

small clusters, and sometimes their total absence, became apparent in presynaptic terminals; cases of their agglutination being also frequent. In different neuropil regions cases of synapse active zones' protraction and synaptic cleft distention up to 50-70 nm were also marked sometimes. At the same time the availability of separate terminals, where the "dark" type reaction takes place, can't help being noticed. The terminals specified have a high electron-optical density and a great number of synaptic vesicles. Compared to the previous follow-up period, increase of total synapse density values and that of degenerate changed synapse quantity making in cervical spine - 106,1% and 194,0%, thoracic one - 115,7% and 322,8%, lumbar one - 104,8% and 171,0% from the original values, accordingly ($p < 0,05$) happens from the part of anterior horns' motor neurons on the 10th day. Alongside with this, responsively changed synapses' motor neurons' value showings keep on decreasing, compared to the previous follow-up periods, making in cervical spine 79,7%, thoracic spine - 89,4%, lumbar spine - 77,1% from the original ones ($p < 0,05$). On the 25th day after finishing the effect the beginning of reparative processes' development is marked, that manifests in the ultrasonic level particularly in the fact that in cytoplasm of a considerable part of both "light" and "dark" motor neurons the number of endoplasmic reticulum and Golgi complex cisterns, and also ribosomes, chondriosomes, and lysosomes increases. The specified structures are revealed preferentially in perinuclear zones of a neuron. Compared to the previous follow-up period, on the 25th day after finishing X-ray radiation a combination is noted in anterior horns of all parts of the spinal cord: degenerate changed synapse number decrease and responsively changed motor neurons' synapse number appreciable increase, making in cervical spine - 148,3% and 107,1%, in thoracic one - 288,6% and 122,5%, in lumbar one - 128,3% и 107,3% from the original values accordingly ($p < 0,05$). For anterior horns' motor neurons' responsively changed synapses in the specified term the increased osmophilia of active zones and also full-blown node of postsynaptic membrane were typical. By the end of the observation period (the 60th day after finishing X-ray radiation), unlike the previous follow-up periods, values both of responsively changed synapse quantity and total

motor neuron synapse density exceed the original ones in all parts of spinal cord, making in cervical part - 114,6% and 103,9%, thoracic - 139,9% and 115,1%, lumbar - 111,9% and 101,3%, accordingly ($p < 0,05$). Responsively changed synapses of anterior horns' motor neurons of all localization parts were characterized with increased active zones' osmophilia and full-blown node of postsynaptic membrane. On the 60th day after X-ray radiation the quantity indexes of degenerate changed synapses of motor neurons of the specified structures are significantly higher than the original ones in all parts of spinal cord, especially thoracic one, where it exceeds the original 2,5 times as much, while in cervical part - 1,3 times, lumbar - 1,2 times as much ($p < 0,05$).

Thus, the results of the carried out research demonstrate the fact that at X-ray effect during the whole experiment (60 days) changes of morphoquantitative indicants of responsive and degenerate changes of motor neurons' synapses of spinal cord of guinea-pigs are observed; they reaching maximal manifestation degree from the part of the specified structures in cervical spine.

ULTRASTRUCTURAL CHANGES OF EPITHELIAL CELLS OF SKIN EPIDERMIS AT MICROWAVES EXPOSURE (EXPERIMENTAL STUDY)

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The analysis of the dynamics of ultrastructural changes reflecting the degree of responsive and destructive changes of skin epidermis basal layer epidermal cells of guinea-pigs during 60 days after finishing microwaves exposure (length of wave - 12,6 cm, frequency - 2375 MHz, power flow density (PFD) - 60 mW/cm², exposure time - 10 min) has been carried out in the research.

With the development of science and technology in everyday life and industry as well as while taking diagnostic remedial measures, sources of SHF radiation (microwaves) get more and more popularity. (Gosalves J. et al., 2002; Dasdag S. et al., 2003; Yao K. et al., 2004). The first organ to be exposed to microwaves is skin that caused the necessity to study the dynamics of ultrastructural changes in epidermal skin cells,

and in particular, basaliocytes from different localization areas (head (cheek), back, stomach), while being affected with microwaves.

The research was carried out on 65 mature guinea-pig males weighing 400-450 g, from which 35 were used in the experiment, and 30 served as the control. Maintenance and work with the experimental animals were carried out in accordance with the rules accepted by the European Convention about the defense of vertebrate animals used for experimental and other scientific purposes (Strassburg, 1986). The experimental animals were exposed to the effect of microwaves (length of wave - 12,6 cm, frequency - 2375 MHz, power flow density (PFD) - 60 mW/cm², exposure time - 10 min). The continuously-operated therapeutic apparatus "Luch-58" served as a microwave generator. At the irradiation a continuously-operated cylinder-shaped radiant №1 with the diameter 90 mm was used. The dosimetry was made by a thermistor bridge M3-10 with thermistor coaxial head M 5-17. After finishing microwave exposure rectal temperature of the experimental animals was measured by means of the medical electro-thermometer TPMEM-1. The irradiation took place at one and the same time of the day - from 10 to 11 o'clock in autumn-winter period taking into account daily and seasonal radiosensitivity (Shcherbova Ye.N., 1984). Before the experiment the guinea-pigs 3-5 times were subject to a "false" effect with the apparatus on, but the irradiation off, to exclude the stress factor. Excluding the animals from the experiment and sampling the materials were done immediately, in 6 hours, on the 1st, 5th, 10th, 25th and 60th days after finishing the exposure. The flaps of skin were taken from different areas (head (cheek), back, stomach). For submicroscopy the skin flaps were fixed in 2,5% glutaraldehyde in 0,2 M cacodylate buffer (pH-7,2) and post-fixed in 1% solution of osmic acid. All the objects were poured with araldite. Sectioning was carried out on an ultratome LKB-III. Semifine sections were stained with toluidine blue, ultrafine ones - contrasted with uranyl acetate and plumbum citrate, observed and photographed through electronic microscope JEM-100 CX-II. Hematological control (total count of erythrocytes and leucocytes) was carried out during the experiment.

