
Letters to the Editor and Comments on Practice



Fiber and Diabetes

In a recent very helpful editorial on fiber and diabetes¹ the author discussed only in passing the important clinical question of determining the most appropriate fiber-containing foods for diabetic persons. He mentioned the acute experiments that have repeatedly suggested that foods high in fiber from cereal sources (e.g., wholemeal bread) and some vegetables (e.g., potato) are unfavorable when compared with those containing gel-forming fiber (e.g., lentils, soybeans, and various other cooked dried beans). The glycemic index is considerably smaller after eating the latter foods. Furthermore, incorporating substantial quantities of insoluble fiber (from cereal sources) into meals makes little difference to the postprandial glucose levels.² Indeed, there seems to be no difference between white and wholemeal bread.³ However, in my opinion, such acute experiments cannot be used as the sole means of determining the best carbohydrate-containing foods for diabetic persons.

There have now been several controlled studies from our own and other groups (not mentioned in the editorial) that have examined in some detail the effects of longer-term feeding of high-fiber foods.⁴⁻⁹ When comparing high- and low-fiber diets under such conditions, a remarkably consistent pattern emerges: the predominant effect of a high-fiber diet is a reduction in overnight, fasting, and preprandial glucose levels. The entire blood glucose curve is shifted downward. The effect on postprandial levels is much less striking, and in some studies there is little difference in levels after meals. Indeed, in our own most recent study a high-fiber diet produced a significant 2% fall in hemoglobin A_{1c} in poorly controlled non-insulin-dependent diabetic patients on maximal doses of oral therapy despite the fact that incremental blood glucose levels (the postprandial increase above preprandial levels) were marginally higher on the high-fiber diet. It is of particular interest that this phenomenon is apparent regardless of which type of fiber is predominant: in the long term, even guar supplementation is principally associated with an overall reduction of the 24-h blood glucose curve.⁹ This phenomenon was not apparent in the earlier long-term studies since they did not include 24-h metabolic profiles, but compared the effects of high- and low-fiber diets simply on the

basis of glycosuria, a small number of blood glucose measurements, or requirements of hypoglycemic therapy.

The practical relevance of these findings is obvious: Postprandial glucose response to a single food or even a single meal cannot be used exclusively to determine optimal carbohydrate-containing foods since a reduction in postprandial glycemia is quite clearly not the only mechanism by which high-fiber diets exert long-term benefits. There is no doubt that foods containing large amounts of soluble or gel-forming fiber produce "favorable" results in acute and long-term feeding experiments. However, most of the long-term feeding experiments showing a favorable effect of dietary fiber have contained appreciable quantities of insoluble fiber from cereals and vegetables, which have an "unfavorable" glycemic response and do not reduce postprandial glycemia. The most striking example is a recent Norwegian study that produced a substantial improvement in the diabetes control of insulin-dependent patients by increasing the intake of bread made from various unrefined cereals. This was the only dietary change, and the improvement was as great as that observed when the bread was enriched with guar,¹⁰ the most "potent" form of soluble fiber studied to date.

Until a more satisfactory means of finding the best carbohydrate foods can be found, one can, in my opinion, say no more than that the diet should contain a variety of high-fiber foods, with those high in gel-forming fiber (such as the different types of dried beans) being the best bet. The glycemic response concept is based on the principle that the mechanism by which fiber improves carbohydrate metabolism is chiefly via an effect on gastric emptying time, transit time, and absorption, whereas Dr. Muñoz makes very clear in his editorial that the situation is far more complicated than this.

Perhaps Dr. Muñoz did not consider this aspect in detail because he regards "the applicability of high-fiber diets to the management of outpatients as still in question." The studies quoted above were controlled, conducted in diabetic persons going about their usual activities, and do provide some longer-term beneficial effects in diabetic persons studied away from metabolic units. Dr. Muñoz wishes to see before making recommendations. I agree that it would be useful to have more information concerning the long-term effects of feeding guar, a substance that may be more appropriately regarded as a

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.

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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 12⁶ wk. Four of them¹⁻⁴ 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 study² 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