

Low-Carbohydrate Diets May Increase Energy Expenditure

Miriam E. Tucker

November 15, 2018

UPDATED November 16, 2018 // NASHVILLE, Tennessee — Lowering dietary carbohydrate intake could help in maintaining weight loss, new research suggests. However, some experts say the trial methodology makes drawing conclusions difficult.

Findings from the randomized trial comparing the metabolic effects of diets of varying carbohydrate-to-fat ratio were presented November 14 here at Obesity Week 2018 by David S. Ludwig, MD, and Cara B. Ebbeling, MD, both of the New Balance Foundation Obesity Prevention Center, Boston Children's Hospital, and Harvard Medical School, Boston, Massachusetts. The findings were [simultaneously published](#) in *BMJ*, with Ebbeling as lead author.

The study found that lowering dietary carbohydrate increased energy expenditure during weight loss maintenance, especially among those with high insulin secretion.

However, the investigators' use of doubly labeled water to measure energy expenditure was called into question during the Obesity Week symposium by Kevin Hall, PhD, a senior investigator at the National Institute of Diabetes and Digestive and Kidney Diseases, Bethesda, Maryland.

The bottom line, symposium chair and Obesity Society president Caroline M. Apovian, MD, told *Medscape Medical News*, is, "We need to do more studies to show that this is actually the case. There's controversy.... This may mean that we haven't yet figured out how to find out what each individual person needs to eat for better health."

Research in the Media Spotlight

The research was the subject of much media coverage, with headlines such as "Low-Carb Diets May Burn More Calories," "How a Low-Carb Diet Might Help you Maintain a Healthy Weight," and "Low-Carb Diets May be Best for Losing Weight and Keeping It Off."

These stories honed in on the fact that metabolism increased among those on the low-carb diet in the study, with some of them eventually burning a few hundred calories a day more than those on the low-fat diet. It was suggested that this could help people maintain weight loss more easily, the concept being that "all calories are not metabolically alike."

But this conclusion was drawn on the basis that the methodology — using doubly labeled water — was robust, which, as outlined above, was the subject of much debate following the presentation.

But even Ebbeling and coauthors admit that more work is needed.

"Additional research is warranted to examine the effects of glycemic load on body weight. If metabolic benefits of reduced glycemic load diets are confirmed, development of appropriate behavioral and environmental interventions would be necessary for optimal translation to public health," they state in their article.

Study Tested Difference in Energy Expenditure Between Diets Long Term

At Obesity Week, senior author Ludwig outlined the details of the study, which tested the carbohydrate-insulin model of obesity.

That states that the increased ratio of insulin-to-glucagon concentrations after consumption of a high-carbohydrate meal directs metabolic fuels away from oxidation and toward storage in adipose tissue. This process is thought to increase hunger and food cravings, lower energy expenditure, and predispose to weight gain, particularly among people with high insulin secretion, Ludwig explained.

Prior studies haven't found a difference in energy expenditure between low-carbohydrate and low-fat diets and were mostly short term — less than 2 weeks, he said.

However, the process of adapting to one or the other eating pattern takes longer than that, he stressed.

"The carbohydrate-insulin model offers a physiological mechanism for understanding why obesity rates have increased since the 1970s in the United States, as dietary fats were replaced with high glycemic load foods, including refined grains and added sugars," he and his coauthors explain in their article.

Their controlled feeding trial tested the effects of diets varying in carbohydrate-to-fat ratio on energy expenditure during weight

loss maintenance through 20 weeks in 164 adults with a body mass index of 25 kg/m² or higher who had lost at least 10% of their body weight during a 10-week run-in period, using a diet containing 45% of total energy from carbohydrate, 30% from fat, and 25% from protein.

Participants were assigned to one of three weight maintenance diets that varied by carbohydrate-to-fat ratio. All contained 20% protein. The diets differed as follows: the high-carb diet contained 60% carbohydrate and 20% fat; the moderate-carb diet, 40% carbohydrate and 40% fat; and the low-carb diet, 20% carbohydrate and 60% fat. Participants followed these diets for 20 weeks.

