The main purpose of the project is to determine the role of the hormone - **IRISIN** in the control of female reproduction. The female reproductive system is regulated by the interaction of hormones produced by the hypothalamus, anterior pituitary and ovaries. Moreover, it is now clear that fertility depends on the energy metabolism status. It can be assumed, also based on our previous research, that in addition to hormones affecting only selected metabolic processes or only reproductive organs, there are also other hormones creating a link controlling both the metabolic status and reproductive system functions. A growing body of evidence suggests that both metabolism and reproduction are controlled by the same endocrine system. A sound knowledge of the mechanisms that control energy homeostasis and reproduction is needed in the overcoming of human infertility as well as in the animal breeding practice. Based on scant literature data and findings from our preliminary studies, a hypothesis can be put forward that irisin, a hormone which controls energy homeostasis, is also engaged in the control of the reproduction, both at the level of the ovaries and the upstream branches of the hypothalamic-pituitary-ovarian axis. In the present project, it is planned to investigate the expression of the irisin gene as well as the concentration and localisation of the hormone protein in the specialised hypothalamic structures (part of the brain secreting GnRH - the hormone controlling the pituitary gland and, indirectly, ovaries), in the pituitary gland, whose hormones directly affect the reproductive system functions, and in the ovaries of gilts during the oestrous cycle and early pregnancy, associated with the implantation of embryos. We are going to investigate the serum and follicular fluid levels of irisin during the oestrous cycle and early pregnancy. Another objective of the proposed research is to determine the effect of irisin on the secretory functions of the pituitary gland and ovaries at different phases of the cycle: to investigate the secretion of FSH and LH by the anterior pituitary cells and the secretion of steroid hormones by luteal cells, granulosa cells and theca interna cells, to determine the mechanism of irisin action in these cells, to clarify the influence of the hormone on the processes of angiogenesis, apoptosis and proliferation as well as to analyse the effect of irisin on the transcriptome and proteome of the pituitary and ovarian cells of pigs. Findings from this research may help to better understand the mechanisms of hormonal control of metabolism and reproduction in pigs, an economically important species, and in the future, they may facilitate the modification of these processes in animals. Moreover, the domestic pig is also a good experimental model for understanding human health and diseases. It is much more similar to humans than the more frequently used laboratory rodents. Thus, results from the research project will also significantly contribute to a better understanding of human physiology. In the future, the results of the proposed research may help to solve the problems related to female infertility. This proposal will be realised in international cooperation with the University of Perugia in Italy.