

# Diabetes Bars and Beverages: The Benefits and the Controversies

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The couple in the advertisement, a pair of retirees, is enjoying a vigorous outing on the beach. They walk briskly through the surf as waves roll in over their feet. We find out that the couple faces having diabetes. However, they use a special food product the ad tells us is “designed for people with diabetes.” The product helps them control their blood glucose and maintain optimal health. The scene is hopeful and reassuring that, with the help of this product, it is possible to have good diabetes control, look good, and feel great and to do so without an overwhelming amount of effort.

This ad was no doubt produced to capture the attention of the burgeoning market of individuals with diabetes—16 million adults in the United States.<sup>1</sup> Through visual suggestion, the ad offers an important message about positive lifestyle choices, such as doing moderate physical activity, eating right, maintaining a healthy weight, managing stress, and enjoying life. However, at the end of the scene, a significant oversight becomes obvious. When the waves wash back, we see the couple, otherwise seemingly doing things right, walking along *barefooted*, thereby leaving themselves vulnerable to potentially undesirable consequences.

The food item advertised is one of a growing number of products known as “functional” or “medical” foods that are formulated to address the nutrition concerns of people with diabetes or abnormal glucose tolerance. These products, in the form of beverages and snack bars, are developed to meet society’s demand for convenience, portability, and good taste. At the same time, they are promoted as healthy foods that help people with

diabetes manage their disease by improving glycemic control and lowering risk factors for long-term complications, especially cardiovascular disease.

This article offers information about currently available diabetes bars and beverages, the research that has driven their development, and the important role that diabetes care providers play in guiding their patients toward the appropriate use of these products. Many of the diabetes medical foods entering the marketplace are modified, enhanced, fortified, or supplemented in order to confront diabetes from a number of directions. The challenge is to evaluate each of these products and assess the contribution each makes to patients’ overall nutrient intake. The goal should be to offer patients guidance about how they may integrate these products into an eating plan that achieves their goals for diabetes medical nutrition therapy.<sup>2,3</sup> In the end, we want to avoid an oversight that could, from a nutritional standpoint, expose bare feet.

## Functional Features of Diabetes Medical Foods

The complex formulation of the diabetes bars and beverages on the market responds to the mounting evidence that certain nutrients and physiologically active food components play a role in improving glycemic control and reducing risk factors for development of diabetes complications. Functional features in these products include resistant starch and added fiber; fortification with vitamins and minerals—specifically, notably high amounts of the antioxidant vitamins C and E and chromium; and the use of soy. Some products manipulate the

percentages of the macronutrients carbohydrate, protein, and fat, while others incorporate herbal and other non-traditional remedies. (See Tables 1 and 2.)

In evaluating each product, it is important to determine whether there is sufficient evidence to support its purported role in diabetes management and whether the inclusion of a functional feature is truly efficacious.

## Resistant starch and soluble fiber

Nutrition recommendations for people with diabetes advise that the total amount of carbohydrate consumed is more important than the source of carbohydrate. However, these same recommendations recognize that various starches cause different glycemic responses.<sup>3</sup>

Resistant starch is a carbohydrate source that requires special consideration. It withstands breakdown by digestive enzymes and thus is digested and absorbed at a slow and sustained rate. This results in a coinciding low postprandial blood glucose peak and a continued slow release of glucose into the bloodstream for several hours.<sup>4,5</sup> Consequently, resistant starch, either in the form of uncooked cornstarch or produced through food processing, is a key functional feature of diabetes bars and beverages. Other benefits include a lowering of insulin response and improvement in insulin efficiency in the postprandial phase, an improvement in lipid metabolism as evidenced by lower LDL cholesterol and triglyceride levels, and improvements in fibrinolytic capacity.<sup>6–8</sup> Because products that contain resistant starch, especially uncooked cornstarch, lead to a slow release of glucose into the bloodstream, they may help prevent hypo-

