

# Diabetic Patients Lost Weight, Improved Blood Sugar on Low-Carb Diet

Weight loss – which was entirely fat – was completely accounted for by reduced calorie consumption.

BY CONNI BERGMANN KOURY, EDITOR-IN-CHIEF

**W**hile experts agree that people on low-carbohydrate, high-protein, high-fat diets lose weight, it is not known how the diet causes weight loss or how it affects blood glucose levels in patients with type 2 diabetes.

"We undertook this study to find out why people on the 'Atkins diet' lose weight," Guenther Boden, MD, from Temple University School of Medicine, Philadelphia, said in an interview with *Diabetic Microvascular Complications Today*. "There could be four possibilities: they eat less, they spend more energy, they lose water instead of fat or there is something special about carbohydrate calories."

A low-carbohydrate diet study was done with 10 obese patients who had type 2 diabetes. All were under strict 24-hour supervision in a clinical research center. "This was different from other studies reported in the literature, as we measured every calorie that these patients ate and every calorie that they spent," Dr. Boden said.

## MAINTAIN DIET FOR 7 DAYS

For the first 7 days, the patients were told to maintain their usual diet and activity level. "We told them to eat exactly as they do at home. If it was not on the hospital menu, we got it from the outside. The idea was to get a stable baseline," Dr. Boden said.

Three white men and seven black women were enrolled in the study. Their average age was 51 years, average height was 169.7 cm (5 ft, 5.7 in) and the average weight was 114.75 kg (252.5 lbs).

During the usual-diet phase of the study, days 1 through 7, the mean energy intake was 3,111 kcal/day. This matched the patients' daily energy expenditure. "These patients were in equilibrium," Dr. Boden said. "They took in the same

number of calories as they expended, so neither their weight nor their body composition changed."

On day 8 of the study, Dr. Boden and colleagues reduced the patients' carbohydrate intake from an average of 309 grams per day to about 21 grams per day. "That is known as the induction-type Atkins diet. It would be very difficult for anyone to stay on just 21 grams of carbohydrates for a long period of time, but we wanted to study the real Atkins-style diet."

## UNLIMITED PROTEIN AND FAT

During days 8 through 21, patients were allowed to eat protein and fat as much, as often and at any time they wanted. They chose from a modified hospital diet that included only allowable foods without sauces, gravies or other carbohydrate-containing ingredients. They could have beef patties, ground turkey, chicken breasts, turkey, ham, raw or steamed vegetables, butter and diet gelatin.

"We allowed unlimited amounts of cheese and cream cheese. As with the usual diets, patients could request allowable items that were not available in the hospital kitchen such as fresh fish, various cuts of beef, cream and additional vegetables," Dr. Boden said.

The researchers weighed and recorded food consumed, patients' body weights, vital signs, fasting plasma glucose levels and 24-hour urine outputs daily. Other measurements included total 24-hour calorie expenditure, diet satisfaction, insulin sensitivity, blood insulin, leptin and ghrelin levels.

"What happened? Well right away, the patients dropped their caloric intake from 3,100 to 2,100 calories a day," Dr. Boden said. "They did not change their caloric expenditure."

