Abstract

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Plasma thyroid hormone kinetics are altered in iron-deficient rats.

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BACKGROUND: Iron deficiency anemia is associated with lower plasma thyroid hormone concentrations in rodents and, in some studies, in humans.

OBJECTIVE: The objective of this project was to determine if plasma triiodothyronine (T3) and thyroxine (T4) kinetics were affected by iron deficiency.

METHODS: Studies were done at a near-thermoneutral temperature (30 degrees C), and a cool environmental temperature (15 degrees C), to determine plasma T3 and T4 kinetics as a function of dietary iron intake and environmental need for the hormones. Weanling male Sprague-Dawley rats were fed either a low Fe diet [iron-deficient group (ID), <5 microg/g Fe] or a control diet [control group (CN), 35 microg/g Fe] at each temperature for 7 wk before the tracer kinetic studies. An additional ID group receiving exogenous thyroid hormone replacement was also used at the cooler temperature.

RESULTS: For T4, the disposal rate was >60% lower (89 +/- 6 vs. 256 +/- 53 pmol/h, P < 0.001) in ID rats than in controls at 30 degrees C, and approximately 40% lower (192 +/- 27 vs. 372 +/- 26 pmol/h, P < 0.01) in ID rats at 15 degrees C. Exogenous T4 replacement in a cohort of ID rats at 15 degrees C normalized the T4 concentration and the disposal rate. For T3, the disposal rate was significantly lower in ID rats in a cool environment (92 +/- 11 vs. 129 +/- 11 pmol/h, P < 0.01); thyroxine replacement again normalized the T3 disposal rate (126 +/- 12 pmol/h). Neither liver nor brown fat thyroxine 5'-deiodinase activities were sufficiently different to explain the lower T3 disposal rates in iron deficiency.

CONCLUSION: Thus, plasma thyroid hormone kinetics in iron deficiency anemia are corrected by simply providing more thyroxine. This suggests a central regulatory defect as the primary lesion and not peripheral alterations.

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