

ABSTRACT

Nervous tissue, especially the brain, is very sensitive to the lack of oxygen and nutrients. Without supply of these components, the tissue endures only a few minutes and then, after the depletion of all ATP, permanent damage or even cell death occurs in neurons and glial cells. During ischemia or hypoxia, an excessive amount of the excitant neurotransmitter glutamate is released, which is neurotoxic. It causes ion imbalance and also apoptotic signaling pathways may be triggered because of the high level of intracellular calcium. Signaling through G protein-coupled receptors (GPCRs) can be involved in the establishment of increased cell resilience to hypoxic injury. Stimulation of some GPCRs, e.g. adenosine, opioid, cannabinoid and melatonin receptors, can afford neuroprotection. Activation of their cognate G proteins may lead to blockade of ion channels or affect the effector proteins, thus helping the stabilization of ion homeostasis and the inhibition of glutamate release. Moreover, some of the receptor agonists have antioxidant character, whereby they prevent the harmful action of free radicals. Neuroprotective mechanisms promote neuronal survival during harmful conditions and are also able to slow down the processes responsible for the development of neurodegenerative diseases.

Key words: G protein-coupled receptors, transmembrane signaling, neuroprotection