphasize specific type of neurobiological vulnerabilities and they are related to the brain biochemistry and point to the abnormalities in the function of variety of neurotransmitters within the brain

stem neuronal circuits, limbic system and fronto-temporal cortical areas mainly, including serotonin (in locus coeruleus, nuclei raphae, amygdala, hippocampus, hypothalamus), noradrenaline, GABA, dopamine, benzodiazepine, cholecystokinin-tetrapeptide (CCK-4) and others. Most of these theories place an emphasis on the paroxysmal excess of receptor hyperexcitability within the brain stem structures. These literary data led us to open the question whether there are certain behavioural and electrophysiological correlates of the impairment of the visual-oculomotor integrations which can be presumed in brain stem dysfunctions. Our results point to the marked oscillations of the overall activation within the oculomotor neuronal circuits in PD patients. It was revealed by the marked oscillation of the angular velocity of the recorded pursuit eye movements. Furthermore, the very pronounced inaccuracy of saccadic eye movements was found also.

Central electrophysiological correlates, saccadic evoked potentials and P3 wave are strongly affected by the saccadic inaccuracy and, therefore, they can not be taken into account. Instead, last year we started to apply the nonlinear analysis of EEG recordings which showed a significant increase in degree of chaos after retrieval of stressful memory. It suggests that the evaluation of these phenomena might be important for better elucidation of PD pathogenesis.

The literary data point to the disturbances of tracking eye movements in schizophrenia. In contrast, our results aimed at a detailed analysis of the optokinetic nystagmus showed that this kind of the optomotor response is not grossly impaired. However, as in panic disorder, variability in the optokinetic response of schizophrenics is higher and differences in the interdependence of the optokinetic response parameters were found. In contrast to studies of smooth pursuit eye movements that mostly attribute the deficits to impaired frontal lobe function our early results suggest subcortical rather than cortical origin of intrusions into the optokinetic system in schizophrenia. Taking together our results in PD patients, in schizophrenics as also our previous findings in patients suffering from depressive symptoms it seems that the eye movement disturbances can not be taken as specific signs of a particular mental disorder as it is frequently suggested.

We take the position that in several mental disorders there is an impairment of focussing the attention especially on the particular experimental task or demands. The oscillation of attention between the subjective inner experience and the experimental conditions results in the inaccuracy of eye movements expressed as dysmetria in the saccadic eye movements or the pronounced oscillation on the gain of pursuit eye movements. On the other hand, the oculomotor deficits found in several mental disorders may better specify the level of possible disturbance within the hierarchical level of the central nervous system. This our point of view supports the premotor theory of spatial attention. Our research studies were presented successfully on the five international symposia and conferences of the Collegium Internationale Activitatis Nervosae Superioris (C.I.A.N.S.) organized by the Institute in last 6 years and the international community has elected our colleague for the post of C.I.A.N.S. president (2003-2005).

The great amount of detailed physiological and anatomical data alone is not enough to infer how neural circuits work. To unravel complex processes in the neural system the incorporation of modelling techniques into the repertoire of basic neuroscientific research is absolutely essential.

There is wide variation in the focus and scale of neurobiological modelling ranging from a systems-level approach to single neurons and simulations of sub-cellular processes. An important point is a realism of applied models - all of them should make biologically plausible conceptual suggestions, provide testable interpretations and predictions.

Much effort is dedicated to understanding how sensory data, encoded as ionic fluxes, membrane potentials or neuronal firing rates, are processed to represent and recognize a stimulus and to extract its relevant features for behaviourally adequate reaction. The biophysical level of description that specifies biophysical mechanisms and operations that underlie computations is a promising approach. Data from this level together with restrictions derived from the empirical knowledge form the basis for creation of phenomenological models and conceptual hypotheses to understand how information processing is going on in neuronal networks.

In the last period of time the other major research themes were targeted on the analysis of the coding and decoding of temporal patterns and simulation of information processing in the neural networks with the aid of computer program JASTAP developed in our Institute we analyzed functional meaning of a tentative frequency preference of synaptic connections. Model experiments have shown that paired-pulse facilitation (PPF) attaining its maximum after a specific interval between pair of arriving spikes might turn a “weak” plastic synapse attached to an integrate-and-fire neuron to a frequency-tuned device. Resulting computational capabilities create biologically plausible mechanisms of information processing relating to:

- a) Real-time identification of temporal patterns in a stream of random spiking activity (a recognition problem).
- b) Co-determination of the specific activity routing among neurons (an addressing problem) resulting in definite spatio-temporal patterns of the output activity (an input-output pattern problem).

In our studies aiming at a significance of temporal profiles of spike trains in information transmission we devised a model of a “decoder” with capability to discriminate unequal degrees of the spike-timing stochasticity. Presented model of a biologically plausible entity operates as an adaptive filter tracking time variations of the inter-pulse intervals (IPIs). Its emergent functional capacity is transmission or cancelling of the pulse streams and this “decision making” depends on the degree of the IPI regularity of the input train quantified by the coefficient of variation.

In the last years, the topics, as well as the complex of methods used at the Institute correspond more to the general frame, mirrored in the initial name of the Institute – Institute of Experimental Medicine SAS. This results from application of new research methods in physiological pharmacology, physiological morphology, physiological biochemistry and molecular biology. Similarly, the mapping of the bioelectrical correlates for various

physiological and behavioural reactions and human and animal behavioural studies were introduced. Moreover, new methods of analysis and modelling the information processing in the brain are used. It is also a consequence of using the experimental models of selected disorders and diseases. Such new approaches are fostered due to well established and broad co-operations of the Institute with institutes of the Medical faculty of Comenius University in Bratislava as well as with its several clinical departments. A very important furtherance covers the international co-operation. The last is more closely characterised in a supplement of *Physiological Research* (Vol. 55, 2006, Suppl.1) publishing the results of topics treated by means of the international projects of the Institute. The contemporary orientation is also reflected by appointing the Institute as the National Contact Office of the European Network for Workplace Health Promotion in Slovakia. The reviews of our last results have been just published in the monograph entitled “*Selected diseases of civilisation: basic mechanisms and clinical implications*“ edited by O. Pecháňová and F. Jagla.

3. Concept of R&D activity of the Organisation for the next four years (max. 5 pages)

i. Present state of knowledge and status of ongoing research related to the subject of the Concept, from both international and national perspective

Europe is facing major challenges due to globalization and demographic change. It greatly influences the health of entire population. The situation is mirrored in the FP7 with its focus on translation of basic discoveries into clinical applications including scientific validation of experimental results. It concerns the health research as well. Translating research for human health within the FP7 will be focussed on integration of biological data and processes as well as on the brain and cardiovascular diseases

In the field of experimental hypertension, as stated above, we have demonstrated that several antihypertensives, besides their main effect, are able to increase production of nitric oxide, improve its bioavailability and to decrease oxidative stress. These activities of various antihypertensives may also significantly contribute to their beneficial effects, i.e. blood pressure reduction and prevention of target organ damage. Furthermore we have documented that chronic effect of different antioxidants on blood pressure in experimental hypertension is dependent on the stage of hypertension development. Both Meeting of International Society of Hypertension held in Fukuoka and Meeting of European Society of Hypertension held in Madrid last year focused on cardiovascular diseases, recognizing that hypertension is the common denominator in cardiovascular diseases. The scientific sessions were oriented on diabetes, nephrology, and metabolic syndrome, particularly. The fact that we have applied for APVV grant titled “*Hypertension as a part of metabolic syndrome: the effect of antioxidant therapy*” yet before the Meetings was a satisfactory indicator that our scientific activities are up to date and in accordance with world and European scientific trends. Thus, in the future we plan to study hypertension within the clusters of metabolic syndrome. The metabolic syndrome is a widely prevalent and multi-factorial disorder. This syndrome predicts the development of type 2 diabetes mellitus, atherosclerosis, cardiovascular disease and cerebrovascular stroke. The molecular mechanisms responsible for the metabolic syndrome are not known. Since metabolic syndrome apparently affects 10-30% of the population in the

world and more than 20% of the population in Slovak Republic, research on its pathogenesis and control is really needed.

According to the “*Global Aging Program, AARP*” and “*European Academy for Medicine of Ageing*” aging started to be one of the most studied problems in Europe and the USA. It is generally accepted that aging is associated with increase of blood pressure. Thus the next plan of our Institute is to study development of hypertension and associated alterations due to aging and to compare „aging hypertension“ with „juvenile hypertension“.

Regarding our previous research, we will continue in investigation of cardiovascular alterations produced by chronic red wine polyphenols in chronic stress as well as in rats with various genetic predisposition to hypertension. The idea is to participate in *EuroSTRESS Program* (2008-2010) in the co-operation with another research institutes as well as industrial partners in Slovak Republic.

In model-based analysis of the cardiac repolarization we aim to improve our computer model to study the changes in repolarization dispersion with respect to variations in the connection between model elements and variations in the electrical conductivity of the model “extra-cellular” space. For the enhancement of diagnostic interpretation of the cardiac recovery from ECG the effect of ventricular geometry changes during mechanical systole on the T wave pattern on the heart vector will be analyzed.

At present one of the components of the multiple cardiovascular risk factors control aims at the reduction of the increased cardiac sympathetic activation, which is considered to play an important role in the development of left ventricular hypertrophy, and is known to be a significant risk factor for cardiovascular morbidity and mortality. Our aim is to refine the diagnostic value of the ventricular repolarization parameters, by making more accurate their normal dispersion limits - considering not only the influence of age and gender but also of the somatotype and of the common physiological situations affecting their variability. From our preliminary results it is evident, that the repolarization pattern is individually not constant and stable over time. Our intent is to assess the beat-to-beat dynamic changes of the repolarization parameters at rest, and in physiological situations with a sudden sway of the autonomic discharge to the heart.

We have also shown that the better understanding of the mechanism underlying compensation for incorrect vestibular and somatosensory interaction is demanded for improving balance assessment and treatment of patients with sensory deficits. For the coming four years the SENSATION-AAL project was accepted and it will be supported within the FP6. This project - we are included in - offers the opportunity for a significant advancement of the state-of-the-art in the field of ambulatory assisting devices for enhancing safety and security in balance and movement. The ultimate goal of the project is to assist older people in maintaining independent mobility and daily life activities and prevent injuries by introducing smart body fixed sensor based technology that allow medical professionals to initiate interventions in the home environment.

To achieve this goal, the SENSATION-AAL project will design, test and release a next-generation, smart, wireless on-body system which enables monitoring of activities of daily living and simultaneous real-time active control of physical performance using principles such as sensory augmentation and biofeedback. SENSATION-AAL will develop an ICT-based solution which is highly usable and can support the elderly people in their preferred environment. Ultimately, this project could have important influences on the quality of life of European citizens.

