Metabolic advantage of low-carbohydrate diets: a calorie is still not a calorie

Four stages of acceptance: 1) this is worthless nonsense; 2) this is an interesting, but perverse, point of view; 3) this is true, but quite unimportant; 4) I always said so.—JBS Haldane

Dear Sir:

When Galileo claimed the world went around the sun, he was forbidden by the Pope to continue such “heretical teaching.” Writing to Copernicus, Galileo said, “They will not even look in my telescope.” It is easy to think such rigid beliefs could not possibly occur in the modern scientific community, yet they certainly do. When it comes to nutritional sciences, some nutritionists ignore well-controlled studies refuting the idea that diets of equal caloric content will always result in identical weight and fat loss independent of macronutrient composition.

Thus, I would like to compliment Krieger et al (1) on their well-designed meta-regression examining the effects of variations in protein and carbohydrate intakes on body mass and composition during energy restriction. The authors rightly concluded that low- and very-low-carbohydrate diets favorably affect body mass and composition independent of energy intake, supporting the proposed metabolic advantage of these diets (2–4). Contrary to some beliefs, such a response does not violate any thermodynamic laws (4).

The perception that “a calorie is a calorie” was refuted by Young et al in 1971 (5). They compared 3 diets that contained the same amount of calories (1800 kcal/d) and protein (115 g/d) but that differed in carbohydrate content (3). After 9 wk on the 30-g, 60-g, and 104-g carbohydrate diets, weight loss was 16.2, 12.8, and 11.9 kg and fat accounted for 95%, 84%, and 75% of the weight loss, respectively. Thus, the authors concluded, “Weight loss, fat loss, and percent of weight loss as fat appeared to be inversely related to the level of carbohydrate in the isocaloric, isoprotein diets.”

Modern studies have reported similar findings. For example, a recent randomized, balanced, 2-diet study compared the effects of isocaloric and energy-restricted very-low-carbohydrate (ketogenic) and low-fat diets on weight loss and body composition in overweight and obese men and women (6). Despite a significantly greater calorie intake with the ketogenic diet than with the low-fat diet (1855 compared with 1562 kcal/d, respectively), both the between- and within-group comparisons revealed a distinct advantage of a ketogenic diet over a low-fat diet for weight loss and fat loss in men. In fact, 5 men showed a >10 pound difference in weight loss.

Studies conducted in knockout mice also refute the notion of “a calorie is a calorie.” Blumberg et al (7) showed that the lack of an insulin receptor in fat tissue produces almost complete protection against obesity. In other words, fat-specific insulin receptor knockout mice can eat a lot of “extra calories” and still hardly gain any fat mass. Also, evidence exists that hyperinsulinemia increases fat mass without a concomitant increase in energy intake (8). Thus, it is clear that insulin plays an important role in obesity, independent of energy intake. Furthermore, it has been reported that hormone-sensitive lipase (the chief enzyme responsible for the mobilization of free fatty acids from adipose tissue) null mice are resistant to dietary-induced obesity secondary to an apparent increase in thermogenesis and energy expenditure (9). Finally, mice lacking acyl-coenzyme A:diacylglycerol acyltransferase 1 (one of 2 diacylglycerol acyltransferase enzymes that catalyze the final reaction in the pathways of
mammalian triacylglycerol synthesis) have increased energy expenditure and insulin sensitivity and are protected against dietary induced obesity (10).

The author had no conflict of interest to declare.

Anssi H Manninen

Advanced Research Press Inc
690 Route 25A
Setauket, NY 11733
E-mail: sportsnutrition@luukku.com

REFERENCES

Erratum


In Tables 2–7, the geometric means of the log-transformed biomarkers should have been provided with 95% CIs, rather than with SEs, given that the intervals are not symmetric on the back-transformed scale. The estimation of 95% CIs does not change the interpretation of the results or the conclusions of the article.