**Table 1. Diabetes Snack Bars**

| Product  | Functional Features  | Product Claims   | Caloric and Nutrient Distribution  |
|--|--|--|--|
| Balance Bar<br>Balance Bar Company<br>800-678-4246<br>www.balancebar.com                             | <ul style="list-style-type: none"> <li>•Twenty-three essential vitamins and minerals</li> <li>•Added antioxidants: 100% DV vitamins C and E</li> <li>•Soy protein</li> <li>•40-30-30* nutritional profile</li> </ul>   | <ul style="list-style-type: none"> <li>•Provides fuel for an active lifestyle</li> <li>•Convenient form of complete nutrition</li> <li>•Aids muscle recovery and repletes energy stores after exercise</li> <li>•Reduces hunger and enhances satiety—aids weight control</li> </ul>  | 200 calories/bar<br>28% protein (14 g)<br>44% carbohydrate (22 g)<br>27% fat (6 g)<br>Saturated fat 1.5 g<br>Cholesterol 0 mg<br>Sodium 190 mg<br>Fiber 2 g        |
| Choice DM Nutrition Bar<br>Mead Johnson Nutritionals<br>800-247-7893<br>www.choicedm.com             | <ul style="list-style-type: none"> <li>•Resistant starch</li> <li>•Added fiber: 3 g/bar</li> <li>•Nutritionally complete: contains ≥15% DV of 24 essential vitamins and minerals</li> <li>•Added antioxidants: 50% DV vitamin C, 100% DV vitamin E</li> <li>•35% DV chromium</li> </ul>  | <ul style="list-style-type: none"> <li>•Between-meal or bedtime snack or part of a meal</li> <li>•Helps people with diabetes manage their blood glucose levels</li> </ul>  | 140 calories/bar<br>18.4% protein (6 g)<br>52.3% carbohydrate (19 g)<br>29.3% fat (4.5 g)<br>Saturated fat 2.5 g<br>Cholesterol <5 mg<br>Sodium 80 mg<br>Fiber 3 g |
| Extend Bar<br>Clinical Products Ltd.<br>877-339-8363<br>www.extendbar.com                            | <ul style="list-style-type: none"> <li>•Uncooked cornstarch—an extended action carbohydrate</li> <li>•Works up to 9 h</li> </ul>   | <ul style="list-style-type: none"> <li>•Ideal food for anyone at risk for hypoglycemia (especially those on insulin or sulfonylureas)</li> <li>•Ideal pre-exercise or bedtime snack</li> <li>•Add to breakfast or other meals as a carbohydrate source to help stabilize and reduce variations in blood glucose</li> </ul> | 160 calories/bar<br>10% protein (4 g)<br>75% carbohydrate (30 g)<br>14% fat (2.5 g)<br>Saturated fat 0 g<br>Cholesterol 0 mg<br>Sodium 85 mg<br>Fiber 0 g          |
| Glucerna Snack Bar<br>Ross Products Division<br>Abbott Laboratories<br>800-227-5767<br>www.abott.com | <ul style="list-style-type: none"> <li>•Resistant starch</li> <li>•Added fiber: 4 g/bar including soy fiber, guar gum, and microcrystalline cellulose</li> <li>•Provides ≥15% DV for 24 key vitamins and minerals</li> <li>•Fortified with antioxidants: 100% DVs for vitamins C and E</li> <li>•Contains soy protein isolate</li> </ul> | <ul style="list-style-type: none"> <li>•Snack or occasional meal replacement</li> <li>•Source of complete, balanced nutrition</li> </ul>   | 140 calories/bar<br>17% protein (6 g)<br>57% carbohydrate (24 g)<br>26% fat (4 g)<br>Saturated fat 1 g<br>Cholesterol <5 mg<br>Sodium 75 mg<br>Fiber 4 g           |
| NiteBite Timed Release Glucose<br>ICN Pharmaceuticals Inc.<br>800-795-1880<br>www.nitebite.com       | <ul style="list-style-type: none"> <li>•Timed-release glucose formulation that includes sucrose, protein, and uncooked cornstarch</li> </ul>   | <ul style="list-style-type: none"> <li>•Specifically designed for the nutritional management of hypoglycemia</li> <li>•For use by anyone at risk for developing hypoglycemia</li> <li>•Beneficial as part of evening snack or before exercise</li> </ul>   | 100 calories/bar<br>12% protein (3 g)<br>60% carbohydrate (15 g)<br>30% fat (3.5 g)<br>Saturated fat 1.5 g<br>Cholesterol 5 mg<br>Sodium 40 mg<br>Fiber 0 g        |

\*40% carbohydrate, 30% protein, and 30% fat

glycemia when incorporated into a nighttime snack or consumed as a pre-exercise carbohydrate source.<sup>9</sup>

Fiber fortification, especially with viscous water-soluble fiber, is another feature of diabetes bars and beverages. Water-soluble fiber delays transit time through the stomach and small intestine, and fiber viscosity slows the transit of chyme through the intestinal tract. This slows absorption rates and lowers blood concentrations of nutrients postprandially.<sup>10</sup>

High-fiber diets have been shown to lower postmeal blood glucose rise, improve insulin sensitivity, and reduce hyperinsulinemia,<sup>10-12</sup> to reduce total cholesterol by ≥5%, to modestly reduce LDL cholesterol, and to lower triglyceride levels.<sup>11,12</sup> Fiber may also favorably affect clotting factors.<sup>8</sup>

Although all individuals, including those with diabetes, are encouraged to consume 20–35 g/day of fiber from both soluble and insoluble sources,<sup>3</sup> average daily fiber intake among Americans is only about 14–15 g.<sup>13</sup> Individuals who have restricted calorie intakes may be especially vulnerable to an inadequate fiber intake. Although we must encourage consumption of a variety of fruits, vegetables, and whole grains, supplemental foods can be additional fiber sources.

