**Summary**

Obesity is a chronic disease characterized by an excessive adipose tissue accumulation (>20% men’s body weight and >30% women’s body weight) and body mass index (BMI) ≥30 kg/m2. Obesity is associated with multiple co-morbidities, including hypertension, cardiovascular disease, depression, sleep apnea, cancer and type 2 diabetes mellitus (T2DM), which in 2015 was one of top ten causes of death globally. Bariatric surgery remains the most effective treatment of morbid obesity and purposeful therapy for associated co-morbidities. Metabolomics seems to be the perfect tool to follow even the smallest metabolic changes.

The aim of this study was to compare serum metabolic profiles of patients subjected to bariatric surgeries and to search for pre-operative and post-operative metabolic markers linked to the different rate of type 2 diabetes remission after bariatric surgery.

The discussed bariatric procedures provoked a statistically significant decrease of BMI and an increase of excess weight loss (EWL%), reduction of biochemical and clinical parameters such as fasting plasma glucose, HOMA-IR, HbA1c%, triglycerides (TG) and uric acid. The performed LC-MS and GC-MS fingerprinting analyses resulted in 49 significant and identified metabolites responsible for post-operative modulations. Bariatric procedures induced changes in such groups of metabolites as amino acids, acylcarnitines, fatty acids and their amides, phospholipids, sphingolipids and others like sulphur-containing metabolites. Additionally, a significant increase of acylcarnitines levels, including acetyl-L-carnitine was observed in patients with quicker type 2 diabetes remission. This can suggest the importance of fatty acid beta oxidation in earlier recovery of T2DM after bariatric surgery.

The evaluation of biochemical and clinical data in regard to obtained metabolomics results enable us to conclude that during first six months post-surgery laparoscopic sleeve gastrectomy and laparoscopic Roux-en-Y gastric bypass are very similar in terms of the general clinical outcome (obesity and type 2 diabetes remission), but they strongly differ from each other in molecular mechanisms leading to the final effect. Additionally, the preliminary results suggest that fatty acid beta oxidation seems to be a key pathway regulating the rate of diabetes remission after bariatric procedures.