Functions of Amotl2 protein in the central nervous system

The primary function of the central nervous system (CNS) is to receive stimuli from outside and inside the body, analyze them, and react to them. This system is responsible for complex cognitive processes, thinking, learning and memory. The basic unit in the nervous system is a neuron, which consists of the cell body and two types of protrusions: a long protrusion called an axon, and numerous protrusions called dendrites. Dendrites specialize in collecting information from other cells, and axons allow signals to be transported to other neurons. Synapses are specialized cellular connections that play a crucial role in transmitting information between cells and processing the signals. The proper functioning of synapses and the organization of the neural network is necessary for the transmission of information in the CNS, and defects in the formation of synaptic connections and the organization of the dendritic tree are characteristic of severe mental conditions, such as schizophrenia, Rett syndrome, and autism.

The proposed project aims to characterize the functions of a protein called Amotl2 in neurons and the CNS. So far, the role of Amotl2 has been studied mainly in cell polarization, adhesion, and cancer progression, but not in the CNS. Amotl2 belongs to a family of proteins called Angiomotins, which in addition to Amotl2, also includes Amot and Amotl1. These proteins are closely related and have a similar organization of protein domains.

Interestingly, the functions of the remaining Angiomotins in the brain are poorly understood. However, there are reports that Amot controls the development of dendrites and synapses. Our unpublished results have shown that Amotl1 may be a potential factor associated with mental health conditions. These studies are just the beginning of understanding the functions of Angiomotins in the brain. Our preliminary results indicate that Amotl2 also has an essential role in regulating synapses and the brain. Therefore, the current project aims to examine them systematically. The experiments will be conducted on purified proteins and should reveal Amotl2 molecular partners in neurons. We will also investigate morphological and molecular changes in neurons with the deletion of the Amotl2 gene. In addition, we will check whether mice without Amotl2 show behavioral abnormalities.

Defects in brain functioning and neurological processes are one of the biggest challenges for the health care system. Our project will characterize behavioral, structural, and molecular abnormalities in mice with Amotl2 deletion in neurons. The obtained results could help develop new treatments for nervous system diseases. We will use very innovative techniques in the proposed project, and the results obtained by us have a chance to contribute to the knowledge about neurons and the brain significantly.