Immunolocalization of BDNF, GDNF, and NT-3 in the Rat Parietal Cortex after the Permanent Occlusion of the Middle Cerebral Artery

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The immunolocalization of brain-derived neurotrophic factor (BDNF), neurotrophin-3 (NT-3), and glial cell line-derived neurotrophic factor (GDNF) in the parietal cortex of rats was studied in a model of focal stroke caused by permanent occlusion of the middle cerebral artery. The spatial density of stained cells constantly varies across the layers of the cortex and at different periods of the ischemic process, demonstrating opposite topographic trends in the stroke nucleus and penumbra. All investigated neurotrophins are characterized by a significant reduction of immunoreactive cells in layers IV–VI of the cortex on the first and third days of ischemia. In the supragranular layers, their number remains relatively stable, or slightly decreases in comparison with the control. On the 8th day of ischemia neurotrophins are almost not detected in neurons of the nucleus of the stroke, and induction of immunoreactivity occurs in the penumbra. In penumbra NT-3-immunoreactive neurons prevail in layers II–III, BDNF is detected in neurons of layers II–III and V, and astrocytes constitute the main population of GDNF-immunoreactive cells. The topography of neurotrophins in the contralateral hemisphere follows the pattern of their localization in the area of the penumbra. The heterogeneous stratification of neurotrophins and their selective response to ischemic damage are determined by their different participation in the maintenance of cytoprotective and neurodestructive effects.

Keywords: brain-derived neurotrophic factor, neurotrophin-3, glial cell line-derived neurotrophic factor, selective neuroprotection, middle cerebral artery occlusion, stroke