

The body's physiological activity is under complex and comprehensive regulation. The neuroendocrine system is key system here, and neuropeptides, as protein signaling molecules of this system, play an extremely important role in controlling physiological processes occurring in the body. These compounds function as neurotransmitters, neuromodulators or neurohormones. Thus, they modulate the activity of both nerve and non-nerve cells. Neuropeptides can influence target cells in two ways, by acting on membrane ionotropic receptors, which are also ion channels, or by acting on metabotropic receptors. Activation of the first class is associated with changes in the bioelectric properties of cells, including their excitability, which correspond into a change in their activity. It mainly concerns nerve and muscle cells. Activation of metabotropic receptors is associated with the activation of the intracellular signaling pathways with the participation of various molecules such as calcium ions or cyclic nucleotides. These molecules precisely regulate the state of the cell activity.

Neuropeptides play an important role in the regulation of physiological processes both in insects and mammals. Every year a large group of new neuropeptides is identified, but the mechanisms of action of many of them are still not well understood. In many cases, due to the similarities between the neuroendocrine system of insects and mammals, the properties of insect neuropeptides can be predicted on the basis of their similarity to mammalian counterparts, however, this is not enough to fully assess their role and mechanism of action. Therefore, **we plan to determine the activity of four insect neuropeptides on nerve cells and cardiomyocytes**. We intend to assess their impact on the bioelectrical properties of cells using biochips for multi-channel data recording (MEA-system) and the impact on the level of secondary messengers using immunoenzymatic techniques. Research will be conducted on cell lines of neurons and cardiomyocytes from insects and mammals. This will also help determine whether insect neuropeptides are able to affect mammalian cell activity. We also plan to use mammalian homologs of the insect neuropeptides, which will allow more complete determination of the cross-activity of neuropeptides from both animal groups. Moreover the project also assess the specificity of the effects of the test compounds on receptors located in the studied cells using fluorescent and radioactive labeled neuropeptides, and identifying the receptors activated by the tested neuropeptides using mass spectrometry. The results of the research will allow to better understand the mechanism of action of the tested neuropeptides, not only in insects. Take into account that the proper functioning of the neuroendocrine system, as well as the proper regulation of the activity of neurons and cardiomyocytes is crucial for the proper condition of the body, **the results of this proposal may in the future contribute to the search for new solutions in the treatment of various disorders and diseases**. In addition, understanding the role of the tested neuropeptides in the regulation of insect physiology gives new perspectives in the search for **novel ways to regulate the population of insects harmful to humans**, which is extremely important in the context of the problems of modern agriculture with providing sufficient food for the increasing human population.