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Development of diet-induced obesity in the rat, followed by radioanalytical methods

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High-fat-feeding induction and development of obesity was followed in male C57BL/6J mice maintained on a special high-fat (HF) diet, in comparison with the same animals maintained on a standard low-fat (LF) diet. In parallel to several morphological parameters, changes in the thyroid status of the animals were followed. Serum total thyroxine (T4) and 3,5,3'-triiodothyronine (T3) concentrations were determined using radioimmunoanalytical kits. Moreover, with the aid of our newly developed radiometric enzyme assay, we measured changes in the enzyme activity of type 3 iodothyronine deiodinase (D3) in several depots of murine white adipose tissue (WAT). D3 is the key enzyme in the metabolism of thyroid hormones, converting biologically most active T3 and prohormone T4 into inactive metabolites (3,3'-diiodothyronine, T2 and 3,3',5'-triiodothyronine, reverse T3, respectively). HF-diet feeding resulted in an increased size of adipocytes and in a significantly higher weight of both epididymal-visceral and dorsolumbar-subcutaneous fat depots. Total T4 and total T3 plasma levels were significantly elevated in mice fed HF-diet, in comparison with mice maintained on LF-diet. Development of HF-diet-induced obesity in the mice was associated with an enhancement of D3 activity in WAT. After maintaining the mice on HF-diet for two weeks, the D3 activity was significantly increased in their subcutaneous fat (142 ± 20 vs. 85 ± 12 fmol T2/h/mg protein) but not so much in epididymal fat. In conclusion, HF-diet-induced obesity in mice was associated with proliferation and differentiation of WAT and stimulation of thyroid hormones metabolism in WAT. Support from the Academy of Sciences of the Czech Republic (Project No. AV0Z50110509) and from the Czech Science Foundation (GACR Grant No. 304/08/0256) is acknowledged.

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