

FOOD Insight™

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Putting Sugars into Perspective

Sugars have been in the news for years, but the story about sugars is often incomplete or confusing. Although there is no doubt that sugars bring sweet pleasure to eating, do sugars have more to offer than just sweetness and calories?

Sugars are a natural part of many foods and are a functional ingredient in others. Regardless of whether sugars occur naturally in foods or are added during manufacturing, during cooking, or at the table, sugars enhance the taste, texture, color, and aroma of many kinds of foods. This article will answer many questions about sugars and will also explain how moderate amounts of sugars can fit into a healthful eating plan, no matter what their source.

Sugars in Foods

Except for fiber, most carbohydrates, including sugars, fuel the body with the same amount of energy: 4 calories per gram. Foods eaten every day contain sugars that occur naturally. For example, many fruits and vegetables get their sweet taste from *glucose*, *fructose* and *sucrose*. *Glucose* and *fructose* are simple sugars that are found in table sugar, most fruits, and honey. *Sucrose* is the scientific name for table sugar and it is actually a combination of two simple sugars—*glucose* and *fructose*—both of which occur naturally. In milk products, the naturally occurring sugar is called

lactose, which gives milk products some of their characteristic flavor without an obvious sweet taste (lactose is perceived as tasting less sweet than sucrose or fructose).

Although sugars are most known for their taste, they contribute more than just sweetness when they are added to foods. That is why sugars are ingredients in many prepared foods, including baked goods, jellies and preserves, canned and frozen fruits, candies, frozen desserts, and even foods that do not taste sweet. Sugars perform many functions that consumers may not even think about, such as the following:

- They add texture, flavor, and color to baked foods helping them brown evenly.
- They help bread to rise.



- They contribute to the “bulk,” or volume, of ice cream, baked goods, and preserves and jams.
- They enhance the creamy texture of frozen desserts.
- They provide a satisfying body and texture in beverages.
- They enhance flavor and balance the natural acidity in non-sweet foods, such as salad dressings, sauces, and condiments.
- They preserve the flavor, aroma, and color of the fruits used in jellies, jams, and preserves (and prevent spoilage after the jar is opened).
- They improve flavor and texture and help preserve the natural color and shape of the fruits used for canning and freezing.

In prepared foods, added sugars may be found in other forms beyond table sugar, such as brown sugar, confectioner’s sugar (which has a powdery texture), and turbinado sugar (a light brown granulated sugar with a slight molasses flavor). Other sugars found in prepared foods include corn syrup, high-fructose corn syrup (HFCS), fruit juice concentrate, honey, and molasses, to name a few. All of these sugars are added for function, flavor, or both.

Added and Naturally Occurring Sugars

The terms “added” and “naturally occurring” are often used when the ingredients in foods are

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Global Nutrition and Food Safety:

Since its foundation in 1945, the Food and Agriculture Organization of the United Nations (FAO) has led international efforts in fighting hunger. As member countries—including the United States—strive to meet the United Nations' Millennium Development Goals (MDGs) by 2015, FAO ensures that the goals related to promoting good health and nutrition are met by providing technical expertise and disseminating information on food security, food production, and supply, as well as on current food safety and nutrition issues. The eight MDGs provide countries around the world a framework for development of efforts to address the goals within a specified period of time. The first goal is to eradicate extreme poverty and hunger. Among the other goals are improvements in maternal health and reductions in the rates of mortality among children. The MDGs thus have implications for food security and the health and well-being of people around the world. FAO also brings together nations to discuss and shape policies in the areas of promoting good health and nutrition.

The International Congress of Nutrition (ICN) is the quadrennial gathering of the International Union on Nutritional Sciences, whose mission is to promote advancements in nutrition science, research, and development through international cooperation. In its upcoming 19th quadrennial conference, the theme will be *Nutrition Security for All*.

FAO, ICN, and member nations address nutrition-related topics relevant to consumer protection in the United States and abroad. Dr. Kraissid Tontisirin, FAO's former director of

the Nutrition and Consumer Protection Division and president of the 2009 ICN Organizing Committee, shares his perspectives on the broad-based food and nutrition issues affecting global consumer health.



Dr. Kraissid Tontisirin

Q: What is your scientific background, and what led you to join FAO's Food and Nutrition Division [ESN], now called Nutrition and Consumer Protection Division [AGN]?

