Obesity and related metabolic disorders are global issues, which reach younger and younger generation. Obesity results from energy imbalance, such as increased calorie intake and reduction in physical activity. Moreover, macronutrient composition of diets can contribute to development of metabolic problems. It has been proven that foods rich in simple carbohydrates, sodium or trans fats should be avoided.

So called ”western diet”, which is consumed in highly developed countries, is characterized by high intakes of red processed meat, pre-packaged foods, butter, fried foods, high-fat dairy products, eggs, refined grains, potatoes, corn and high-sugar drinks. To mimic effects of above diet in laboratory settings cafeteria diet (CD) is used. In the CD about 45-55% of the energy comes from fats, and it contains of a variety of products, which are characterized by good taste with high energy density.

Importantly, nutritional exposures (positive or negative) could start as early as at pregnancy and continue during lactation, and may cause serious alterations in offspring. According to the concept of the prenatal programming, environmental factors that act during early stages of development can organize or imprint physiological and behavioral systems. A strong correlation between low birth weight of children, high cortisol levels and later development of obesity, type 2 diabetes (DM2) and reproductive dysfunctions were reported.

Besides metabolic disturbances that occur in obese patients, there are secondary problems including alterations in the reproductive system (e.g., disruptions of menstrual cycle in women, decrease in testosterone levels and spermatogenesis in men, hypogonadism, premature child birth, miscarriages or infertility). In animal models of perinatal or postnatal exposure to the CD similar alterations in reproductive functions were seen. **However, the mechanism(s) by which diet during pregnancy and lactation influences the endocrine functions of the offspring, and especially reproductive system are not fully understood.**

The field of reproductive biology was revolutionized by the discovery that a peptide kisspeptin (KP) plays the crucial role in the regulation of puberty and functions of the hypothalamic-pituitary-gonadal (HPG) axis, which governed the reproduction. However, recently it was shown that this peptide acts together with neurokinin B (NKB) and dynorphin A (Dyn A). It was found that in the part of the brain arcuate nucleus (Arc) of the hypothalamus, there are neurons called KNDy, which colocalized above mentioned peptides and control reproduction. Importantly for this project, the Arc could be a place where interactions between metabolism and reproduction occur.

In the current project effects of maternal CD on metabolic and reproductive functions of offspring will be studied. The hypothesis that maternal CD diet, which lead to development of obesity, causes alterations in expression of KNDy neurons in the hypothalamus and kisspeptin and its receptor in peripheral organs of offspring will be tested. Moreover, sex-specific effects of maternal CD on KNDy neurons and kisspeptin system are expected.

Data obtained as a result of this study will significantly broaden the knowledge of neuroendocrinology and endocrinology. Moreover, this study may contribute to society education and better understanding the mechanism(s) of prenatal programming of metabolic and reproductive functions. The obtained results can be used to promote a healthy lifestyle and appropriate diet selections.