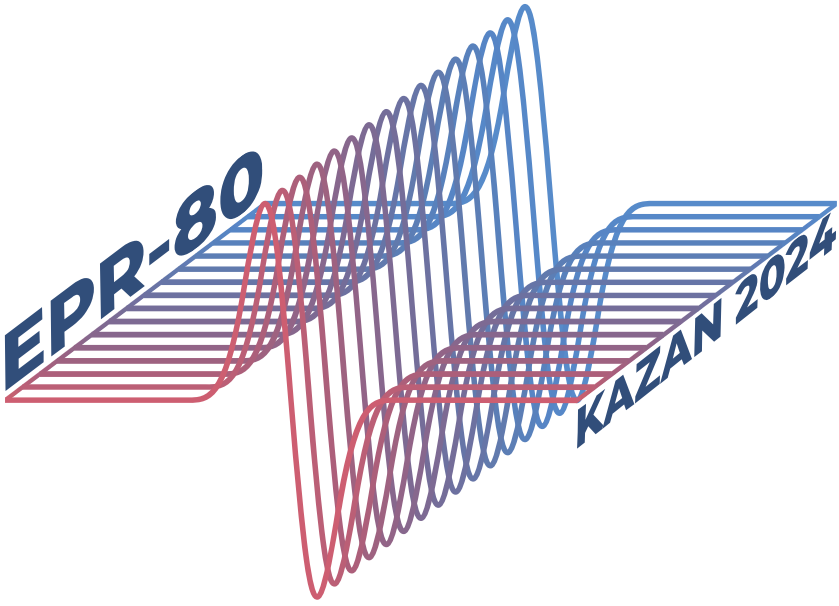
The International Conference

MAGNETIC RESONANCE – CURRENT STATE AND FUTURE PERSPECTIVES (EPR-80)

Kazan, Russia, September 23–27, 2024



BOOK OF ABSTRACTS

Казанский федеральный
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OF THE INTERNATIONAL CONFERENCES

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EMR signals in rat spinal cord 7 days after its traumatic injury

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Recently, the study of molecular mechanisms of nerve tissue damage, and the search for ways to recover from the resulting disorder, have been carried out very intensively. One of the metabolites actively involved in the development of post-traumatic conditions when nerve tissue is damaged is iron. It is known that spinal cord (SC) injury is accompanied by cell death and bleeding, which cause an increase of free iron pool. In this case, it is possible an increase of the processes of iron biomineralization in tissues, which results in the formation of crystalline iron oxides. The EPR technique makes it possible to detect such crystals.

To date, it is known about the observation of electron magnetic resonance (EMR) signals in injured nerve tissues depending on magnetic field orientation, but their nature is insufficiently explored. The aim of the work was to study the emerging EMR signals in the tissue of injured rat SC and compare them with signals in healthy tissues. SC tissues were studied: control (n=3) and with an experimental model of spinal cord injury (SCI) for 7 days (n=6). Two types of EMR signals were detected in SC tissues, corresponding to crystalline iron oxides formed as a result of biomineralization. Their temperature and angular characteristics have been studied. The first type, characterized by the dependence of H_{res} on orientation of the magnetic field, is attributed to nanocrystalline magnetite. The second type, characterized by superparamagnetic temperature behavior, is evidently attributed to the crystalline core of ferritin, ferrihydrite.

A noticeable increase in the EMR signal in the area of SC injury was found compared with neighboring areas of the SC, as well as compared with similar non-injured SC tissues of control rats, on average more than twice, indicating the accumulation of crystalline iron in the injured tissue. In rat, with the maximum effect, the signal in the area of SC injury increased 10 times.

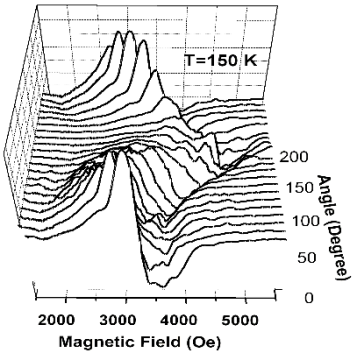

Fig. 1. An example of the EMR signal in injured spin cord and its angular dependence.