A: After obtaining my M.D. from Mahidol University in Bangkok, I was trained as a pediatrician in the U.S. and received my Ph.D. in nutrition from MIT [Massachusetts Institute of Technology] in 1973. I subsequently taught nutrition and conducted research at Mahidol. Eventually, I became the director of the Institute of Nutrition, Mahidol University, and chairman of Thailand's Food and Nutrition Planning Committee, where I promoted the concept of using nutrition as a social indicator in the context of the Thai government's Poverty Alleviation Plan. My collaborative work with the different ministries, as

well as my involvement with several regional nutrition projects in Asia led me to become a technical advisor in expert missions and meetings organized by various U.N. agencies. By mid-1999, I was invited to submit my CV for the directorship of FAO's Food and Nutrition Division. I accepted the post in April 2000.

Q: How has renaming the "Food and Nutrition Division" to "Nutrition and Consumer Protection" changed FAO's food priorities, if at all?

A: Under the FAO reforms, the Food and Nutrition Division was renamed when it transferred from the Economics and Social Department [ES] to the Agriculture, Biosecurity, Nutrition, and Consumer Protection Department [AG] in January 2006. In the face of limited resources, the idea at that time was to improve efficiency from "farm to table." It was a good opportunity to work more closely with the supply side—plant and animal production, land, and water development—and emphasize nutrition, quality, and safety up to the consumer end of the food chain.

Q: What were the issues that shaped the agricultural, food, and nutrition environment during your tenure as director of ESN/AGN?

A: The first issue I worked on was updating scientific knowledge on protein and energy requirements in human nutrition. Of course, such normative work involved a long-time partner, the World Health Organization [WHO]. One of

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the subsequent collaborations was the Joint WHO/FAO Expert Consultation on Diet, Health, Nutrition, and the Prevention of Chronic Diseases. I tried to put nutrition at the center of development, working with other U.N. agencies and its partners. Part of the issues environment was strengthening FAO's role as a key player in food safety and quality for consumer protection through capacity building, setting food standards through *Codex Alimentarius*, [a collection of internationally recognized standards, codes of practice, guidelines and other recommendations relating to foods, food production and food safety under the auspices of consumer protection] and the expansion of scientific advice to benefit member countries.

Q: Talk about what has been accomplished and what remains to be done to protect consumers.

A: In the past, FAO emphasized food energy supply because one of its key mandates was to deal with food security and fighting hunger. During my term, we highlighted the nutrition quality (i.e., micronutrient content) of diets. Now, FAO has crossed the “new frontier” of working on the dietary factors of chronic diseases, such as obesity, diabetes, cardiovascular disease, and certain types of cancer. However, FAO's shift to this issue has been gradual. In order to meet the U.N.'s MDGs, much still needs to be done to promote healthful diets among families and populations. People are looking for nutritious and safe food. With guidelines for

ensuring the quality of the food supply, FAO can play a very important role in meeting the demand for healthful foods not only for the prevention of undernutrition but also the prevention and control of chronic diseases.

“...more than 850 million people worldwide suffer from energy and nutrient deficiencies.”

Q: How would you describe the adequacy and state of safety of the global food supply today?

A: The overall food safety situation has apparently improved over time because of the increased awareness and commitment of each nation. However, foodborne disease and hazards are still major problems. Undernutrition remains to be solved since more than 850 million people worldwide suffer from energy and nutrient deficiencies. The high prevalence of chronic disease and overnutrition adds complexity to the issue. The challenge of working with nutrition and consumer protection is to implement food safety and quality standards that promote healthful diets.

Q: What steps in biosecurity have been undertaken to protect the global food supply?

A: One has to be careful about using the term “biosecurity” because it is interpreted differently across countries. It is not to be associated

with the limited concept of “bioterrorism.” FAO promotes an integrated approach to “biosecurity” in dealing with food safety, plant [health], and animal health. It involves good agricultural practices, good hygienic practices, good manufacturing practices, and quality assurance measures along the food chain. With these concepts and strategies, one can ensure high quality and safe food for consumers.

Q: Where does consumer education fit in ESN/AGN's priorities?

A: The core functions of ESN/AGN include nutrition information, communication, consumer education, and the promotion of nutrition labeling and food-based dietary guidelines [FBDG] as educational tools for the general public while working through public health institutions, community-based programs, and families. Before I left FAO, we focused on nutrition education in schools—developing curriculum and school gardening planning guides—to instill the principle of “learning by doing” in formal education settings.

Q: Where does consumer research on perceptions, attitudes, and understanding of dietary guidance and food labeling fit into the AGN's mission and priorities?

A: Consumer research is quite essential. For tools such as the FBDG to be effective, consumers need to be part of the dietary guideline development process. Consumer testing of key nutritional messages . . . [and the] concepts of portion size and serving size through focus

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groups, interviews, and other methods will help improve the communication of qualitative and quantitative dietary guidance.