**Protein and fat**

The mix of protein and fat in diabetes supplements serves the functional purpose of improving glycemic control and reducing cardiovascular risk factors (Tables 1 and 2). Most bars and beverages that are considered nutri-

tionally complete are formulated to support the National Cholesterol Education Program<sup>14</sup> guidelines for moderate fat, low saturated fat, and low cholesterol intake. These guidelines are especially important to help people with diabetes maintain desirable blood lipid levels.<sup>3,11</sup>

Fat is added to those diabetes bars that are formulated to prevent hypoglycemia because fat delays gastric emptying, slows the absorption of carbohydrate, and therefore delays the postprandial blood glucose peak. Because fat extends the nutrient absorption time and entrance into the bloodstream as glucose, its role in these products is to lower the risk of hypoglycemia.<sup>9</sup>

The ideal dietary protein mix is much debated, in part because of the

Table 2. Diabetes Beverages

| Product   | Functional Features  | Product Claims   | Caloric and Nutrient Distribution  |
|---|--|--|--|
| Choice DM Beverage<br>Mead Johnson Nutritionals<br>800-247-7893<br>www.choicedm.com                           | <ul style="list-style-type: none"> <li>•25% calories from MUFA*</li> <li>•24% essential vitamins and minerals</li> <li>•100% DV of vitamin C and 150% DV of vitamin E</li> <li>•Added fiber: 3 g/serving</li> </ul>  | <ul style="list-style-type: none"> <li>•Use as part of diabetes meal plan</li> </ul>   | 220 calories/8 oz. can<br>16% protein (9 g)<br>44% carbohydrate (24 g)<br>27% fat (6 g)<br>Saturated fat 1.5 g<br>Cholesterol 0 mg<br>Sodium 220 mg<br>Fiber 3 g   |
| Glucerna Shake<br>Ross Products Division<br>Abbott Laboratories<br>800-227-5767<br>www.abbott.com             | <ul style="list-style-type: none"> <li>•≥25% DV of 24 vitamins and minerals</li> <li>•50% DV of vitamins B6, B12, and folate</li> <li>•100% DV of vitamins C, E, and chromium</li> <li>•Slow-digesting carbohydrate</li> <li>•3 g fiber/serving including soy fiber</li> <li>•Modified fat: high MUFA</li> </ul> | <ul style="list-style-type: none"> <li>•Source of complete, balanced nutrition</li> <li>•Use as a snack, supplement, or meal replacement</li> <li>•For people with diabetes or abnormal glucose tolerance</li> </ul> | 220 calories/8 oz. can<br>18% protein (10 g)<br>52% carbohydrate (29 g)<br>35% fat (8.5 g)<br>Saturated fat 1 g<br>Cholesterol <5 mg<br>Sodium 210 mg<br>Fiber 3 g |
| Level Best (beverage/tablet combination)<br>Functional Foods, Inc.<br>800-600-9095<br>www.functionalfoods.com | <ul style="list-style-type: none"> <li>•Low glycemic index carbohydrate, including fructose, barley, psyllium</li> <li>•10 mcg chromium picolinate</li> <li>•Contains 1,200 mg red yeast salicin</li> <li>•Contains ginseng</li> </ul>   | <ul style="list-style-type: none"> <li>•To be taken with lunch and dinner meals to help maintain healthy blood glucose and blood cholesterol levels and to support blood clotting function</li> </ul>                | 45 calories/serving<br>18% protein (2 g)<br>62% carbohydrate (7 g)<br>20% fat (1 g)  |

\*MUFA, monounsaturated fatty acid

influence of the once-again-popular low-carbohydrate, high-protein diet trend. Nutrition recommendations for people with diabetes advise that 10–20% of daily calories should come from protein.<sup>3</sup> The percentage of protein in some bars designed for people with diabetes is as high as 30% of calories, whereas carbohydrate provides only 40% of calories in these products.

