Fat tissue plays a main role in the development of the metabolic syndrome. Many components of the metabolic syndrome may be improved by dietary arrangements, including an increased intake of n-3 PUFA. In addition to the positive effect of n-3 PUFA, a possible effect of a higher calcium intake on influencing weight loss and energy metabolism has also been discussed for a long time. In addition to nutritional factors, genetic factors significantly contribute to influencing weight and lipid and glucose metabolism.

In study A, 40 obese women were observed during three weeks of weight reduction management. Women were randomly divided into two groups. The first group received yogurt enriched with n-3 PUFA, and the second group consumed yoghurt without the supplementation. The results show that low-dose supplementation with n-3 PUFA in yogurt in combination with a reduced energy intake increases n-3 PUFA content in serum lipids and prevents adverse changes in the composition of FA in serum after a short-term low-calorie diet.

In study B, we monitored the influence of n-3 PUFA supplementation on short-term weight management with VLCD in 20 women with severe obesity, who were randomly divided into two groups. The first group received VLCD enriched with n-3 PUFA, the second group VLCD with a placebo. The addition of fish-origin n-3 PUFA into a very strict low-energy diet resulted in a greater reduction in BMI and hip circumference. A significant increase in levels of beta-hydroxybutyrate in the group with the addition of n-3 PUFA was probably due to increased β-oxidation of FA.

In study C, 67 overweight or obese women underwent a complex four-week spa weight reduction program. The aim was to determine the effect of different forms of calcium supplementation in a diet on anthropometric, biochemical, hormonal and psycho-behavioral parameters. Higher calcium intake during the weight reduction process led to a lower decrease in FFM in women with supplementation in comparison with the control group. We also noticed, in relation to calcium supplementation, different levels of resistin in response to a weight reduction.

The last part is devoted to an influence of mutations in the intestinal form of the FABP gene (FABP2). In study D, we focused on the effect of FABP2 gene mutation Ala54Thr on the distribution of adipose tissue, anthropometric parameters, and parameters of lipid and glucose metabolism in 117 obese women. A following study E has extended the cohort in comparison to the previous study, and – in addition to monitoring the impact of mutations Ala54Thr on the above mentioned parameters – it is focused on the possible effects on insulin levels, C-peptide, testosterone, somatotropin, cortisol, SHBG, DHEA and DHEAS. The results of studies D and E show a possible association between polymorphism Thr54Thr and lower BMI, and possible effects on the distribution of adipose tissue. Thr54Thr FABP2 gene polymorphism in comparison with heterozygote forms and homozygotes Ala54Ala could lead to a reduced storage of fat predominantly in the abdominal area.

The results of our studies indicate that nutritional factors can significantly affect the energy, glucose and lipid metabolism and influence the success of the weight management. Besides the nutritional factors, genetic factors are also involved. Their influence needs to be verified on a larger group of subjects.