



# Sugars and Your Health

## Fact Sheet

HEALTHY EATING for LIFE PROGRAM

*This publication provides information to help people age 65 and older eat to maintain health. Friends, family, and others concerned with people this age also may profit.*

Our ancestors learned by trial and error that naturally sweet foods were usually safe to eat. People naturally like sweet foods. Cave drawings indicate that prehistoric people liked honey, dates, and figs. The Egyptians practiced beekeeping as early as 2000 B.C.

Now the question is, “Do we overindulge our sweet tooth?” So many of our favorite foods are high in sugar. What are the differences between sweeteners and are some of them harmful? Can something that tasty also be good for us?

### What is Sugar?

When food scientists talk about sugars, they mean a wide variety of sweeteners found naturally in foods as well as the sugars added during food pro-

cessing. Consumers usually think only of the sugars added to their foods either by themselves or by the food manufacturer. They forget that all sugars are found in nature and originally come from plants.

On food labels, sugar goes by many names. See “It's All Sugar” at the bottom of this page.

### Glucose

Of the more than one hundred substances classified as sugars, glucose is the most abundant. Pure glucose is usually marketed as dextrose. Glucose, either alone or linked to other sugars, occurs naturally in milk, fruits, vegetables, and grains. Several million glucose units can be linked to each other in long chains to form starch molecules. Therefore, we get most of the sugar we use from starchy foods, such as wheat, corn and rice, even though starch does not taste sweet.

Glucose (also called blood sugar) is the body's principal carbohydrate and used for energy. It is particularly important for brain tissue because the brain, under normal conditions, uses only glucose for energy.

### Sucrose

Common table sugar (refined white sugar) is sucrose. Sucrose, a double sugar, is composed of two single sugars (glucose and fructose) linked together. During digestion, this linkage is broken. The two sugars are absorbed through the intestinal wall and enter the bloodstream.

### Fructose

Fructose, or fruit sugar, is found naturally in foods and is now manufactured from the starch in corn. In beverages, it tastes sweeter than sugar and is being used in increasing amounts in soft drinks.

Some fructose is being marketed for use in diabetic and low-calorie diets. These claims are hard to justify in that fructose has the same number of calories as other sugars and can easily be converted by

### It's All Sugar

- All different forms of cane or beet sugar (sucrose) such as refined or table sugar, natural sweetener, powdered or confectioners' sugar, molasses, brown sugar, sorghum and raw sugar.
- Glucose, dextrose, glucose corn syrups, or corn syrup solids.
- Fructose, levulose or fruit sugar, and high-fructose corn syrups (HFCS), which also have varying amounts of glucose.
- Fruit juice concentrate such as grape or apple juice concentrate.
- Honey (about half glucose and half fructose).
- Lactose or milk sugar, an animal sugar; whey and milk solids have lactose.
- Maltose or malt sugar; maltodextrins.
- Maple syrup.

the body into glucose. It is not recommended for people with diabetes.

## Honey

Honey, which contains both fructose and glucose, is sugar also. The only difference is that it is less refined than table sugar. It has no special advantage for diabetic or other modified diets.

Although honey contains some vitamins and minerals in very small amounts, you would have to eat a huge amount of honey to get enough of these nutrients. Also, honey has more calories than refined sugar. A cup of honey contains 1030 calories, compared with 770 calories in a cup of sugar.

When it comes to digesting and using sugars for energy, *it makes no difference to your body whether the sugar is in the food naturally or added later.* Glucose is glucose wherever you find it, in the fresh apple or in table sugar.

## Sugar in Food

People are often surprised to learn how much sugar they eat. Sucrose is still the most common sugar added to food but its use is declining. The big change is in the amount of high fructose corn syrup (HFCS) being consumed. HFCS plus other corn sweeteners now make up more than half of all added sugars.

The trend is for more of our calories to come from added sugars (201 grams per person per day in 1987-88 versus 193 grams per person per day in 1977-78). On the average, about one calorie in ten is an added sweetener.

