SUMMARY

THE EFFECT OF CHEMERIN ON THE FUNCTION OF PORCINE PITUITARY GLAND (*SUS SCROFA DOMESTICA* L.) DURING THE OESTROUS CYCLE AND EARLY PREGNANCY

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Doctoral thesis was carried out in the Department of Animal Anatomy and Physiology, Faculty of Biology and Biotechnology, University of Warmia and Mazury in Olsztyn under the guidance of prof. dr hab. Tadeusz Kaminski.

The doctoral thesis comprises two papers published in 2020 (1 – *Animal Reproduction Science*, 2020, doi: 10.1016/j.anireprosci.2020.106532; 2 – *Theriogenology*, 2020, doi: 10.1016/j.theriogenology.2020.07.032), focused on the chemerin system expression in the pituitary of pigs (*Sus scrofa domestica* L.) during the oestrous cycle and early gestation, and the influence of chemerin on gonadotrophins secretion, and activation of Akt, MAPK/Erk1/2 and AMPK signalling pathways in this gland.

It has long been known that the nutritional status of the female body affects reproductive functions, as these processes require large energy expenditure. Studies on the adipokines, substances produced in the adipose tissue, indicate that they affect both metabolism and reproduction. Chemerin is a new member of the adipokine family. Chemerin with its three receptors create the chemerin system. So far, the expression of some elements of this system has been demonstrated, among others, in the liver, white adipose tissue, spleen and lungs. The pleiotropic action of chemerin is postulated. It affects, among others, food intake, energy homeostasis, functioning of the adipose tissue and insulin sensitivity. The role of this adipokine in relation to reproduction is still poorly understood. Most of the studies on the chemerin system have focused on the adipokine itself and its main receptor, CMKLR1, whose expression was found in the ovaries of women, rodents and cows. Our studies confirmed the presence of all elements of the chemerin system in the ovaries and uterus, as well as in the hypothalamus, the highest branch of the porcine hypothalamic-pituitary-gonadal (HPG) axis. In the case of the pituitary gland, so far, chemerin transcript has been identified in mice, baboons and chimpanzees, while *CMKLR1* mRNA has only been found in mice. To date, the effect of hormonal changes associated with the individual phases of the oestrous cycle and pregnancy on the level of transcripts and proteins of chemerin and its three receptors has

not been analysed in the pituitary. Nothing is known about the influence of chemerin on the secretory functions of the pituitary and the signalling pathways that may be used by chemerin.

The aim of this study was to determine the effect of chemerin on the functions of the porcine pituitary gland during the oestrous cycle and early pregnancy. The assumed aim of the research was achieved by the accomplishment of the following tasks:

1) determination of the expression of chemerin (*RARRES2*) and its three receptors' (*CMKLR1*, *GPR1* and *CCRL2*) genes in the porcine anterior (AP) and posterior (PP) pituitary during four phases of the oestrous cycle (days 2-3, 10-12, 14-16, 17-19 of the cycle) and four periods of early pregnancy (days 10-11, 12-13, 15-16, 27-28 of pregnancy) using real-time PCR;
2) determination of the expression of chemerin and its three receptors' (CMKLR1, GPR1 and CCRL2) proteins in the porcine AP and PP during mentioned above four phases of the oestrous cycle and four periods of early pregnancy using Western Blot;
3) examination of the cellular localization of chemerin and its receptors in the porcine AP on days 10-12 of the oestrous cycle and days 15-16 of pregnancy using immunofluorescence staining;
4) investigation of chemerin influence on basal and GnRH and/or insulin-induced secretion of gonadotrophins by porcine AP cells during the oestrous cycle using ELISA;
5) determination of chemerin effect on Akt, MAPK/Erk1/2 and AMPK signalling pathways in the porcine AP cells on days 10-12 of the oestrous cycle using Western Blot.

Based on the obtained results the following conclusions were drawn:

- the presence of all elements of the chemerin system was confirmed in both porcine pituitary lobes;
- the expression of chemerin and its receptors fluctuated during different phases of the cycle and early gestation, which could be related to changes in the endocrine status of female pigs;

- it has been demonstrated that chemerin affects secretion profiles of gonadotrophins and the activation/inhibition of Akt, MAPK/Erk/1/2 and AMPK signalling pathways in the porcine pituitary.

The obtained results indicate that chemerin may participate in the regulation of the reproductive processes of gilts *via* the effect on the secretory functions of the pituitary.

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