

# WHAT IS FRUCTOSE?

## What is fructose?

Fructose is a natural sugar found in many fruits, vegetables, and honey. It is the sweetest of the naturally occurring nutritive (caloric) sweeteners and has many unique functional and nutritional properties that make it a valuable food ingredient.

## What are the most significant dietary sources of fructose?

Fructose is also found in sucrose (table sugar), honey, agave nectar, fruit juices, fruit juice concentrates, pure crystalline fructose and high fructose corn syrup (HFCS).



## Availability

### Are there different types of fructose?

Fructose is found in many places. People often think of high fructose corn syrup (HFCS) when they think of fructose, however HFCS is more like sucrose (sugar) than fructose. A lesser known source of fructose is crystalline fructose. Pure crystalline fructose consists of only fructose, while sucrose and HFCS contain almost equal amounts of fructose and glucose. The ratio of glucose to fructose in HFCS varies, but is typically around 55% fructose and 45% glucose — about the same percentages found in sucrose or table sugar.

### What has been the impact of crystalline fructose on the amount of total dietary fructose consumed?

Pure crystalline fructose has had a negligible effect on the amount of total dietary fructose consumed because of the small volume of this sugar produced relative to all other naturally occurring and added starches, syrups and sweeteners. Because pure crystalline fructose is sweeter than sugar, less of it is used in products to achieve the same level of sweetness, which also contributes to its negligible effect on total fructose intake.

## Functionality & Use

### Why has the production of fructose risen in the past 30 years?

For one simple reason: fructose is a high quality ingredient with many useful physical and functional properties. In addition to sweetness, fructose provides flavor enhancement, mixes well with other sweeteners and starches, extends the shelf life of acidic beverages, improves humectancy and protects fruit textures in frozen foods.

### What are the benefits of crystalline fructose use in foods and beverages?

Because pure crystalline fructose is sweeter than sugar, less of it is used in products to achieve the same level of sweetness. Thus, pure crystalline fructose can be used in making lower-sugar and lower-calorie foods. Consumer research from the Calorie Control Council shows that 187 million adult Americans are incorporating low-calorie and sugar-free foods and beverages into their diet as part of a healthy lifestyle. People will continue to demand a greater variety of low calorie products as they strive to make healthier food choices.

Fructose has been used in whole new categories of food and beverage products, such as shelf-stable nutrition bars, soft moist cookies, pourable frozen juice concentrates and energy-reduced products.

It has also been suggested that fructose be used for individuals with special dietary or nutritional needs, like endurance athletes.

### What are the primary foods and beverages in which fructose is used?

Primary applications for crystalline fructose include dry mix beverages, low calorie products, enhanced or flavored water, still and carbonated beverages, sports and energy drinks, chocolate milk, breakfast cereals, baked goods, yogurt, fruit packs and confections.

## Metabolism and a Low Glycemic Index

### How is fructose metabolized?

The metabolism of fructose has been studied for decades and is well documented in the scientific literature. Fructose is metabolized primarily by the liver. Fructose is not toxic to the liver, as has been suggested. Regardless of the fructose source (e.g., fruits, vegetables, honey, HFCS, crystalline fructose or table sugar) it is metabolized using the same pathways.

### Can people with diabetes consume fructose?

Yes. Fructose has a low glycemic index and does not lead to the same spikes in blood sugar or insulin that result from glucose consumption. In addition, the excellent sweetness of fructose means that less of it is required to sweeten foods or beverages and this can translate to fewer calories consumed.



## Health & Safety

### Is fructose safe?

Sucrose and HFCS have long been considered Generally Recognized As Safe (GRAS). As a significant component of these two sweeteners, the safety of fructose has been thoroughly documented in several scientific reviews performed by the Food and Drug Administration (FDA) and other expert panels.

The FDA concluded, “High fructose corn syrup is as safe for use in food as sucrose, corn syrup and invert sugar.” An International Life Sciences Institute (ILSI) Expert Panel concluded, “fructose is a valuable, traditional source of food energy, and there is no basis for recommending increases or decreases in its use in the general food supply or in special dietary use products.”

A Joint Consultation of the World Health Organization and the United Nations Food and Agriculture Organization found that consumption of sugars is not a causative factor in any disease, including obesity.

### Are there any documented health risks for fructose?

The only proven health risk of nutritive sweeteners at typical consumption levels is dental caries (also known as tooth decay). When compared to all other sugars, fructose is among the least likely to cause tooth decay.

### Is there good evidence to support recent claims for a unique role for fructose in the global epidemic of obesity?

No. Such claims are based on unproven hypotheses and statistical correlation, not scientific data. There is no evidence to support a unique role for fructose in the global epidemic of obesity. In fact, data has shown that Americans' intake of calories from sugar has stayed the same or gone down in the past decade, while the intake of calories from fat has gone up.



### Should consumers be concerned about recent reports in the media of problematic effects for fructose?

Fructose is not responsible for the obesity epidemic or any other health issues the U.S. is facing. Obesity is a multi-faceted condition brought on by several factors, not just one. Allegations that fructose causes increased fat production or increased appetite are based on poorly constructed experiments which often test unrealistically high levels of fructose, much higher than the levels found in a typical human diet. These studies are also often carried out in animals that are poor models for human fructose metabolism. Consequently, the findings from these studies are extreme, and not applicable to real-life situations.

### Would limiting pure crystalline fructose or HFCS in the diet impact global obesity?

Limiting fructose or HFCS in the diet would not have an impact on global obesity. Food formulators would simply reformulate products by substituting alternate sweeteners, many of which contain fructose as one of their components. Further, obesity is a global phenomenon while HFCS is primarily used in the United States. Obesity rates in Europe and South America are high whereas these areas do not use HFCS as a sweetening agent for food and beverages.

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