It is estimated that in the year 2020 the depression will be the most common cause of working disability. The second most common mental disorder will be the various types of the anxiety disorders. We have shown that even after successive treatment of panic disorder patients the hyperexcitability within the brain stem does not disappear. This fact can be

demonstrated by means of the oculomotor disturbance correlates, that is not only by means of the eye movement changes as such but also by the eye movement related potentials in EEG. We have also pointed to the fact that the similar oculomotor signs can be recorded in panic and depressive patients. It seems that similar oculomotor disturbances might be found in several mental disorders and they can not be taken as specific correlate of a particular disorder, as it is frequently suggested in the literature. As for the panic disorder a promising diagnostic tool might be the nonlinear EEG analysis which we introduced last year. It characterises the fragmentary, temporally and spatially disorganized character of memorized stressful emotional experiences on the level of the bioelectric activity of the brain. The nonlinear changes in neuronal dynamics might be important for pathophysiology of panic disorder. For our further program we are planning to use electrophysiological methods and behavioural tests to characterize more closely the higher brain functions changes in specific neuropsychiatric disorders including panic disorder, schizophrenia and selected types of anxiety disorders as compared to healthy individuals. Such oriented studies are unique in the national context. The problems addressed are highly relevant in the context of international science and research.

On the most general level we will further study the mechanisms of coding the information in the central nervous system by means of the neuronal network models. These studies will be focused on the identification of mechanisms of neural processing in the case of interval encoded information. One of the topical problem is the activity routing in a fully connected network depending on a pattern of an input spiking activity and transformation of this pattern in a space. The second studied problem concerns the estimation to which extent a neuronal network preserves the frequency encoded information. An important problem is to quantify the correctness of the network “decisions” whether the spiking frequencies compared under biologically plausible conditions, were the same or not.

ii. Organisation’s role or significance in the overall research effort within the field of concept on both the national and international scales.

The cumulative physiological approach towards the living organisms is not very common for the contemporarily very specialized physiological research institutions. The Institute develops continually the systemic and integrative physiological approaches in studied topics mentioned above. Briefly, our scientific effort in the field of integrative cardiovascular physiology and neurophysiology is mirrored in following invitations of the Institute:

- 1) To join the mentioned MedNatNet project of EU countries.
- 2) To participate in formulating the background material for EU ministerial meeting which launched in 2005 in a joint project oriented on the health and aging.
- 3) To take the position of the scientific guarantor of the ENWHP activities.

A very important furtherance covers the international co-operation specified in [III, 4] International projects and funding. Moreover, as listed below, the Institute was invited to co-organize important international symposia and conferences abroad (e.g. USA, Russia, Italy, France, Croatia, Czech Republic etc.). The overall research effort of the Institute is directed to the problems of the basic mechanisms of selected diseases of civilisation and their possible clinical implications. In this sense the Institute has a unique position in Slovakia. The position of the Institute is fostered due to well established and broad co-operations of the Institute with institutes of the Medical faculty of Comenius University in Bratislava as well as with its several clinical departments.

iii. Objectives of the Concept

Taking into account the above mentioned facts the objectives of the concept of our Institute are as follows:

- Study of hypertension within the cluster of metabolic syndrome.
- Analysis of dynamics of endothelial and neurogenic regulation as well as morphology of blood vessels in rats in the first stage of hypertension development.
- Study of maintenance of hypertension and associated alterations due to aging.
- Investigation of cardiovascular alterations produced by chronic red wine polyphenol treatment in chronic stress as well as in rats with various genetic predisposition to hypertension.
- Analysis of changes in repolarization dispersion with respect to variations in the connection between model elements and the electrical conductivity of the model “extra-cellular” space.
- The analysis of the effect of ventricular geometry changes during mechanical systole on the T wave pattern of the heart vector.
- To examine the effects of adding sensory information to balance control as a tool for improvement of the age-induced balance instability.
- The study of relation between the psychologically described etiological factors and the biological nature of the organ pathology in selected brain disorders.
- The analysis of the sensorimotor integration by means of non-linear EEG data analysis.
- The analysis of the feature –selective attention in auditory modality.
- The analysis of the biologically plausible models of information processing by means of the neuronal network models.

The final and the most important objective of the concept is to link together the cardiovascular and neurophysiological observations. With this aim we will study:

- behaviour and cardiovascular alterations in animals with different neurodegenerative diseases
- posture and balance in older hypertensive patients
- the short-term effect of natural antihypertensives on the spatial memory by means so-called memory-guided saccade task in normotensive controls and hypertensive patients

iv. Proposed strategies and methods to be applied, and time schedule

The goal of *cardiovascular physiology* will be to analyze the imbalance in nitric oxide and superoxide anion generation in the model of metabolic syndrome (rats SHR/NDmcr-cp (cp/cp) developed in Hamamatsu, Japan) and different models of hypertension: spontaneous, social stress-induced and so-called NO-deficient, particularly. The pharmacological interventions both in the prevention and treatment of hypertension will be analysed concurrently. With the aim to study the blood vessel responses to vasoactive substances in the conditions with intact and removed endothelium we will use myograph and organ bath isometric tension techniques. The up-to-date biochemical and molecular methods will be used for determination of enzyme activities and expressions that are responsible for nitric oxide, reactive oxygen species production and degradation as well as apoptotic processes. Morphological and morphometric studies will be performed for detailed analysis of structural alterations especially after antihypertensive therapy. The open field test method and behavioural tests will be used for investigation of locomotor activity and behaviour of the

animals. Another topic concerns the question of affecting the human electrocardiographic phenomena by selected biological and environmental factors. The obtained results will be confronted with the original computer model of heart activation.

The goal of **neurophysiology and psychophysiology** will be to analyze the processing of visual, somatosensory and acoustic information with consecutive preparation of motor response, especially postural and eye movements. The questions concern mainly the variations in strategy of sensory information processing and in the effects of different mental sets affecting the overall level of the activation of cerebral hemispheres, respectively. As a link between cardiovascular and psychophysiological studies we are introducing the study of the spatial memory under the effect of the natural antihypertensive drugs. Memory is the best example of translation from neuropsychological observations in humans to detailed studies in animals as also from detailed analysis in rodents and nonhuman primate models into the human neuropsychological studies. Memory plays also a crucial role in evoking fear, phobias and anxiety which in turn affect the level of the blood pressure.

Special position in coming years will be paid to the participation in the FP6 program. We will examine the effects of adding sensory information to balance control as a tool for improvement of the age-induced balance instability. Balance responses will be quantified by the centre of pressure of feet during stance - stabilometry and by the inclination of body segments - 2D-accelerometry.

Time schedule:

01.2007-12.2009

- *Study of hypertension within the cluster of metabolic syndrome.* This topic will be study in the framework of APVV project, but predominantly within the cooperation with Osaka City University in Japan based on the new collaboration agreement on the topic of metabolic syndrome.
- *Analysis of dynamics of endothelial and neurogenic regulation as well as morphology of blood vessels in rats in the first stage of hypertension development.*
- *To study maintenance of hypertension and associated alterations due to aging.*
- Following topics will be studied within the VEGA projects as well as the international bilateral projects of the Institute:
- *Analysis of the changes in repolarization dispersion with respect to variations in the connection between model elements and the electrical conductivity of the model "extra-cellular" space.*
- *The study of changes in repolarization dispersion with respect to variations in the connection between model elements and the electrical conductivity of the model "extra-cellular" space.*
- *The study of relation between the psychologically described etiological factors and the biological nature of the organ pathology in selected brain disorders.*

01.2007-12.2010

- ***Posture and balance in older persons as well as in hypertensive patients.***
This program will be performed under the accepted and financed project in FP6.
- *Investigation of cardiovascular alterations produced by chronic red wine polyphenol treatment in chronic stress as well as in rats with various genetic predisposition to hypertension.*

The topic of red wine polyphenolic compound is studied in our Institute for several years. In this time period we will focused on the effects of polyphenol treatment on chronic stress. The topic will be study within the APVV project and in the cooperation

with Universite Louis Pasteur de Strasbourg in France and University of Brescia in Italy.

01.2008-12.2010

- *The effect of natural antihypertensive drugs on spatial memory in normotensive controls and hypertensive patients*

Last year we have already started with the preliminary experiments on red wine polyphenol effects on memory-guided saccade task. In this time period we will continue with the analysis. Moreover we will compare the memory-guided saccade task of normotensive control with hypertensive patients. We will also analyse the disturbances of balance in older hypertensive patients.

01.2009-12.2010

- *Behaviour and cardiovascular alterations in animals with different neurodegenerative diseases as well as in patients suffering from mental disorders*

From the beginning of the year 2009 we plan to start the common cardiovascular and neurophysiological experiments on the animal models of different neurodegenerative diseases as well as in patients suffering from selected brain disorders. We will apply for APVV and/or VEGA grants with the aim to receive financial support for the projects that include this topic.

III. Partial indicators of the main activities:

1. Research output

- List of the selected publications documenting the most important results of basic research. Total number of publications in the whole assessed period should not exceed the average number of the research employees**

1. PECHÁŇOVÁ, O. - JENDEKOVÁ, L. - KOJŠOVÁ, S. - JAGLA, F. Possible role of nitric oxide in the locomotor activity of hypertensive rats. In *Behavioural Brain Research*. Vol.174, no.1 (2006), p.160-6 (IF 2,865).
2. BERNATOVA, I., - CSIZMADIOVA, Z. Effect of chronic social stress on nitric oxide synthesis and vascular function in rats with family history of hypertension. In *Life Sciences* Vol. 78, no. 15 (2006), p. 1726-1732 (IF 2,512).
3. SZATHMÁRY, V. - RUTTKAY-NEDECKÝ, I.: Computer model study of electrocardiologic manifestations in asymmetric left ventricular hypertrophy. In *Journal of Cardiovascular Electrophysiology*. Vol.17, (2006) p.1020-1025. (IF 3,285)
4. PECHÁŇOVÁ, O. - MATUŠKOVÁ, J. - CAPIKOVÁ, D. - JENDEKOVÁ, L. - PAULIS, L. - ŠIMKO, F. Effect of spironolactone and captopril on nitric oxide and S-nitrosothiol formation in kidney of L-NAME-treated rats. In *Kidney International*. Vol.70, no. 1 (2006), p.170-6 (IF 4,927).
5. PECHÁŇOVÁ, O. - BERNÁTOVÁ, I. - BABÁL, P. - MARTINÉZ, M. - KYSELÁ, S. - ŠTVRTINA, S. - ANDRIANTSITOHAINA, R. Red wine polyphenols prevent

