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A Sweetener With a Bad Rap

By MELANIE WARNER

EVERY time Marie Cabrera goes shopping, she brings along her mental checklist of things to avoid. It includes products with artery-clogging trans fats, cholesterol-inducing saturated fats, MSG and the bogeyman du jour, high-fructose corn syrup. That last one, she says, is the hardest to avoid unless she happens to be shopping in the small natural-foods section of her supermarket.

As she pushed her shopping cart down an aisle of the Super Stop & Shop near her hometown of Warren, R.I., recently, Ms. Cabrera, a retired schoolteacher, offered her thoughts on why she steers clear of high-fructose corn syrup: "It's been linked to obesity, and it's just not something that's natural or good for you."

This is the perception that many consumers have of the syrup, a synthetic sweetener that has replaced plain old sugar and become a ubiquitous ingredient in American processed foods. High-fructose corn syrup provides the sweet zing in everything from Coke, Pepsi and Snapple iced tea to Dannon yogurt and Chips Ahoy cookies. It also lurks in unexpected places, like Ritz crackers, Wonder bread, Wishbone ranch dressing and Campbell's tomato soup.

In the news media and on myriad Web sites, high-fructose corn syrup has been labeled "the Devil's candy," a "sinister invention," "the crack of sweeteners" and "crud." Many scientific articles and news reports have noted that since 1980, obesity rates have climbed at a rate remarkably similar to that of high-fructose corn syrup consumption. A distant derivative of corn, the highly processed syrup was created in the late 1960's and has become a hard-to-avoid staple of the American diet over the last 25 years. It spooks foodies, parents and nutritionists alike. But is it really that bad?

Many scientists say that there is little data to back up the demonization of high-fructose corn syrup, and that links between the crystalline goop and obesity are based upon misperceptions and unproved theories, or are simply coincidental.

"There's no substantial evidence to support the idea that high-fructose corn syrup is somehow responsible for obesity," said Dr. Walter Willett, the chairman of the nutrition department of the Harvard School of Public Health and a prominent proponent of healthy diets. "If there was no high-fructose corn syrup, I don't think we would see a change in anything important. I think there's this overreaction."

Dr. Willett says that he is not defending high-fructose corn syrup as a healthy ingredient, but that he simply thinks that the product is no worse than the refined white sugar it replaces, since both offer easily consumed

calories with no nutrients in them. High fructose corn syrup's possible link to obesity is the only specific health problem that the ingredient's critics have cited to date — and experts say they believe that this link is tenuous, at best.

Even the two scientists who first propagated the idea of a unique link between high-fructose corn syrup and America's soaring obesity rates have gently backed off from their initial theories. Barry M. Popkin, a nutrition professor at the University of North Carolina at Chapel Hill, says that a widely read paper on the subject that he wrote in 2004 with George A. Bray, a professor of medicine at the Pennington Biomedical Research Center in Baton Rouge, La., was just meant to be a "suggestion" that would inspire further study.

"It was a theory meant to spur science, but it's quite possible that it may be found out not to be true," Professor Popkin said. "I don't think there should be a perception that high-fructose corn syrup has caused obesity until we know more."

Professor Popkin says that he and Professor Bray both decided not to raise the issue of high-fructose corn syrup for a beverage panel that they and four other scientists formed last year at the University of North Carolina. The panel was convened to provide clear guidelines to consumers about the nutritional risks and benefits of various beverages.

Rather than single out high-fructose corn syrup for derision, the panel focused on the proliferation of beverages with added sugars, regardless of what sweetener was used. Those beverages, the panel said, should be consumed at the lowest possible level, no more than eight ounces a day. "We felt there were much bigger issues and it would be a distraction," Professor Popkin said of high-fructose corn syrup.

AS America's obesity problem has evolved into a major public health concern over the last five years, singling out high-fructose corn syrup as a singular culprit reflects, perhaps, society's early response to a vexingly complex issue. Scientists say part of the confusion about the ingredient's role in the nutrition debate stems from a basic misunderstanding: the idea that high-fructose corn syrup is actually high in fructose.

Studies have shown that the human body metabolizes fructose, the sweetest of the natural sugars, in a way that may promote weight gain. Specifically, fructose does not prompt the production of certain hormones that help regulate appetite and fat storage, and it produces elevated levels of triglycerides that researchers have linked to an increased risk of heart disease.

But the name "high-fructose corn syrup" is something of a misnomer. It is high only in relation to regular corn syrup, not to sugar. The version of high-fructose corn syrup used in sodas and other sweetened drinks consists of 55 percent fructose and 45 percent glucose, very similar to white sugar, which is 50 percent fructose and 50 percent glucose. The form of high-fructose corn syrup used in other products like breads, jams and yogurt — 42 percent fructose and 58 percent glucose — is actually lower in fructose than white sugar.

