

MRI neurophenotyping of the consequences of experimental hyperglycemia in different genotypes of mice

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Motivation and Aim: Neurophenotyping of laboratory animals in models of human pathology has biological and further medical significance. There is a question: how the choice of the genetic line of mice can affect the results of the study? We have focused on the pharmacological model of hyperglycemia, knowing that prolonged hyperglycemia affects brain function and this effect is quite strong. Thus, we have obtained a comparative study of the effect of prolonged hyperglycemia on the neurophenotype of different genetic lines of mice.

Methods and Algorithms: The neurophenotypes of 4 genetic lines of mice were studied in the work: CD1, C57BL/6, Cntn6, NODSCID. In animals of these genotypes, prolonged hyperglycemia was modeled by intraperitoneal administration of streptozotocin. The neurophenotype was assessed using MRI methods: classical MRI methods such as T2-weighted images and proton-weighted images, MRI angiography and MRI spectroscopy methods.

Results: When studying the morphological, circulatory and metabolic characteristics of the brain, the data indicate their significant interlinear variability. The greatest deviation in the neurophenotype when exposed to prolonged hyperglycemia was found in NODSCID mice, a smaller deviation in the CD1 line, and insignificant in the C57BL/6 and Cntn6 lines. At the same time, similar changes were found in all 4 lines: a decrease in brain size and an increase in the level of taurine in the brain. Also, neurophenotyping of the Cntn6 transgenic line created at the Institute of Cytology and Genetics of the Siberian Branch of the Russian Academy of Sciences using the CRISPR/Cas9 genetic technology based on the C57BL/6 line was performed for the first time.

Conclusion: In the course of the study, we found that the genotype of an animal can affect the level of neurophenotype changes during prolonged hyperglycemia. They also performed neurophenotyping using MRI methods in 4 lines of mice, in the Cntn6 line, for the first time.

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