- cardiovascular alterations in L-NAME-induced hypertension. In *Journal of Hypertension*. Vol. 22, no. 8, 2004, p.1551-9. (IF 5,218)
6. PECHÁŇOVÁ, O. - ZICHA, J. - KOJŠOVÁ, S. - DOBEŠOVÁ, Z. - JENDEKOVA, L. - KUNEŠ, J. Effect of chronic N-acetylcysteine treatment on the development of spontaneous hypertension. In *Clinical Science (Lond)*. Vol. 110, no.2 (2006), p. 235-42 (IF 2,641).
 7. PECHÁŇOVÁ, O. - DOBEŠOVA, Z. - ČEJKA, J. - KUNEŠ, J. - ZICHA, J. Vasoactive systems in L-NAME hypertension: the role of inducible nitric oxide synthase. In *Journal of Hypertension*. Vol. 22, no. 1, 2004, p.167-73. (IF 5,218)
 8. RIEČANSKÝ, I. - THIELE, A. - DISTLER, C. - HOFFMANN, K.-P. Chromatic sensitivity of neurones in area MT of the anaesthetised macaque monkey compared to human motion perception. In *Experimental Brain Research*. Vol. 167, (2005), p. 504-525. (IF 2.304)
 9. KELLEROVÁ, E. Stimulus – induced changes and circadian and ultradian periodicities of blood pressure and heart rate in newborns. In *Neuroendocrinology Letters*. Vol.24, no. Suppl.1, 2003, p. 92-95. (IF 1.280)
 10. PAVLÁSEK, J. - JENČA, J. - HARMAN, R. Rate coding: neurobiological network performing detection of the difference between mean spiking rates. In *Acta Neurobiologiae Experimentalis*. Vol. 63, 2003, p. 83-98. (IF 1.209)
 11. BERNÁTOVÁ, I. - RIGATTO, K.V. - KEY. M.P. – MORRIS, M. Stress-induced pressor and corticosterone responses in oxytocin deficient mice. In *Experimental Physiology*. Vol. 89, no. 5, 2004, p. 549-57. (IF 1,220)
 12. BERNÁTOVÁ, I. - DUBOVICKY, M. - PRICE, WA. - GRUBBS, RD. - LUCOT, JB. - MORRIS, M. Effect of chronic pyridostigmine bromide treatment on cardiovascular and behavioral parameters in mice. In *Pharmacology Biochemistry and Behavior*. Vol. 74, no. 4, 2003, p.901-907. (IF 1.741)
 13. GEROVÁ, M. - KRISTEK, F. - ČAČANYIOVÁ, S. - CEBOVÁ, M. Acetylcholine and bradykinin enhance hypotension and affect the function of remodelled conduit arteries in SHR and SHR treated with nitric oxide donors. In *Brazilian Journal of Medical and Biological Research*. Vol. 38, (2005), p.959-966. (IF 0,859)
 14. ČAČANYIOVÁ, S., CEBOVÁ, M., KUNEŠ, J., KRISTEK, F. Comparison of vascular function and structure of iliac artery in spontaneously hypertensive and hereditary hypertriglyceridemic rats. In *Physiological Research*. Vol. 55, (suppl.1), (2006), p. S73-79 (IF 1,806).
 15. TÖRÖK, J. - KOPRDOVÁ, R. - CEBOVÁ, M. - KUNEŠ, K. – KRISTEK, F. Functional and structural pattern of arterial responses in hereditary

hypertriglyceridemic and spontaneously hypertensive rats. In *Physiological Research*. Vol. 55, Suppl. 1 (2006), p.S65-71 (IF 1,806).

16. HLAVAČKA, F. - HORAK, FB. Somatosensory influence on postural response to galvanic vestibular stimulation. In *Physiological Research*. Vol. 55, suppl.1, (2006), p S121-S127. (IF 1,806).
17. KRISTEK, F. - GEROVÁ, M. Hypotrophy of conduit artery walls of the offspring of nitric oxide-defective rats. In *Brazilian Journal of Medical and Biological Research*. Vol. 37, 2004, p.601-606. (IF 0,859)
18. RIGATTO, K. - PURYEAR, R. - BERNÁTOVÁ, I. - MORRIS, M. Salt appetite and the renin-angiotensin system: effect of oxytocin deficiency. In *Hypertension*. Vol. 42, no. 4, 2003, p.793-797. (IF 5,013)
19. JOAQUIM, L.F. – FARAH, V.M.- BERNÁTOVÁ, I. – FAZAN, R. JR. - GRUBBS, R. - MORRIS, M. Enhanced heart rate variability and baroreflex index after stress and cholinesterase inhibition in mice. In *American Journal of Physiology*. Vol. 287, no. 1, 2004, p. H251-257. (IF 3,658)
20. ZICHA, J. - PECHÁŇOVÁ, O. - DOBEŠOVÁ, Z. - KUNEŠ, J. Hypertensive response to chronic NG-nitro-L-arginine methyl ester (L-NAME) treatment is similar in immature and adult Wistar rats. In *Clinical Science*. Vol. 105, no.4, 2003, p. 483 - 489. (IF 2,641)

ii. List of monographs/books published abroad

- [1] **The Institute did not publish a monograph abroad**

iii. List of monographs/books published in Slovakia

- [1] **MECHANIZMY REGULÁCIE KRVNÉHO TLAKU A ICH PORUCHY.** I.Bernátová, F.Kristek, O.Pecháňová, J.Török (Eds.), Univerzita Komenského Bratislava, 2006, 312s
- [2] **SELECTED DISEASES OF CIVILISATION. Basic mechanisms and clinical implications.** O.Pecháňová, F.Jagla, (Eds.), Univerzita Komenského Bratislava, 2006, 323 s.

iv. List of other scientific outputs specifically important for the Organisation

- [1] **Physiological Research, Vol. 55, Suppl.1 2006 (IF 2005 – 1,806)**

The whole number publishes the results of selected international cooperations of the Institute. It covers 14 reviewed publications in extenso and the editorial.

v. Table of research outputs

Table **Research outputs** shows research outputs in number of specified entries; these entries are then divided by FTE employees with a university degree (from Tab. Research staff) for all Organisation at the respective year; finally these entries are divided by the total salary budget (from Tab. Salary budget).

Research outputs	2003			2004			2005			2006			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
chapters in monographs, books published abroad	1	0,03	0,12	0	0,00	0,00	0	0,00	0,00	0	0,00	0,00	1	0,3	0,01	0,03
chapters in monographs, books published in Slovakia	0	0,00	0,00	1	0,03	0,12	4	0,10	0,47	31	0,82	3,51	36	9,0	0,24	1,07
CC publications	13	0,36	1,59	13	0,34	1,58	8	0,21	0,94	28	0,74	3,17	62	15,5	0,41	1,84
scientific publications indexed by other databases (<u>Scopus</u>)	4	0,11	0,49	3	0,08	0,37	5	0,13	0,59	2	0,05	0,23	14	3,5	0,09	0,41
scientific publications in other journals	7	0,19	0,86	8	0,21	0,97	5	0,13	0,59	8	0,21	0,91	28	7,0	0,19	0,83
publications in proc. of international scientific conferences	4	0,11	0,49	1	0,03	0,12	43	1,11	5,04	13	0,35	1,47	61	15,3	0,41	1,81
publications in proc. of nat. scientific conferences	0	0,00	0,00	0	0,00	0,00	0	0,00	0,00	7	0,19	0,79	7	1,8	0,05	0,21
active participations at international conferences	78	2,17	9,55	38	1,01	4,63	92	2,38	10,78	103	2,74	11,67	311	77,8	2,07	9,22
active participations at national conferences	8	0,22	0,98	21	0,56	2,56	12	0,31	1,41	28	0,74	3,17	69	17,3	0,46	2,04

vi. Renormalized publications²

Renormalized publications = number of CC publications in the given year times authorship's portion of the Organisation times the journal impact factor in 2005 divided by the median impact factor in the research field

Renormalised publications	2003			2004			2005			2006		
	number	No. / FTE	No. / salary budget	number	No. / FTE	No. / salary budget	number	No. / FTE	No. / salary budget	number	No. / FTE	No. / salary budget
Renormalized publications	9,001	0,25	1,10	10,231	0,27	1,25	7,559	0,20	0,89	23,758	0,63	2,69

vii. List of patents and patent applications

[1] No one during the assessed period

viii. Supplementary information and/or comments on the scientific output of the Organisation

As a scientific output we consider also the fact, that our scientists are regularly invited to our partner institutes abroad to work out specialized experiments (Prague, Bologna, Brescia, Portland, Osaka and others).

2. Responses to the scientific output

Table Citations shows specified responses to the scientific outputs; these entries are then divided by the FTE employees with a university degree (from Tab. Research staff) for all Organisation at the respective year; finally these entries are divided by the total salary budget (from Tab. Salary budget).

² This information is required only from the Organisations of the Section 2 of the Slovak Academy of Sciences.

Citations	2002			2003			2004			2005			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
Web of Science	125	3,5	15,3	106	2,8	12,9	102	2,6	11,9	111	3,0	12,6	444	111,0	3,0	52,6
specify Database www	11	0,3	1,3	0	0,0	0,0	11	0,3	1,3	3	0,1	0,3	25	6,3	0,2	3,0
specify Database Scopus	0	0,0	0,0	9	0,2	1,1	8	0,2	0,9	23	0,6	2,6	40	10,0	0,3	4,7
in monographs, conf. proceedings and other publications abroad	0	0,0	0,0	6	0,2	0,7	5	0,1	0,6	5	0,1	0,6	16	4,0	0,1	1,9
in monographs, conf. proceedings and other publications in Slovakia	0	0,0	0,0	3	0,1	0,4	1	0,0	0,1	20	0,5	2,3	24	6,0	0,2	2,8

i. List of 10 top-cited publications and number of their citations in the assessment period

1. Inglis T - Shupert CL - Hlavačka F - Horak FB: Effect of galvanic vestibular stimulation on human postural responses during support surface translations. J. Neurophysiol., 73, 2, 1995, 896-901
Number of citations: ISI 22 and Scopus 7
2. Horak FB - Hlavačka F: Somatosensory loss increases vestibulospinal sensitivity. J. Neurophysiol., 86, 2, 2001, 575-585
Number of citations: ISI 22 and Scopus 1
3. Jackowski A - Crockard A - Burnstock G - RoissRussel R - Kristek F: The time course of intracranial pathophysiological changes following experimental subarachnoid haemorrhage in the rat. J Cereb Blood Flow Metab., 10, 1990, 835-849
Number of citations: ISI 19
4. Bernátová I - Pecháňová O - Babál P - Kyselá S - Štvrtina S - Andriantsitohaina R: Wine polyphenols improve cardiovascular remodeling and vascular function in NO-deficient hypertension. Am J Heart Circ Physiol., 282, 3, 2002, H942-948
Number of citations: ISI 15 and Scopus 1

