

POPULAR SCIENCE PROJECT SUMMARY

The nutritional status of an animal is closely related to its reproductive potential. It is known that the main role in the control of appetite and body weight is played by the hypothalamus, which is also the highest branch of the hypothalamic-pituitary-gonadal (HPG) axis involved in the regulation of reproductive processes. In turn, examples of hormones engaged in the regulation of food intake are: leptin, adiponectin, chemerin and orexins. Interestingly, studies on the role of these hormones have shown that they are also involved in the reproductive processes. In the earlier studies, we observed dependent on the oestrous cycle phase changes in the expression of these adipokines and their receptors in the HPG axis structures. It can be assumed that these substances create a hormonal link between the metabolic status and the reproductive system. Based on fragmentary literature data and our own preliminary studies, it is possible to hypothesize that apelin is also such a hormone. Apelin shows a multidirectional effect and its expression was found in various organs, such as the stomach, heart, lungs, brain, as well as in the reproductive system. It suggests that this hormone is involved in regulation of the reproductive functions. The aim of the proposed project is to verify the research hypothesis assuming that the expression of apelin and its receptor takes place in the pituitary gland, and the expression of genes and the corresponding proteins depend on the hormonal status of female pigs, which is associated with the phase of the oestrous cycle and pregnancy. It is also hypothesized that apelin is involved in the regulation of the secretory functions of pituitary cells.

As part of this project, it is proposed to investigate the gene expression of apelin and its receptor (APJ) as well as the protein concentration of apelin and its receptor in the pituitary of the domestic pig during the oestrous cycle and early pregnancy. It is also planned to determine the localization of apelin and its receptor in the pituitary gland, as well as to examine the influence of apelin on the secretory functions of the anterior pituitary (responsible for secretion of FSH and LH – hormones directly affecting the ovary) during various stages of the oestrous cycle.

Previous studies on apelin and its receptor in the reproductive structures (including the hypothalamus, pituitary, ovaries, and uterus) were mainly performed on humans and rodents. The expression of apelin and its receptor during pregnancy has not been studied so far. An indication that this type of research may be important is the fact that the level of apelin is lower in blood of pregnant women when compared to non-pregnant individuals. The expression of the apelin system (apelin and its receptor) in the porcine pituitary gland has not been studied to date. More advanced pituitary examinations to indicate the type of apelin producing cells and expressing its receptor were made only on male rats. The effect of apelin on the production of gonadotrophins (LH and FSH) in the pituitary of females has not been determined.

Data obtained from this research may help to gain a better understanding of the mechanisms of the hormonal control of metabolism and reproduction in pigs, an economically important species, and in the future may facilitate the modification of these processes in these animals. Moreover, by being similar to the human organism, the domestic pig is a very good experimental model, hence the results will be important for the understanding of human physiology as well.