Physiol. Res. 55 (Suppl. 1): S1-S2, 2006

Introduction

It is a great pleasure to introduce this special issue of Physiological Research as the representative publication of the international co-operations of the Institute of Normal and Pathological Physiology, Slovak Academy of Sciences in Bratislava.

For more than 50 years, the Institute develops the basic and applied research in the field of experimental medicine. The Institute is engaged in the research of the physiological and pathophysiological mechanisms playing a substantial role in the so-called diseases from civilization. This activity is reflected in participation of the Institute in the EU program devoted to the work place health promotion.

Today, the cumulative physiological approach towards the living organisms is not very common for the contemporarily very specialized physiological research institutions. Thus, such an approach, apart from the interinstitutional collaborations, demands international co-operations as well. Our international relationships in the field of cardiovascular physiology and neurophysiology which represent the main scientific interest of our Institute are developed within formalized but namely individually organized bilateral interdisciplinary projects and programs. Our Institute maintains variety of international co-operations with the partner institutes in Europe, North America and Asia. Actually, the number of our up-to-date co-operations is changing according to the current interests, needs, and possibilities. Therefore, in this special issue we present results reached continually with our partners from laboratories in the France, Italy, USA, Russia, Hungary and of course with our long years partners and friends in Czech Republic in the last years.

Studies in the field of ***cardiovascular physiology*** are focused on the analysis of experimental hypertension and repolarization dispersion in the heart using different *in vitro* and *in vivo* models. In various models of hypertension impaired endothelium-dependent relaxation has been described implying an endothelial dysfunction and an apparent decrease in the production of bioactive nitric oxide. The goal of our studies is to analyze the imbalance in nitric oxide and superoxide anion generation in 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 is analysed concurently. With the aim to study the blood vessel responses to vasoactive substances in the conditions with intact and removed endothelium we use myograph and organ bath isometric tension techniques. The up-to-date biochemical and molecular methods are used for determination of enzyme activities and expressions that are responsible for nitric oxide and reactive oxygen species production and degradation. Morphological and morphometrical study is performed for detailed analysis of structural alterations especially after antihypertensive therapy. Another topic concerns the question of affecting the human electrocardiographic phenomena by selected biological and environmental factors. The obtained results are confronted with the original computer model of heart activation.

The regulatory mechanisms of sensorimotor integration is the common topic for those our colleagues who are interested in ***neurophysiological and psychophysiological studies***. These integration subserve the interaction among the subjects, between a man and an animal as well as between a living creature and his/her environment. The changes of the physiological correlates of the sensorimotor interaction inform also about the interferential influences, the effect of possible risk factors as also about the pathophysiological mechanisms involved. They help to fill the gap between the psychologically described etiological factors and the biological nature of the organ pathology. It has lagged behind in comparison with research on the biological homeostatic processes. For following presentation we select two topics. One concerns the role of sensory control of the human upright posture aiming to find out new knowledge, perspective diagnostic methods as well as the more effective possibilities of rehabilitation the

© 2006 Institute of Physiology, Academy of Sciences of the Czech Republic, Prague, Czech Republic
Fax +420 241 062 164
E-mail: physres@biomed.cas.cz http://www.biomed.cas.cz/physiolres

stance and gait disturbances. The second topic concerns the higher cortical functions participating in the mechanisms responsible for the cognitive and behavioral conflict in several mental disorders. To study the specific nonlinear chaotic changes in the bioelectrical activity of the human brain may provide the more appropriate psychophysiological correlates of the actual brain state in patients suffering from various affective disorders.

The co-operations with our international partners and such cumulative and complex approach allowed us to study mutual interference of environmental, genetic, and pharmacological factors in their influences of blood pressure and heart and brain functions during normal and pathological conditions.

MUDr. Fedor Jagla, CSc. Director

RNDr. Oľga Pecháňová, DrSc. Scientific Secretary