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Questions & Answers

In addition to these Fructose Questions and Answers, you may download the Calorie Control Council's **"Facts about Fructose" Brochure** (pdf).

What is Fructose?

Is fructose a 'natural' sugar?

Yes, fructose is a natural sugar. It is found throughout nature as a component of many of the foods we eat.

Where is fructose found in nature?

Fructose is found naturally in many fruits and vegetables, and as one of the several components of honey.

What are the most important dietary sources of fructose?

Fructose is also found in the added sugars sucrose, pure **crystalline fructose** and high fructose syrups (HFS). The latter encompass fructose- and glucose-containing syrups made from wheat, rice and other starch sources, as well as cornstarch (HFCS).

Chemistry

What is fructose?

Fructose is a monosaccharide, a simple natural sweetener. 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.

Availability

How much fructose is there in the typical diet?

Fructose makes up about 9% of calories in the typical diet.

Has the proportion of fructose in the diet changed over the last 30 years?

The introduction of high fructose syrups [also known as **high fructose corn syrup** and isoglucose] in the latter quarter of the 20th century really did very little to change the ratio of simple

sugars to starch, or the ratio of glucose to fructose. Why? Because high fructose syrup (HFS) and sucrose have nearly the same composition, and HFS simply replaced sucrose in many applications on a one-for-one basis.

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

Pure crystalline fructose has had a negligible effect on the carbohydrate composition of the diet because of the small volume of this sugar produced relative to all other naturally occurring and added starches, syrups and sweeteners.

Functionality & Use

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

For one simple reason: fructose is a high quality ingredient with many marvelous physical and functional properties. In addition to sweetness, fructose provides flavor enhancement, ingredient synergy with other sweeteners and starches, improved shelf stability in acidic beverages and intermediate moisture foods, humectancy, surface browning, fermentable sugars for yeast-raised baked goods, and protection of delicate fruit textures in frozen foods.

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

Recent research from the Calorie Control Council Consumer Survey shows that more than 180 million adult Americans are incorporating **low calorie foods** and sugar-free foods and beverages into their meal plan 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 can help meet this demand because of its unique sweetness and functionality.

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.

Some are even suggesting the application of fructose for those with special dietary or nutritional needs, like endurance athletes.

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

Primary applications areas 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 are fructose and other sugars absorbed by the body during digestion?

Fructose is absorbed from the small intestines by well-

characterized mechanisms. Rarely, some individuals experience difficulty absorbing fructose, usually because of a hereditary deficiency in the transport mechanism. Most people absorb fructose quickly and easily.

How are fructose and other sugars metabolized by the body after absorption?

Fructose and glucose are metabolized differently from one another, following separate but intersecting metabolic pathways. It is important to understand that these pathways operate independent of the source of the sugars. That is, fructose and glucose are always metabolized using the same fundamental pathways, whether they originally came from table sugar, crystalline fructose, starch, HFS, fruit, honey, vegetables or other sources.

Can people with diabetes consume fructose?

Yes. Fructose has a **low glycemic index**, which results in low serum glucose and insulin responses. (**What is the glycemic index?**) Both are advantageous to those on a **diabetes diet**. In addition, its superior sweetness means that it can be used to reduce the calorie content of many popular foods and beverages.

Health & Safety

Has the safety of fructose been studied by authoritative scientific bodies?

Sucrose and HFS 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 authoritative scientific reviews:

- GRAS status of HFS established (1983) — reviewed by FDA primarily as a component of HFS
- Report of the Sugars Task Force (1986) — reviewed by FDA from all natural and added sources
- Health Effects of Dietary Fructose (1993) — reviewed by an ILSI-convened Expert Panel from all natural and added dietary sources
- GRAS status of sugars reaffirmed (1996) — reviewed by FDA from all added sources

The FDA concluded, "High fructose [corn] syrup is as safe for use in food as sucrose, corn syrup and invert sugar." The 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. Specifically stating:

- "Much controversy surrounds the extent to which sugars and starch promote obesity. There is no direct evidence to implicate either of these groups of carbohydrates in the etiology of obesity, based on data derived from studies in

affluent societies."

and

- Sucrose and other sugars have not been directly implicated in the etiology of diabetes and recommendations concerning intake relate primarily to the avoidance of all energy-dense foods in order to reduce obesity.

Are there any documented health risks for fructose?

The only proven health risk of nutritive sweeteners at typical consumption levels is dental caries. Fructose is among the least cariogenic of the nutritive sugars.

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

No. Such claims are simply untested and unproven hypotheses based on statistical correlation, not scientific data. There is no evidence to support a unique role for fructose in the global epidemic of obesity.

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

Recent unfounded allegations suggest that fructose is uniquely responsible for the current obesity crisis in the U.S. These allegations — such as increased fat production or increased appetite — are based on poorly conceived experimentation of little relevance to the human diet, which tests unphysiologically high levels of fructose as the sole carbohydrate, often in animals that are poor models for human metabolism. The consequences of such exaggerated diets are predictably extreme, and are thoroughly reviewed by Forbes, *et.al*.⁶

Would limiting pure crystalline fructose or HFS in the diet have any impact on global obesity?

Limiting fructose or HFS in the diet would have NO impact on global obesity. Food formulators would simply reformulate products by substituting alternate sweeteners, many of which contain fructose as one of their components.