A corn cob is visible on the left side of the image. On the right, a glass beaker is filled with an orange liquid, with measurement markings at 100, 150, 200, and 250 ml. The text '250 ml APPROX.' is printed on the beaker. The background is a light, neutral color.

BAD

**TO THE
LAST DROP:**

**Refiners Squeeze
Dangerous Additives
from Corn**

Dr. Joseph Mercola

Dr. Joseph Mercola

The Dangers of High-Fructose Corn Syrup

There is no shortage of sugar in the 21st century. From obvious items such as doughnuts, candy, and sugary drinks, to the less obvious, which now include most every processed food on the shelf at the supermarket.

It is probably no mystery that sugar is not good for you as I have been documenting the scientific dangers of sugar for many years. In fact after reviewing the evidence of the damage sugar can cause, it is my firm belief that regular use of sugar is even worse for you than cigarettes.¹

High Fructose Corn Syrup (HFCS)

Research has shown that the highly processed fructose in HFCS contributes far more to obesity and insulin resistance syndrome than simple table sugar.²

In animal studies, fructose consumption was found to produce:

- Insulin resistance
- Impaired glucose tolerance
- High insulin levels
- High triglycerides
- High blood pressure

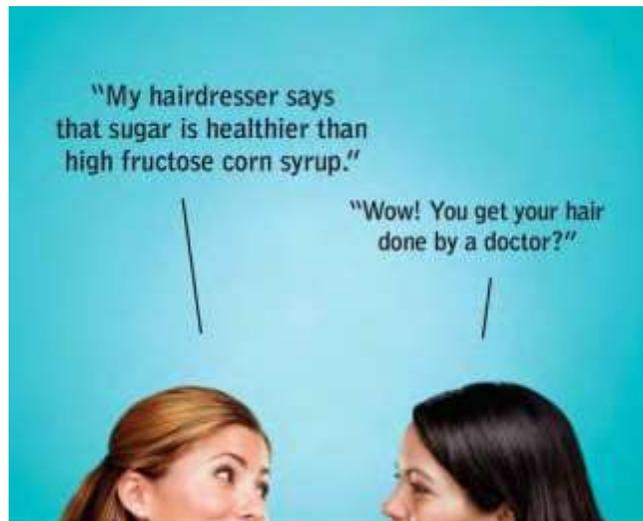
Consuming HFCS also contributes to fat deposits in your liver (fatty liver) and increases the buildup of dangerous lipoproteins, part of cholesterol deposits, in your blood vessel walls.³ This leads to plaque buildup and a narrowing of your blood vessels, which increase your susceptibility to both strokes and heart attacks.⁴

While studies show that the average American's consumption of fructose increased 26 percent from 1970 to 1997 and continued to increase until 2002, it declined the next year.

According to the USDA Yearbook, there was a drop from 44.7 pounds of consumption per year per person of HFCS in 2002, to 43.4 pounds in 2003.⁵

So it seems that educational efforts warning the public of this sweetener's danger are starting to make a dent but there is a long way to go as HFCS is pervasive in many processed foods because it is cheap to use, which is partially related to its subsidy by the US government.





The corn industry has noticed this decrease and started to fight this with manipulative television commercials and print ads.

But now that you know the truth you won't be fooled by their deceptive ads.

The History of High-Fructose Corn Syrup

Until the 1970s, most of the sugar we ate came from sucrose, which was derived from sugar beets or sugar cane.

High-fructose corn syrup was invented by a pair of researchers named Marshall and Kooi, in 1957.⁶ Until that time, people had operated with the understanding – the correct one, in fact – that there is no fructose in corn syrup. Corn syrup contains another sugar molecule, considerably less sweet than fructose, called glucose.

These two researchers developed an enzyme called glucose isomerase in their laboratory that astonishingly could rearrange the molecular structure of the glucose in corn syrup, and convert it into fructose.⁷ The more glucose in the corn syrup that the enzyme converted to fructose, the sweeter the syrup became.

This discovery was a boon to American corn refiners who, because of federal subsidies and other reasons, have an excess of corn to use (another reason for the push to ethanol). And the potential cost savings were enormous. Using high-fructose corn syrup instead of regular corn syrup meant that a standard recipe requiring a fixed amount of corn syrup could afford to use far less corn syrup, without sacrificing any sweetness.

High-fructose corn syrup began to be produced on an industry-wide scale in the 1970s, and rapidly took over much of the sweetener market. According to a 1997 USDA report, in 1970 sucrose accounted for about 83 percent of sweeteners Americans ate, and by 1997 sucrose accounted for only about 43 percent. High-fructose corn syrup made up

almost the entire remainder, or about 56 percent of the sweeteners that Americans consumed.⁸

Another USDA Report spanning the years 1970-2003 showed per capita consumption of sucrose versus HFCS. The usage table showed that sucrose consumption fell rapidly while HFCS consumption generally went up.⁹ In fact, Dr. Alan Gaby, a nutritional medical specialist, said:

"The increase in HFCS consumption far exceeds the increases in intake of any other food or food group."¹⁰

And today, largely due to the massive corn lobby in the U.S. that has convinced the government to set import quotas and tariffs on sugar cane, making the environment more favorable to corn producers, it's actually cheaper to make HFCS than to buy cane or beet sugar!¹¹

You can see by these facts how HFCS got its stranglehold on the American marketplace, and some of the reasons why it is such a serious health threat to you and your family.