Six- to eleven-year-old children consume the most sugar, with girls consuming less than boys (172 versus 238 grams in the 1987-88 survey). Children consume about 14 percent of their calories as added sugar.

We are not toting sugar home in ten-pound bags as we once did. Instead we buy our foods already sweetened. Besides such foods as candy, desserts, syrups, and soft drinks, many other foods have added sugar.

A check of package labels reveals that sugar is an ingredient in canned and dried soups, catsup, cereals, cured meats, peanut butter, pickled foods, seasoning mixes, snack crackers, tomato sauce, frozen dinners, and a host of other items.

## Why So Much Sugar?

- Sugar makes food taste good. There are more “sweet” taste buds located on our tongues than any other kind. Cold can numb the taste buds somewhat, so more sugar is often added to frozen foods.
- Sugar causes browning when cakes and other batters are baked.
- Sugar helps leaven baked products when air is beaten into sugar and fat mixtures.
- Sugar helps keep a product moist.
- Sugar preserves a food by discouraging bacterial growth.
- Sugar helps give a baked product a tender texture.
- High amounts of sugar are sometimes used to cut the cost of a product because sugar is one of the least expensive ingredients in food.

## Sugar in Our Bodies

All sugars and starches are carbohydrates, our main source of energy. Most of the carbohydrates we eat are combinations of starch and two or more sugars, such as sucrose and lactose.

During digestion, these sugars and starches are broken down by enzymes into simple sugars of glucose, fructose, and galactose. They enter the bloodstream and are carried to the liver. There, all sugars are converted into glucose and carried throughout the body. All carbohydrates furnish 4 calories of energy per gram.

Excess glucose can be linked together again to form glycogen, an animal-type starch found chiefly in muscles and the liver. Glycogen is readily available when needed for energy.

Proteins and fats are limited in their capacity to furnish glucose. On a carbohydrate-free diet, fats are not completely used up to give energy and ketone by-products can accumulate to dangerous levels.

Ketones are acidic substances that can upset our acid-base balance. In severe cases, coma and death can result. Ketosis is a frequent complication of diabetes as well as high-fat, high protein, low-carbohydrate reducing diets. Weight-loss diets high in pro-

teins and fats and low in carbohydrates are dangerous and not recommended.

A number of minerals and vitamins are needed to convert carbohydrates into energy. For example, sodium helps move glucose out of the intestinal tract and into the bloodstream.

The mineral chromium helps move glucose into muscle and fat cells. Magnesium and manganese are required for glucose metabolism inside cells. The B vitamins—thiamin, riboflavin, niacin, B<sub>6</sub> and pantothenic acid—are all needed in the process of getting energy from glucose. This is an important reason for eating carbohydrate foods with many nutrients rather than just sugar.

Fortunately, most starchy foods carry good amounts of vitamins and minerals. Table sugar and many of the other sugars listed on food labels have been refined so much that they are low in nutrients and fiber. Honey is also very limited nutritionally.

## Sugar and Health

### Tooth decay

The strongest case against sugar is how it promotes *tooth decay*. “Sugar” in this sense refers primarily to sucrose, but other sugars can also cause tooth decay. Tooth decay needs four conditions:

- A susceptible tooth.
- Bacteria that can produce acid to erode the tooth surface.
- Food (especially sugar) for the bacteria.
- And enough time for these factors to interact.

*Streptococcus mutans*, the most potent of the decay-causing bacteria, favors sucrose but can use other sugars. It does not matter whether the sugar is refined, such as sucrose and corn syrup, or “natural” as in honey and fruits. In a study with rats, honey was found to cause more decay than sucrose. Even the sugar in bananas, grapes, and raisins can promote tooth decay.