5. Smieško V - Kožík J - Doležel S: Role of endothelium in the control of arterial diameter by blood-flow. *Blood Vessels*, 22, 5, 1985, 247-251
Number of citations: ISI 9
6. Pecháňová O - Bernátová I - Pelouch V - Babál P: L-NAME induced protein remodeling and fibrosis in the rat heart. *Physiol Res.*, 48, 5, 1999, 353-362
Number of citations: ISI 9
7. Török J - Gvozdjaková A - Kucharská J - Balažovjeh I - Kyselá S - Šimko F - Gvozdjak J: Passive smoking impairs endothelium-dependent relaxation of isolated rabbit arteries. *Physiol Res.*, 49, 2000, 135-141
Number of citations: ISI 8
8. Babál P - Pecháňová O - Bernátová I – Štvrtina S: Chronic inhibition of NO synthesis produces myocardial fibrosis and arterial media hyperplasia. *Histol. Histopathol.*, 12, 3, 1997, 623-629
Number of citations: ISI 8
9. Štolc S - Vlkolinský R - Pavlásek J: Neuroprotection by the pyridoindole stobadine: A minireview. *Brain Res Bull.*, 42, 5, 1997, 335-340
Number of citations: ISI 8
10. Šimko F - Matušková J - Lupták I - Krajčirovicová K - Kucharská J - Gvozdjaková A - Babál P - Pecháňová O: Effect of simvastatin on remodeling of the left ventricle and aorta in L-NAME-induced hypertension. *Life Sci.*, 74, 10, 2004, 1211-1224
Number of citations: ISI 8

ii. List of top-cited authors from the Organisation (at most 10 % of the research employees) and their number of citations in the assessment period

- [1] **Dipl.Ing. F.Hlavačka, CSc.** 141 (WOS), 23 (Scopus)
 [2] **RNDr. O. Pecháňová, DrSc.** 92 (WOS), 8 (Scopus) 16 (others)
 [3] **Mgr. I.Bernátová, CSc.** 90 (WOS) 4 (Scopus) 14 (others)

iii. Supplementary information and/or comments on responses to the scientific output of the Organisation

During the assessed period following papers (with the affiliation of the Institute) of former fellows of the Institute were cited

L.Cigánek	12 (WOS), 3 (Scopus)
J.Černáček	12 (WOS), 1 (Scopus)
I.Ruttkay-Nedecký:	4 (WOS), 6 (Scopus)
F.Podivinský:	3 (WOS),

3. Research status of the Organisation in the international and national context

- **International/European position of the Organisation**

- i. **List of the most important research activities documenting international importance of the research performed by the Organisation, incl. major projects (details of projects should be supplied under Indicator 4). Collective membership in the international research organisations, in particular within the European Research Area**

[1] After the preparation in years 2005-2006 **the project: SENSATION AAL - SENSing and ACTION to support mobility in Ambient Assisted Living** was accepted within the 6FP. The Department of Biocybernetic of the Institute is involved. This project offers the opportunity for a significant advancement of the state-of-the-art in the field of ambulatory assisting devices for enhancing safety and security in human upright posture, that is in balance and movement. The ultimate goal of the project is to assist older people in maintaining independent mobility and daily life activities and prevent injuries by introducing smart body fixed sensor based technology that allow medical professionals to initiate interventions in the home environment.

[2] Since the Institute co-operates very closely with the Collegium Internationale Activitatis Nervosae Superioris (C.I.A.N.S.) it participated for last 5 years on the business meetings of the European Network for Workplace Health Promotion (ENWHP). The C.I.A.N.S. as the scientific organization in the field of neurobiology of behaviour is interested in the life style problems also. At the end of 2005 the Institute was asked to take a position of the National Contact Office of the ENWHP in Slovakia. At the beginning of 2006 the Institute was appointed as the national coordinator of **the ENWHP project Move Europe** in Slovakia. This project is concentrated on the life style and its consequences upon working ability of employees. The project is planned for the period 2006/06/31 – 2008/12/31. The results should serve for the health policy of the EU in following years. In connection with this activity the Institute co-operates with the Czech “Združení pro podporu zdraví” (Association for health promotion) supported by the Czech Ministry of Health and several Czech insurance companies.

- [3] The Institute participated in the formulation of the background material for EU ministerial meeting prepared by the Finnish Ministry of Social Affairs and Health and the Finnish Institute of Occupational Health (see Reports of the Ministry of Social Affairs and Health 2006:62, Helsinki) which launched in 2005 a **joint project” Health in the World of Work – Prolonging Healthy Working Years”**.
- [4] There is a lack of medical doctors working in the basic medical research. This is valid for all EU countries. Such situation led the group of professors from Amsterdam Free University in the year 2003 to ask selected institutions for joining **the project within the frame Socrates Erasmus III called Medical Natural Sciences** (acronym MedNatNet). The network was established with the aim to contribute to the system of education of specialists for the basic medical research by combining the selected courses from medical faculty as well as from faculty of natural sciences. The Institute was asked to coordinate the MedNatNet project in Slovakia.

ii. List of international conferences (co-) organised by the Organisation

- [1] **International symposium: NITRIC OXIDE: from molecular level to clinical application.** September 12-15,2003, Brač, Croatia. Organized by the Institute.
- [2] **3rd International Posture Symposium.** September 6-9-, 2003, Smolenice Castle. Organized by the Institute
- [3] **39th International Interdisciplinary Conference on Experimental and Clinical Study of Higher Nervous Functions.** October 15-17, 2003, Trenčianske Teplice, Slovakia. Organized by the Institute
- [4] **International symposium within the frame of 2nd International Interdisciplinary Conference on Cardiovascular Medicine and Science.** July 23-25, 2003, Bethesda, Washington DC, USA. Co-organized by the Institute
- [5] **Special symposium C.I.A.N.S. dedicated to 100 yrs anniversary of Nobel Prize Award to I.P.Pavlov.** May 17-19, 2004, St.Petersburg, Russia. Co-organized by the Institute.
- [6] **COST Action 844 Symposium: The Role of the Nitric Oxide in Cardiovascular System.** April 8-10, 2005, Bratislava, Slovakia. Organized by the Institute.
- [7] **International C.I.A.N.S. Conference 2005.** June 29th -July2nd , 2005, Bratislava, Slovakia. Organized by the Institute.
- [8] **International symposium: NITRIC OXIDE: Basic Regulations and Pharmacological Interventions.** September 21-24, Tučepi, Croatia. Organized by the Institute.
- [9] **4th International Posture Symposium.** June 25-28, 2006, Smolenice castle, Slovakia. Organized by the Institute.

- [10] **International symposium> Integrative Physiology: Basic and Clinical** within the frame of the International C.I.A.N.S. Conference Neuro-Psycho-Physiological and Social Research and Interventions from an Interdisciplinary point of View. June 17/18, 2006, Milano, Italy. Co-organized by the Institute.
- [11] **Normální a patologická fyziologie CNS** within the frame of the 41st International Interdisciplinary Conference on Experimental and Clinical Study of Higher Nervous Functions. August 28-30, 2006, Brno, Czech Republik. Co-organized by the Institute.

iii. List of international journals edited/published by the Organisation

The Institute does not publish an international journal.

iv. List of edited proceedings from international scientific conferences and other proceedings

- [1] International symposium: NITRIC OXIDE: from molecular level to clinical application. September 12-15, 2003, Brač, Croatia.
- [2] 3rd International Posture Symposium. September 6-9-, 2003, Smolenice Castle.
- [3] 39th International Interdisciplinary Conference on Experimental and Clinical Study of Higher Nervous Functions. October 15-17, 2003, Trenčianske Teplice, Slovakia.
- [4] COST Action 844 Symposium: The Role of the Nitric Oxide in Cardiovascular System. April 8-10, 2005, Bratislava, Slovakia.
- [5] International C.I.A.N.S. Conference 2005. June 29th -July 2nd , 2005, Bratislava, Slovakia.
- [6] International symposium: NITRIC OXIDE: Basic Regulations and Pharmacological Interventions. September 21-24, Tučepi, Croatia.
- [7] 4th International Posture Symposium. June 25-28, 2006, Smolenice castle, Slovakia.

• National position of the Organisation

- i. **List of selected most important national projects (Centres of Excellence, National Reference Laboratories, Agency for the Promotion of Research and Development (APVV/APVT), National Research Programmes, Scientific Grant Agency of the Slovak Academy of Sciences and the Ministry of Education (VEGA), and others)**

APVT

Title: The effect of antioxidant treatment on cardiovascular system in experimental hypertension: the role of endothelium

APVV

Title: Role of bioflavonoids in prevention of social stress-induced hypertension

APVV

Title: Protection of the heart against malignant arrhythmias and heart failure

Project with Industrial Partner

Title: The effects of red wine polyphenolic compounds on hypertension and reparative processes in the myocardium

Details including the all VEGA projects see in 4. National projects and funding.

ii. List of national scientific conferences (co)-organised by the Organisation

- [1] The Institute organized the symposium Vasodilatory and antioxidatory mechanisms in cardiovascular system, Bratislava, September 16, 2004
- [2] The Institute organized seven seminars: Testing of hypotheses in biomedical studies during the year 2004.
- [3] The Institute took part in organizing the symposium Biological Aspects of Mental Disorders within the frame of 6th Congress of Slovak Psychiatry. (Sp.N.Ves, June 9-12, 2006)
- [4] The Institute organized the peer-review procedure of our cardiovascular projects with participation of co-working colleagues from Czech Republic and Russia, Smolenice castle, November 24-25, 2005.
- [5] The Institute organized five seminars: Testing of hypotheses in biomedical studies during the year 2005.
- [6] The Institute organized 3 seminars on modelling, measurement and evaluation of cardiac electric field: June 2-4, 2005; October 26, 2005 and November 22, 2005.
- [7] In cooperation with Slovak Society for Higher Brain Functions SMA the Institute organized two scientific sessions – January 20, 2005 and March 3, 2005
- [8] The Institute has organized two seminars on modelling, measurement and evaluation of cardiac electric field: September 27, 2006 and November 29, 2006
- [9] The Institute organized the workshop: Mechanisms of development and sustaining the hypertension: Vasodilatory and antioxidatory mechanisms in cardiovascular system, November 9-15, 2006
- [10] The Institute organized a scientific meeting for the Association of medical doctors from Bratislava, February 21, 2006
- [11] The Institute took part in organizing the First Slovak Neuropsychiatric Colloquium, November 30 - December 1, 2006, Bojnice Spa.

iii. List of national journals published by the Organisation

- [1] The Institute does not publish the national journal.

iv. List of edited proceedings of national scientific conferences/events

[1] The Institute did not edit proceedings from national events

- **International/European position of the individual researchers**

- i. **List of invited/keynote presentations at international conferences, documented by an invitation letter or programme**

(2003)

JAGLA, F. Electrophysiological correlates of visual-oculomotor integration in relation to certain mental activities. *Meeting of C.I.A.N.S. representatives*, Bad Kreuznach, NSR, 12.3.2003 (Keynote presentation)

PECHÁŇOVÁ, O. - BERNÁTOVÁ, I. - ZENEBE, W. - ANDRIANTSITOHAINA, R. Red wine polyphenols increase nitric oxide synthase expression and activity: Relation to blood pressure. *Second International Conference on Cardiovascular Medicine and Science*, Bethesda, Maryland, 23.-25. 7. 2003.

