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abstracts

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Dynamics of Nitric Oxide Production in Heart and Liver of Rats During Increasing 30-Days Restriction of Motor Activity and Subsequent Recovery

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Nitric oxide (NO) is known to be a paramount signaling molecule modulating the physiological functions of the organism and the cell metabolism [1, 2]. Its role is documented for the central and autonomous nervous systems, for cardiovascular function and blood supply to the brain and the heart, where deviations in NO level may incur risks of stroke and infarction [3, 4]. The NO system is also essential in adaptation to environmental changes and external conditions such as physical load [5]. It has been found that NO impairs the progress of myocardial infarction, and this impairment lies in the reduced heart rate, reduced blood pressure, stroke volume and cardiac output [6]. There is also an opposite point of view, according to which an excess of NO is a compensatory factor that helps to maintain tissue perfusion and provides antiarrhythmic effect during reperfusion [7]. The described literature data indicate two opposite effects of NO: a stimulating, positive, as well as toxic, and damaging effect that can lead to cell death. There are clear contradictions in the assessment of the effects of the NO donors and the NOS blockers, when it is considered that these impacts or stimuli provide unambiguous effect, although the exact quantification of NO in the tissues has not been conducted under these conditions.

The restriction of motor activity (MA) is one of the most important medical and social problems caused by lifestyle, professional activity, prolonged bed rest, etc [2]. The destructive effect it has on virtually all organs and systems of the body is evidenced by extensive convincing experimental and clinical material. Reducing the load on the muscular apparatus leads to changes in functional and morphological properties of tissues down to pathological conditions, oxygen consumption by tissues and activity of oxidative processes are significantly reduced. Problems associated with the restriction of MA, in modern society are increasing, and this is due to lifestyle changes, with an increase in the number of patients who require bed rest. Molecular processes, which underlie the changes in physiological functions: the parameters of cellular respiration, skeletal muscle proteins and the system of NO, have attracted increasing attention lately. Therefore, the objective of the study was to investigate the role of NO in the consequences resulting from the recovery after restriction of MA by analyzing the NO-containing paramagnetic complexes in various tissues of rats growing under restricted physical activity.

Our team has studied the content of NO in tissues of rats by EPR spectroscopy using the method of spin traps. As spin trap were applied the complex of Fe^{2+} with diethyldithiocarbamate DETC)$_2$-Fe^{2+}-NO. The records were carried out on EPR spectrometer X-band firm "Bruker" EMX/plus and ER 200E SRC. We have found that the amount of NO produced in the tissues of the ventricles and atria of the heart increases after 30-day restriction of MA in 2–3 times. It was found that after 2 weeks of recovery of MA the level of NO production in the tissues of the heart is reduced even more. Thus, the obtained results allow to conclude about the presence of close relations between the level of NO in the body with a regime of physical activity. Because the review of literature data shows that the restriction of MA causes significant changes in the cardiovascular system, blood flow and supply of oxygen to the body, it can be assumed that some of these changes caused a fixed increase of NO production in the key activities of the body tissues.

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