Even if high-fructose corn syrup is no worse than sugar, it may never be popular with consumers like Ms. Cabrera who routinely seek out natural and organic foods. Most manufacturers of natural products shun the

syrup, in part because many of them consider it an artificial ingredient. Among natural-foods enthusiasts and many nutritionists, there is a belief that the foods humans have been consuming for hundreds or even thousands of years are better handled by our bodies than many of the modern and chemically derived concoctions introduced into the food supply in the last 60 or so years.

Among producers of organic products, there is a similar prohibition against high fructose corn syrup in favor of regular sugar, although one ingredient company, Marroquin International of Santa Cruz, Calif., sells organic high-fructose corn syrup.

Michael F. Jacobson, director of the Center for Science in the Public Interest, a nutrition advocacy group that often criticizes the food industry, says that unlike sugar molecules, which reside in the stalks of sugar cane or the beets that are used to make sugar, high-fructose corn syrup is artificial because it is not found anywhere in corn.

"You're causing a change in the molecular structure, and that shouldn't be considered natural," he said, adding, however, that he never supported the notion that high-fructose corn syrup was a unique contributor to obesity.

Produced in large manufacturing facilities scattered mostly across the flat, golden expanse of the American corn belt, high-fructose corn syrup is not a product that anyone could cook up at home using a few ears of corn. The process starts with corn kernels and takes place in a series of stainless steel vats and tubes in which a dozen different mechanical processes and chemical reactions occur — including several rounds of high-velocity spinning and the introduction of three different enzymes to incite molecular rearrangements.

The enzymes turn most of the glucose molecules in corn into fructose, which makes the substance sweeter. This 90 percent fructose syrup mixture is then combined with regular corn syrup, which is 100 percent glucose molecules, to get the right percentage of fructose and glucose. The final product is a clear, goopy liquid that is roughly as sweet as sugar.

The major manufacturers of high-fructose corn syrup — the farm giants Archer Daniels Midland, Cargill and Corn Products International and the ingredients company Tate & Lyle — say that their product is natural because it is made from plain old corn (though some of it is genetically modified) and contains no synthetic materials or color or flavor additives.

The Food and Drug Administration has never established rules on what, exactly, "natural" means, allowing companies to pitch products as natural even if they contain high-fructose corn syrup. Cadbury Schweppes recently began promoting 7-Up, which is sweetened with high-fructose corn syrup, as "100 percent natural." Capri Sun fruit-flavored drinks from Kraft are also promoted as all-natural, although they, too, are sweetened with high-fructose corn syrup. Cadbury and Kraft both say they believe that high-fructose corn syrup is natural because it is made from corn.

Sugar is considered natural because there are no chemical processes involved in its production and no

molecular changes occur as it is processed. The Sugar Association, which represents sugar growers and producers, filed a petition in February with the Food and Drug Administration asking the agency to define "natural," but the association says the agency has not yet responded.

THE modern supermarket, of course, is stocked with artificial additives and the highly processed products of modern food science, most of them unknown outside of food technology circles. Still, even with this cacophony of indecipherable, hard-to-pronounce ingredients, few have been singled out for the scorn heaped upon high-fructose corn syrup.

Yoshiyuki Takasaki, a scientist, patented high-fructose corn syrup in 1971 while working for a government-affiliated laboratory in Japan. But it wasn't until 2001, shortly after the United States surgeon general issued a landmark report on obesity, that the brouhaha over the substance began. Warning that America's expanding waistline could reverse many health gains achieved in recent decades, the report prompted new research into the causes of obesity.

Professor Bray of the Pennington research center — a lean, bespectacled man who had spent much of his career studying obesity and diabetes — said he had been pondering the obesity problem for several years when, in early 2002, he had a sudden insight. Charting federal data on the consumption of high-fructose corn syrup against data on obesity rates, he found amazing parallels between his two graphs.

Starting in 1980, around the time that manufacturers started replacing sugar in sodas with a more cheaply produced sweetener — high-fructose corn syrup — there was a sharp increase in male and female obesity in the United States. From 1980 to 2000, the incidence of obesity doubled, after having remained relatively flat for the preceding 20 years, the data showed. Could high-fructose corn syrup be making us fat, Professor Bray wondered? After all, according to his analysis of government consumption data, per capita intake of the syrup had increased by more than 1,000 percent from 1970 to 1990, exceeding the changes in the intake of any other food group tracked by the Department of Agriculture.

Professor Bray's theory received enormous attention when he teamed up with Professor Popkin to publish the idea in *The American Journal of Clinical Nutrition* in April 2004. Around the same time, a breezy and provocative book about America's obesity problem, "Fat Land" by Greg Critser, generated more awareness of high-fructose corn syrup. Mr. Critser proposed that the syrup made consumers fat because it was so cheap, and thus food makers could afford to offer more products with it and more copious portions.

