Diabetes is recognized as one of the lifestyle diseases characterized by the most rapid increase in incidence in developed countries. These data are worrying given that deaths due to complications of diabetes are recorded every 10 seconds. Diabetes is generally divided into type 1, type 2, gestational diabetes and secondary diabetes. The classification is based on the clinical picture of the disease. Cardiovascular disease, retinopathy, nephropathy, neuropathy and obesity are just a few examples of the comorbidities highly related to the type 2 diabetes. These diseases contribute to lowering the quality of patients life and may lead to their death.

The decreased level of insulin and insulin resistance of the cells in diabetes especially alters carbohydrate and fatty acid metabolism, leading to important secondary complications such as kidney failure, liver dysfunction, cardiac disorders, etc. One of the reasons of these diseases are the lipids, that are a part of the vascular plaque and may lead to microvascular complications. Lipid abnormalities are also related to other comorbidities of type 2 diabetes such as non-alcoholic fatty liver disease (NAFLD) and non-alcoholic steatohepatitis (NASH). Although the functional and pathological abnormalities seen in diabetes are both clinically and experimentally defined, the exact lipidomic changes are not well determined yet.

In this project, we aim to investigate the underlying lipidomic changes of diabetes in different tissues, namely blood serum, heart, liver and kidney tissue in order to define the lipids in the heart, liver and kidney that are positively, negatively or not correlated to the lipids in the blood serum. This might be the future tool of the prediction for heart, liver and kidneys condition by the blood test in the type 2 diabetes. Moreover it might provide a valuable information about precautions that the diabetic patients should take during their diet planning.

The project is based on the interdisciplinary approach of different, complementary spectroscopic techniques application: vibrational spectroscopy (IR and Raman spectroscopy) and matrix assisted laser desorption ionization mass spectrometry imaging (MALDI MSI) to study lipidomic changes in the type 2 diabetic rat.

The innovative nature of the project involves the investigation not only the changes in distribution of lipids affected by diabetes but also discovery of quite new correlations which allows for answering important questions in case of diabetes treatment, and help to assess the effectiveness of disease management in pre-clinical and clinical trials.