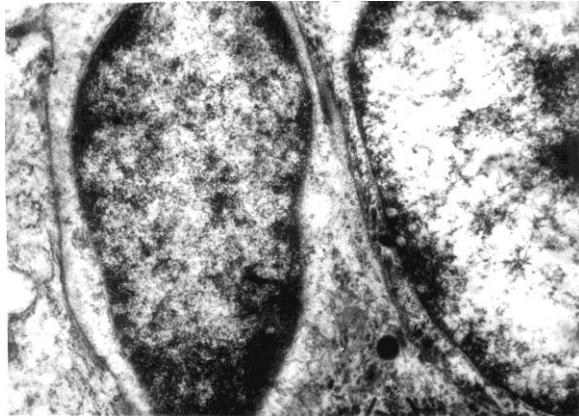
Right after finishing the microwave effect on the part of the guinea-pigs' behaviour some lethargy was marked, rectal temperature

increased on average by 0,9-1,1°C. During the following three days liquid intake decrease was marked. At skin section submicroscopy right after the microwave exposure in the cytoplasm of separate basal layer epidermal cells of head (cheek) and stomach skin vacuolation regions are marked. In 6 hours after the SHF radiation effect in part of basal layer epidermal cells of all localization areas, especially in head (cheek) skin, swelling of nuclei and karyoplasm depression, cytoplasm vacuolation. On the 1st day after the microwave effect, at submicroscopic research, changes of basal layer epitheliocytes are similar to the ones described in the previous term; at the same time full-blown events of perinuclear vacuolation of cytoplasm in some part of basal epidermal cells of head (cheek) skin attract great attention (Picture 2). On the 5th day after the SHF-wave effect in basal epidermal cells significant changes are revealed. Some part of the epidermal basal layer epitheliocytes of all skin areas are expanded, with vague boundaries. In the specified cells changes of nuclei which are characterized with chromatin beads relocation to karyolemma occurs. Sometimes in the specified epitheliocytes, especially in head (cheek) and stomach skin, destructive changes declaring themselves, in particular, as lysis, rhexis and pyknosis of nuclei, that undoubtedly testifies the death process of the part of the cells. Vacuolation events reach a considerable degree of manifestation in basaliocyte cytoplasm; sizes of separate vacuoles matching those of the pyknotic, sharply decreased in size, nucleus in some part of head (cheek) and stomach skin (pic. 2). In the specified time the impoverishment of both erythrocytes - up to 80,4% (p<0,05) and leucocytes - up to 61,7% (p<0,01) in peripheral blood from the control level took place. On the 10th day after the microwave exposure the changes in basal layer epidermal cells described in the previous follow-up period, though expressed in a less degree, retain. In separate epitheliocytes of stomach and head (cheek) skin the events of lysis, rhexis, pyknosis and also frank cytoplasm vacuolation events occur. On the 25th day after finishing SHF-waves exposure of thermogenic intensity a homogenous character of chromatin distribution over the nuclei of the majority of all localization areas' basal layer epidermal cells, and often - relocation of the hyperchromatic nucleolus to karyolemma, - become apparent. As an exception, in the stomach and head (cheek) skin epidermis

separate cells of basal layer with rhexis, lysis and pyknosis of nuclei and also cytoplasm vacuolation events are marked. On the 60th day after the SHF exposure the morphological picture on the part of basal layer epidermal cells of all localization areas differs very little from that of the control. As an exception, in single basal layer epidermal cells of head (cheek) skin cytoplasmic vacuoles occur.

The findings obtained in the experiment testify significant ultrastructural changes of basal epidermal cells of guinea-pigs' skin at microwave exposure of thermogenic intensity; the changes reaching the highest degree of manifestation in head (cheek) and stomach skin. The specified ultrastructural changes of basal epidermal skin cells, and those of destructive character as well, reach their maximum on the 5th day after finishing the microwave effect.

Picture 1. The ultrastructure of a guinea-pig's head skin epidermis basaliocytes. The control. Enlarged by 19000.



Picture 2. The event of the guinea-pig head skin epidermis basaliocyte cytoplasm vacuolation on the 1st day after the microwave effect (arrow). Enlarged by 19000.

