

Role of Fat Replacers in Diabetes Medical Nutrition Therapy

AMERICAN DIABETES ASSOCIATION

General health and diabetes-specific nutrition messages have recommended reducing dietary fat intake. The American Diabetes Association's 1994 nutrition recommendations further emphasized the importance of decreasing saturated fat intake to <10% of total calories (1,2). It is well-known that people with type II diabetes have an increased prevalence of dyslipidemia compared with the general population. The need and desire to reduce dietary total and saturated fat intake has created consumer demand for good-tasting lower-fat foods. The availability of ingredients referred to as fat replacers has enabled the creation of many reduced-calorie, light, fat-free, nonfat, or low-fat foods to meet this demand (3). This position paper is based on a technical review paper that discusses published research and issues that remain unresolved (3).

DEFINITION AND CLASSIFICATION OF FAT REPLACERS

Fat replacers are ingredients that mimic one or more of the roles of fat in a food. Currently, no one available ingredient is an ideal fat replacer; therefore, several fat replacers are often used in one food. The ideal fat replacer is defined as a safe compound (with no health risks) that has all the functional and organoleptic properties (taste and appearance characteristics) of fat with significantly fewer calories than fat.

Fat replacers are usually classified into three categories based on their nutrient source:

- Carbohydrate-based: 1) Carbohydrate polymers/hydrocolloids consisting of modified food starches, dextrans, and maltodextrins are created from cereals, grains, or starches, such as corn, potato, and tapioca, and gums, gels, and fibers; and 2) polyols (also called

sugar alcohols)/bulking ingredients, such as sorbitol, maltitol, isomalt, mannitol, xylitol, and a variety of hydrogenated starch hydrolysates.

- Protein-based: Developed through the process of modifying protein; currently either egg white or whey are used.
- Fat-based: Several types of fat-based fat replacers exist. Emulsifiers, produced by replacing the triglycerides in vegetable oils, such as mono- and diglycerides, and polysorbate, have been used in foods for many years. The design of other fat-based ingredients modifies a fat to minimize the 9 kcal/g while retaining the creaminess and richness of fat. Several of these latter ingredients are only partially absorbed and, therefore, contribute 5 kcal/g. A noncaloric ingredient, olestra, was approved as a food additive by the Food and Drug Administration (FDA) on 24 January 1996 for use in savory (fried) snack foods and crackers.

Several fat replacers are identified on the ingredient list by their brand name; however, most are not. Therefore, consumers cannot identify most of these ingredients as fat replacers. To date, most fat replacers are primarily carbohydrate-based; however, it is predicted that more protein and fat-based ingredients will be developed and approved over the next decade.

SAFETY OF FAT REPLACERS

Existing scientific literature demonstrates and the FDA regulatory processes assure that with currently available fat replacers, there is reasonable certainty of no harm. As new fat replacers are developed, the FDA's Generally Recognized as Safe (GRAS) or food additive review processes ensure that their safety is properly evaluated.

HEALTH AND NUTRITION BENEFITS OF FAT REPLACERS

The health and nutrition benefits of fat replacers have been minimally explored. Recent research examining their use has raised practical questions.

Minimal research has been conducted on most categories of fat replacers; however, the majority of research has been conducted with one fat replacer, olestra. This is in part because it is the only fat replacer to date for which an FDA food additive petition was filed and, therefore, for which research was required. Some of that research examined the biochemical response (e.g., lipid and blood glucose levels, vitamin retention) to replacing dietary fat with a nonabsorbable fat. This research demonstrated that olestra has the potential to lower total and LDL cholesterol levels whether a person is on a high, moderate, or essentially cholesterol-free diet. It is noteworthy that the levels of olestra consumed in these studies were higher than estimated intakes under the recent FDA olestra approval.