KRISTEK, F. - TÖRÖK, J. Beneficial effect of pentaerythryl tetranitrate and molsidomine in NO-deficient hypertension. *Second International Interdisciplinary Conference on Cardiovascular Medicine and Science*, Bethesda, Maryland, 23.-25. 7. 2003.

BERNÁTOVÁ, I. - DUBOVICKÝ, M. - PRICE, W.A. - GRUBBS, R.D. - LUCOT, J.B. - MORRIS, M. Effect of chronic pyridostigmine bromide treatment on cardiovascular parameters and behaviour in mice. *Second International Conference on Cardiovascular Medicine and Science*, Bethesda, Maryland, 23.-25. 7. 2003.

(2004)

SZATHMÁRY, V. - TYŠLER, M. Effect of ventricular repolarization changes on ECG parameters. A model study. *V. Joint Meeting of international Society for Holter and Noninvasive Electrocardiology and Working Group for Noninvasive Electrocardiology, Polish Cardiac Society*, Zakopane, Poland, 19. – 21. 2. 2004.

JAGLA, F. – KUKUMBERG, P. – JERGELOVÁ, M. Panická porucha - periférne a centrálné elektrofyziologické koreláty. *IInd Czech – Slovak Neuropsychiatric symposium*, Český Krumlov, 23. – 25. 9. 2004.

JERGELOVÁ, M. – JAGLA, F. Príspevok k neurofyziologickým prejavom vnímania, vykonávania a imaginácie pohybu. *IInd Czech – Slovak Neuropsychiatric symposium*, Český Krumlov, 23. – 25. 9. 2004.

PECHÁŇOVÁ, O. Mechanizmy účinku antioxidantných látok v prevencii a liečbe hypertenzie. *32. konferencia Komisie experimentálnej kardiológie pri Českej a Slovenskej fyziologickej spoločnosti*, Piatrová pri Martine, 13. - 15. 10. 2004.

(2005)

JAGLA, F. Psychophysiology: its use in experimental and clinical research - *Lectio Magistralis. Seminary: L' UOMO BIOPSIKOSOCIALE: come conoscerlo, come aiutarlo.* Palermo, Taliansko, 3.-4. 12. 2005 (Lectio Magistralis).

PECHÁŇOVÁ, O. Significance of antioxidants in the experimental hypertension. Whole university lecture invited by the *University Complutense, Madride, Spain*, 14.12.2005.

SZATHMÁRY, V. Počítačový model depolarizácie a repolarizácie srdcových komôr. *Lecture and demonstration of computer model invited by the Chair of information systems, Pannonian University, Veszprém, Hungary*, 12. 10. 2005.

KATINA, S. Total variation penalty and statistical inference in shape analysis: from theory and simulations to applications in biological sciences. *Lecture invited by the University of Kassel, Germany*, 15.11.2005.

KRISTEK, F. Different effect of NO donors on geometry and reactivity of conduit arteries in SHR and NO-deficient rats. *Workshop COST 844: The role of nitric oxide in cardiovascular system*, Bratislava, 2005, 8. – 10. 4. 2005. In *Physiological Research* Vol. 54, no. 5, p.52P.

TÖRÖK, J. - LÍŠKOVÁ, S. - PAULIS, L. - KRAJČIROVIČOVÁ, K. - PECHÁŇOVÁ, O. - ŠIMKO, F. Effect of melatonin on endothelial function of conduit artery in rat with experimental hypertension. *Workshop COST 844: The role of nitric oxide in cardiovascular system*, Bratislava, 2005, 8. – 10. 4. 2005. In *Physiological Research* Vol. 54, no. 5, p.52P.

PECHÁŇOVÁ, O. - BERNÁTOVÁ, I. - ŠIMKO, F. - BABÁL, P. - ANDRIANTSITOHAINA, R. - ZICHA, J. - KUNEŠ, J. Antioxidant effect of antihypertensive therapy in the experimental hypertension. *Workshop COST 844: The role of nitric oxide in cardiovascular system*, Bratislava, 2005, 8. – 10. 4. 2005. In *Physiological Research* Vol. 54, no. 5, p.52P.

BERNÁTOVÁ, I. - BABÁL, P. - GRUBBS R.D. - MORRIS, M. Acetylcholinesterase inhibition affects cardio-vascular system in mice. *Workshop COST 844: The role of nitric oxide in cardiovascular system*, Bratislava, 2005, 8. – 10. 4. 2005. In *Physiological Research* Vol. 54, no. 5, p.52P.

(2006)

BERNÁTOVÁ, I. Regulatory mechanisms of nitric oxide deficient hypertension. *Semmelweis symposium, Nitric oxide and nitrosative stress in the cardiovascular system*, Budapest, Maďarsko, 29-31.10.2006.

PECHÁŇOVÁ, O. Antioxidant effect of antihypertensive therapy within the development of high blood pressure. *Lecture invited by the Research Center Project for Studying Lifestyle Related Diseases*, Mugokawa Women University, Nishinomiya, Japonsko, 23.10.2006.

PECHÁŇOVÁ, O. Significance of antioxidants in the L-NAME-induced hypertension. *Lecture invited by the Osaka City University, Department of Biochemistry and Molecular Pathology*, Osaka, Japonsko, 24.10.2006

PECHÁŇOVÁ, O. The effect of spironolactone on nitric oxide production in experimental hypertension. Lecture invited by the *Osaka City University (whole university lecture)*, Osaka, Japonsko, 1.11.2006.

PECHÁŇOVÁ, O., BERNÁTOVÁ, I., BABÁL, P., MARTINEZ, M.C., ČAČÁNYIOVÁ, S., STVRTINA, S., ANDRIANTSITOHAINA, R. Red wine polyphenols prevent cardiovascular alterations in experimental hypertension: Molecular mechanisms. *International symposium FAPRONATURA, First International Symposium about Pharmacology of Natural Products 2006*, Varadero, Cuba, 20.-24. 11. 2006.

PECHÁŇOVÁ, O., JENDEKOVÁ, L., CSIZMADIOVÁ, Z., KOJŠOVÁ, S. The effect of apocynin on reactive oxygen species and nitric oxide production in the borderline and spontaneous hypertension. *5th International Congress of Pathophysiology*, Peking, China, 28.6. - 1.7. 2006, In Chinese Journal of Pathophysiology 2006, 22 (13): 271.

SZATHMÁRY, V. Modelová simulácia rôznorodosti repolarizácie srdcových komôr a jej reprezentácia srdcovým vektorom. *XXIX. Dni lekárskej biofyziky, Sekcia 3: Vedecko-výskumná činnosť ako neoddeliteľná súčasť profesionalizácie vysokého školstva a zdravotníctva, grantové projekty – Vyžiadané prednášky III.*, Bratislava, 16.-18. 5. 2006.

SZATHMÁRY, V. Numerical Modeling of Heart Electrical Activity: Principles and Applications. *Lecture invited by the Chair of information systems, Pannonian University, Veszprém, Hungary*, 08. 11. 2006.

ii. List of employees who served as members of the organising and/or programme committees for international conferences

- [1] 3rd International Posture Symposium. September 6-9-, 2003, Smolenice Castle.
F.Hlavačka – chairman, K.Dérerová, O.Dzurková, Z.Hercegová, J.Musilová
- [2] International symposium: NITRIC OXIDE: from molecular level to clinical application. September 12-15,2003, Brač, Croatia.
O.Pecháňová - chairperson, I.Bernátová, F.Kristek, J.Török
- [3] 39th International Interdisciplinary Conference on Experimental and Clinical Study of Higher Nervous Functions. October 15-17, 2003, Trenčianske Teplice,
F.Jagla -chairman, M.Jergelová, M.Neuwerthová, I.Riečanský, V.Zikmund
- [4] International symposium within the frame of 2nd International Interdisciplinary Conference on Cardiovascular Medicine and Science. July 23-25, 2003, Bethesda, Washington, USA.
I.Bernátová, F.Kristek, O.Pecháňová
- [5] Special symposium C.I.A.N.S. dedicated to 100 yrs anniversary of Nobel Prize Award to I.P.Pavlov. May 17-19, 2004, St.Petersburg, Russia.
F.Jagla – chairman
- [6] XXXX. International Interdisciplinarz conference of experimental and clinical stuidz of higher nervous functions, September 15-17, 2004, Plzeň, Czech Republic.
F.Jagla, M.Jergelová, I.Riečanský

- [7] 6th Meeting on New Frontiers in Basic Cardiovascular Research, September 15-16, 2004, La Grand-Motte, Montpellier, France.

O.Pecháňová

- [8] COST Action 844 Symposium: The Role of the Nitric Oxide in Cardiovascular System. April 8-10, 2005, Bratislava, Slovakia.

F.Kristek – chairman, O.Pecháňová

- [9] International C.I.A.N.S. Conference 2005. June 29th -July2nd , 2005, Bratislava, Slovakia.

F.Jagla – chairman, Ľ.Bolvanská, M.Jergelová, Ľ.Pišáková, I.Riečanský

- [10] International symposium: NITRIC OXIDE: Basic Regulations and Pharmacological Interventions. September 21-24, Tučepi, Croatia.

O.Pecháňová - chairperson, I.Bernátová, L.Jendeková, S.Kojšová, F.Kristek, J. Török

- [11] 4th International Posture Symposium. June 25-28, 2006, Smolenice castle, Slovakia.

F.Hlavačka – chairman, N.Adamcová, J.Bzdúšek, K.Dérerová

- [12] Normální a patologická fyziologie CNS within the frame of the 41st International Interdisciplinary Conference on Experimental and Clinical Study of Higher Nervous Functions. August 28-30, 2006, Brno, Czech Republik.