Sticky, tooth-adhering sugars are more harmful than those in liquid form. Sugar consumed throughout the day promotes more decay than an equal amount of sugar eaten at one or two meals. Each time we eat sugar, we activate the production of acid by plaque bacteria for about twenty-five minutes.

Eating two or three caramels during a morning can cause more decay than drinking the same

amount of sugar in a soda pop. This is not to suggest that caramels or soda pop are to be favored over bananas and raisins. These fruits carry a wide variety of nutrients needed for health. It does suggest, however, that continual snacking on raisins or cereal is not good for teeth.

Some sugar alcohols (sorbitol and xylitol) do not promote dental decay. These sweet-tasting alcohols are used in “sugarless” gums. They do furnish calories, however, and large amounts can cause diarrhea.

Fluoride and other treatments are proving very effective in protecting teeth. New studies show that use of fluoridated water and toothpastes have cut tooth decay by one-third in the last decade.

The link between periodontal (gum) disease and sugar is not as strong. However, it is possible that nutritional factors are involved in its development. More research is needed.

### Overweight and obesity

Sugar may promote overweight and obesity but just how much is not clear. Many dieters have observed that they can lose weight by cutting down on sugars and starches. They assume that carbohydrates, especially starches, are the cause of their excess fat. This is unlikely.

We gain weight from simply taking in more calories than we use. All calories count from whatever source, but fat calories are more easily stored than carbohydrate and protein ones. Unused glucose can be converted into fat and stored in fat cells. About one calorie in four is needed to process sugar into fat, whereas fat requires almost no calories to be stored in fat cells.

Carbohydrate is more effective than fat in controlling appetite and therefore it aids weight control. Pasta is *not* especially fattening unless you add high calorie sauces made with butter, cream, or other fat.

One caution is that some of our favorite sweets, like chocolate, are also high in fat. Parents may wish to limit sweets, such as fruit juice, before a child’s meal because of its effect on his or her appetite. Sweets at the end of the meal can provide a sense of fullness and satisfaction.

The amazing fact is that even though we are using more sugar replacements, such as saccharin, aspartame, and acesulfame K, in diet soft drinks, frozen desserts, syrups, etc. we are not reducing obesity.

More Americans are gaining weight. One reason may be larger portions like jumbo cookies. When we consume “diet” soft drinks, we often replace those calories with larger portions or other foods high in sugar and fat.

## **Sugar and Diabetes**

Diabetes experts discount the role of sugar in causing *diabetes mellitus* even though high blood sugar is a prominent feature in this disease. They believe that obesity, genetics, insulin resistance in Type II, and some viruses in type I insulin-dependent diabetes are involved. Insulin is a hormone needed by your body to use glucose.

### **Glucose tolerance factor**

Research findings suggest that even though more insulin is present, many adults with mature-onset diabetes have difficulty using glucose. Some cells may not have enough glucose tolerance factor (GTF). GTF contains the trace mineral chromium. Some older adults are low or mildly deficient in chromium. Also, strenuous exercise, severe injuries, and high sugar intake can increase urinary losses of chromium. Get plenty of chromium by eating whole wheat breads and cereals, meat, mushrooms, and vegetables.

### **Chromium picolinate**

Currently, health food stores are promoting chromium picolinate pills as a food supplement to promote weight loss and increase lean body mass (muscle). While the promotion literature cites USDA studies, the USDA Grand Forks (North Dakota) Human Nutrition Center where it was first made says that there is no good evidence to show that chromium picolinate has any effect on either fat or lean body mass. The studies cited in the advertising have numerous flaws and show only small differences.

### **Glycemic index**

Some experts are paying more attention to the glycemic index of a food. It is an important measure of the food’s ability to raise blood sugar.

During digestion, starch breaks down into glucose, crosses the intestinal wall, and enters the blood system. Fast absorption leads to high blood sugar in people with diabetes.

Starchy foods with a lower glycemic index aid

blood-sugar control. Some starches, as in white bread and mashed potatoes, are digested so quickly that their glycemic index is similar to high-sugar foods like orange juice and candy.

