

ORIGINAL RESEARCH COMMUNICATION

Plasma concentrations of free triiodothyronine predict weight change in euthyroid persons^{1, 2, 3, 4}

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Background: Factors that influence energy metabolism and substrate oxidation, such as thyroid hormones (THs), may be important regulators of body weight.

Objective: We investigated associations of THs cross-sectionally with obesity, energy expenditure, and substrate oxidation and prospectively with weight change.

Design: Euthyroid, nondiabetic, healthy, adult Pima Indians ($n = 89$; 47 M, 42 F) were studied. Percentage body fat (%BF) was measured by using dual-energy X-ray absorptiometry; sleeping metabolic rate (SMR), respiratory quotient, and substrate oxidation rates were measured in a respiratory chamber. Thyroid-stimulating hormone (TSH), free thyroxine (T_4), free triiodothyronine (T_3), and leptin concentrations were measured in fasting plasma samples.

Results: TSH, but neither free T_3 nor free T_4 , was associated with %BF and leptin concentrations ($r = 0.27$ and 0.29 , respectively; both: $P \leq 0.01$). In multiple regression analyses adjusted for age, sex, fat mass, and fat-free mass, free T_3 was a positive predictor of SMR ($P = 0.02$). After adjustment for age, sex, %BF, and energy balance, free T_3 was a negative predictor of 24-h respiratory quotient ($P < 0.05$) and a positive predictor of 24-h lipid oxidation rate ($P = 0.006$). Prospectively, after an average follow-up of 4 ± 2 y, the mean increase in weight was 3 ± 9 kg. Baseline T_3 concentrations were associated with absolute and annual percentage of changes in weight ($r = -0.27$, $P = 0.02$, and $r = -0.28$, $P = 0.009$, for the age- and sex-adjusted associations, respectively).

Conclusions: In euthyroid Pima Indians, lower free T_3 but not free T_4 concentrations were an independent predictor of SMR and lipid oxidation and a predictor of weight gain. This finding indicates that control of T_4 -to- T_3 conversion may play a role in body weight regulation.

Key Words: Thyroid hormones • energy expenditure • lipid oxidation • obesity • respiratory chamber

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