DESCRIPTION FOR THE GENERAL PUBLIC

The goal of the project is to determine on the pig model if restricted diet applied to females - future mothers – during periconceptional period alters the level of DNA methylation of selected genes with the most altered expression (up- and down-regulation) in the beginning of implantation in the endometrium and embryos gilts fed restricted diet during periconceptional period. Domestic pig is an important model organism for health research due to parallels with human. Similarities between human and pigs also exist in renal function, vascular structure, and respiratory rates. Pigs are used as model organism in many areas of biomedical research including obesity, malnutrition, cardiovascular disease. According the latest statistics, 60% of pregnant women in the world suffer from malnutrition (UNICEF). Nowadays, the slimming diets are becoming more and more popular. New statistic show, that 50% of adults in USA are dieting with 80% of dieters trying to lose weight on their own. It is worth to note, that nutrition plays a very important role in many aspects of health and the component of the diet may be one of the major determinants of proper epigenetic modifications, e.g. DNA methylation. A lot of people believe there is a relationship between our health and our ancestors nutrition. Currently, DNA methylation is one of the most broadly studied and well-characterized epigenetic modifications. DNA methylation was discovered in 1948. The interest in DNA methylation has led to new findings about the relationship between epigenetic alterations and a host of disorders including various cancers, mental retardation associated disorders, immune disorders, neuropsychiatric disorders and pediatric disorders. Thus, epigenetics is the study of cellular and physiological trait variations that are not caused by changes in the DNA sequence. Hence, epigenetics is essentially the study of external or environmental factors that turn genes on and off and affect how cells read genes. Maternal environmental exposure during gestation is one of the important area of epigenetic research. Epigenetic modification may be reflected at various stages throughout a person’s life and even in later generations. The last human epidemiological studies have provided evidence that nutrients may alter DNA methylation level during embryos development and the adultlife.

Our preliminary studies indicate that the endometrium is responsive to epigenetic alterations. We determined that the potential both for maintained and *de novo* methylation of DNA in the endometrium during the beginning of implantation may be affected by maternal restricted diet during periconceptional period. We also found that restricted diet decreased intrauterine concentration of steroid hormone - estradiol-17beta. Hence, it is justified that restricted diet or another external factors may alter the activity of steroid pathway in uterine tissues. The study will be performed on gilts fed during periconceptional period restricted diet (in which the protein and energy content is reduced by 30%) and normal diet (in which the protein and energy content is not reduced, according to Norms for Nutrition of Pigs; 1993). It is planned examination the level of DNA methylation of selected genes with the most altered expression in the endometrium and embryos isolated from gilts fed restricted diet during periconceptional period with the use of Methylation Specific PCR. A Methylation Specific PCR can rapidly assess DNA methylation level. A Methylation Specific PCR is also the most common technique used to examine DNA methylation level. In this method, the two reactions are performed: 1) reaction with primers specific to methylated sequence, 2) reaction with primers specific to non-methylated sequence. The application advanced techniques of molecular biology guarantee the performance of research aim and verify the research hypothesis, that restricted diet used in gilts during periconceptional period evokes alterations in DNA methylation level in the endometrium and embryos harvested during the beginning of implantation.

Proposed studies may help to better understanding consequences of restricted diet which unfortunately is very often practiced mainly by women even during periconceptional period, on epigenetic alterations in uterine tissues during the beginning of implantation.