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МАТЕРІАЛИ

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СУЧАСНІ ПРОБЛЕМИ ВИВЧЕННЯ МЕДИКО-ЕКОЛОГІЧНИХ АСПЕКТІВ ЗДОРОВ'Я ЛЮДИНИ

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full-fledged study by nursing bachelors of academic disciplines, in particular anatomy and physiology, in medical institutions.

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EFFECTS OF AU/AG/FE NANOPARTICLES IN CHANGES OF THE CEREBRAL CORTEX STRUCTURE UNDER THE CONDITION DMH-INDUCED COLON ADENOCARCINOMA *IN SITU*

Modern medicine struggles with numerous illnesses, but cancer has been a number one enemy for modern scientists for many years. Colorectal cancer (CRC) takes 2nd place in mortality because of malignant neoplasms. CRC is always accompanied by chronic endotoxicosis, leading to severe changes in homeostasis. All of these lead to structural and functional changes in different organs, and the central nervous system is especially vulnerable. Nanotechnology-based therapy is a new strategy in cancer treatment.

Aim of research. To investigate morphological changes of the cerebral cortex under the condition of DMH-induced colon adenocarcinoma *in situ* and the influence of Au/Ag/Fe nanoparticles composition as correction method.

The study was performed on mature outbred white male rats, divided into two groups: 30 control animals and 60 animals with modeled colorectal adenocarcinoma in situ. CRC was modeled with the injections of DMH (N, N-Dimethylhydrazine, Sigma-Aldrich, N D161608) once a week for 30 weeks subcutaneously. After realization of the experiment and histological verification of development colon adenocarcinoma *in situ* 30 of injured animals received nanoparticles Au/Ag/Fe (d=30 nm; in 1 ml: 1,6 mg Ag; 0,1mg Fe; 3,088 mcg Au) intragastrically for 21 day. We collected pieces of the parietal area of the somatosensory cerebral cortex (fields 1-2) to investigate the microscopic and submicroscopic structure. All histological samples were made according to conventional methods and were studied using a SEOSKAN light microscope and an electron microscope PEM-125K.

We identified significant microscopic changes in ganglionic and pyramidal cortex layers neurons in animals with DMH-induced colon adenocarcinoma *in situ.* "Dark", "intensely dark" and "light" (hypochromic) neurons were found in the cortex of injured animals. "Dark" and "intensely dark neurons had thinned processes, reduced bodies, osmophilic neuroplasm, and karyoplasm. Nuclei were

small in size with an irregular karyolema that forms invaginations. Neuroplasm contained osmophilic lysosomes. Mitochondria were small, with an electron-dense matrix, while others with a locally enlightened matrix, so their cristae were poorly contoured. The tubules of the RER dilated unevenly and partially fragmented, forming light cavities of irregular shape. The "light" neurocytes had round-oval nuclei with pale karyoplasm, small basophilic nucleoli. Some hypochromic cells with slightly basophilic neuroplasm were in a state of tigrolysis, while some cells were in a state of total tigrolysis. We investigated a local widening of perinuclear space, and the number of nuclear pores decreased. Neuroplasm contained secondary lysosomes and lipofuscin inclusions. Most mitochondria were with an enlightened matrix and damaged cristae, enlarged. "Light" cells had dilated, partially disrupted rough endoplasmic reticulum (RER) tubules around the nucleus. Surface of RER contained a small number of ribosomes. We observed hemocapillaries with narrowed lumens filled with erythrocytes, wavy walls, and swollen endotheliocytes in the cortex of the large hemispheres. Significant perivascular edema was present around such blood capillaries. Endothelial cells had swollen, illuminated areas of the cytoplasm. Nuclei of endotheliocytes had a high content of condensed heterochromatin, forming large osmiophilic clusters.

We observed less damage to the brain cortex's structural components after using Au/Ag/Fe nanoparticles as a correction method. In the pyramidal and ganglionic layers of the cortex, tigrolysis in neurocytes was less evident: a middle number of hypochromic and hyperchromic cells, and an increase in the number of normochromic neurocytes. There were many basophilic lumps in the neuroplasm of hyperchromic cells. Round nuclei include euchromatin and large, intensely stained nucleoli. All this indicates a high functional activity of neurocytes. Significantly better preservation of organelles and manifestations of regeneration processes was observed in the majority of normochromic neurocytes on a submicroscopic level. Contoured membranes of moderately expanded RER tubules and the Golgi complex cisternae were found in the neuroplasm. Rounded and oblong-shaped mitochondria mainly had a lighted matrix and partially damaged cristae.

We indicated rounded, euchromatin nuclei with clearly contoured karyolemma membranes; the perinuclear space was thickened in some areas. Nuclear pores were well structured, with one or two hypertrophied nucleoli. Euchromatin prevailed in the karyoplasm, and few heterochromatin lumps were found. An improvement in the structure of hemocapillaries was established.

Their lumens were moderately expanded, the wall and endotheliocytes were contoured, and the perivascular edema was much smaller. Ultrastructural

organization of blood capillaries also demonstrates improvement of transcapillary exchange.

The nuclei of many endotheliocytes had an oblong shape, invagination of the karyolemma, and euchromatin that prevailed in the karyoplasm. We observed preserved membrane organelles in the cytoplasm; free ribosomes and polysomes were also there. Pinocytotic vesicles and caveolae were found in the cytoplasmic areas of endotheliocytes. The capillary basement membrane was moderately thickened but contoured.

DMH-induced CRC leads to severe destructive and neurodegenerative disorders, indicating significant damage to experimental animals' cerebral cortex. We identified significant microscopic and submicroscopic changes in cerebral cortex neurocytes, the destruction of their nuclei, and organelles.

The use of Au/Ag/Fe nanoparticles led to a considerable improvement in the condition of the structural components of the cortex; reduction of destructive changes in blood vessels, which in turn contributed to the activation of neurocyte regeneration.

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MORPHOMETRIC CHARACTERISTICS OF THE RAT'S CECUM WALL IN CONSUMPTION OF THE COMPLEX OF FOOD ADDITIVES IN LAST TERMS OF EXPERIMENT

Most literary sources provide information on the systemic effects of monosodium glutamate on the human and animal body. There are insufficient data on the effect on the large intestine.

The purpose of the work was to establish the dynamics of changes in the morphometric indicators of the structural components of the rats' cecum wall, with the long-term use of a complex of food additives: sodium nitrite, sodium glutamate and Ponceau 4R.

42 mature outbred male rats were involved into the study. The rats of control group (n=14) consumed drinking water and were administered with saline orally. The rats of the experimental group, with access to water *ad libitum*, were administered with 0,6 mg/kg sodium nitrite, 20 mg / kg monosodium glutamate and 5 mg / kg Ponceau 4R in 0.5 ml of distilled water once daily per os. The animals were sacrificed within 8, 12 and 16 weeks under thiopentone anesthesia overdose.