Alternatives to low-fat diets$^{1,2}$

Martijn B Katan

High-carbohydrate, low-fat diets have been thought to reduce the risk of obesity, cancer, and heart disease, but the benefits of carbohydrates are now disputed because their long-term effects on body weight are disappointing (1) and because they lower HDL cholesterol and raise fasting serum triacylglycerol concentrations (2–4). As a result, low-carbohydrate diets have become popular, especially for weight loss.

In this issue of the Journal, Krauss et al (5) compare the effects of high- and low-carbohydrate diets on blood lipoproteins, both before and after weight loss. To that end they fed 4 diets to ≈200 men for 13 wk. The control diet provided 54% of energy from carbohydrate, which is similar to what many health-conscious Americans eat. In the 39% diet, 13% of energy as carbohydrate was replaced by protein; in the 26% diet, another 13% of energy was replaced by monounsaturated fatty acids; and, finally, 6% of unsaturated fatty acids was replaced by saturated fatty acids to produce the 26%-carbohydrate, high-saturated-fat diet. The results for protein in this large, well-controlled trial are especially interesting.

At constant body weight, the addition of protein at the expense of carbohydrates caused a slight increase in both LDL and HDL cholesterol but a decrease in the ratio of total cholesterol to HDL cholesterol. This ratio is the most specific lipid risk factor for coronary heart disease, and its decrease suggests an advantage for dietary protein over carbohydrates. How does this finding compare with previous studies? To find that out I averaged the outcomes of 4 published studies of high-protein diets (6–9), weighted by the square root of the number of subjects. This yielded slightly different values for the effect of protein on LDL and HDL than observed by Krauss et al, but the predicted decrease of 0.20 in the ratio of total to HDL cholesterol agreed well with the decrease of 0.26 observed by Krauss et al. This finding suggests that dietary protein produces a more favorable lipoprotein profile than does dietary carbohydrate, but the data are not conclusive, especially regarding the effects of protein on HDL-cholesterol concentrations.

The 26%-carbohydrate diet was high in both protein and monounsaturated fat. The effect of monounsaturates on lipoproteins can be accurately predicted from a meta-analysis of 60 high-quality trials (4). When combined with my provisional estimates of the effect of protein, the predicted difference between the 26%- and the 54%-carbohydrate diets was an increase of 4 mg/dL in HDL, a decrease of 7 mg/dL in LDL, and a decrease of 0.47 in the ratio of total to HDL cholesterol. Krauss et al observed an increase of 2 mg/dL in HDL, a decrease of 8 mg/dL in LDL, and a decrease of 0.57 in the ratio of total to HDL cholesterol.

This finding confirms that carbohydrates depress HDL and slightly increase LDL compared with unsaturated fat plus protein. The 2 low-carbohydrate diets also markedly lowered serum triacylglycerols: back-transformation of the log values in Table 2 of Krauss et al’s article suggests that triacylglycerol concentrations decreased by 22 mg/dL when carbohydrate was replaced by protein and by 29 mg/dL when replaced by protein plus monounsaturates.

Comparison of the 26%-carbohydrate, high-saturated-fat diet with the 26%-carbohydrate, low-saturated-fat diet addressed the question of what happens when saturated fat replaces unsaturated fat. The observed increases in total and LDL cholesterol in this study matched the predictions of the formulas of Mensink et al (4), but the findings for HDL did not. HDL cholesterol increased when it should have stayed the same. As a result, the ratio of total to HDL cholesterol did not increase. This may have been a chance finding because the evidence that the replacement of unsaturated with saturated fat increases the ratio of total to HDL cholesterol is massive. The 26%-carbohydrate, high-saturated-fat diet clearly produced more favorable lipoprotein values than did the basal 54%-carbohydrate, low-saturated-fat diet. This finding was due more to the diet’s high content of protein and monounsaturated fat than to its saturated fat content, which at 15% of energy was considered average. Nonetheless, the finding adds to the evidence that carbohydrates have adverse effects on triacylglycerols and the ratio of total to HDL cholesterol that are not shared by dietary protein or unsaturated fat.

Carbohydrate intake also induced smaller and denser LDL particles, in agreement with earlier findings (10). The evidence that such particles are atherogenic is intriguing, but patients with small LDL particles also have low serum HDL-cholesterol and high triacylglycerol concentrations, and it is unclear whether small LDL particles have an independent effect on heart disease risk (11).

The above discussion refers to the first 4 wk of the study only. The authors then switched the subjects to calorie-restricted diets for 5 wk and allowed another 4 wk for body weight to stabilize. The effect of weight loss on lipoproteins was more favorable with the high-than with the low-carbohydrate diets, which suggests an
interaction in which the effect of weight loss depends on the subject’s diet. I found it difficult to visualize how a diet can have one effect in men weighing 93 kg, but a different effect in these same men when they weigh 87 kg. Future studies will hopefully clarify this.

This study is valuable because it extends our knowledge of dietary protein and blood lipids. Evidently, proteins lack the triacylglycerol-elevating effect of carbohydrates. However, lipoproteins are now a less pressing problem than is obesity. Low-fat, high-carbohydrate diets have failed to produce long-term weight loss (1), but we should not be overly optimistic about the alternatives. Obesity is a societal disease caused by an overabundance of food and mechanization, and diets high in protein or fat are unlikely to reverse the trend. We also do not know whether the consumption of large amounts of protein is safe for the kidneys and bones; trials to determine this are urgently needed. We have a way to go before we know as much about protein as we do about unsaturated fats. Clinical trials have shown that high intakes of unsaturated fatty acids reduce the risk of heart attacks (12), a finding that is consistent with their favorable effects on lipoproteins (4) and with the inverse associations between unsaturated fat intake and heart disease (13). In comparison, the evidence that high-protein diets prevent heart disease is still slim.

The author had no conflicts of interest.

REFERENCES