Abstract of Ph.D. thesis

Molecular mechanisms of regulation of trafficking and function of different subtypes of NMDA receptors in hippocampal neurons

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N-methyl-D-aspartate (NMDA) receptors are ionotropic glutamate receptors that play a key role in the mammalian central nervous system. Under physiological conditions, these receptors are important for excitatory synaptic transmission and memory formation. However, under pathological conditions, their abnormal regulation or activation may lead to many neurological and psychiatric disorders, such as Alzheimer's disease, Parkinson's disease, Huntington's disease, epilepsy or schizophrenia. Previous studies have shown that the number and type of NMDA receptors on the cell surface are regulated at multiple levels, including their synthesis, folding, internalization or degradation. During the trafficking of NMDA receptors to the cell surface membrane, both the agonist binding and receptor activation are examined. Moreover, NMDA receptors undergo many posttranslational modifications such as palmitoylation, phosphorylation or *N*-glycosylation. In this thesis, we studied the molecular mechanisms that may affect the trafficking and functional properties of NMDA receptors in mammalian cells and rat hippocampal neurons. Specifically, we studied *i)* the role of *N*-glycosylation of the GluN1, GluN2 and GluN3 subunits, and *ii)* the effect of the integrity of the glycine binding sites of the GluN1 and GluN3A subunits on trafficking and functional properties of NMDA receptors. To study these questions, we used a combination of a number of methods including microscopy, biochemistry and electrophysiology.