Diabetes and dietary macronutrients: is carbohydrate all that bad?1–3

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At a time when low-carbohydrate diets are increasingly popular and the obesity epidemic is being blamed more on carbohydrates than on calories, the article by Gerhard et al (1) in this issue of the Journal is refreshing. As has been supported by a substantial amount of evidence in nondiabetic subjects, ad libitum intake of diets restricted in fat predicts modest weight reduction (2). A similar result was found by Gerhard et al, but their subjects had type 2 diabetes, a condition that enabled novel application of the hypothesis. Each participant served as his or her own control under a design in which subjects were randomly assigned to a 6-wk diet with either 65% or 45% of energy as carbohydrates, which was followed by a washout period of 6–12 wk (1). It is important that the additional fat in the low-carbohydrate diet was mostly monounsaturated fat, not saturated fat, and that the high-carbohydrate diet was not adjusted to match the fiber content of the low-carbohydrate diet. Thus, a real-life setting (not that of a metabolic ward) was examined. Because high-carbohydrate diets typically are less energy dense and have a more substantial satiating effect (3), it is not surprising that Gerhard et al found that fewer calories were actually ingested on the high-carbohydrate diet. When caloric intake is estimated in the clinic or at the time of recruitment into a research study, underreporting is expected; however, in this study, all meals were prepared, and the difference in weight loss with the 2 diets (1.06 kg observed, 1.15 kg predicted by using 3500 kcal/lb or 1590 kcal/kg) was almost perfectly explained by the differences in measured energy intake.

Nevertheless, hypocaloric—and not isoecaloric—diets are the lifestyle intervention most needed and are recommended for patients with type 2 diabetes. Although the amount of weight loss can be equal with consumption of energy-restriction diets that are higher in carbohydrates rather than higher in monounsaturated fat (4), increases in postprandial glucose excursion and fasting triacylglycerols and reductions in HDL cholesterol can be seen (5–7). Despite the fact that these metabolic changes could raise concerns about the development of macrovascular and perhaps even microvascular complications in patients with diabetes mellitus, the difference in the effects of dietary carbohydrate and of monounsaturated fat on plasma triacylglycerols and HDL cholesterol typically is small. Moreover, there is no convincing evidence at present that these modest alterations in lipids or in glycemia increase the risk of cardiovascular disease in patients with or without diabetes. An effect of any of these metabolic changes on microangiopathy in diabetes would also be surprising.

Even if very-low-carbohydrate diets produce more weight loss in patients with diabetes than do low-fat diets, as suggested by a recent study in which the low-carbohydrate diet was high in saturated fat as well as in total fat (8), the weight-loss benefit fails to last >6 mo (9). Although the more favorable glucose and lipid changes did persist in the study by Samaha et al (8), when necessary, subtle changes in diabetes management can address the glycemic effect. Whether a low-carbohydrate diet is accomplished by increases in saturated or monounsaturated fat, it is of great interest that, when type 2 diabetes was prevented in subjects with impaired glucose tolerance by lifestyle interventions including diet and exercise, as in the Diabetes Prevention Program (10) and the Finnish Study (11), the diets were restricted in fat and not in carbohydrates. In patients with diabetes of more recent onset in whom insulin secretion is relatively well preserved, the weight loss might trump the modest effect of higher quantities of dietary carbohydrate on glycemia and lipids. When diabetes is more longstanding, however, weight loss per se fails to improve insulin sensitivity or insulin secretion (12). In patients with a long history of type 2 diabetes, a time-dependent escalation of hypoglycemic therapy needs to be anticipated. Where do we then stand? Until the long-term efficacy and safety of low-carbohydrate diets can be documented, the recommendations of the National Cholesterol Education Program (13), the American Heart Association (14), and other professional organizations (15) should remain the standard of care.

REFERENCES


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