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ORIGINAL RESEARCH COMMUNICATION

Accuracy of the Atwater factors and related food energy conversion factors with low-fat, high-fiber diets when energy intake is reduced spontaneously[1,2,3]

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Background: Systems to calculate metabolizable energy (ME) in foods and diets are often based on Atwater factors. The accuracy of these factors with low-fat diets high in fiber is unknown when food intake is reduced spontaneously.

Objective: The objective was to evaluate the accuracy of Atwater factors and other systems for calculating ME available from low-fat, high-fiber diets when food intake was reduced spontaneously.

Design: The ME contents of a high-fat, low-fiber diet and 2 low-fat diets, one high in fruit and vegetable fiber and the other high in cereal fiber, were determined in a randomized parallel study in humans (n = 27) and compared with various factorial and empirical models for calculating ME.

Results: Food intakes decreased with both the high fruit and vegetable fiber and cereal fiber diets. The difference between ME calculated by using Atwater and similar factors and determined ME values was up to 4% for the refined diet and up to 11% for the low-fat, high-fiber diets. Various factorial and empirical systems for calculating food energy failed to reflect the results of the direct determinations.

Conclusion: Atwater factors were inaccurate with low-fat, high-fiber diets. Although modified Atwater factors may be accurate under standardized conditions of zero-nitrogen and zero-energy balance, they overestimate energy availability from high-fiber fruit and vegetable and cereal diets when food intake is reduced spontaneously in addition to when intake is reduced voluntarily.

Key Words: Atwater factors • energy density • dietary fiber • digestibility • metabolizable energy