

Abstract

Neuroplasticity is a fundamental biological phenomenon that accompanies us throughout our lives, both in health and illness. By studying neuroplasticity, we can understand serious neurodegenerative diseases, help remodel the nervous system after damage, or make our actions more efficient in today's world. The first chapter of this thesis will discuss neuroplasticity in the physiological state, describing the development of nervous system, learning and memory, different types of neuroplasticity, and other ways to modify neurogenesis. The following chapter deals with the role of neuroplasticity in disease, its impairment in neuropsychiatric diseases. The most common ones will be described, such as depression, schizophrenia, Alzheimer's disease and Parkinson's disease. The next part of the thesis will discuss the molecular biology of NMDA receptor including structure, activation and excitotoxicity of the NMDA receptor, which is distinct from other receptors. Subsequently, selected NMDA antagonists competitive, non-competitive, uncompetitive, as well as glycine agonists and other selected natural modulators of the NMDA receptor will be described. Finally, this thesis will present the molecular and cellular mechanisms of the BDNF and mTOR pathways, knowledge of which provides a basis for further understanding of events associated with development, growth, and overall remodeling of the nervous system.