Summary in English

The objective of doctoral dissertation in the form of a publication cycle was to investigate the associations between carbohydrate, protein, fat and fiber intake, common genetic variants of the *FTO* gene, obesity, glucose homeostasis and lipid profile. The following two hypotheses were stated and explored: the effect of *FTO* gene polymorphisms on the obesity-related parameters, as well as dietary factors could modify the association between common genetic variants of the *FTO* gene and obesity and obesity-related parameters.

To achieve the aims of the scientific work and to verify the hypotheses, the research was carried out among Caucasian volunteers, selected for gene–diet association and interaction analysis, and genotyped for the *FTO* SNPs (rs3751812, rs8050136, rs9939609, rs6499640, rs8044769, and rs7190492). Measurements of anthropometric parameters, total body fat content and distribution, blood glucose, insulin concentration at fasting and during oral glucose tolerance test (OGTT), and lipid profile were performed. Food intake was analysed based on the three-day food records, and daily physical activity levels were evaluated using the International Physical Activity Questionnaire Long Form (IPAQ-LF). Numerical data were summarized with the number of observations, standard deviation and arithmetic mean. Differences between parameters and dietary groups were compared using the Kruskal-Wallis test for numerical variables, with Dunn's post-hoc test and Holm p-value adjustment, and the chi-squared test for categorical variables. In order to study the hypothesis multivariate linear regression models were used.

Based on the conducted analyses, it was found that associations between *FTO* polymorphisms, daily protein, carbohydrate, fat, and fiber intake, and the effect of these relationships on obesity, glucose homeostasis and lipid profile occur among the study cohort. It was observed that daily macronutrient intake may modulate the impact of *FTO* genetic polymorphisms on investigated parameters. Furthermore, diets based on high-fiber intake, positively influence on the anthropometric parameters, but might be associated with worse lipid profile dependent on the *FTO* genotype. The study findings may have a practical clinical implication in nutritional area, which combine personalized genome-customized diet recommendations.

Keywords: FTO gene; obesity; dietary protein intake; dietary carbohydrates intake; dietary fat intake; dietary fiber intake; macronutrients; gene-diet interaction