pharmacologic agent than a food. However, in light of the present evidence quoted here as well as in Dr. Muñoz's editorial, it seems to me to be quite inappropriate to withhold the suggestion that the naturally occurring high-fiber foods should be recommended to diabetic patients. These foods are traditionally consumed as major dietary items in many populations who have fewer degenerative diseases than affluent societies; they produce improved glycemic control in controlled trials conducted over periods of several months, and they are associated with lower levels of total and LDL-cholesterol. I am unimpressed by suggestions concerning theoretic disadvantages in adequately nourished people, and readers are referred to the references quoted in the editorial to form their own opinions. Physicians wishing to decide whether or not to recommend these foods will have to base their decisions on the present evidence. A definitive answer could only come from a formal randomized controlled clinical trial of a high- and low-fiber diet with a sufficient number of patients (probably several thousand) to examine for differences in morbidity and mortality. Such a trial will never be done. The diabetic associations of several countries, through expert committees on nutrition, have already made recommendations that include a reduction in fat and an increase in fiber-rich carbohydrate. It is my hope that individual physicians will take up these recommendations since lack of enthusiasm about dietary advice in general among doctors accounts for much of the poor compliance found in the rather out-of-date references quoted in the editorial. We hope to be able to publish soon our findings showing different results in at least one clinic where doctors and dietitians regard diet as a key aspect in the management of diabetes.

J. I. MANN, D.M.

From the Department of Community Medicine and General Practice, University of Oxford, Radcliffe Infirmary, Oxford, England.

REFERENCES

[1] Muñoz J. M.: Fiber and diabetes. Diabetes Care 1984; 7:297–300.

[2] McMurray, J. F., and Baumgardner, B.: A high-wheat bran diet in insulin-treated diabetes mellitus: assessment with the artificial pancreas. Diabetes Care 1984; 7:211–14.

[3] Jenkins, D. J. A., Wolever, T. M. S., Jenkins, A. L., Lee, R., Wong, G. S., and Josse, R.: Glycemic response to wheat products: reduced response to pasta but no effect of fiber. Diabetes Care 1983; 6:155–59.

[4] Simpson, R. W., Mann, J. I., Eaton, J., Moore, R. A., Carter, R., and Hockaday, T. D. R.: Improved glucose control in maturity-onset diabetes treated with high-carbohydrate modified fat diet. Br. Med. J. 1979; 1:1753–56.

[5] Simpson, R. W., Mann, J. I., Eaton, J., Carter, R. D., and Hockaday, T. D. R.: High-carbohydrate diets and insulin-dependent diabetics. Br. Med. J. 1979; 2:523–25.

[6] Simpson, H. C. R., Simpson, R. W., Lousley, S., et al.: A high carbohydrate leguminous fiber diet improves all aspects of diabetic control. Lancet 1981; 1:1–5.

[7] Lousley, S. E., Jones, D. B., Slaughter, P., et al.: High carbohydrate–high fibre diets in poorly controlled diabetes. Diabetic Medicine 1984; 1:21–25.

[8] Kinmonth, A.-L., Angus, R. M., Jenkins, P. A., Smith, M. A., and Baum, J. D.: Whole foods and increased dietary fiber improve blood glucose control in diabetic children. Arch. Dis. Child. 1982; 57:187–94.

[9] Aro, A., Uusitupa, M., Voutilainen, E., Hersio, K., Korhonen, T., and Sittonen, O.: Improved diabetic control and hypocholesterolaemic effect induced by long-term dietary supplementation with guar gum in type 2 (insulin-dependent) diabetes. Diabetologia 1981; 21:29–33.

[10] Vaaler, S., Hanssen, K. F., Dahl-Jorgensen, L., et al.: Improvement in long-term diabetic control after high fibre (bran and guar) diets. Diabetologia 1983; 25:200.

Fiber and Diabetes: A Reply

Dr. J. I. Mann clearly points out the need for better controlled, long-term studies in order to evaluate the effects of high carbohydrate–high fiber diets in patients with diabetes mellitus. What one means by "long-term study," however, represents a semantic problem.

In the studies cited by Dr. Mann, the length of follow-up varied between 6,[1-4] 8,[5] and 12[6] wk. Four of them[1-4] demonstrated significant drops in fasting and preprandial blood glucose levels. This "improvement" was not associated with changes in HbA_{1c}.[1,3-5] In one study,[1] the subject experienced significant weight loss while on the high carbohydrate–high fiber diet. In another study[2] the consumption of a high-fiber diet was associated with a 2% drop in HbA_{1c} "in compliant patients." It appears from these studies that the authors did not include three noncompliant patients who experienced an elevation in their HbA_{1c}.

All of these studies were relatively "short term." In order to further evaluate the usefulness of dietary fiber, it appears that observation should be at least 1 yr, and better parameters of diabetes control should be followed. Instead of fasting and pre- or postprandial glycemia, one should look at changes in HbA_{1c}, changes in basal membrane thickness, progression of retinopathy, etc. As Dr. Mann suggested, the studies should also be long enough to evaluate the differences in morbidity and mortality.

The beneficial effects of dietary fiber in the studies quoted by Dr. Mann were based on statistically significant changes in fasting (6.7 mmol/dl [120 mg/dl] versus 5.7 mmol/dl [102 mg/dl]) and preprandial (11.1 mmol/dl [199 mg/dl] versus 8.9 mmol/dl [160 mg/dl]) blood glucose when subjects consumed low- and high-fiber diets, respectively. Since the subjects did not experience changes in their HbA_{1c}, one wonders if those "statistically significant differences" are real or clinically relevant.

