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LETTER TO THE EDITOR

Benefits of ketogenic diets

Nicholas J Krilanovich

310 Myrtle Street
Apartment 306
Mount Vernon, WA 98273
E-mail: njkrilanucla{at}hotmail.com

Dear Sir:

In this age of the obesity epidemic, some careful work reported in the May issue of the Journal by Johnston et al (1) provides more information to help solve the problem. With strict controls in a 6-wk trial, they directly compared 2 diets: a ketogenic very-low carbohydrate (KLC) diet and a nonketogenic low-carbohydrate (NLC) diet. They concluded that the KLC and NLC diets were equally effective in reducing body weight and insulin resistance, but the KLC diet was associated with several adverse metabolic and emotional effects. Thus, the use of ketogenic diets for weight loss is not warranted. This conclusion is amplified by the article's title and by its final sentence: "Patients should know that there is no apparent metabolic advantage associated with ketosis during dieting."

As shown in Table 1 of the article by Johnston et al, the 2 diets were equal in energy content (1500 kcal/d). The major nutrients provided daily by the KLC and NLC diets, respectively, were as follows: 33 and 157 g carbohydrate, 125 and 117 g protein, 100 and 50 g total fat, 35 and 13 g saturated fat, 34 and 16 g monounsaturated fat, 14 and 7 g polyunsaturated fat, 15 and 30 g fiber, and 620 and 230 mg cholesterol. Could some of the adverse metabolic effects reported in this study support the long-expressed concerns about the high-fat Atkins diet? Specifically, should the conclusion of Johnston et al have been that a ketogenic diet that is high in saturated fat and cholesterol is not warranted for weight loss? It can be shown that a blanket rejection of ketogenic diets for weight loss is not warranted.

It is safe to assume that no species could have survived millions of years if its members could not tolerate occasional brief periods of natural starvation, which itself is ketogenic. In fact, everyone approaches ketogenesis in the sleep portion of every diurnal cycle. If only water is ingested, stores of liver glycogen decrease steadily to zero in the first 12–24 h (2, 3). The body then must rely heavily on its vital gluconeogenesis capability to meet the needs of the body for glucose when carbohydrate is not available in sufficient amounts from the diet or from glycogen reserves. A supply of glucose is necessary, especially for the nervous system and erythrocytes. Death usually results if gluconeogenesis fails (2). At the same time, concentrations of insulin and glucose decrease (glucose decreases toward ≈3 mmol/L) while glucagon increases. These changes initiate a strong increase in the concentration of free fatty acids as the body switches from the fed state to the starved state. Although slightly delayed, the concentration of blood ketone bodies increases from a negligible value to ≈2 mmol/L (2, 3). As noted decades ago, after ≈3 d, hunger decreases considerably as the concentration of these ketone bodies continues to increase to >4 mmol/L (3, 4). Ketosis arises because the major fuel being burned is fat from body stores. The brain spares some glucose by using these ketone bodies. This mild ketosis is the body's natural adaptation to starvation and is not to be confused with the dangerous ketoacidosis associated with untreated type 1 diabetes. When zero calories are ingested, the maximum possible rate of weight loss occurs, and there will likely not be a flat weight-loss plateau. Of course, the ingestion of zero calories for an extended time is not healthful because of the total lack of vital nutrients of all kinds.

The protein-sparing modified fast (PSMF) is a human-engineered variation on natural starvation designed to extend the period of rapid weight loss and low hunger while preventing the body from catabolizing itself. Because of the special biochemical importance of glucose, essentially the same changes as described above for starvation take place if little glucose-producing food (carbohydrate) is ingested, despite the fact that protein and fat are still being ingested. Ketostix (Bayer Corporation, Elkhart, IN) can be used to verify the presence of ketosis in ≈3 d. Enough protein must be eaten to provide for the usual daily needs for amino acids plus enough to supply the now-required gluconeogenesis. The total amount of protein needed is not large, ≈1.3 g protein/kg ideal body wt (5). In this 1976 article, Bistrian et al conclude that "For diabetics with some endogenous insulin reserve, the PSMF offers significant advantages for weight reduction, including preservation of lean body mass (as reflected in nitrogen balance) and withdrawal of exogenous insulin." The small amount of carbohydrate allowed must be chosen carefully to maximize the nutrients per gram of carbohydrate.

A controlled study compared reports of appetite and symptoms in 28 obese subjects randomly assigned to either a 500-kcal PSMF or a 1200-kcal balanced diet (6). During the first comparison month, the subjects who consumed the PSMF lost significantly more weight and reported significantly less hunger than did the subjects who consumed the balanced diet; the former group reported significantly greater problems with cold intolerance, constipation, dizziness, dry skin, and fatigue. A ketogenic diet was developed early in the 20th century to successfully treat children with drug refractory epilepsy (7). A direct comparison showed that saturated fat is undesirable even when a high-fat ketogenic diet is required, as in special treatments of refractory epilepsy (8). A 2-wk carefully controlled inpatient study showed that a ketogenic diet was beneficial for the control of weight and blood glucose concentrations in diabetic patients. Cutting carbohydrate consumption to ≈20 g/d produced a spontaneous reduction in calories of ≈1000 kcal/d with little change in hunger, diet satisfaction, or energy levels (9).

Clearly, one major advantage of the ketogenic diet is that it allows the calorie intake to be cut drastically without producing ravenous hunger. A suggestion for extending the benefits of ketogenic weight-loss diets would be to alternate 1–3 wk of the PSMF with longer periods of the Heller plan (10). The Heller plan allows for one full, healthful, balanced meal plus snacks daily that follow a PSMF protocol. This would enable the consumption of useful amounts of vital plant foods while taking the body back and forth through the entire cycle of emptying (23 h) and refilling (1 h) the liver's glycogen stores.

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