



# chapter 7



## Carbohydrates

### OVERVIEW

Carbohydrates are part of a healthful diet. The AMDR for carbohydrates is 45 to 65 percent of total calories. Dietary fiber is composed of nondigestible carbohydrates and lignin intrinsic and intact in plants. Diets rich in dietary fiber have been shown to have a number of beneficial effects, including decreased risk of coronary heart disease and improvement in laxation. There is also interest in the potential relationship between diets containing fiber-rich foods and lower risk of type 2 diabetes. Sugars and starches supply energy to the body in the form of glucose, which is the only energy source for red blood cells and is the preferred energy source for the brain, central nervous system, placenta, and fetus. Sugars can be naturally present in foods (such as the fructose in fruit or the lactose in milk) or added to the food. Added sugars, also

known as caloric sweeteners, are sugars and syrups that are added to foods at the table or during processing or preparation (such as high fructose corn syrup in sweetened beverages and baked products). Although the body's response to sugars does not depend on whether they are naturally present in a food or added to the food, added sugars supply calories but few or no nutrients.

Consequently, it is important to choose carbohydrates wisely. Foods in the basic food groups that provide carbohydrates—fruits, vegetables, grains, and milk—are important sources of many nutrients. Choosing plenty of these foods, within the context of a calorie-controlled diet, can promote health and reduce chronic disease risk. However, the greater the consumption of foods containing large amounts of added sugars, the more difficult it is to



consume enough nutrients without gaining weight. Consumption of added sugars provides calories while providing little, if any, of the essential nutrients.

### DISCUSSION

The recommended dietary fiber intake is 14 grams per 1,000 calories consumed. Initially, some Americans will find it challenging to achieve this level of intake. However, making fiber-rich food choices more often will move people toward this goal and is likely to confer significant health benefits.

The majority of servings from the fruit group should come from whole fruit (fresh, frozen, canned, dried) rather than juice. Increasing the proportion of fruit that is eaten in the form of whole fruit rather than juice is desirable to increase fiber intake. However, inclusion of some juice, such as orange juice, can help meet recommended levels of potassium intake. Appendixes B-1 and B-8 list some of the best sources of potassium and dietary fiber, respectively.

Legumes—such as dry beans and peas—are especially rich in fiber and should be consumed several times per week. They are considered part of both the vegetable group and the meat and beans group as they contain nutrients found in each of these food groups.

Consuming at least half the recommended grain servings as whole grains is important, for all ages, at each calorie level, to meet the fiber recommendation. Consuming at least 3 ounce-equivalents of whole grains per day can reduce the risk of coronary heart disease, may help with weight maintenance, and may lower risk for other chronic diseases. Thus, at lower calorie levels, adults should consume more than half (specifically, at least 3 ounce-equivalents) of whole grains per day, by substituting

### KEY RECOMMENDATIONS

- Choose fiber-rich fruits, vegetables, and whole grains often.
- Choose and prepare foods and beverages with little added sugars or caloric sweeteners, such as amounts suggested by the USDA Food Guide and the DASH Eating Plan.
- Reduce the incidence of dental caries by practicing good oral hygiene and consuming sugar- and starch-containing foods and beverages less frequently.

whole grains for refined grains. (See table 7 for a list of whole grains available in the United States.)

Individuals who consume food or beverages high in added sugars tend to consume more calories than those who consume food or beverages low in added sugars; they also tend to consume lower amounts of micronutrients. Although more research is needed, available prospective studies show a positive association between the consumption of calorically sweetened beverages and weight gain. For this reason, decreased intake of such foods, especially beverages with caloric sweeteners, is recommended to reduce calorie intake and help achieve recommended nutrient intakes and weight control.

Total discretionary calories should not exceed the allowance for any given calorie level, as shown in the USDA Food Guide (see ch. 2). The discretionary calorie allowance covers all calories from added sugars, alcohol, and the additional fat found in even moderate fat choices from the milk and meat group. For example, the 2,000-calorie pattern includes only about 267 discretionary calories. At 29 percent of calories from total fat (including 18 g of solid fat), if no alcohol is consumed, then only 8 teaspoons (32 g) of added sugars can be afforded. This is less than the amount in a typical 12-ounce calorically sweetened soft drink. If fat is decreased to 22 percent of calories, then 18 teaspoons (72 g) of added sugars is allowed. If fat is increased to 35 percent of calories, then no allowance remains for added sugars, even if alcohol is not consumed.

