Summary

Adipose tissue is involved in etiopathogenesis of insulin resistance and subsequent metabolic disorders including type 2 diabetes mellitus and atherosclerosis. Mechanisms responsible for this association are investigated vigorously. One of the well accepted mechanisms linking excessive accummulation of adipose tissue with a development of insulin resistance are free fatty acids, which are released into circulation after hydrolysis of triglycerides stored in adipose tissue in a process of lipolysis. Impairments in a regulation of lipolysis are described in obese patients and lead to increased plasma level of free fatty acids and to impaired mobilisation of energy stores during exercise. In this PhD thesis, regulation of lipolysis in subcutaneous abdominal adipose tissuewas investigated using microdialysis technique. In the first paper we have observed that dysregulation in catecholamine-induced lipolysis and impaired insulin action in adipose tissue can be improved by dynamic-strength training in obese men. In the second study, we have demonstrated significant involvement of newly discovered lipolytic pathway mediated by atrial natriuretic peptide in lipolysis stimulation during exercise.

Adipose tissue is producing several protein substances with regulatory and endocrine functions collectively named „adipokines“, that have been suggested to play a role in pathogenesis of insulin resistance. This topic is covered in the third and fourth publication included in this thesis.

We have shown that non-pharmacological interventions like dynamic-strength training or aerobic training improve insulin resistance in obese men and women even without major changes in plasma levels or adipose tissue gene expression of investigated adipokines v (interleukin 6, tumor necrosis factor- α , adiponectin, interleukin-1b). Only leptin was responsive to these interventions in our studies. Finally, in the fifth paper inluded we have investigated the effect of low-caloric diet on plasma levels and distribution of polymeric isoforms of adiponectin, an important member of adipokine family with profound insulin-sensitizing effects. An increase in all polymeric isoforms was detected using following 10 weeks of low caloric diet, with the low molecular form being the most responsive isoform. These data do not directly support the hypothesis that adipokines (except leptin and adiponectin) play a major role in intervention-induced changes of insulin sensitivity.

Studies integrated into this thesis provide small pieces of knowledge on regualtion of lipolysis in subcutaneous adipose tissue and on the role of adipokines in development of insulin resistance. Inegration of these results with a great number of results published by other research groups might help to understand the function of adipose tissue in respect to etipatogenesis of obesity and insulin resistance and lead to a development of effective therapeutical strategies.