Fertility of livestock species influences profitability of their production. All domestic animal species experience embryonic and fetal losses, which reduce fertility. The highest incidence of embryonic mortality in the pig is observed prior to day 30 of gestation and may result from improper communication among the conceptus and maternal uterus and abnormal implantation. Individual conceptuses may fail to develop or not develop normally due to their failure to respond to components of histotroph that orchestrate their growth and development, not only during the peri-implantation period. Maternal supply of nutrients is critical for conceptus development and feto-placental growth in all mammals. The uterine epithelia synthesize and secrete, as well as transport numerous proteins and nutrients. Among them, long chain polyunsaturated fatty acids are important for cell membrane composition and permeability, eicosanoid synthesis, and metabolic processes. Therefore, developing placenta should be able to regulate fatty acid uptake to adapt to constant changes in demands for its own as well as for developing fetuses. Several studies performed in human indicate that fatty acids are transferred *via* facilitated transport mediated by membrane-bound and cytosolic proteins. For the pig however the role of fatty acids and their transporters during conceptus development and placenta formation and function is still lacking. Results of our initial data showed a dynamic changes in mRNA expression of selected fatty acids transporter/binding proteins in conceptus/trophoblast and the uterine endometrium during the period of implantation and early placenta development indicating an important role of fatty acids and their transport for successful pregnancy establishment.

The main goal of the project is to determine mechanisms and factors regulating the expression of fatty acid transporters in the uterus and conceptus trophoblast, and to examine the role of fatty acids of ω-6 and ω-3 series during placenta formation in the pig. To achieve this goal, we plan to: (1) determine profiles of expression of both membrane and cytosolic transporters and their localization in the maternal endometrium and conceptus/trophoblast; (2) identify factors which may regulate the expression of fatty acid transporters in the maternal endometrium; (3) study the role of fatty acids and their transporters in trophoblast cells; (4) analyze the importance of fatty acids for angiogenesis in the placenta; (5) study whether restricted feeding of pregnant gilts during the period of conceptus implantation will affect early placenta development; in particular fatty acid transport, binding, and metabolism.

Realization of this project will provide new knowledge about factors and mechanisms engaged in the transport of fatty acids during conceptus implantation and early placenta formation in the pig. Placental insufficiency results in fetal loss or low birthweight of piglets, which may further result in pre-weaning mortality or impaired growth rate, if piglets survive. Genetic selection for litter size by the swine industry made this problem even worse. Therefore, understanding how the pig conceptus respond to maternal supply of histotroph and how the placenta functions in regard to nutrient transport seems to be crucial for developing new therapeutic strategies to reduce embryonic mortality and to protect from negative effects of intrauterine competition among embryos. They may also be the basis for further research at both cellular and whole organism levels.