The Effect of the Canonical Wnt Signalling Pathway on the Differentiation Potential of NG2 Glia after Ischemic Injury

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Cerebral brain ischemia is the third most common cause of death in developed countries. The neuronal death is the main cause of disruption of brain functions. Nowadays, it is impossible to treat it clinically in case of neural tissue regeneration. Recent research showed that NG2 glia exhibit increased proliferation rate in response to acute ischemic injury and even differential potential into neurons. However, the regenerative role of these cells in response to brain injury and thus their potential in clinical treatment are still unknown. This project focuses on the influence of Wnt signal pathway on NG2 glia differentiation potential in either physiological condition or after ischemic injury. Experiments were performed in vitro on cortical cells isolated from transgenic mouse strains. They had either inhibited or unmanipulated Wnt signal pathway, three or seven days after they overcame cerebral ischemia. Changes in the differentiation potential of NG2 glia were measured using the combination of two different methods – the patch clamp technique for analysis of electrophysiological properties and immunocytochemistry for specific protein detection. The results show that NG2 glia differentiate into neurons after ischemia. This opens a new possibility of using and enhancing this natural brain regeneration mechanism into therapy of cerebral ischemia. Furthermore, active Wnt signal pathway was proven to be essential for NG2 glia's differentiation into neurons. The inhibition of the Wnt signalling pathway under physiological conditions showed differentiation into astrocytes and after ischemic injury it blocked the overall differentiation of NG2 glia.