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Radiometric quantification of type 1 iodothyronine 5'-deiodinase activity in human white adipose tissue

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White adipose tissue (WAT) represents an important target for thyroid hormones (TH), which are known to modulate adipose tissue metabolism and differentiation of adipocytes. However, relatively little is known about TH metabolism in WAT. Recently, we determined higher activities of the key enzyme of TH metabolism, type 1 iodothyronine 5'-deiodinase (D1), in obese compared to lean control mice. Moreover, D1 activity in murine WAT could be stimulated by leptin, a major adipokine secreted in enhanced rate from hypertrophic adipose tissue. Based on these results, we aimed in the present study to measure activities of the three known iodothyronine deiodinases (IDs) in WAT of humans, and to characterize their possible association with obesity. Omental (OM) and subcutaneous (SC) adipose tissue samples were obtained during elective surgical procedures from a cohort of 70 human subjects with a body mass index (BMI) between 20 and 68 kg/m2. In a randomly selected subpopulation of 19 individuals, IDs activities of types 1 (D1), 2 (D2) and 3 (D3) were estimated in both OM and SC fat depots. IDs activities were measured in sub-mitochondrial supernatant fractions prepared from frozen WAT samples (10-40 ⊠g protein in a final volume of 40 ⊠l) using our recently elaborated radiometric enzyme assays. Specific D2 and D3 enzyme activities were close to the detection limits and there were no apparent differences in these activities between obese and non-obese subjects. On the contrary, activity of D1 could be quantified and it was significantly higher in both OM (ca. four-fold, P = 0.010) and SC (ca. eight-fold, P = 0.004) fat of obese when compared with non-obese individuals. Indeed, D1 activity correlated with BMI in both OM and SC fat depots. In conclusion, we have demonstrated for the first time in humans that (i) activities of enzymes involved in TH metabolism in human WAT differed in subjects according to the degree of adiposity; and that (ii) D1 was increased in hypertrophic adipose tissue (in obese subjects). 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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