Starchy foods with a lower glycemic index are often high in dietary fiber, contain more soluble fiber, and are left in a whole or more intact form, such as cooked dry navy beans and whole kernel corn. These starches take longer to digest and blood-sugar levels will be lower and more normal.

Other foods in the meal can also effect starch digestion times varying the glycemic index for that meal. Good choices are oats, barley, rye, brown rice, and wheat foods such as cracked wheat and bulgur, and high bran cereals.

### **Atherosclerosis**

Researchers are investigating the links between sugar and atherosclerosis, the most common cause of death in the United States. Diabetes, atherosclerosis, heart attacks, and strokes often go together. Eating sugar triggers insulin production which in turn stimulates the body to make fats.

Carbohydrate-sensitive individuals produce more blood triglycerides (fats) than normal individuals. New reports suggest that sugar can also lead to high levels of cholesterol in the blood. Scientists believe that diets that promote both high cholesterol and high triglyceride levels are more dangerous than either one by itself. New research findings suggest that approximately 10 percent of the U.S. population can be described as “carbohydrate-sensitive”—that is, their bodies overreact to sugar.

New dietary recommendations for people with diabetes suggest that they can have a moderate amount of added sugar, i.e., up to 10 percent of their calories. This means that someone consuming 1600 calories could have up to 10 teaspoons (about 3 tablespoons) daily of added sugars in their food. These new recommendations do not ban all sugar, but do stress moderation plus more fiber, limiting fats, and weight control.

### **Hypoglycemia**

Some physicians believe that hypoglycemia (low blood sugar) can be aggravated by too much sugar. Low blood sugar itself is a symptom rather than a disease. Moderately low blood sugar can cause symptoms of dizziness, hunger, weakness, sweat-

ing, a higher pulse rate than normal, and mental confusion.

Hypoglycemia can be brought on by drugs and alcoholic beverages. Hypoglycemia is also an early symptom of diabetes. People with diabetes can give themselves too much insulin or exercise too much and become hypoglycemic with little warning.

Liver disease, some tumors, hormone deficiencies, and other conditions can also lower blood sugar. Persons who have had part of their stomachs removed because of disease or obesity can become hypoglycemic a few hours after eating. Some persons can feel symptoms even though their blood sugars are not much below normal.

Although many people believe they are hypoglycemic, most physicians specializing in endocrine (hormone) disorders, such as diabetes, do not agree. One of the difficulties in diagnosis is that low-blood-sugar symptoms are similar to those of anxiety. Each case should be carefully explored to rule out serious conditions such as tumors of the pancreas, diabetes, and congenital enzyme defects.

Treatment of hypoglycemia ordinarily includes a reduction in sugar intake and sometimes in starch. Before embarking on any drastic treatment, have your physician do careful testing including a five-hour glucose tolerance test. In this way, you can get appropriate treatment and, perhaps, avoid serious consequences due to mistaken or delayed diagnosis.

### **Hyperactivity**

In the popular press, high-carbohydrate diets, especially high-sugar diets, have been accused of causing hyperactivity in children. Too much sugar has also been blamed for antisocial behavior, juvenile delinquency, poor attentiveness in school, and other problems. There is little or no good evidence to support these views. In fact sugar is more apt to make us sleepy than "hyper." A serious problem with early studies often quoted in the popular media was lack of control for the placebo effect.

### **Lactose intolerance**

Lactose intolerance is a condition in which lactose, a milk sugar, is not digested but ferments and causes gas. More black and Oriental than white people have this problem. Symptoms of diarrhea, gas, and cramps usually begin in adolescence and

young adult years. Lactose intolerance is caused by inadequate amounts of lactase, a digestive enzyme in the intestinal tract that splits lactose or milk sugar into the simple sugars of glucose and galactose.

Some individuals low in lactase have found they can use enzyme-treated milk. Others find that using only small amounts of milk causes little difficulty as compared with drinking a whole glass of milk at one time.

