

ORIGINAL RESEARCH COMMUNICATION

Validation study of energy expenditure and intake during calorie restriction using doubly labeled water and changes in body composition^{1,2,3}

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Background: Clinical trials involving calorie restriction (CR) require an assessment of adherence to a prescribed CR with the use of an objective measure of energy intake (EI).

Objective: The objective was to validate the use of energy expenditure (EE) measured by doubly labeled water (DLW), in conjunction with precise measures of body composition, to calculate an individual's EI during 30% CR.

Design: Ten participants underwent 30% CR for 3 wk. During the last week (7 d), 24-h EE was measured in a respiratory chamber and simultaneously by DLW (EE_{DLW}). EI was calculated from 7-d EE measured by DLW and from changes in energy stores (ES) (weight and body composition). Calculated EI was then compared with the actual EI measured in the chamber by using the following equations: calculated EI (kcal/d) = EE_{DLW} + ΔES, where ΔES_{FM/FFM} (kcal/d) = (9.3 x ΔFM, g/d) + (1.1 x ΔFFM, g/d), FM is fat mass, and FFM is fat-free mass.

Results: We found close agreement (R = 0.88) between EE measured in the metabolic chamber and EE_{DLW} during CR. Using the measured respiratory quotient, we found that the mean (±SD) EE_{DLW} was 1934 ± 377 kcal/d and EE measured in the metabolic chamber was 1906 ± 327 kcal/d, ie, a 1.3 ± 8.9% overestimation. EI calculated from EE_{DLW} and from changes in ES was 8.7 ± 36.7% higher than the actual EI provided during the chamber stay (1596 ± 656 kcal/d).

Conclusions: DLW methods can accurately estimate 24-h EE during CR. Although the mean difference between actual and calculated EIs for the group was small, we conclude that the interindividual variability was too large to provide an assessment of CR adherence on an individual basis.

Key Words: Doubly labeled water method • DLW • energy intake • body composition • metabolic chamber

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Am. J. Clinical Nutrition, October 1, 2007; 86(4): 1251 - 1252.

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Reply to L Bowman and AB Loucks

Am. J. Clinical Nutrition, October 1, 2007; 86(4): 1252 - 1253.

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