Obesity is a growing public health problem worldwide, also among pregnant women. Western diet is characterised as a consumption of highly-processed products, pork meat, animal-based products, sweets and sweetened drinks. These products are energy-rich but deficient in vitamins and minerals, whose consumption may lead to accumulation of fat in the body and obesity. Maternal nutrition before, during, and after pregnancy (i.e. the lactating phase) may affect metabolism of the progeny. This phenomenon is called fetal programming.

In animals, “cafeteria diet” is used to mimic the effect of “Western diet”. The cafeteria diet consists of fat, sweet, salty and palatable foods that are also choline-deficient. Choline is a micronutrient relevant to human health and development. It is an essential nutrient that must be supplied to the body by dietary sources to maintain proper nutritional levels. Choline is a precursor to acetylcholine, a neurotransmitter synthesised in cholinergic in neurons.

There are three types of adipose tissue: white (WAT), beige (BeAT) and brown adipose tissue (BAT). BAT and BeAT have the potential to oxidize fatty acids and glucose, as well as dissipate energy in the form of heat. This ability increases energy expenditure and therefore may potentially help to achieve negative energy balance, which is necessary to lose weight. Beige adipocytes are likely to originate from a process known as “browning.” Recently, a new process of browning has been discovered. This pathway engages acetylcholine and CHRNA2, a subunit of cholinergic receptors.

We hypothesised that feeding rats the cafeteria diet (deficient in choline) before, during, and after pregnancy (the lactation stage) will affect the browning adipose tissue of mother and offspring. The main aim of the study is thus investigating the role of the CHRNA2 in the browning of adipose tissue.

To achieve the aim of the research, a study on laboratory rats was planned. The first experimental group would be fed a "cafeteria diet" before and during pregnancy, as well as in the lactating stage. The control group would be fed a standard rodent diet throughout the experiment. We will analyse the levels of choline and acetylcholine, genes related to the metabolism of these compounds, and "browning adipose tissue" markers in the mothers and their offspring.

To date, there has been no research done on the regulation of adipose tissue browning by the cholinergic pathway in a generational study. The effect of the Western dietary style was not investigated in this process. Results of this study may increase basic knowledge on the metabolism, specifically on the regulation of acetylcholine on adipose tissue browning.