THE DISCOVERY OF METALLOTHIONEINS RESPONSE IN THE SYNOVIAL TISSUES OF RATS UNDER THE ACUTE GONARTHRITIS

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Metallothioneins are the unique heat-stable intracellular proteins of particular composition. They are buffering the Zinc (Zn) withing the cell providing its regulatory transfer to other cellular targets. The inflammation processes are frequently accompanied by the Zn deficiency in the body. There are plural data witnessing a continuous deficiency of Zn in serum and plasma of patients with inflammation. However, to the best of our knowledges, the ability to accumulate Zn in the metallothioneins under the gonarthritis (GA) was not investigated. Moreover, the efflux of metallothioneins from the cells can be expected under the inflammation, but the presence of these proteins in the synovial tissues was not in the focus of studies. Therefore, the aim of this study was to evaluate the presence of metallothioneins in the synovial tissues of rat with induced GA.

The acute GA was induced in rats by intra-articular administration of carrageenan. After euthanasia, knee joints were removed surgically, serum was prepared from blood. The synovial tissues were homogenized, and the supernatants were used. Thermostable proteins were isolated by size-exclusion chromatography on Sephadex G-50. For each replicate, two combined samples of tissues in each group were utilised. Each sample was comprised with 70 mg or 100 mg of tissue per individual (to the total of 350 mg or 500 mg from five specimens). The level of sialic acids in the blood serum was assayed for the indication of GA severity.

High level of sialic acids in the serum of the exposed rats confirming the GA diagniosis. Gel-filtration of the thermostable extract revealed in each group the peak with apparent molecular mass of 8 kDa. It was identified as MTs-containing peak basing upon its spectral features, thermostability and molecular weight. In each group, the UV-spectrum of this peak had the typical maximum of absorption in the area of 245–255 nm indicating the presence of metal-thiolate clusters and did not shown the maximum at 280 nm reflecting the absense of the aminoacid residues with aromatic groups in these unique proteins. However, in the exposed animals, the profile of elution was distorted and had two additional peaks with the moleciular mass about 15 and 5 kDa. This manifesrtation was particularly evident in the 500 mg-samples.These additional peaks can reflect particular instability of metallothioneins with the partial oxidative polymerization and the breakdown to the separate domains. These signs can be the results of the instability of metallothioneins in the injured tissue. The reasons for this modification of metallothionein can be the oxidative destroying of the link between two domains and oxidation of thiols with the creaton of olygomers. On the other hand, the consequence of this oxidation can be the lost of the metal-binding properties and, in result, the injury of Zn homeostasys.

To summarize, we discover the metallothioneins in the knee joints of rats and detect the change of their properties under the GA pathology. The evaluation of the metallothionein chromatographyc profile can be utilised in the evaluation of the injury of the sinovial tissues in the degenerative disorder of the knee joint.

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