Additional research on olestra and other fat replacers has focused on behavioral issues, e.g., how people consume food products with fat replacers in them. Most covert studies (when subjects are uninformed about the use of foods with fat replacers) indicate there is partial to full replacement of energy intake when fat replacers are substituted for fat in food. In these studies, the replaced energy has been mainly from carbohydrate or protein, thus reducing the percentage of fat in the diet. There is minimal research on the impact of foods with fat replacers fed to subjects who are informed about the use of foods with fat replacers.

INCORPORATING FOODS WITH FAT REPLACERS INTO DIABETES FOOD/MEAL PLANS

The use of foods with fat replacers may have unintended effects:

- Intake of the reduced fat/calorie food may not result in total daily reduction in fat or calories because of overconsumption or replacement by other

Approved 17 August 1996.

For a technical review on this subject see *Warshaw et al.* in this issue (*Diabetes Care* 19:1294-1301, 1996).

foods. (Reduction in total daily calories is not always an intended effect.)

- Intake of the reduced fat/calorie food may result in a higher intake of carbohydrate that may affect glycemic control.

Rather than simply suggesting that clients with diabetes reduce their fat intake by using low-fat or fat-free foods, it is recommended that the clinician determine how the client might use the products and provide the client with self-management training on their appropriate use to accomplish individual medical nutrition therapy goals.

Foods with fat replacers can be substituted in an individual's meal plan using the macronutrient profile of the food product, the individual's diabetes medical nutrition therapy goals, and these guidelines (4,5):

- Food products containing fat replacers and providing <20 calories or <5 g of carbohydrate per serving would be expected to have a negligible effect on metabolic control and are considered "free foods." Free foods contributing 20 calories per serving should be limited to three servings spread throughout the day.
- Food products containing fat replacers providing 6–10 g of carbohydrate per serving can be considered one-half of a carbohydrate choice. From 11 to 20 grams of carbohydrate per serving can be considered one carbohydrate choice.

These foods should be substituted for other carbohydrate choices (starch, fruit, or milk) in the meal plan.

- Total grams of polyols are included in the total grams of carbohydrate in a serving size on the Nutrition Facts panel on food labels, but are not considered sugars for labeling purposes. Calories from sugar alcohols may vary, but average about 2 kcal/g. There is no need to calculate the grams of sugar alcohols unless there are 5 or more grams in a serving. If there are more than 5 g per serving, subtract half the grams of sugar alcohol from the grams of total carbohydrate and then calculate exchanges.

SUMMARY — Foods with fat replacers have the potential to help people with diabetes reduce total and saturated fat intake and may therefore, in time, reduce the increased prevalence of dyslipidemia in type II diabetes. However, for these foods to have any potential benefit to people with diabetes, people with diabetes must learn to use them appropriately. People with diabetes should receive self-management training on how to identify ingredients that are fat replacers on labels, how to use the food label to determine serving sizes, and how to incorporate these foods into their food/meal plan, along with the selection of a wide variety of nutritious foods. Health professionals

and people with diabetes need to keep current with the ever-changing marketplace, available food products, and growing body of scientific literature. Additional research is needed to assess the impact of the use of fat replacers on the macronutrient content of the diet, metabolic parameters related to diabetes, and potential health and nutrition benefits for the person with diabetes.

References

1. American Diabetes Association: Nutrition recommendations and principles for people with diabetes mellitus (Position Statement). *Diabetes Care* 17:519–522, 1994
2. American Diabetes Association: Nutrition principles for the management of diabetes and related complications and recommendations (Technical Review). *Diabetes Care* 17:490–518, 1994
3. Warshaw HS, Franz MJ, Powers MA, Wheeler ML: Fat replacers: their use in foods and role in diabetes medical nutrition therapy (Technical Review). *Diabetes Care* 19:1294–1301, 1996
4. American Diabetes Association, The American Dietetic Association: *Exchange Lists for Meal Planning*. Alexandria, VA, American Diabetes Association and Chicago, IL, The American Dietetic Association, 1995
5. Wheeler ML, Franz MJ, Barrier P: Helpful hints: using the 1995 *Exchange Lists for Meal Planning*. *Diabetes Spectrum* 8:325–326, 1995