

At present time, there is growing interest in two classes of lipids – sterols and fatty acids, which possess many different roles in living organisms. The concentrations of cholesterol biosynthetic precursors (lanosterol, desmosterol) reflect level of cholesterol biosynthesis, whereas the plasma phytosterol (campesterol, β -sitosterol) concentrations can be used for estimation of fractional absorption of dietary cholesterol. These groups are sometimes called together as noncholesterol sterols. The dissertation thesis dealt with the significance of analysis of noncholesterol sterols and fatty acid profile in various pathophysiological states.

The methodology part of the thesis covered some aspects of analysis of these compounds with capillary gas chromatography. We found that for the minor fatty acid analysis, both the type of the column and the software used play an important role. The gas chromatography step contributes by the least part to the total error of the procedure, whereas the effect of other steps (extraction, thin-layer chromatography and methylation process) is more pronounced. The comparison of fatty acid profiles in lipoprotein particles with low and very low density revealed differences, but these differences were highly interindividual. We also found that it is possible to replace the analysis of the fatty acid profile in plasma phosphatidylcholines with the less laborious analysis of the sum of phospholipids.

The sterol analysis was optimized by preferring the acetylation of samples and split mode of injection. The one-run analysis for the quantitation of minor sterols together with cholesterol was proven to be not reliable, therefore it was decided to use the method of two internal standards and two chromatographic runs. Comparison of the contribution of individual steps of sterol analysis showed that quantitative analysis of lanosterol and 5 α -cholestanol is burdened with the error excluding these analytes from clinical evaluation.

In the experimental part of the thesis, the administration of hypolipidemic drugs (three statins and one fibrate) to brain lipids of male Wistar rats was studied. The statins used caused lowered content of cholesterol and diphosphatidylglycerol, which was counterbalanced by higher concentration of sphingolipids in brain lipids. The profiles of fatty acids were not considerably changed.

Clinical part of the thesis focused on the metabolism of fatty acids and cholesterol in anorexia nervosa, protein-energy malnutrition and reduction diet in the obese. The patients with anorexia nervosa had elevated concentrations of total cholesterol, triacylglycerols, HDL-cholesterol, campesterol and β -sitosterol. We also observed lower content of n-6

polyunsaturated fatty acids in all lipid classes. These changes seem to be the result of complex mechanisms including diminished catabolism of lipoprotein particles rich in triacylglycerols, unchanged level of biosynthesis of cholesterol and enhanced resorption of exogenous cholesterol.

Patients with proteino-energetic malnutrition exhibited lowered concentration of total cholesterol in plasma as well as in lipoprotein classes; concentration of apoA-I was higher, too. The concentration of lathosterol, indicator of cholesterol biosynthesis was not changed. The analysis of fatty acid profile showed higher content of monounsaturated and lowered content of polyunsaturated fatty acids. These metabolic changes in proteino-energetic malnutrition are connected more or less with higher utilization of cholesterol from lipoprotein particles in peripheral tissues.

Reduction diet set at the content of fat in the diet within the range of 20 and 45 energy % lowers body weight in order of percents, but it has no marked impact on cholesterol biosynthesis. The results suggest the diet-induced changes in fatty acid composition are controlled by the calorie deficit of the diet and the proportion of dietary fat plays a minor role. Ten-week low energy reduction diet induced changes in the metabolism of both cholesterol and phytosterols, which can be ascribed either to lowered dietary absorption or deteriorated turnover of phytosterols from the adipose tissue.