The high-protein formulation is based on the popular claims that protein has a low glycemic index, prevents high glucose excursions, decreases insulin levels, reduces fat storage, reduces hunger, and improves weight-loss success and glycemic control. These claims are very controversial and are of questionable accuracy.<sup>15</sup> Soy protein, which is added to some products, is associated with a beneficial and significant lowering of total cholesterol, LDL cholesterol, and triglycerides without affecting HDL cholesterol.<sup>11,2</sup>

Protein serves another functional purpose in diabetes bars formulated to prevent hypoglycemia. It is added to these products based on the notion that it is converted to glucose and released into the bloodstream 2.5–5 h after it is consumed.<sup>9</sup> Protein, there-

fore, contributes to a delayed postprandial blood glucose peak and may help prevent nighttime or exercise-related hypoglycemia.<sup>9</sup> The degree to which protein is converted to glucose in the blood and the role that it plays in preventing hypoglycemia is another highly debated topic.<sup>15</sup>

**Vitamins, minerals, and antioxidants**

Historically, beverage supplements that are labeled “nutritionally complete” have been formulated to meet the nutritional needs of undernourished, hospitalized patients who depended on these products as a primary means of nourishment. Thus, they have been formulated to provide approximately 100% of the daily value (DV) for essential vitamins and minerals *per 1,000 cc*, the amount contained in about four, 8-oz. cans of beverage. These products, still touted as nutritionally complete, now target all individuals with diabetes. Many of the available bars and beverages provide 100% DV for vitamins C and E and chromium *per serving*. (See Tables 1 and 2.)

Considerable evidence suggests that oxidative processes are involved in the development of atherosclerotic diseases, and that antioxidants, especially

vitamin E, play a role in lowering disease risk.<sup>11,16–18</sup> Chromium supplementation is gaining popularity as its potential to improve insulin action, improve fasting and postprandial blood glucose, and reduce blood lipids gains acceptance.<sup>18,19</sup> B vitamins, especially folic acid, are recognized to play a role in reducing homocysteine levels and may be beneficial in the prevention and treatment of vascular complications of diabetes.<sup>11,18</sup> Because there is much research bringing good news about the benefits of these nutrients, they are popular additions to functional foods.

However, the potential for excess intake certainly exists. Diabetes bars and beverages can potentially contribute significant amounts of these nutrients to the total daily intake. Individuals with diabetes, either on their own or by advice of their physician, may also be supplementing these same vitamins and minerals in addition to consuming other highly fortified foods. Diabetes care providers must carefully assess total micronutrient intake from supplemental products in addition to the amounts taken in from all other sources to ensure that total intake is adequate but not above tolerable upper intake levels (UL).<sup>20</sup>

Interestingly, with the exception of folic acid, neither the American Diabetes Association, the American Dietetic Association, nor the American Heart Association support routine supplementation or fortification of these micronutrients. Rather, they encourage consuming a varied diet that includes plenty of plant foods.<sup>11,20</sup>

### Implications for Use

Given the potential benefits and possible controversies surrounding diabetes medical foods, what advice should we offer individuals with diabetes about using these products?

- Diabetes snack bars and beverages are supplemental foods. They can be beneficial when appropriately incorporated into a diabetes meal plan but should not be routinely used as meal replacements.
- Some diabetes snack bars and beverages are formulated to blunt the postprandial blood glucose rise and thus reduce the incidence of hyperglycemia. These tend to be called “nutritionally complete” and can be either incorporated into a meal or snack as a carbohydrate choice or used as a calorie-controlled meal or snack replacement. In either case, their purpose is to cause a reduced postprandial glycemic effect. These products can be especially helpful to people with type 2 diabetes.
- Other snack bars, most containing uncooked cornstarch, are formulated to prevent hypoglycemia, especially at night. Their intended use is as part of a bedtime snack or as a pre- or postexercise snack. These products may be especially helpful to patients on intensive insulin therapy who are susceptible to hypoglycemia, particularly those with hypoglycemia unawareness.
- Diabetes snack bars and beverages are not appropriate treatments for hypoglycemia because they are formulated to cause a blunted or delayed rise in blood glucose. If an immediate-acting source of carbohydrate is needed, a conventional snack bar or other carbohydrate source that is quickly absorbed and causes a rapid blood glucose rise should be used.
- Snack bars that contain uncooked cornstarch may be useful in a num-

ber of diabetes management situations. They may help prevent hypoglycemia if consumed after alcohol ingestion. When incorporated into the breakfast meal, they may also help prevent morning postprandial blood glucose elevations associated with pregnancy.<sup>21</sup>

- Self-monitoring of blood glucose and careful record keeping will enable clinicians and people with diabetes to determine the effects of snack bars or beverages on blood glucose levels. Because each diabetes bar or beverage has a unique formulation, its glycemic effect may also be unique.
- The nutrient composition of all food products, including medical foods formulated for people with diabetes, should be evaluated with current nutrition guidelines and recommendations in mind.<sup>3,11</sup> Ultimately, however, it is overall dietary practices and patterns of food intake over time rather than intake of a single food item that determines dietary health and success in achieving good glycemic control.

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