

Both, the animals and people live in the environment generating a huge number of stimuli. Every living organism for the proper functioning requires a relative equilibrium state (constant temperature, body hydration, electrolyte balance, balance of energy resources) needed for normal physiological processes (growth processes, immune system functioning, reproductive system, the pace of metabolic change). Integration and processing of stimuli reaching the body takes place in the central nervous system, where the information is then transcribed to other systems and organs. Action of systems, tissues and cells must be coordinated and properly coordinated processes taking place at various levels of the organism and organization requires an efficient communications system, which consists of: the circulatory, nervous and endocrine system. The last one is responsible for the production and secretion of hormones - protein like substances which can affect the regulation of processes such as growth, reproduction or cell metabolism. In addition to the well-known hormones (growth hormone, thyroid hormones, oxytocin) there is also a group of less-known - although extremely important - proteins described as neuropeptides (hormones produced primarily by nerve cells and performing the functions of neuromediators). Neuropeptides initiate a cascade of events intended to modulating the secretion of hormones by the endocrine glands, which enables the body to adjust to temporary and/or permanent change in the conditions of the environment.

One class of neuropeptides are neurotrophin - which are described like proteins growth factors. They are produced by nerve cells, and their function is mainly to stimulate differentiation and survival of developing neurons. Moreover, they are involved in processes related to neurons neuroplasticity and neuroprotective mechanisms such as stimulation of growth of neurons and the formation of connections between nerve cells. In recent years, many of neurotrophins were discovered, but the most important are: nerve growth factor (NGF), brain-derived neurotrophic factor, neurotrophin-3 (NT-3), neurotrophin-4 (NT-4), neurotrophin-6, and neurotrophin-7 which together form the family of neurotrophic factors.

Current knowledge on the effects of neurotrophins is still incomplete, in particular has not been known so far their role in regulating of the reproductive hormones activity, which is the main subject of our team research. In our research project we decided to focus on examining the influence of brain-derived neurotrophic factor (BDNF) on the modulation of crucial reproductive hormone axis gene expression. Research hypothesis assumes that BDNF may directly (through GnRH neurons) or indirectly (through NPY neurons) affect the expression of genes of this axis. In our study as an experimental model we will use sheep. We choose it because of fact that it has a relatively, in comparison to other experimental animals, large brain what making easier to find specific, selected brain structures where we can locate changes in the activity of interest us hormones.

In order to verify our research assumptions, we plan to administrated BDNF directly into the third ventricle of sheep brain. During the experiment, blood samples will be collected for determination of changes in the level of LH and FSH by using radioimmunoassay method. Also select structure of the hypothalamus and the pituitary gland from animals will be collected to determine the changes in chosen gene expression using a Real Time RT qPCR method. Moreover, using the ELISA method we will determined the concentration of LH and FSH hormones in gonadotrophic cells of the pituitary gland.

Planned research take significant in terms of science problem of the neuropeptides participation in the regulation of reproductive functions in CNS. The results will also help to extend knowledge about the BDNF influence on organism reproductive function. Presented research works will determine, whether BDNF acts at the level of the hypothalamus directly (through GnRH neurons) on these processes, or his action in the CNS is only indirectly - through the activation of NPY neurons. The endocrine mechanism of growth and development in sheep serves as model for the entire group of ruminants, and may be also informative for research conducted on other large mammals. Results of these studies will extend our knowledge in the field of animal breeding science, veterinary science and biology.