Manufacturers had always been able to buy the sweetener at prices 20 percent to 70 percent less than those of sugar. In a 1983 article in *Fortune* magazine, one beverage analyst estimated that by switching to high-fructose corn syrup, Coca-Cola gained a cost advantage over Pepsi and its bottlers of \$70 million a year. A year later, Pepsi followed in Coke's footsteps and also began using the sweetener. Mr. Critser argued that the cost savings allowed soft-drink companies to create larger sizes that were only marginally more expensive, thus propelling people to drink more soda. It also freed up extra marketing money, he said. "High-fructose corn syrup really allowed companies to transform their brands and to become some of the biggest brands in the

world," Mr. Critser said in a recent interview.

There is little question that after beverage companies began adding high-fructose corn syrup into soda in the early 1980's, soft-drink consumption soared. From 1980 to 2000, per-person consumption of sweetened soda rose by 40 percent, to 440 12-ounce cans a year, according to the Agriculture Department's Economic Research Service. During roughly the same period, the inflation-adjusted price of soda declined by about one-third, according to [Bureau of Labor Statistics](#) data.

Also in the 1980's, supersizing began in earnest. In 1983, for example, 7-Eleven rolled out its 44-ounce soda and, in 1988, the huge 64-ounce. And [McDonald's](#) began supersizing its drinks in the late 80's. But whether all of this would have happened anyway, even if sodas still were sweetened with pricier sugar, is hard to say, according to analysts.

John Sicher, publisher of the trade journal *Beverage Digest*, says he thinks that the lower cost of soda today, versus 20 years ago, is attributable largely to the advent of bigger packaging, which lowers distribution and manufacturing costs. He cited several reasons for soda's dominant presence in the American diet: "I think that the higher consumption of soft drinks today is more about the increased prevalence of product," he said. "It's the growth of fast-food restaurants, much more availability in supermarkets, the growth of convenience stores with coolers in them and a huge build-out of new vending machines in the 1990's. I don't think it has anything to do with high-fructose corn syrup."

Dave DeCecco, a spokesman for Pepsi, says the company's decisions over the years about package and portion sizes were based on the changing desires of consumers — and had nothing to do with the price of high-fructose corn syrup. "The cost of the sweetener in the product is extremely minimal to the point of not even mattering," he said.

Mr. Critser, the author of "Fat Land," says that John Peters, a scientist at [Procter & Gamble](#) and a founder of America on the Move, a foundation devoted to obesity prevention, was the first person to get him thinking about a link between the cheap cost of high-fructose corn syrup and obesity.

Reached three weeks ago at his office at Procter & Gamble in Cincinnati, Mr. Peters said the idea was "just a hypothesis, without any data to back it up." Asked if he thought that high-fructose corn syrup had played a unique role in America's obesity problem, he said, "I don't think we know."

Few scientists and nutritionists are willing to believe that the small amount of additional fructose in high-fructose corn syrup, as opposed to sugar, makes a difference in people's weight. Dr. Peter J. Havel, an endocrinology researcher in the department of nutrition at the [University of California](#), Davis, said he did not think that the replacement of sugar, or sucrose, with high-fructose corn syrup in the food supply was, by itself, responsible for the increase of obesity in the population.

"I don't think it is likely that things would be very different if people consumed increased amounts of either sucrose or high-fructose corn syrup," he said in an interview. "Overconsumption of either sweetener, along

with dietary fat and decreased physical activity, could contribute to weight gain."

THE recent backlash against the ingredient, which has enjoyed more than 20 years of uninterrupted sales growth, has caused its corporate sponsors to take notice. Audrae Erickson, president of the Corn Refiners Association, a trade group in Washington that represents the biggest makers of high-fructose corn syrup, put up a Web site, HFCSFacts.com, three years ago to blunt criticism of the sweetener. The site includes information about the amount of fructose in the syrup and charts showing sharp increases in obesity in countries that use very little of the liquid. (Outside of Canada, the United States is the only country with a significant consumption of high-fructose corn syrup, largely because other countries have erected successful trade barriers to protect sugar.)

But Ms. Erickson says her arguments that high-fructose corn syrup is a safe ingredient have gained little traction. She says her trade group recently entertained the idea of changing the sweetener's name. "It really does have this negative connotation," she said.

Manufacturers of high-fructose corn syrup, however, may have more than an image problem to deal with. Annual per capita consumption of the sweetener is down 7 percent, to 59.2 pounds in 2005, from its peak of 63.7 pounds in 1999, according to the Agriculture Department. Ms. Erickson says that this is attributable less to the negative perceptions of high-fructose corn syrup than to the popularity of drinks with fewer calories, such as diet soda, bottled water and sports drinks. Annual per capita consumption of refined sugar has also declined, falling 4 percent from 1999 to 63.4 pounds, in 2005.

All of which suits Ms. Cabrera just fine. Regardless of what experts say about high-fructose corn syrup, she says she will still try to avoid it. But now, after learning that many experts say the substance is handled no differently in the body than sugar, she says that she will probably let some products with high-fructose corn syrup slide.

"I guess I don't need to be so hard-core about it," she said.

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