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EPR Study of Nitric Oxide Production in Spinal Cord of Rats after Spinal Cord Injury in Acute and Chronic Periods

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The role of nitric oxide (NO) in the functioning of nervous and cardiac systems is very important [1]. The literature provides evidence of two opposing modes of NO influence on the physiology of various tissues: (1) positive, stimulatory, versus (2) toxic, damaging action that may lead to cell death. Hence it can be asserted that the "sign" of effect depends on the amount of NO, yet it is not clear what amounts should be regarded as low, normal, or elevated. It is shown that the change of the NO production in the tissues can result in various pathologies [2]. Early by method of EPR spectroscopy we studied the changes of intensity of NO production after modeling of hypokinesia to rats (the limitation of moving activity) through analyses of quality of NO containing paramagnetic complexes in tissues of heart and liver. It was established that after 30- and 60- days hypokinesia take place the 2-3 fold increase of NO quality as in heart and in liver tissues. [3]. One of the problems arise under a spinal pathology is the limitation of moving activity. Rehabilitation after spinal cord injury is one of the actual questions of modern medicine. High frequency of spine-spinal cord injury combined with the complexity of the pathogenesis of traumatic disease of spinal cord and insufficient effectiveness of treatment methods. In present no clear opinion about the role of NO in pathogenesis of traumatic disease of the spinal cord: it is able to mediate regulatory and cytotoxic effects. Therefore, we carried out a study of the dynamics of changes in the levels of NO in the tissues of spinal cord of rats in acute and chronic periods of traumatic disease of spinal cord using EPR spectroscopy.

This series of experiments were performed on rats of Wistar population weighing an average of 200 g. Animals were kept in conditions of vivarium with adjustable light regime 12 hours a day, 12 hours a night, with free access to food and water. Standard open spine-spinal cord injury inflicted on the level of the first lumbar vertebra (L1). Operations were performed in a sterile operating room, with the use of neurosurgical instruments. For anesthesia was used ketamine. We studied the content of NO in the tissues of spinal cord. During EPR samples preparation the spin traps method has been used (prof. Vanin A.F.) [4]. As a spin traps were applied the complex of Fe^{2+} with diethyldithiocarbamate (DETC)-(DETC)₂- Fe^{2+} -NO.

It was shown that in the acute period (in 3 days after injury) of spinal cord injury the level of NO production in tissues of spinal cord were on average 3

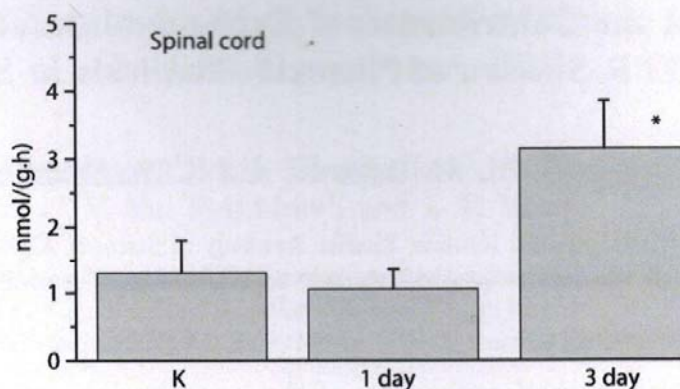


Fig. 1. Intensity of EPR signal of spin trap $(\text{DETC})_2\text{-Fe}^{2+}\text{-NO}$ from spinal cord of control and rats in 1 and 3 days after spinal cord injury.

times higher than in intact animals (Fig. 1) in the future, there is some decrease, but NO production remains above the test values in average 2 times. Thus, the acute spinal cord injuries accompanied by a significant increase of production of NO, which is maintained in chronic period of a disease.

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