High sugar intakes have also been implicated in other adverse health conditions, such as high blood pressure, cancer, and nutrient deficiencies, but much more research is needed.

### **Recommended Sugar Intake**

There is no recommended dietary allowance (RDA) for carbohydrate intake. However, several authorities and medical groups are recommending that over 50 percent of the calories in our diets come from all sources of carbohydrates.

On a 2000-calorie diet, this means that 250 grams or more of carbohydrates would meet this guideline minimum (250 grams at 4 calories per gram equals 1000 calories). Starches and sugars that occur in foods naturally are our best sources of carbohydrates.

To give us all of the carbohydrate our bodies need, eat *six to eleven* servings of grains daily as recommended in the Food Guide Pyramid. Also eat legumes as a source of protein and other nutrients as well as starch. Eating five or more servings of fruits and vegetables and the lactose in milk, yogurt, and cheese can supply the rest of our carbohydrate needs.

Nutritionists are concerned about some children getting too much sugar. Even careful mothers can sometimes give small children too much fruit juice, thereby replacing the nutrients in milk and other foods with high-sugar fruit juice.

Very little carbohydrate needs to come from sucrose or other added sugars. A number of researchers agree that refined sugars should be limited to 10 percent of energy intake. For a 2000-calorie diet, this means 50 grams of added sugars or less than four tablespoons of sugar daily. Another suggestion is to limit sucrose and other added sugars to 2 or 3 teaspoons per meal (3 teaspoons equal 1 tablespoon).

## Sugar in Foods

<i>Food</i>	<i>Teaspoons of sugar</i>	<i>Food</i>	<i>Teaspoons of sugar</i>
Apple pie (1/7 sector)	9-10	Instant breakfast (1 package)	5
Apple, raw, medium	4 <sup>1</sup> / <sub>2</sub>	Jelly (1 tablespoon)	3
Apple juice (6 fluid ounces)	5 <sup>1</sup> / <sub>2</sub>	Milk (1 cup)	3
Carmel popcorn (1.2 ounces, 1 cup)	3 <sup>1</sup> / <sub>2</sub>	Oat flakes (1 ounce)	1
Chewing gum	1 <sup>1</sup> / <sub>2</sub>	Orange juice (1/2 cup)	3
Chocolate bar (1.45 ounces)	5	Pudding pops	2 <sup>1</sup> / <sub>2</sub>
Chocolate milk, 1 cup	6 <sup>1</sup> / <sub>2</sub>	Raisins (1/2 ounce or 1 packet)	3
Frozen yogurt, vanilla soft serve (1/2 cup)	4	Raisin bran cereal (1.4 ounce, 3/4 cup)	3
Gelatin dessert (1 cup)	9	Sherbert (1/2 cup)	6
Gum drops, 10 small (1.25 ounces)	3 <sup>1</sup> / <sub>2</sub>	Corn flakes (1 ounce, 1 cup)	1 <sup>1</sup> / <sub>2</sub>
Honey (1 tablespoon)	4	Snack cake (2 to 2 1/2 ounces)	6-8
Hot fudge sundae	10-11	Sugar corn cereal (1 cup)	3
Ice cream, vanilla (1/2 cup)	2 <sup>1</sup> / <sub>2</sub>	Sugared rice cereal (1 ounce)	2 <sup>1</sup> / <sub>2</sub>
Ice milk, vanilla (1/2 cup)	3	Sweetened cola pop (12-ounce can)	9-10
		Tomato catsup (1 tablespoon)	1

Many consumers want to know how much sugar is in the foods they buy. Total carbohydrate content is much easier to determine than sugar content alone. In addition, there is no way nor need to analyze separately for sugar added and sugar found naturally in foods—that is, to distinguish between the natural sugar in a peach and that added to the syrup in canned peaches. Your body handles both sugars the same way.

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