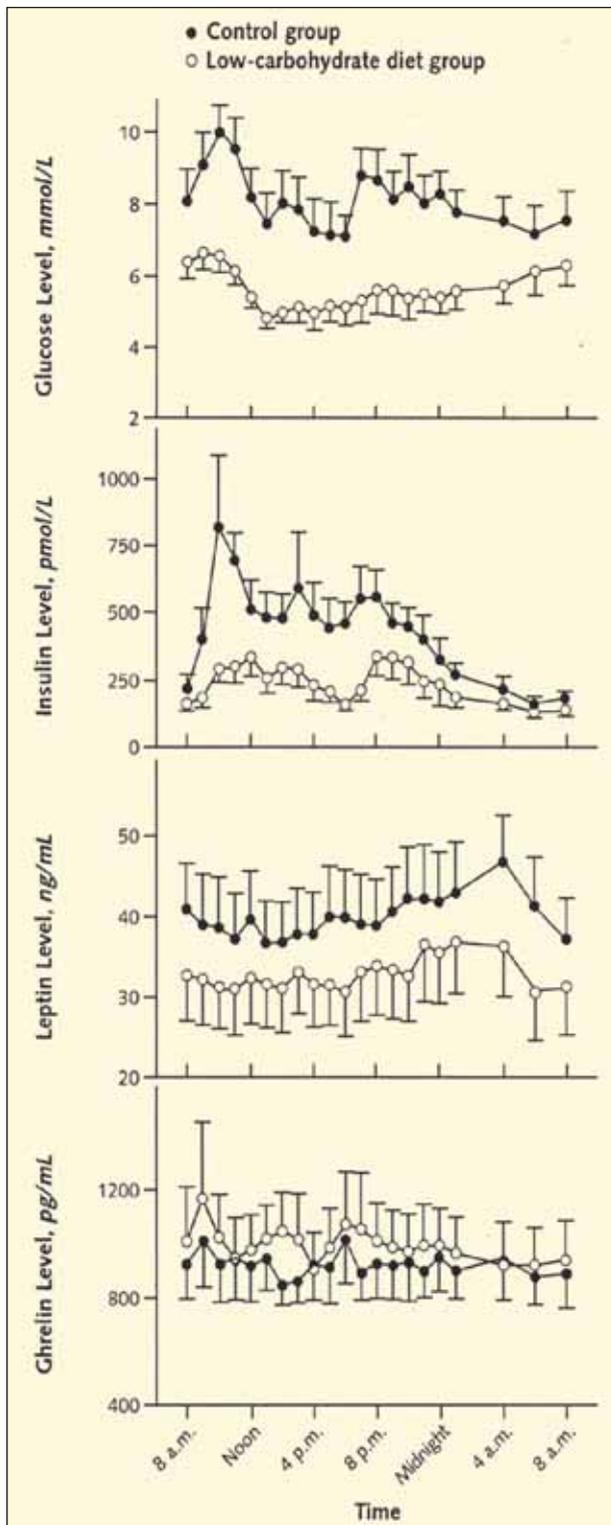


Figure 1. Profiles of 24-hour plasma glucose, insulin, leptin and ghrelin. Data are from 9 patients with type 2 diabetes obtained on day 7 on their usual high-carbohydrate, high-protein, high-fat diet and after 2 weeks on a low-carbohydrate diet.

The mean energy deficit of 1,027 kcal/day completely accounted for the weight loss of 1.65 kg in 14 days, which was entirely made up of fat.

"The real mystery is why did the patients not compensate for the reduction in complex carbohydrate calories? They could have and they did not," Dr. Boden said. The intake of protein and fat increased slightly, but it was not statistically significant.

The researchers concluded that carbohydrates stimulated excessive appetite in these patients in the first place. "What's so amazing is that when these patients stopped eating carbohydrates, they spontaneously adjusted from an excessive caloric intake of 3,100 kcal/day to a normal intake for their height of 2,100 kcal/day."

Data from this study, Dr. Boden said, support the idea that carbohydrates stimulate appetite. They seduce people into eating more than they really need. "The lesson here is that if you want to curtail your appetite, reduce carbohydrates."

#### TYPE 2 DIABETES AND CARBS

Dr. Boden and colleagues also found that mean 24-hour plasma profiles of glucose levels in these patients during the low-carbohydrate phase of the diet were almost normalized (from a mean of 7.5 mmol/L to 6.3 mmol/L) (Figure 1).

"We had to decrease medication levels in some patients or their sugar would have fallen too low," Dr. Boden said, adding that this is nothing new – it has been known for years that blood sugar levels are primarily controlled by carbohydrates in the diet.

When low-carbohydrate diets came into the marketplace, many physicians and dietitians were extremely concerned that the high fat content of these eating plans would lead to heart disease. However, Dr. Boden said, so far no study has shown that to be the case. While this study was too short to make any conclusions regarding long-term lipid levels, patients did have a 35% mean drop in triglycerides and a 10% mean drop in cholesterol.

"So far the initial fears that this diet is bad for your heart have not been confirmed. While the long-term effects of this diet remain uncertain, we ought to keep an open mind," he said. ■

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Boden G, Sargrad K, Homko C, et al. Effect of a low-carbohydrate diet on appetite, blood glucose levels, and insulin resistance in obese patients with type 2 diabetes. *Ann Intern Med*. 2005;142:403-411.