F.Jagla

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

- [1] **F. Jagla**

- a) Collegium Internationale Activitatis Nervosae Superioris (C.I.A.N.S.): *member of the Executive Committee, 2003-2005 president, since 2005 vicepresident*
- b) Centre for Vision and Visual Cognition, University of Durham, Durham, UK, *external associate member*
- c) European Network for Workplace Health Promotion (ENWHP) *member, National Contact Office (NCO) of ENWHP in Slovakia*

- [2] **V. Zikmund**

Collegium Internationale Activitatis Nervosae Superioris (C.I.A.N.S.): *member of the Executive Committee*

- [3] **I. Ruttkay-Nedecký**

Collegium Internationale Activitatis Nervosae Superioris (C.I.A.N.S.): *grounding member*

International Society of Electrocardiography: *grounding member*

- [4] Editorial board *Physiological Research*

M.Gerová, O.Pecháňová, V.Smieško

- [5] Editorial board *Neuroendocrinology Letters*

E.Kellerová, V. Zikmund

- [6] Editorial board *International Journal of Cardiovascular Medicine and Science*
F.Kristek
- [7] Editorial board *Homeostasis in health and disease*
F.Jagla, V.Zikmund
- [8] Editorial consultant *Journal of Electrocardiology*
I. Ruttaky-Nedecký
- [9] Editorial board *Research & Reviews in BioScience*
I.Bernátová
- [10] Editorial board *General Physiology and Biophysics*
O.Pecháňová
- [11] *Individual members of:*
Collegium Internationale Activitatis Nervosae Superioris (C.I.A.N.S.):
F.Jagla, M.Jergelová, I.Riečanský, I.Ruttaky-Nedecký, V.Zikmund
Interamerican Society for Hypertension:
I.Bernátová, M.Gerová, F.Kristek, O.Pecháňová, J. Török
International Brain Research Organization:
F.Hlavačka, M.Jergelová, J.Pavlásek, I.Ruttaky-Nedecký, V.Zikmund
International Society for Electrocardiography
V.Regecová, I.Ruttaky-Nedecký, V.Szathmáry
International Society for Heart Research
I.Bernátová, O.Pecháňová
International Society for Hypertension
M.Gerová, O.Pecháňová
American Physiological Society
M.Gerová
American Heart Association
M.Gerová
International Society for Posture and Gait Research
F.Hlavačka
Czech Society for Hypertension
O.Pecháňová

iv. List of international scientific awards and distinctions

- [1] **I.Bernátová**
- a) Post Doctoral Scientist Award – San Diego, 2003
 - b) Young Scientist Travel Award – San Diego, 2003
 - c) Best Poster, Annual Meeting Eur. Council for Cardiovasc.Res. Nice, 2006

[2] **F.Jagla**

- a) Since 2001 visiting docent - Laboratorio di Scienze Cognitivo Comportamentali e di Terapia C.C., Istituto Tolman, Palermo, Italy
- b) Since 2005 visiting professor - Associazione Italiana di Analisi e Modificazione del Comportamento e Terapia Comportamentale e Cognitiva, Milano, Italy

[3] **L.Paulis**

Jiří Widimsky Award, 16 Congress Eur.Soc.Hypertension, Madrid, 2006

[4] **O.Pecháňová**

- a) Since 2005 expert columnist of Journal Saludad Ciencia, section invited expert columnists
- b) Best poster of authors O.Pecháňová, L.Paulis, S.Kojšová, F.Šimko, Intern.Soc. Heart Res Conference, Tromso, Norway, 2005
- c) Award for contribution on 21st Congress of Int.Soc. Hypertension, Fukuoka, Japan, 2006

[5] **I.Riečanský**

- a) Young Psychiatric Fellow, WPA International Congress, Istanbul, Turkey, 2006
- b) European College of Neuropsychopharmacol. Education Committee Award, 2006

[6] **Z.Csizmadiová, P.Janega, L.Jendeková, S.Kojšová, A.Puzserová**

Student Accommodation Grant Award, 16th European Meeting on Hypertension, Madrid, Spain, 2006

[7] **S.Kojšová**

Student Accommodation Grant Award, 15th European Meeting on Hypertension, Milan, Italy, 2005

- **National position of the individual researchers**

- i. **List of invited/keynote presentations at national conferences documented by an invitation letter or programme**

(2003)

KELLEROVÁ, E. Reakcie kardiovaskulárneho systému na sympatergné podnety. Dérerova prednáška. *XLIII. Dérerov memoriál*, Bratislava, 25. 4. 2003.

(2004)

JAGLA, F. – KUKUMBERG, P. – JERGELOVÁ, M. Panická porucha: elektrofyziologické koreláty poruchy dolnej časti mozgového kmeňa. *VI. Slovenský psychiatrický zjazd*, Spišská Nová Ves., 9. – 12. 6. 2004.

(2006)

JAGLA, F. Kampaň EÚ za podporu zdravia na závodoch a účasť Slovenska v projektoch. *Vedecko-odborná konferencia Životné podmienky a zdravie s medzinárodnou účasťou*, Štrbské Pleso, 11.-13.10.2006.

ii. **List of employees who served as members of organising and programme committees of national conferences**

- [1] Symposium of the Slovak League against epilepsy, Liptovský Ján, June 11-12, 2004
E.Kellerová
- [2] IXth Congress of the Slovak Society of Cardiology, Bratislava, October 7-9, 2004,
O.Pecháňová, V.Szathmáry
- [3] Scientific meetings of the Slovak Society for Higher Brain Functions SkMA, Bratislava January 20th, March 11th, and October 20th, 2005:
F.Jagla, M.Jergelová, O.Pecháňová, V.Szathmáry, V.Zikmund
- [4] 81st Physiological Days, Košice, February 2-4, 2005:
O.Pecháňová, J.Török
- [4] Drobnicov Memorial, June 15-17, 2005, Makov,
O.Pecháňová
- [5] Workshop: Mechanisms of development and sustaining the hypertension, vasodilatory and antioxidative mechanisms in cardiovascular system. Bratislava, November 9-15, 2006
O.Pecháňová, I.Bernátová, F.Kristek, J. Török
- [6] 1st Slovak Neuropsychiatric Colloquium, Bojnice, November 30 – December 1, 2006,
F.Jagla

iii. **List of employees serving in important national scientific bodies (e.g. boards, committees, editorial boards of scientific journals)**

- [1] **F.Jagla** - Slovak Society for Higher Brain Functions SkMA - president
Slovak Physiological Society SkMA – treasurer
Slovak Neuropsychiatric Society SkMA – member of national committee
- [2] **M. Jergelová** – Slovak Society for Higher Brain Functions SkMA – member of national committee
- [3] **O.Pecháňová** – Slovak Physiological Society SkMA – member of national committee
- [4] **J. Török** – Slovak Physiological Society SkMA – member of national committee
- [5] **V.Zikmund** – Slovak Society for Higher Brain Functions SkMA – member of national committee and honorary president
- [6] **I.Ruttkay-Nedecký** – member of the editorial board of journal Kardiológia

iv. **List of national awards and distinctions**

- [1] **M.Gerová**: Silver Medal of the Slovak Medical Association, 2005
- [2] **F.Jagla**: Golden Medal of the Slovak Medical Association, 2005
Honorary J.Jessenius Medal of the Slovak Academy of Sciences, 2005

- [3] **L.Jendeková, S.Kojšová, Ľ.Paulis, O.Pecháňová** – Award of the Slovak Society of Cardiology, 2006
- [4] **Ľ.Paulis**: 1st place in Student Scientific Conference, Medical Faculty, 2006
The University Rector Award for magister thesis, 2006
Award of the Ľudová banka for results during the graduate studies, 2006
- [5] **P.Janega**: 1st place in Student Scientific Conference, Medical Faculty, 2006
Award of the University Rector for organization of Student Scientific Conference, 2006
- [6] **I.Riečanský**: Guoth Prize of the Slovak Medical Association for the experimental work of young scientist during postgraduate studies in International Graduate School of Neuroscience, Bochum, FRG, 2005
- [7] **I.Ruttkay-Nedecký**: Niederland medal of Slovak Medical Association, 2006
Doctissimi Slovacie, Slovak Academz of Sciences, 2006
- [8] **V.Zikmund**: Niederland Prize of the Slovak Medical Association, 2005

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

The Institute cooperates very closely with the Collegium Internationale Activitatis Nervosae Superioris and with its national partner the Slovak Society for Higher Brain Functions SkMA.

The Institute played a substantial role in grounding the professional organization. The NO Club – which joins all the Slovak professionals interested in the scientific research of the effects of the nitric oxide upon the organism.

Both the above activities resulted in organizing the international conferences and symposia as stated above.

4. Project structure, research grants and other funding resources

- **International projects and funding**
 - i. **List of major projects within the European Research Area – 5th and 6th Framework Programme of the EU, European Science Foundation, NATO, COST, INTAS, CERN, etc. (here and in items below please specify: type of project, title, grant number, duration, funding, responsible person in the Organisation and his/her status in the project, e.g. coordinator, principal investigator, investigator)**

[1] COST**Title:** Apoptosis and Programmed Cell Death Biotechnology and Agriculture.**Grant number:** COST 844**Duration:** 2004-2005**Funding:** 130 000 Sk

and further 1 800 000 Sk for organisation and funding of COST Meeting (2005)

Responsible person: RNDr. František Kristek, CSc.**Status:** principal investigator**[2] Socrates Erasmus III****Title:** Medical Natural Sciences (MedNatNet)**Duration:** 2003-2005**Funding:** 55 000 Sk**Responsible persons:** MUDr. Fedor Jagla, CSc., RNDr. Olga Pecháňová, DrSc.**Status:** principal investigator**[3] European Network for Workplace Health Promotion****Title:** Move Europe**Grant number:** 2005303**Duration:** 2005/11 – 2008/12**Funding:** 1000 EURO from ENWHP/ 25 000 Sk for 2006**Responsible person:** MUDr. Fedor Jagla, CSc.**Status:** national coordinator**ii. List of other international projects incl. funding****[1] DAAD****Title:** The effects of natural polyphenols in the cardiovascular system: cell and molecular level.**Grant number:** DAAD 323-PPP**Duration:** 01.2002 –12.2003**Funding:** 222 300 Sk**Responsible person:** RNDr. O. Pecháňová, DrSc.**Status:** principal investigator**[2] Department of Electronics Computer Science and Systems, University of Bologna, Italy****Title:** Development of new methods for the improvement of human balance control an integrated approach based on modelling techniques and biofeedback devices**Duration:** 2001-2003

Funding: 50 000 Sk

Responsible person: Ing. F. Hlavačka, CSc.: Molecular Mechanisms and Applications in

Status: principal investigator

iii. List of other important projects and collaborations without direct funding

[1] Neurological Science Intitute of OHSU, Human Balance Disorders Lab., Portland, Oregon, USA

Title: Multisensory feedback interactions in human postural control

Duration: 1999-2003 and 2004-2009

Responsible person: Ing. F. Hlavačka, CSc.