Q: How can the gap between science and communication be bridged to improve consumers' understanding of current agricultural and nutrition research?

A: In communicating scientific knowledge to consumers, one has to take into account the health status, culture, traditions, and local food practices of each country. Using FBDG as an example, keep in mind that the science behind the dietary guidance continues to evolve and necessitates periodic updates every five to ten years.

Q: How can member countries of FAO address the obesity epidemic, which, in some places, coexists with undernutrition?

A: Member countries need to have a nutrition-oriented policy on food production and supply. It requires thinking about what constitutes a "healthful diet." I believe in the near future, the demand will increase for more healthful diets that include more fresh vegetables, fruits, and fish not only in developed countries but also in the developing world. Agriculture plays an important role not only in generating income but also in supplying nutritious and safe foods that prevent both under- and overnutrition.

Q: What should consumers know about foods derived from biotechnology?

A: Biotechnology can be a powerful tool to enhance food production, because it can increase yield and improve the physical and nutritional quality of food. The Joint

FAO/WHO's Food Standards Programme executed by the *Codex Alimentarius* Commission has developed risk analysis principles and guidelines for conducting safety assessments of food products derived from recombinant DNA technology. New food products produced by modern biotechnology need to be evaluated on a case-to-case basis. Currently, there is no evidence that such foods carry higher risks than those produced through conventional methods. However, monitoring for long-term consequences is necessary.

Q: How important are foods and dietary components that may provide a benefit beyond basic nutrition?

A: This is a new area that needs to be explored more in the future. There are many non-nutrient substances in food—antioxidants and dietary fiber, for example—that may support good health. That's why we have to promote a *food-based* approach to dietary guidance. Food provides not only energy and "classical" nutrients but also non-nutrient components that may have complementary functions important to nutritional well-being.

Q: What role do the broad-based food, beverage, and agricultural industries play in ensuring consumers' protection?

A: Food production and supply have to be linked to nutritional requirements, health, and development. All these stakeholders can play a vital role in promoting healthful diets among consumers if they have nutritional well-being as a common objective.

Q: Who should participate in the 19th ICN to be held in Bangkok on October 4-9, 2009?

A: Nutrition is a broad field, covering disciplines from molecular biology to global health. Therefore, the 19th ICN should be attended by nutritionists; researchers; educators; graduate students; public health and development officials; representatives from the private sector, including the food, agriculture, and beverage industries; and members of civil society.

Q: What food safety and nutrition issues will likely shape the agenda of the 2009 ICN?

A: The theme of the Congress is Nutrition Security for All. This encompasses the meaning of nutritional well-being in the human life cycle. The goal of the conference is to share and discuss various ways and means of achieving nutrition security which, in one dimension, can be viewed as a continuum of food production, availability, access, consumption, utilization, and sustainability. Other dimensions include health protection and promotion, education, and "people participation." Topics such as current developmental issues, i.e., the MDGs, food biotechnology, biofortification, food safety, health promotion, nutrition communication, public health, and clinical nutrition, may be explored. The efficacy of gender-, family-, and community-based approaches will also be examined. In case no direct links can be established, perhaps a cluster of issues from emerging scientific research can be identified now and reexamined in the near future.

Putting Sugars into Perspective

discussed and are often associated with the sugars found in foods. There is no chemical difference between added or natural sugars. It is only the source of those sugars that is different. Sugars that are found in unprocessed foods are considered “naturally occurring,” while the same sugar that is added in processing is an “added sugar.”

Regardless of their source, the same sugar is digested and metabolized in the same way by the body. Both naturally occurring and added sugars can be part of a balanced diet that includes a variety of foods. When foods with sugars are consumed, the body does not distinguish between naturally occurring and added sugars.

Sugars in Your Body

Sugars, along with starches and fiber, belong to a nutrient group called carbohydrates, which are also referred to as “carbs.” Carbohydrates are the body’s most important and readily available source of energy.

The body digests sugars, which are generally made up of complex units (and other carbohydrates) by breaking them into smaller units, primarily glucose and fructose. These “simple” sugars are absorbed into the bloodstream, where they are transported to the cells of the body and are then converted into energy. Glucose requires insulin (a hormone secreted by the pancreas) to move from the bloodstream into the cells of the body, whereas fructose is usually first converted to glucose in the liver.

Glucose is the body’s primary fuel that powers everything you do: moving, breathing, thinking, and even digesting food.