How HFCS Worsens Diabetes

Diabetes is a chronic disease that inflicts 1 in 12 Americans, or nearly 24 million people in the U.S.¹² Approximately 5.7 million Americans remain undiagnosed, and 57 million are estimated to be pre-diabetic.

In just 2007 alone, 1.6 million new cases of diabetes were diagnosed in people 20 years of age or older.¹³

Of perhaps greatest concern, however, is the rapid rate at which this disease is growing. According to the World Health Organization (WHO), by the year 2030, the number of people with diabetes will number over 366 million.¹⁴

This is truly a disease of alarming proportions. If you currently have diabetes, you know the pain and inconvenience it causes, not to mention the number of secondary health concerns you face, such as serious eye diseases and foot/leg infections -- which, if not halted quickly, can lead to blindness or even amputation of a limb.

As you know, diabetes is a condition that affects your body's ability to use sugar. But the concept being overlooked by conventional medicine is that diabetes is not actually a disease of blood sugar.



Yes, blood sugar becomes elevated when you have diabetes, but it is just a symptom of the real problem -- and an attempt by your body to keep things in balance.

The Real Cause of Diabetes

The primary problem with diabetes is insulin, and more specifically insulin resistance, along with faulty leptin signaling.¹⁵

As I said earlier, using HFCS has been shown to increase insulin resistance,¹⁶ so consumption of HFCS can seriously worsen your diabetes, or, if you are pre-diabetic, it can assault your immune system to the extent that it succumbs to the disease.

Fructose has also been found to react with protein molecules to form “toxic, advanced glycation end-products (AGEs).” Glycation is a haphazard process that impairs the functioning of the molecules in your body. These AGEs appear to play a role in the onset of vascular, renal, and ocular complications of diabetes.¹⁷



Coupled with the fact that fructose is an addictive substance,¹⁸ you have the “perfect storm” to produce pre-diabetes and diabetes conditions from even low-dose, repetitive fructose ingestion. And since fructose is hidden in so many foods, it is a difficult process to determine just how much you’re getting and what your disease risk is becoming.

But keep in mind, some of the major risk factors for diabetes: heredity, obesity, a sedentary lifestyle, an unhealthy diet, high blood pressure, and high cholesterol. Almost all of these factors are within your power to change.

And there is one lifestyle change that will go a long way to cutting almost all your risk factors for this disease, or improving your current condition considerably.

And that is to avoid HFCS.

A healthier lifestyle, which avoids HFCS in any form, can significantly lower the following risk factors: obesity, high cholesterol, and high blood pressure.

We know that HFCS contributes greatly to excess weight and obesity. And earlier I mentioned a study where animals that were fed fructose developed both high triglycerides and hypertension. So avoiding all forms of HFCS eliminates these three major risk factors right off the bat. In turn, with less weight and a healthier body, you are much more likely to get out and exercise, which eliminates yet another risk factor.

So there is a domino effect that takes place from just one lifestyle adjustment. And, if you couple more exercise with optimal time in the sun so you get your daily dose of vitamin D,¹⁹ you've taken one more step in the direction of health, and away from chronic diseases such as diabetes.

Remember, no one risk factor will generally decide your fate. It is a number of factors in combination that create a situation favorable for a disease to take hold.

Foods That Can Help Control Diabetes

There are many foods that can help in the management of diabetes. Obviously, a good start in avoiding insulin resistance is to remove all known forms of HFCS from your diet.

Stopping all sodas would be one of the most important steps to take as they are not only the primary source of HFCS but also the single largest source of calories for people in the US.



While diet sodas don't contain HFCS, they are likely even WORSE due to the artificial sweeteners they contain, which have been shown to have even more long term toxicity than HFCS. I have documented these on my website and in my award winning book *Sweet Deception*.

Avoiding fruit drinks is also useful. While they are far better than soda, most are not fresh, and even fresh ones are problematic if you struggle with high insulin levels.

Also, avoid processed foods as much as possible, since most of them also contain HFCS, along with additives and preservatives.

A 2007 U.S. study found that drinking tea could help protect you against HFCS-induced damage:

Researchers analyzed 11 different soft drinks and found "*astonishingly high*" levels of reactive carbonyls. These compounds are thought to cause cell and tissue damage, and have been linked to diabetes, since diabetics have higher levels in their blood. Researchers said that adding a compound found in tea, Epigallocatechin gallate, or EGCG in short, to HFCS-sweetened soft drinks reduced the effects of the reactive carbonyls.²⁰

While it is not surprising that these beneficial compounds may help to neutralize some of the toxins formed by high-fructose corn syrup, don't believe the industry's sales pitch telling you that HFCS-laden soft drinks doctored-up with a tea "extract" are safe for you. It simply won't make up for the damage that HFCS can do to your body.

