

BAKING

## The High Fructose Corn Syrup Conspiracy



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**T**hank heavens for the popular press. The life of food scientists would be so boring and employment opportunities fewer without the popular press' understanding of some food subjects. In the past year there have been reports on what can be best described as the evils of high fructose corn syrup (HFCS). It is being pointed at for its contribution to obesity in America. Some reports have even alluded to its purported addictive nature. I will try to shed some light on HFCS and its appeal to the food bakery industry developers.

What motivates me to write this is the excitement that took place back in the late 1980s. Organizations purporting to be protecting the public exposed the "dangers" of tropical fats in foods and left food companies with little choice but to take them out of products. For many food companies and suppliers it was deemed easier to conform to the implied health threat than to try and educate the public on why they were used and the nuances of shortening formulation and its effects on finished products. The truth be known, the total saturates in the products used in baked goods were often the same or actually higher, but tropical fats weren't on the label. The upside to it all was that it kept shortening developers employed for a couple of years.

After watching some recent TV programs and talking to consumers I see the same lack of understanding and reporting of HFCS that I did with tropical fats. Here is my effort to explain why we use HFCS in formulations and to show that it really isn't a conspiracy to fatten up America.

Before the 1970s when HFCS came into its own, sugar was the primary sweetener of choice. Sugar or sucrose is made up of the simple sugars glucose and fructose bound together. When we eat sucrose, enzymes in our mouths and in our stomach break it down quickly into its simple forms, glucose and fructose. HFCS is composed of molecules of glucose and fructose. The ratios of glucose and fructose in HFCS vary from what you get with the digestion of sucrose, which is 1:1 or 50/50. HFCS typically is composed of 42% fructose and 55% glucose or conversely 55% fructose and 42% glucose. The remaining 3% of solids are longer chains of saccharides. The fructose and glucose in HFCS are not bound together. HFCS is typically in a solution of 29–31% water and 69–71% solids. The difference between catalyzed sucrose and HFCS is not huge, but it is enough to make HFCS more advantageous to use than sucrose in baked products.

Sucrose from beets or sugar cane, with its price supports and the various steps required to turn it into sugar, is more expensive than HFCS. With the growth of ethanol production from corn, the price difference between sucrose and HFCS has narrowed. The pound for pound cost of HFCS is lower than granulated sugar. Keep in mind it is approximately 30% water, but even on a solids basis it is still cheaper than sugar as a sweetener. From the sweetness aspect, HFCS is generally given a sweetness rating of 150 compared to sucrose's rating of 100.

Another aspect of HFCS is that it is a liquid. This translates into easier, lower costs of transportation, handling, storage, and weighing or metering of HFCS. These types of handling advantages certainly help from a cost perspective, thus the cost savings extends beyond just the cost of the ingredient. It is much easier and cheaper to pump a liquid around a plant and meter it than to convey, scale, and/or hand dump a dry product such as sucrose.

What motivates a formulator to use an ingredient is functionality and/or cost. Functionality always trumps cost when it comes right down to it. If the ingredient hurts the product, no matter how cheap it is, the company can't afford to use it. If the product isn't good, no matter what the price, it won't sell and thus will fail in the market place. It is always a gamble when launching a new product. You need to make it as good as you can or face failure. We all know stories of how fickle the market can be when choosing which products succeed and which fail.

Though HFCS has the same basic components as sucrose it functions very differently in baked goods. What is so appealing about using HFCS is that it keeps products soft and pliable. Using HFCS will give cookies a softer bite that is moist in mouth feel over a longer period than sucrose. I believe this is due to it not crystallizing as quickly in a product as sucrose. This is its greatest functional benefit to formulations.

There are several drawbacks to using HFCS a developer needs to keep in mind. It is one of those ingredients where the adage "if some is good more must be better" does not apply. One quality is its sweetness. Recall that it is half again as sweet as sucrose. If you taste it, it is a different type of sweet than that of sugar. If you use too high of a level it tends to overwhelm flavors. If you try to increase levels of flavor to overcome this masking effect the result is often off flavors coming through from the flavors before the desired flavor comes through. It can be a frustrating exercise to try to overcome this sweetness. It is something to keep in mind when you are wondering why your chocolate cookie doesn't taste very chocolaty despite having twice the amount of cocoa you would normally use or that vanilla note that just won't come through in a chocolate chip cookie.

Another potential challenge is that the moisture it brings to the product won't bake out enough to allow the structure to set. This can occur in muffins and cakes where a more open defined cell structure is needed. A way around this is the use of "gelled" shelf life extender, where HFCS and other functional components are suspended in a gel that helps form or maintain a structure. These

gels can also be useful in extending the shelf life of products even longer than just HFCS alone. This allows for higher levels of HFCS to be incorporated into a formula.

Because of the water content of HFCS, the moisture can be a limiting factor of how much can be used in your product. In a product like a cookie or muffin that is high in fat and low in flour, this can limit the amount you use as it will cause excessive spread in the cookie or muffin cap. Here again a gelled product can be helpful in striking that delicate balance.

When using higher levels of HFCS the bake can be critical. HFCS contributes to crust color so it is easy to brown a product too much. The other critical point is that over baking will cause the product, especially cookies, to become tough and leathery.

In the end there are specific attributes HFCS gives to a product that no other ingredient can. It is used because it is the best in-

gredient at the most reasonable cost to deliver the best product possible to the consumer. When it comes to consumption of foods, whether it is HFCS, tropical fats, or any other food, moderation is the best rule. If you eat too much of anything it will eventually have a negative affect on your body. As for the growing obesity epidemic here in America, calories in need to equal calories out. If you don't get your exercise and burn up those calories they are going to go to your waistline or elsewhere.

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