Enjoying Sugars in Moderation

The latest edition of *Dietary Guidelines for Americans* (2005), from

the U.S. Department of Agriculture, is based on the recommendations of expert panels from the Institute of Medicine that recognize that carbohydrates are essential to a healthful diet. In addition to serving as an important source of energy, many carbohydrate-containing foods, including those with naturally occurring sugars, also provide important vitamins, minerals, and phytonutrients (“phyto” is simply a term that refers to plants; thus, phytonutrients are “nutrients from plants”).

For good health, the *Dietary Guidelines* encourage consumers to choose their carbohydrates wisely but not in excess of their calorie needs. This translates to eating more fruits, vegetables, and whole grains and low-fat and fat-free milk products. Sugars provide some of the carbohydrates supplied by all these foods.

Nevertheless, the *Dietary Guidelines* also recommend that consumers choose and prepare foods and beverages with fewer added sugars to help control their daily calorie intakes. Sugars alone, however, are not high-calorie ingredients. So why limit added sugars? From a nutrition perspective, added sugars contribute calories, which help provide energy but few other nutrients. Depending on an individual’s choices, certain foods and beverages with added sugars might replace more nutrient-dense foods, along with the vitamins and minerals that they provide. On the other hand, many foods with added sugars contribute significantly to a healthful diet, such as yogurts or cereals.

Many of the foods that consumers enjoy would not be the same without sugars. Sugars can add appeal to nutritious foods that might otherwise be avoided. Small amounts of added sugars enhance the flavor and acceptance of many foods, making it easier to follow dietary guidelines that encourage the consumption of more fruits, vegetables, whole-grain, and low-fat or fat-free milk

products. For example, sugar may be added to grapefruit, yogurt, or oatmeal. Likewise, small amounts of sugars added to whole-grain breakfast cereals and sour fruits such as cranberries enhance the flavor of those foods, thereby encouraging consumption and helping to improve intake of important nutrients.

Do Sugars Cause Weight Gain?

No single class of foods alone causes weight gain. Weight gain is a result of consistently eating more calories than the number of calories expended—no matter what the source of those calories is (i.e., proteins, fats, alcohol, carbohydrates, or sugars). To avoid weight gain, it is important to balance the number of calories consumed with the number of calories expended.

People with weight problems do not necessarily consume more sugars than normal-weight people or have more of a “sweet tooth.” Although people may enjoy sweet tastes, it does not mean that consuming sugary foods and beverages will lead to overindulgence. For those who are attempting to manage calorie intake, the occasional inclusion of some sweet flavors in the diet may help to make a reduced-calorie diet more appealing. Foods and beverages sweetened with low-calorie sweeteners are also an option for people who are concerned about calories. They add a negligible amount of calories to foods and beverages while proving a broader variety of choices for weight-conscious individuals or people who must restrict their calorie intake, such as people living with diabetes.

The bottom line is that consumers can adopt a balanced approach to choosing carbohydrates and sugars. It is easy to overindulge in sweet-tasting foods and beverages, as they can be very appealing. The consumption of sugars to excess, however, can lead to the

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consumption of too many calories, so consumers need to monitor their daily calorie consumption carefully.

Consumers can also follow the dietary guidance found at www.MyPyramid.gov, which the U.S. Department of Agriculture provides to give consumers advice about eating enough fruits, vegetables, whole grains, and milk. Then, as their daily calorie intakes allow, consumers can enjoy foods with added sugars in moderation as part of an overall healthful diet.

Fructose Facts

Fructose is a simple sugar that occurs naturally in fruits, some vegetables, honey, and table sugar. Fructose also makes up about half of the sugars in both table sugar and high-fructose corn syrup. Fructose may also be added to certain foods as either crystalline fructose or liquid fructose. Like other sugars, crystalline and liquid fructose supply about 4 calories per gram. Crystalline fructose is made from cornstarch. It looks and tastes much like table sugar and may be used in baked goods, frozen foods, beverages, and tabletop sweeteners.

A Teaspoonful of Sugar

When consumers hear the word “sugar,” they probably think of table sugar. Yet, table sugar is just one type of sugar found in foods. The term “sugar” is often used to designate a variety of caloric sweeteners.

Although different types of sugars provide essentially the same amount of calories by weight—4 calories per gram—they vary in their densities, or their weight per teaspoon. Sugars that weigh more per teaspoon, such as honey and corn syrup, provide more calories per teaspoon, but these sugars are slightly sweeter than table sugar, so a smaller amount of the sugar may be used to achieve the same sweetness.

