



## **The 7th Congress of Biophysicists of Russia - conference proceedings**

### **Abstracts**

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are not only highly conserved cellular components, but also central participants in most diseases, the study of their properties in the context of biological sex becomes important for further deep understanding of pathogenetic mechanisms.

The aim of the work was to search for the sexual dimorphism of brain glial cells during aging, depending on the presence of sex chromosomes, and to determine the role of MERC in this process.

Aging in the primary culture of cerebral cortex astrocytes was achieved by a replicative "passage" aging model. Functional, molecular, and structural differences between cell cultures containing XX- and XY-sex chromosomes were evaluated after genotyping of newborn mice from which the cortex cells were taken. The expression of a number of genes was assessed by real-time PCR, the functional state of cells was studied using calcium imaging using Fluo-4-AM calcium dye (Thermo Fischer, USA). Immunocytochemical labeling of astrocytic cells made it possible to identify the cells, the state of contacts between mitochondria and the endoplasmic reticulum was assessed using transmission electron microscopy, and the content of NSE, S100, BDNF, and estradiol was detected using enzyme-linked immunosorbent assay (ELISA) (Cloud-Clone, China).

Quantitative determination of proteins and estradiol in the cell medium and cell lysates by ELISA showed no statistically significant differences between cells containing different sex chromosomes. Calcium imaging in vitro revealed a statistically significant difference in the calcium activity of astrocytic cells depending on the sex chromosomes at passages 8 and 9. The duration and frequency of calcium oscillations in the XX genotype was higher than in the XY genotype. Differences in the viability of glial cells between genotypes at late passages were found: in the XX genotype, the viability of cells is higher than in cells with the XY genotype. The difference in the expression of several genes was determined: *snplh*; *stat3*; *MFN*; *IgF1*; *Il6*; *cGamp*. The volume of astrocytic cells of the XX genotype was larger than that of the XY astroglia. At the same time, no ultrastructural differences were found in the qualitative analysis between astrocytes of different genotypes for sex chromosomes.

Thus, data have been revealed that prove the existence of differences in the functional properties (calcium activity, expression of a number of genes) and morphometric parameters (cell volume) of astrocytes during aging, depending on the presence of sex chromosomes, which indicates the need for further study of the sexual dimorphism of somatic cells. The study was supported by the Russian Science Foundation, grant No. 22-15-20043.

#### S9.730. The study of NO content in the skeletal muscles of rats in the deficit of movement by EPR-spectroscopy

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In the conditions of the industrial and urban environment life of modern man offers the organism a form of vital activity of its organs and systems far from the level of motor activity and safety from the necessary requirements inherent in evolution. There is extensive and convincing experimental and clinical evidence about the destructive effect that the lack of movement has on the body's organs and systems. There is a decrease in the load on the muscular apparatus, which leads to changes in functional and morphological changes to pathological conditions depending on the duration and degree of hypokinesia. It is known that during movement deficit, the hind limbs of rats are under-loaded and significant structural changes in the muscles in the form of dystrophy are detected. NO is an important modulator of cellular activity in many tissues in vertebrates and invertebrates. NO is able to interact with a variety of substances • thiols, proteins, sugars, metal ions, heme proteins, etc., localized in a

variety of tissues and organelles, which suggests the presence of NO and its complexes in various tissues. The nitric oxide system, which plays a role in the activation of antioxidant enzymes, limits the stress response. The electron paramagnetic resonance method was used to investigate the intensity of nitric oxide production by analyzing the amount of NO-containing paramagnetic complexes in the tissues of calf muscle of rats growing under conditions of movement deficit. Restriction of motor activity in penile cells was 30 days. Rats of the control group were kept under conditions of natural motor activity, 4-5 animals per cage. Due to the short lifetime of NO, which manifests itself in its low concentration in tissues, the method of electron paramagnetic resonance (EPR) is the most expedient to detect and quantify NO. The method is based on the reaction of a radical (in this case NO) with a spin trap • we applied the Fe2+ complex with diethyldithiocarbamate (DETC), which allows to capture NO and form a stable triple complex (DETC)2-Fe2+-NO in animal tissues. Nitric oxide production was evaluated by the intensity of the EPR signal belonging to the (DETC)2-Fe2+-NO complex. The signals were compared by the integral intensity value, since the integral intensity of the EPR signal is directly proportional to the concentration of paramagnetic complexes. Tissues of animal calf muscle were taken for the study. The EPR spectra of the prepared samples were recorded on an ER-200E-SRC Bruker EMX/plus X-band EPR spectrometer with an ER 4112HV temperature attachment at 77 K. The following parameters were kept constant in all experiments: microwave power of 30 mW, modulation of 5 G, amplification of 4 × 10<sup>4</sup>, time constant of 100 ms, spectrum recording time of 50 s, and number of accumulations of 8. It was found that the amount of NO in the skeletal muscles of rats growing under hypokinesia conditions did not differ from those of the control group.

#### S9.731. The study of morphometric parameters of platelets using electron microscopy

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Platelets are non-nuclear blood cells measuring 2-4 micrometers. Their main function is to assemble a hemostatic thrombus at the site of vessel injury. There are a number of inherited diseases in which morphological changes in the structure of platelets are observed: Wiskott-Aldrich syndrome, MYH9-associated syndromes, Gray Platelet syndrome, Gernansky-Pudlak syndrome, Paris-Trousseau syndrome, Chediak-Higashi syndrome. Morphological abnormalities can be divided into abnormalities of the platelet cytoskeleton, alpha and dense granules, and membrane abnormalities. Diseases affecting the structure or number of granules usually require confirmation by transmission electron microscopy.

The purpose of this work is to develop a method for analyzing the morphometric parameters of platelets using electron microscopy.

Results. The methods of sample preparation of platelets for electron transmission microscopy were debugged and the parameters for the morphometric evaluation of platelets were selected. The following indicators were selected: the ratio of platelet sizes, the number of alpha granules per platelet and their size, platelet area and the ratio of the number of granules to this area. A set of norms was produced for comparison with the results of patient analyzes for selected indicators. Conclusion. Electron microscopy in the clinical diagnosis of platelets plays an important role in disorders associated with dense and alpha granules, as this is the only method that allows you to visualize and reliably determine their condition and number. To a lesser extent, electron microscopy is used to confirm cytoskeletal or membrane