It cannot be denied that diet plays a very important role in the management of patients with diabetes mellitus. We

should, however, be more realistic and accept the fact that most patients with diabetes mellitus, congestive heart failure, hyperlipidemia, etc., do not follow their diets as well as we would like. The study by Najemnik et al.[7] was of interest because it showed that the supplementation of ususal diets with guar caused significant improvement in their metabolism, carbohydrate, and lipids.

JUAN M. MUÑOZ, M.D.

From the Fargo Clinic, Ltd., 737 Broadway, Box 2067, Fargo, North Dakota 58123.

Address reprint requests to Juan M. Muñoz, M.D., at the above address.

REFERENCES

[1] Simpson, R. W., Mann, J. I., Eaton, J., Carter, R. D., and Hockaday, T. D. R.: High-carbohydrate diets and insulin-dependent diabetics. Br. Med. J. 1979; 2:523–25.

[2] Simpson, R. W., Mann, J. I., Eaton, J., Moore, R. A., Carter, R., and Hockaday, T. D. R.: Improved glucose control in maturity-onset diabetes treated with high-carbohydrate modified fat diet. Br. Med. J. 1979; 1:1753–56.

[3] Simpson, H. C. R., Simpson, R. W., Lousley, S., et al.: A high carbohydrate leguminous fibre diet improves all aspects of diabetic control. Lancet 1981; 1:1–5.

[4] Kinmonth, A.-L., Angus, R. M., Jenkins, P. A., Smith, M. A., and Baum, J. D.: Whole foods and increased dietary fibre improve blood glucose control in diabetic children. Arch. Dis. Child. 1982; 57:187–94.

[5] Vaaler, S., Hanssen, K. F., Dahl-Jorgensen, L., et al.: Improvement in long-term diabetic control after high fibre (bran and guar) diets. Diabetologia 1983; 25:200.

[6] Aro, A., Uusitupa, M., Voutilainen, E., Hersio, K., Korhonen, T., and Sittonen, O.: Improved diabetic control and hypocholesterolaemic effect induced by long-term dietary supplementation with guar gum in type 2 (insulin-dependent) diabetes. Diabetologia 1981; 21:29–33.

[7] Najemnik, C., Kritz, H., Irsigler, K., Laube, H., Knick, B., Klimm, H. D., Wahl, P., Vollmar, J., and Brauning, C.: Guar and its effects on metabolic control in type II diabetic subjects. Diabetes Care 1984; 7:215–20.

Mathematical Model to Obtain Cholesterol, P/S Ratio, and Fiber Daily Intake

There is a great deal of interest in estimating the cholesterol, fatty acid (P/S ratio), and fiber content of the diet of diabetic patients.[1] Nonetheless, this computation is fairly tedious. On the other hand, calculation of the protein, lipid, and carbohydrate content and the ratio of vegetable origin lipids to animal origin lipids (VL/AL) is simply and rapidly carried out. From these data, we propose an efficient and rapid mathematical model that permits an estimation of the amount of dietary cholesterol, fiber, and P/S ratio. One hundred thirty seven–day dietary surveys were carried out. The composition of protein, lipid, and carbohydrate of the diet, the P/S ratio, and the amount of cholesterol were calculated using the food composition table established by Renaud.[2] The content of fibers was estimated using the Paul index.[3] An ascending step-by-step multiple linear curve was produced to determine the most representative parameters of the variables under investigation. Results are expressed as mean ± SD.

Our subjects ingested 2400 ± 890 kcal daily, distributed as follows: lipids, 117 ± 53 g; proteins, 86 ± 33 g; carbohydrates, 250 ± 108 g. The ratio VL/AL was 0.55 ± 0.56, whereas the P/S ratio was 0.34 ± 0.33. The quantity of cholesterol ingested was 479 ± 228 mg/24 h and quantity of fiber was 12.55 ± 8.0 g/24 h. Calculation of the ratios P/S and VL/AL required 6 ± 1 min and 35 ± 7 s, respectively.

There exists a positive linear correlation between the P/S ratio and VL/AL: $P/S = 0.6\,VL/AL$; $r = 0.98$; $P < 0.001$.

The mulitple linear curve allows an estimation of the daily intake of cholesterol and fiber with respect to the quantity of essential nutrients ingested:

$$\text{Cholesterol (mg/24 h)} = (3.57 \times L) - (168 \times P/S) + (0.8 \times P) - (0.09 \times \text{kcal}) + 267,\ P < 0.01$$

$$\text{Fiber (g/24 h)} = (0.024 \times \text{kcal}) + (0.057 \times P) - (0.075 \times Hc) - (0.24 \times L) - 3.2,\ P < 0.01$$

The reliability of our research is based on the validity of the data published in the food composition tables. Our results provide a simple, rapid, easily programmable means to estimate the P/S ratio and the amount of cholesterol and dietary fiber ingested. Our subjects take in one-third of dietary cholesterol from butter. Moreover, they ingest very few dried vegetables. In our country, the extraction rate of bread flour is around 75%. So, the proposed model for the estimation of fiber intake is only right if the study population ingests white bread.

Thus, this type of calculation should be tested again if the total energy input and the distribution of essential nutrients are quite different from those of our subjects. The formulae are valid only for the food composition tables that we used. For example, an energy input of 2500 kcal/24 h (comprised of 55% carbohydrate, 30% lipid, and 15% protein) should contain 1.66 times more vegetable lipid than animal, 250 mg of cholesterol, and 17 g of fiber.

DOMINIQUE TATER, M.D.
FRANCOISE LE GALL, R.D.
JEAN-PIERRE BERCOVICI, M.D.

From the Divisions of Endocrinology, Metabolism, and Nutrition, University of Bretagne Occidentale, Morvan Hospital, 29279 Brest, France.

REFERENCES

[1] American Diabetes Association: Principles of nutrition and dietary recommendations for individuals with diabetes mellitus. Diabetes 1979; 28:1027–30.