1 Teaspoon of: Provides the following Number of calories:

Brown sugar (packed).....	17
Confectioner's sugar	10
Corn syrup	19
Crystalline fructose	15
High-fructose corn syrup	18
Honey.....	21
Maple sugar.....	11
Molasses.....	19
Table sugar	16

Amounts of Various Sugars in Everyday Foods

DESCRIPTION	GRAMS (rounded)
Apple, medium	14
Bread, whole grain, 1 slice.....	2
Carbonated beverage, cola-type, 12 fl oz can.....	33
Carrots, 1 cup cooked	5
Catsup, 1 tbsp.....	3
Chocolate candy bar, 1.55 oz	25
Grapes, 1 cup.....	25
Milk, 1%, 1 cup	13
Oatmeal cookie, 1.....	6
Orange juice, fresh, 1 cup.....	21
Sweet corn, 1 cup cooked	5

Note: The foods in this table are not nutritionally comparable. They are shown here only to illustrate their sugar contents.

Source: *USDA National Nutrient Database for Standard Reference, Release 18, 2005.*

For more information on sugars and other nutrition issues, contact a registered dietitian or go to ifc.org.

High-Fructose Corn Syrup Facts

High-fructose corn syrup (HFCS) is a mixture of glucose and fructose produced from corn syrup. The most frequently used types are HFCS 42 (which consists of 42 percent fructose and 58 percent glucose), and HFCS 55 (which consists of 55 percent fructose and 45 percent glucose). Common uses for HFCS include beverages and baking applications. Regardless of the name, HFCS 55 contains approximately the same percentage of glucose and fructose as table sugar, while HFCS 42 has less fructose than does table sugar. High fructose corn syrup, table sugar, and honey are all digested in the same way and result in the same sugars being available to the body.

HFCS makes foods, such as bread and breakfast cereal, brown well when they are baked and gives chewy cookies and snack bars their soft textures.

It's simple...
glucose + fructose
= sucrose

Does HFCS Cause Weight Gain?

The general advice about sugars and weight gain applies to HFCS as well. Questions about a possible link between HFCS and obesity have resulted from misleading reports that confuse pure fructose with HFCS—two similarly sounding but very different ingredients. Contrary to its name, HFCS, like table sugar, is a mixture of glucose and fructose in approximately the same ratios. Pure fructose and HFCS are different, and at this time, no research findings or evidence suggest that HFCS, fructose, or other sugars are the cause of the rising rates of obesity. The over consumption of all foods and beverages, combined with a lack of physical activity, is the more likely cause of the current rise in obesity rates.

New Research on Consumer Attitudes toward Food Biotechnology



After a decade of consumer attitudinal research (1997 to 2006), it is clear that a majority of consumers are confident in the U.S. food supply and express little to no concern about food and agricultural biotechnology. A significant majority also has no marked concern about the labeling of foods produced through the use of biotechnology. Consumers have less favorable attitudes, however, toward animal biotechnology, particularly cloning. Higher levels of awareness about plant and animal biotechnology, information about the benefits of biotechnology, and government

safety assurances have all had positive effects on consumer attitudes. Nevertheless, many consumers are unaware of the use of biotechnology in food production, and there is a clear need for science-based information on the subject that can be directed to those members of the public who remain uninformed. Check out the findings of the 2006 Cogent Research survey of U.S. adult consumer attitudes toward food biotechnology commissioned by the International Food Information Council at <http://ific.org/research/>.

New Self-Study Continuing Education Module for Dietitians

According to the 2006 Position of the American Dietetic Association, food and nutrition professionals have a key role in educating the public about food and agricultural biotechnology. The newest continuing professional education (CPE) self-study module available from the IFIC Foundation is **Food Biotechnology 101: A Primer on the Science and the Public Debate**. This CPE will help prepare dietitians to provide the public with science-based information about biotechnology, one of many technologies that will affect agricultural and food production in the 21st century. This and other CPE modules are available at <http://ific.org/adacpe/>.

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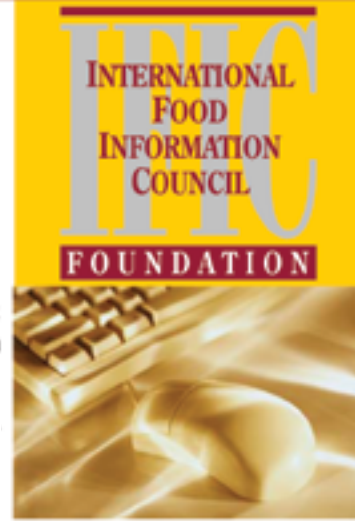
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