In some cases, small amounts of sugars added to nutrient-dense foods, such as breakfast cereals and reduced-fat milk products, may increase a person's intake of such

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foods by enhancing the palatability of these products, thus improving nutrient intake without contributing excessive calories. The major sources of added sugars are listed in table 13 (app. A-3 provides examples of how added sugars can fit into the discretionary calorie allowance).

The Nutrition Facts Panel on the food label provides the amount of total sugars but does not list added sugars separately. People should examine the ingredient list to find out whether a food contains added sugars. The ingredient list is usually located under the Nutrition Facts Panel or on the side of a food label. Ingredients are listed in order of predominance, by weight; that is, the ingredient with the greatest contribution to the product weight is listed first and the ingredient contributing the least amount is listed last. Table 14 lists ingredients that are included in the term “added sugars.”<sup>14</sup>

Sugars and starches contribute to dental caries by providing substrate for bacterial fermentation in the mouth. Thus, the frequency and duration of consumption of starches and sugars can be important factors because they increase exposure to cariogenic substrates. Drinking fluoridated water and/or using fluoride-containing dental hygiene

products help reduce the risk of dental caries. Most bottled water is not fluoridated. With the increase in consumption of bottled water, there is concern that Americans may not be getting enough fluoride for maintenance of oral health. A combined approach of reducing the frequency and duration of exposure to fermentable carbohydrate intake and optimizing oral hygiene practices, such as drinking fluoridated water and brushing and flossing teeth, is the most effective way to reduce incidence of dental caries.

### Considerations for Specific Population Groups

#### Older Adults

Dietary fiber is important for laxation. Since constipation may affect up to 20 percent of people over 65 years of age, older adults should choose to consume foods rich in dietary fiber. Other causes of constipation among this age group may include drug interactions with laxation and lack of appropriate hydration (see ch. 2).

#### Children

Carbohydrate intakes of children need special considerations with regard to obtaining sufficient amounts of fiber, avoiding excessive amounts of calories from added sugars, and preventing dental caries. Several cross-sectional surveys on U.S. children and adolescents have found inadequate dietary fiber intakes, which could be improved by increasing consumption of whole fruits, vegetables, and whole-grain products. Sugars can improve the palatability of foods and beverages that otherwise might not be consumed. This may explain why the consumption of sweetened dairy foods and beverages and presweetened cereals is positively associated with childrens’ and adolescents’ nutrient intake. However, beverages with caloric sweeteners, sugars and sweets, and other sweetened foods that provide little or no nutrients are negatively associated with diet quality and can contribute to excessive energy intakes, affirming the importance of reducing added sugar intake substantially from current levels. Most of the studies of preschool children suggest a positive association between sucrose consumption and dental caries, though other factors (particularly infrequent brushing or not using fluoridated toothpaste) are more predictive of caries outcome than is sugar consumption.

<sup>14</sup> For information on amounts of added sugars in some common foods, see Krebs-Smith, SM. Choose beverages and foods to moderate your intake of sugars: measurement requires quantification. *The Journal of Nutrition (J Nutr)* 131(2S-1): 527S-535S, 2001.

**TABLE 13. Major Sources of Added Sugars (Caloric Sweeteners) in the American Diet**

Food groups that contribute more than 5 percent of the added sugars to the American diet in decreasing order.

Food Categories	Contribution to Added Sugars Intake (percent of total added sugars consumed)
Regular soft drinks	33.0
Sugars and candy	16.1
Cakes, cookies, pies	12.9
Fruit drinks (fruitades and fruit punch)	9.7
Dairy desserts and milk products (ice cream, sweetened yogurt, and sweetened milk)	8.6
Other grains (cinnamon toast and honey-nut waffles)	5.8

Source: Guthrie and Morton, *Journal of the American Dietetic Association*, 2000.

**TABLE 14. Names for Added Sugars That Appear on Food Labels**

Some of the names for added sugars that may be in processed foods and listed on the label ingredients list.

Brown sugar	Invert sugar
Corn sweetener	Lactose
Corn syrup	Maltose
Dextrose	Malt syrup
Fructose	Molasses
Fruit juice concentrates	Raw sugar
Glucose	Sucrose
High-fructose corn syrup	Sugar
Honey	Syrup