Status: principal investigator

[2] Department of Pharmacology and Toxicology, Institute of Biomedicine, University of Helsinki, PL 8, FIN - 00014 Helsinki, Finland

Title: Experimental models of hypertension: biochemical parameters and pharmacological influence.

Duration: 2000-2003

Responsible person: RNDr. O. Pecháňová, DrSc.

Status: principal investigator

[3] Laboratoire de Pharmacologie et Physicochimie des Interactions Cellulaires et Moléculaires, Universite Louis Pasteur de Strasbourg, 67401 Illkirch Cedex, France

Title: Effect of natural polyphenols on hypertension and myocardial hypertrophy in different models of experimental hypertension.

Duration: 2000-2003 and 2004-2007

Responsible person: RNDr. O. Pecháňová, DrSc.

Status: principal investigator

[4] Department of Bioengineering, Research Institute for Technical Physics and Material Science, MAV, Budapest, Hungary

Title: Improvement of the cardiovascular system understanding with the aim to improve diagnostics and treatment of cardiac patients

Duration: 2003-2006

Responsible person: RNDr. Vavrinec Szathmáry, CSc.

Status: principal investigator

[5] Social Research Institute AR, Cluj-Napoca, Romania

Title: Neurophysiological correlates of spatial negative priming task in anxious subjects

Duration: 2002-2005

Responsible person: MUDr. Fedor Jagla, CSc.

Status: principal investigator

[6] Institute of Physiology, Academy of Sciences of Czech Republic, Prague, Czech Republic

Title: Different models of experimental hypertension and vasoactive systems.

Duration: 2003-2005 and 2006-2008

Responsible person: RNDr. O. Pecháňová, DrSc.

Status: principal investigator

[7] Department of Biomedical Sciences and Biotechnology, Division of Human Anatomy, University of Brescia, 25123 Brescia, Italy

Title: The effect of natural polyphenols on the damage of cardiovascular system and kidney induces by long-term cyclosporine A treatment.

Duration: 2004-2006

Responsible person: RNDr. O. Pecháňová, DrSc.

Status: principal investigator

[8] Department of Pharmacology and Toxicology, Wright State University School of Medicine, Dayton, Ohio

Title: The influence of stress and inhibition of acetylcholinesterase on the reactivity and variability of blood pressure and heart frequency in mice with normal genotype and with oxygen gene deletion.

Duration: 2003-2005

Responsible person: Mgr.I. Bernátová, CSc.

Status: principal investigator

[9] Institute of Physiology, Masaryk University, Brno, Czech Republic

Title: Analysis of the central electrophysiological correlates in relation to anxiety

Duration: 2005-2007

Responsible person: MUDr. Fedor Jagla, CSc.

Status: principal investigator

[10] I.P.Pavlov Institute of Physiology, Russian Academy of Sciences , St. Petersburg, Russia

Title: Cooperation in postgraduate education

Duration: 2005-2006

Responsible person: MUDr. Fedor Jagla, CSc., RNDr. Ol'ga Pecháňová, DrSc.

Status: principal investigator

[11] Department of Biochemistry and Molecular Pathology, Osaka City University, Osaka, Japonsko

Title: Development of high blood pressure within the metabolic syndrome.

Duration: 2006-2009

Responsible person: RNDr. O. Pecháňová, DrSc.

Status: principal investigator

[12] Institute of Theoretical and Experimental Biophysics, RAS, Pushchino, Moscow region, Russia

Title: To work out new methods for noninvasive determination of electrophysiological state of the heart with aim to improve cardiac diagnostics, using mathematical and computer modelling.

Duration: 2003-2006

Responsible person: RNDr. Vavrinec Szathmáry, CSc.

Status: principal investigator

[13] Institute for Information Trnasmission Problems, RAS, Moscow, Russia

Title: Noninvasive electrophysiological investigation of the heart on the basis of mathematical modelling.

Duration: 2003-2006

Responsible person: RNDr. Vavrinec Szathmáry, CSc.

Status: principal investigator

- **National projects and funding**

- i. **List of projects supported by the Agency for the Promotion of Research and Development (APVV/APVT), National Research Programmes, and their funding**

[1] APVT

Title: The effect of antioxidant treatment on cardiovascular system in experimental hypertension: the role of endothelium

Grant number: APVT No. 51- 017902

Duration: 09.2002 –10.2005

Funding: 341 000 Sk

Responsible person: RNDr. O. Pecháňová, DrSc.

Status: principal investigator

[2] APVV

Title: Role of bioflavonoids in prevention of social stress-induced hypertension

Grant number: APVT-51-018004

Duration: 2005-2007

Funding: 2 000 000 Sk

Responsible person: Mgr. Iveta Bernátová, CSc.

Status: principal investigator

[3] APVV

Title: Protection of the heart against malignant arrhythmias and heart failure

Grant number: APVV-51-059505

Duration: 2006-2008

Funding: 103 000 Sk

Responsible person: Mgr. Iveta Bernátová, CSc.

Status: investigator

[4] Project with Industrial Partner

Title: The effects of red wine polyphenolic compounds on hypertension and reparative processes in the myocardium

Grant number: PS 02A0106

Duration: 2002-2003

Funding: 200 000 Sk

Responsible person: RNDr. O. Pecháňová, DrSc.

Status: principal investigator

- ii. **Number of 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	2003	2004	2005	2006
number	7	10	8	11
funding (millions of SKK)	0,731	0,935	0,876	0,939

- **Summary of funding from external resources**

External resources	2003	2004	2005	2006	total	average
external resources (millions of SKK)	1,016	0,497	2,224	0,190	3,927	0,982
external resources transferred to cooperating research organisations (millions of SKK)	0,000	0,000	0,397	0,388	0,785	0,196
ratio between external resources and total salary budget	0,124	0,060	0,261	0,022	0,467	0,117
overall expenditures from external as well as institutional resources(millions of SKK)	14,279	14,315	15,753	13,369	57,716	14,429

Supplementary information and/or comments on research projects and funding resources

There are other resources from bilateral international projects (BIP). The BIP with Czech colleagues in Prague brought us not only the payment of several travel expenses for participation in Congresses, Conferences and Symposia (common lectures) all over the world but also the supply of certain expensive chemicals as well. The very expensive PROVINOL™ is at our disposal due to the BIP with Strasbourg in France. The extremely expensive animal model of metabolic syndrome we were able to use by means of the BIP with Japan. The modern EEG apparatus we have on the basis of the BIP with Czech colleagues from Brno. Several our co-operating partners abroad accept our PhD students for partial fulfilling the study plan (e.g. Prague, Strasbourg, Berlin, St:Petersburg). The financial value of the above mentioned resources might reach even two million crowns in the assessed period.

5. Organisation of PhD studies, other pedagogical activities

- List of accredited programmes of doctoral studies (as stipulated in the previously effective legislation as well as in the recently amended Act on the Universities)**

1. Normal and Pathological Physiology

- ii. Summary table on doctoral studies (number of internal/external PhD students; number of students who completed their study by a successful thesis defence; number of PhD students who quitted the programme)

PhD study	31.12.2003			31.12.2004			31.12.2005			31.12.2006		
number of potential PhD supervisors	8.			8.			8.			8.		
PhD students	number	defended thesis	students quitted									
internal	2	1	0	3	1	0	4	1	0	4	0	0
external	3	0	0	5	0	0	5	0	0	6	0	0
supervised at external institution by the research employees of the assessed organisation	1	0	0	1	0	0	2	0	1	2	0	1

- iii. Postdoctoral positions supported by

a) external funding (specify the source)

2003-2004

M.Haburčák

C.Haburčáková – supported by the Boston University, USA

2003-2005

W.T.Zenebe – supported by Texas University, USA

Since 2006

M. Cebová – supported by the Maine University, USA

b) internal funding - the Slovak Academy of Sciences Supporting Fund of Stefan Schwarz

Nobody during assessed period.

iv. Summary table on pedagogical activities in undergraduate programmes for each year

Teaching	2003	2004	2005	2006
lectures (hours/year)				
practicum courses (hours/year)				
supervised diploma works (in total)				
members in PhD committees (in total)				
members in DrSc. committees (in total)				
members in university/faculty councils (in total)				
members in habilitation/inauguration committees (in total)				

v. List of published university textbooks

[1] Chapter on physiology of vision by F.Jagla in Medical Physiology edited by K.Javorka et al., second edition 2006

vi. Number of published academic course books

No publication during the assessed period.

vii. List of joint research laboratories/facilities with the universities

[1] The laboratories of the Department of Cardiovascular Physiology serve for more than 10 years as the educational basis for the graduate students from the Chair of Animal Physiology and Ethology of the Faculty of Natural Sciences, Comenius University. Moreover, Assoc.prof. J. Török, MD, CSc. and RNDr. O.Pecháňová, CSc., DrSc. are the lecturers for the graduate students from the above Chair.

[2] The same is true for the laboratories of the Department of Brain Physiology where the practicum courses for the graduate students from the Chair of Psychology, Faculty of Philosophy Comenius University are done. F.Jagla, MD, CSc. Serves as lecturer for the course from Neurophysiology.

viii. Supplementary information and/or comments on doctoral studies and pedagogical activities

The very reach co-operation and contacts with the Medical Faculty, Faculty of Natural Sciences and Philosophical Faculty of the Comenius University in Bratislava has opened the door for many graduate students of the University to come to our Institute for preparing the theses for bacalateur degree, for the degree of magister as also for consulting many seminar works.

