

Effect of high protein vs high carbohydrate intake on insulin sensitivity, body weight, hemoglobin A1c, and blood pressure in patients with type 2 diabetes mellitus.

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BACKGROUND: Extremely low carbohydrate/high protein diets are popular methods of weight loss. Compliance with these diets is poor and long-term effectiveness and the safety of these diets for patients with type 2 diabetes is not known. **OBJECTIVE:** The objective of the current study was to evaluate effects of less extreme changes in carbohydrate or protein diets on weight, insulin sensitivity, glycemic control, cardiovascular risk factors (blood pressure, lipid levels), and renal function in obese inner-city patients with type 2 diabetes. **DESIGN:** Study patients were admitted to the General Clinical Research Center for 24 hours for initial tests including a hyperinsulinemic-euglycemic clamp (for measurement of insulin sensitivity), bioelectrical impedance analysis (BIA) and anthropometric measurements (for assessment of body composition), indirect calorimetry (for measurement of REE), electronic blood pressure monitoring, and blood chemistries to measure blood lipids levels along with renal and hepatic functions. Six patients with type 2 diabetes (five women and one man) were randomly assigned to the high-protein diet (40% carbohydrate, 30% protein, 30% fat) and six patients (four women and two men) to the high-carbohydrate diet (55% carbohydrate, 15% protein, 30% fat). All patients returned to the General Clinical Research Center weekly for monitoring of food records; dietary compliance; and measurements of body weight, blood pressure, and blood glucose. After 8 weeks on these diets, all patients were readmitted to the General Clinical Research Center for the same series of tests. **INTERVENTION:** Twelve study patients were taught to select either the high-protein or high-carbohydrate diet and were followed for 8 weeks. **MAIN OUTCOME MEASURES:** Insulin sensitivity, hemoglobin A1c, weight, and blood pressure were measured. **STATISTICAL ANALYSES:** Statistical significance was assessed using two-tailed Student's t tests and two-way repeated measures analysis of variance. **RESULTS:** Both the high-carbohydrate and high-protein groups lost weight (-2.2±0.9 kg, -2.5±1.6 kg, respectively, $P < .05$) and the difference between the groups was not significant ($P = .9$). In the high-carbohydrate group, hemoglobin A1c decreased (from 8.2% to 6.9%, $P < .03$), fasting plasma glucose decreased (from 8.8 to 7.2 mmol/L, $P < .02$), and insulin sensitivity increased (from 12.8 to 17.2 micromol/kg/min, $P < .03$). No significant changes in these parameters occurred in the high-protein group, instead systolic and diastolic blood pressures decreased (-10.5±2.3 mm Hg, $P = .003$ and -18±9.0 mm Hg, $P < .05$, respectively). After 2 months on these hypocaloric diets, each diet had either no or minimal effects on lipid levels (total cholesterol, low-density lipoprotein, high-density lipoprotein), renal (blood urea nitrogen, serum creatinine), or hepatic function (aspartate aminotransferase, alanine aminotransferase, bilirubin).

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