cell research

Structure of the kidney after administration of high doses of lithium carbonate to mice with skin melanoma

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Lithium represents a promising agent for neutron capture therapy (NCT) of cancer, as it has a large thermal neutron absorption cross-section and provides 100% localization of energy release inside the cell, compared to boron, which is traditionally used in NCT. It is assumed that the introduction of high doses of lithium will promote the accumulation of lithium in tumor cells at concentrations required for successful NCT; however, it is currently unknown whether such doses will be toxic to the body, given that kidney damage is one of the most common side effects of lithium therapy. The aim of this study was to evaluate kidney structure when administering high doses of lithium carbonate (LC) to mice with implanted B16 skin melanoma. The B16 skin melanoma cell line and C57BL/6 mice were used in the experiment. The animals were divided into 11 groups (n=5): a control group; 5 groups receiving LC at a dose of 300 mg/kg, and 5 groups receiving LC at a dose of 400 mg/kg. Animals were sacrificed at 15 minutes, 30 minutes, 90 minutes, 180 minutes, and 7 days after LC administration. Autopsy material (kidneys) was prepared using standard techniques for electron microscopy; morphometric analysis of electronograms was performed using the ImageJ program.

No significant differences were found between the control and experimental groups among the studied parameters (thickness of the glomerular basement membrane and the basement membrane of proximal tubular epithelial cells, width and number of podocyte foot processes, number of fenestrae in the endothelial cells of the glomerular capillaries, and width of the slit diaphragm). Swelling of the epithelial cells in the proximal tubules and a decrease in endosomes were observed at early stages of the experiment (15-180 minutes), indicating dystrophic changes with subsequent regeneration while maintaining areas of cytoplasmic swelling in epithelial cells after 7 days. The results obtained indicate the potential for using LC in doses necessary for a successful neutron capture reaction.

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