6. Direct output to the society

(applications of results, popularisation and outreach activities)

i. List of the most important results of applied research projects

[1] Polyphenolic substances have been indicated to mediate the beneficial effects of red wine on cardiovascular diseases. Therefore, the effects on hemodynamic and morphological status of the cardiovascular system was elucidated. Particularly, we have evaluated the preventive and regressive effects of the red wine polyphenols, Provinol, on arterial hypertension as well as hypertrophy, myocardial fibrosis and vascular remodeling of the aorta in the rat experimental hypertension models - nitric oxide (NO)-deficient hypertension and spontaneous hypertension. The results were compared with the data received from the group of rats treated with natural red wine diluted with drinking water. Provinol treatment significantly reduced the increase in blood pressure caused by chronic inhibition of NO synthesis by nitro-L-arginine methyl ester (L-NAME) (Fig. A). Provinol reduced myocardial fibrosis and decreased aortic wall thickness but did not affect hypertrophy. Provinol also accelerated decrease of blood pressure in fully developed hypertension (Fig. B). The results imply that increased NO synthase activity accounts for the effects of Provinol. Long-term red wine drinking prolonged the onset of spontaneous hypertension in rats, however it was not able to prevent from the structural alterations in the heart and blood vessels developed by increased blood pressure. *PS 02A0106, RNDr. O.Pecháňová, DrSc. Applicator: Corporation of wine producers in Slovak Republic*

[2] In cooperation with the IInd Neurological clinic of the Medical faculty in Bratislava, several groups of panic outpatients in the interparoxysmal period, without specific medication and regularly working at their workplaces, underwent in the Institute electrophysiological examinations. The extreme increase of the inaccuracy of the gaze fixations was found. Consecutive corrective eye movements redirecting the gaze to the visual target influence substantially the evoked potentials time locked to the saccadic eye movements registered over the frontal brain cortical areas (frontal eye fields) and

also the same potentials registered over posterior parietal areas. The correspondence between the angular velocity of the eye movements and the angular velocity of the objects moving within the visual fields significantly depends upon the visual object velocity. By the high velocities of visual objects the interindividual variability is markedly increased. The latencies of the P300 wave, which is a certain index of information processing on hierarchically higher levels of the central nervous system, are prolonged and their amplitudes lowered as well. The registered changes in the electrophysiological correlates point to the very important participation of the neurotransmitter systems of the brain stem lower parts in the etiopathogenesis of the panic disorders. *VEGA grant 2/2028/24, MUDr. F.Jagla, CSc., Applicator: IInd Neurological Clinic, Medical faculty, Comenius University, Bratislava*

- [3] Stereotype in static load and minimal motor activity during sitting results often in low back pain. In co-operation with Departments of the Physical Medicine and Rehabilitation of FNŠP and of ŠNOP in Bratislava we tested whether the dynamic condition of sitting on the air pillow (PC pillow) could be a prevention of lower back pain in those whose sitting position is the most common working posture. Observation was based on patient's estimation of pain by an analogy scale, clinical observation and postural activity measurement during sitting. Patients were evaluated before rehabilitation, after rehabilitation and after one month period of sitting on the PC pillow. The posturographic measurement was performed using the test-chair developed at the Institute. Stabilograms were recorded during sitting on the lateral unstable force platform. The subject was sitting at the 10 cm thick foam, with eyes closed and arms stretched imitating PC writing. The stability of sitting was characterized by the statokinezigram area (TA) and amplitude (Ax) and velocity (Rx) of lateral body tilts were used to estimate muscles activity, i.e. ergonomic of sitting. The results confirmed the positive influence of rehabilitation and dynamic condition of sitting in patients with the low back pain. It is important to notice that the prolonged sitting on the PC air pillow induced further posture improvement in comparison to the condition after rehabilitation (Fig. 1). From this point of view we recommend the application of sitting on PC pillow as a part of complex and preventive rehabilitation. *VEGA grant 2/4070/25, Dipl.Ing. F.Hlavačka, CSc., Applicator FRO FNŠP and FRO ŠNOP Bratislava.*
- [4] We have studied the effects of red wine polyphenolic compounds (Provinols™) on cardiovascular system and kidney in relation to the molecular and biochemical mechanisms of these compounds. We provided the evidence that Provinols™ was able to produce endothelium-dependent relaxation as a result of enhanced nitric oxide (NO) synthesis. Administration of Provinols™ partially prevents the development of hypertension and accelerates the decrease of blood pressure in already established hypertension. The effects of Provinols™ include attenuation of fibrosis in the heart and kidney, reduction of vessel wall thickening and improvement of vascular and nefron

functions. These effects of Provinols™ were associated with increased NO production, decreased oxidative membrane damage and decreased production of inflammatory markers within the cardiovascular system and kidney. Provinols™, however, blunted the elevation of NO production and vasorelaxation during experimental social stress. Thus, Provinols™ might maintain equilibrium between endothelium-derived vasoconstrictor and vasodilator factors in stress.

Bilateral interinstitute project INPP SAS – Universite L.Pasteur de Strasbourg: RNDr.Pecháňová, CSc., DrSc., Applicator Societé Francaise de Distillerie, Vallont Pont d'Arc, France.

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

[1] The Institute took an active part in seminary organized by the Ministry of Health of Slovak Republik under the auspices of Unit G1, DG SANCO (Luxembourg): *New Programme of Community Action in the Field of Public Health*. The responsible persons from the Ministry of Health from Poland, Czech Republic, Hungary, Austria and Slovenian Republic took part in the event. The Institute discussed the problems concerning the *Health state, life style and work conditions* (January 23-24, 2003, Bratislava)

[2] The Institute took an active part in the session of the Committee of the United Nations for peaceful use of the cosmos. Within the frame of discussing the theme: *Use of space technologies for medical research and praxis* we presented the results and methods of vestibular organ research in space with their applications in clinical praxis. (February 17th, 2003, Vienna, Austria)

[3] The Institute was appointed as the National Contact Office (NCO) of the European Network for Workplace Health Promotion (ENWHP). The Institute was appointed as the national coordinator of the ENWHP project Move Europe in Slovakia. Moreover, the Institute organized a common workshop of the Collegium Internationale Activitatis Nervosae Superioris and ENWHP: *Behavioural Modelling* (July 1st, 2005, Bratislava).

[4] The Institute, as the NCO of the ENWHP took an active part in the business meeting of the above network in Cracow, Poland (October 11-12, 2006) and consecutively has informed the national specialist, participant of the conference *Living Conditions and Health* (Strbské Pleso, October 13th, 2006) about the new projects of the ENWHP supported by DG SANCO (Luxembourg).

iii. List of the most important popularisation activities

- [1] The Day of the Open Doors – 2004 dedicated to the students of the secondary schools, 2005 – dedicated to the special school for the gifted students, 2006 – for the public. Every time a possibility to visit particular laboratories and to discuss personal problems attracted many subject to come. We were really happy to see the interest of young people in science.
- [2] The press conference (2006) on the problem of health in working aging population with an accent on the significance of the life style as well as on the role played by the employers.
- [3] Following the press conference there was an interview with the director of the Institute in TV channel TA3
- [4] There was another interview with the director followed by talk with the listeners in the radio station SRO.

iv. List of patents issued abroad, incl. revenues

No one during the assessed period

v. List of the patents issued in Slovakia, incl. revenues

No patent was issued in Slovakia during the assessed period.

vi. List of licences sold abroad, incl. revenues

No one during the assessed period

vii. List of licences sold in Slovakia, incl. revenues

No one during the assessed period

viii. List of contracts with industrial partners, incl. revenues

No one during the assessed period

ix. List of research projects with industrial partners, incl. revenues

- [1] As stated above we had the common project with the Corporation of wine producers of Slovakia. This project helped us to study the effect of the red wine polyphenols upon the regulation of the blood pressure as well as upon the morphological, physiological and biochemical changes within the cardiovascular system. The above Corporation supplied us with red wine polyphenols.

x. Summary of outreach activities

Outreach activities	2003	2004	2005	2006	total
studies for the decision sphere, government and NGOs, international and foreign organisations	2	0	1	1	4
articles in press media/internet popularising results of science, in particular those achieved by the Organization	3	0	2	13	18
appearances in telecommunication media popularising results of science, in particular those achieved by the Organization	0	2	3	4	9
public popularisation lectures	0	0	2	0	2

xi. Supplementary information and/or comments on applications and popularisation activities

The Institute co-operates with the Special school for gifted children. We organized the Day of Opened Doors for the above school and we were invited to present the psychophysiological possibilities for studying giftedness on the 4th International Conference” Developmental Distinctivenesses and Potential realization of Gifted Children (2005).

7. Background and management. Staffing policy and implementation of findings from previous assessments

i. Summary table of personnel

Personnel	2003	2004	2005	2006
all personel	58	61	61	61
research employees from Tab. Research staff	17,9	19,9	20,3	19,6
FTE from Tab. Research staff	35,9	37,8	38,7	37,6
averaged age of research employees with university degree	51	51	51	54,2

ii. Professional qualification structure

Number of	2003	2004	2005	2006
DrSc.	2	2	2	3
PhD / CSc.	13	14	13	11
Prof.	1	1	1	1
Doc./Assoc. Prof.	2	2	2	2

iii. Status and development of research infrastructure incl. experimental, computing and technical base (description of the present infrastructure, premises, and material and technical resources. Infrastructure, instrumentation and major technical equipment necessary for the achievement of the objectives specified in the research Concept)

The only sufficient situation concerns the computational technique. We have our own programs, or by means of bilateral co-operations we have at our disposal very specialized and sophisticated software's. The not very sufficient situation as for the technical resources we need to be compensated with the very rich and fruitful co-operation with partners in Bratislava and abroad. The advantage is we have access to modern technologies. The disadvantage concerns the authorship of common publications. Contemporary system of evaluation within the Slovak Academy of Sciences is not convenient

iv. Status and development of bibliographic resources, activities of the Organisation's library and/or information centre

The budget does not enable us to supply the library as needed. The particular research teams according to the financial situation (grants) used to buy the most needed actual literature, but it is not enough. The same situation is concerning the journals. These days we are obtaining gratis the journal BRAIN, the American Journal of Physiology is at our disposal because our colleague as a member of the American Society is obtaining it at a reduced rate. We have our colleagues in the editorial board of Physiological Research as also in Homeostasis in health and disease. This is the reason we have also these journals at our library. The good situation is that the Slovak Academy of Sciences supplied the community with several electronic bases.

v. Describe how the results and suggestions of the previous assessment were taken into account

1. Suggestion – to modernize the technical and informational equipments

We were able to modernize the informational system, the institute is plugged in onto the optical cable, we have changed the old hubs for the modern switches and the whole intramural net was improved.

2. Suggestion – to publish in journals with better impact factors

As it is seen from the final reports also this situation is better now. In the year 2006 the scientific output is equal to the sum of the outputs from previous three years. Also, two monographs were published, one in Slovak language and the other in English language, and the special number of the Physiological Research was completed with the manuscripts from the Institute. Of course, we are interested in further improving the situation. The good signal is our young colleagues obtained some awards for their presentation and they were able also to publish their results in accepted journals.

3. Suggestion – to enable young colleagues the on-line possibility for the relevant literature

As stated under (1), by means of the all academic situation it was done.

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

On April 1st 2007 new management of the Institute will take the posts.

Bratislava, February 27th, 2007

RNDr. O.Pecháňová, DrSc.
Scientific secretary

MUDr. F.Jagla, CSc.,
Director

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