Total energy expenditure — measured by doubly labeled water — differed by diet in the intention-to-treat analysis ($P = .002$), with a linear trend of 52 kcal/day for every 10% decrease in the contribution of carbohydrate to total energy intake.

The change in total energy expenditure was 91 kcal/day greater in participants assigned to the moderate-carbohydrate diet and 209 kcal/day greater in those on the low-carbohydrate diet compared with the high-carbohydrate diet.

In the per protocol analysis, which included 120 participants, the respective differences were 131 kcal/day and 278 kcal/day.

And among participants with the highest third of pre-weight loss insulin secretion, the difference between the low- and high-carbohydrate diet was 308 kcal/day in the intention-to-treat analysis and 478 kcal/day in the per protocol analysis ($P < .004$).

Novel Finding of Reduction in Ghrelin with Low-Carb Diet

The difference in total energy expenditure between diets was not primarily attributable to resting energy expenditure or physical activity level, which were marginally higher in participants assigned to the low-carbohydrate diet, say the scientists in their article.

Other potentially contributory components of energy expenditure include thermic effect of food, activity of brown adipose tissue, autonomic tone, nutrient cycling, fidgeting and related nonexercise activity thermogenesis, "and changes in the efficiency of movement that we did not capture with cycle ergometry."

A change in metabolism is suggested by hormonal responses to diet, they note.

Levels of ghrelin, produced primarily in the stomach, were significantly lower in participants assigned to the low-carbohydrate diet ($P < .007$ for both intention-to-treat and per-protocol analyses), "a novel finding," they say in their *BMJ* article.

"Beyond effects on hunger, ghrelin has been reported to lower energy expenditure and promote fat deposition, providing another mechanistic explanation for our primary outcome."

Leptin levels (an adipocyte hormone that signals body energy stores) were also lower in participants assigned to the low-carbohydrate diet ($P = .06$ and $P = .005$ for intention-to-treat and per-protocol analyses respectively), suggesting improvement in leptin sensitivity.

"Prospective studies have observed that people with the greatest declines in leptin levels after weight loss have the lowest risk for weight regain," they observe.

Methodology Questioned

During the discussion on the methodology, it was explained that, with doubly labeled water, both the hydrogen and oxygen have been partly or completely replaced (labeled) with an uncommon isotope for tracing purposes.

Hall said that, despite being considered the gold-standard method for measuring energy expenditure, the method is flawed for several reasons, including that it hasn't been validated during low-carbohydrate diets.

Hall also said that doubly labeled water "requires careful estimation of respiratory quotient that depends on diet composition, energy imbalance, and their interaction."

Moreover, he noted that the method biases the results in favor of the low-carbohydrate diet by about 30 to 60 kcal/day through "loss of the deuterium isotope via de novo lipogenesis."

And finally, he asserted, "Doubly labeled water expenditure differences need to be corroborated by commensurate measurements of energy intake and body composition changes."

Ludwig rebutted on several of the technical points and concluded that the post hoc analyses Hall was citing "are highly speculative and very weak data to attack a gold standard method that has been used in a variety of dietary conditions for at least three decades."

And in their article, he and his colleagues discuss this issue at length and conclude, "Any bias of dietary composition on the

accuracy of the doubly labeled water method during weight maintenance is highly speculative and unlikely to be meaningful."

Apovian, who is professor of medicine and pediatrics at Boston University and director of the Center for Nutrition and Weight Management at Boston Medical Center, told *Medscape Medical News*, "We have a study showing that low-carbohydrate diets allow you to increase your energy expenditure vs low-fat. There are some limitations.... The answer may lie in genetics."

Asked what physicians should tell patients right now who inquire about which diet is best, she replied, "Whichever diet you feel you can adhere to is still the best diet. That's all we know."

BMJ. Published November 14, 2018. [Abstract](#)

Medscape Medical News © 2018 WebMD, LLC

Send comments and news tips to news@medscape.net.

Cite this article: Low-Carbohydrate Diets May Increase Energy Expenditure - *Medscape* - Nov 15, 2018.