However, EGCG is found in high quantities in green tea, and this is a beverage that you can certainly enjoy the benefits of, in moderation. I say “in moderation” primarily because I still believe that pure water is what you were primarily designed to drink, and when you stray too far from this life-giving fluid, you can run into severe health problems.

A precautionary note about green tea: Some green teas are NOT what they appear to be. Any pre-made green tea that comes in a bottle may be loaded with HFCS, additives, preservatives, plus caffeine and more which are NOT healthy for you so please be sure and check the label.

To learn more about diabetes and how to treat it naturally, please review the articles [here](#).

How HFCS Worsens Metabolic Syndrome

Metabolic syndrome is a condition characterized by disorders of lipoprotein metabolism (high cholesterol and triglycerides), hypertension, and hyperglycemia (abnormally high concentrations of glucose in the blood).²¹

This syndrome afflicts more than 50 million Americans, and approximately half of all Americans are predisposed to it, making it one of the more serious health issues in the U.S.

Metabolic syndrome is a result of the continual influx of HFCS-containing soft drinks and other non-nutritive, high-fructose foods, which creates insulin resistance. Insulin resistance means that muscles are no longer able to make glycogen, a form of stored carbohydrate, from food energy.

Insulin resistance can promote an increase in fats in your bloodstream, which leads to metabolic syndrome.²²

Insulin resistance also disrupts the way carbohydrates, lipids, and proteins obtained from your food are handled by your body.

In 2007, researchers at Yale University School of Medicine studied how insulin resistance works. Insulin-resistant individuals in their study were found to have their carbohydrate energy rerouted to liver fat production. This process elevated the participants' blood triglycerides by as much as 60 percent, while lowering their HDL (good) cholesterol by 20 percent.²³



This occurred even though all the participants were young and lean, with no excess abdominal fat (a trait often linked to metabolic syndrome).

The study concluded that exercise was an effective way to fight insulin resistance. I would add that avoiding all products containing HFCS is another key step to correcting insulin resistance, and to preventing it in the first place.

How HFCS Can Damage Your Immune System

Increases in immune system problems have greatly increased in recent years. Asthma, hay fever, eczema, food allergies, lupus, multiple sclerosis, and other afflictions are all on the rise.²⁴

And one thing that has also increased dramatically in recent years is the use of hidden and overt sugars, such as HFCS, in the food supply. This is no coincidence. Sugar is a potent enemy of your immune system, not to mention most of your bodily processes.

In research studies, fructose has been found to inhibit the action of white blood cells,²⁵ one of the key elements of your immune capability.

These studies have shown that eating or drinking 100 grams (8 tbsp) of processed sugar, the equivalent of one typical can of soda, can reduce the ability of your white blood cells to kill germs by 40 percent!

In fact, sugar suppresses your immune system for hours after you consume it. The immune-suppressing effect of sugar starts less than 30 minutes after eating it, and may last up to five hours.²⁶

Thus, if you eat some HFCS-containing food, it causes your immune system to be largely “off-line” for a long period of time, leaving you much more susceptible to germs, viruses, parasites, and whatever else might be hanging around. Therefore, a key way to strengthen your immune system is to avoid any foods with HFCS, and other damaging sugars in them.

I will be talking later about some “healthy” sugars you can substitute instead that could help boost your immunity, and provide other benefits as well.



How HFCS Speeds Up Your Aging Process

There are few other ways to accelerate aging faster than eating HFCS. According to Dr. Rosedale, the single marker for lifespan, if there was one, is insulin -- specifically, insulin sensitivity.²⁷

It is now a well-known fact that insulin speeds up aging. Eating HFCS, and other forms of sugar and grains, increases your insulin level,²⁸ and that is the equivalent of slamming your foot on your aging accelerator.

When your cells stop being sensitive to insulin, causing your insulin levels to go up, you again get insulin resistance, a common denominator in many disease conditions we've been talking about.



HFCS remains the prime villain in these insulin resistance issues. Avoiding sugar in all its forms will help you to control your insulin level, and that will help you to feel and look younger for longer.²⁹

So what else can you do to increase your longevity? You can start by dipping into that "fountain of youth" already available to you: eating a healthy diet.³⁰

You can go to Mercola.com for further information about eating a healthy diet. And I'll be telling you the secrets of how to stay away from foods that contain HFCS in upcoming sections.

HFCS Loaded with Dangerous Mercury Poisons

Recent headlines have reported some shocking news: HFCS has now been found to contain mercury. In January 2009, the journal *Environmental Health* reported that mercury had been found in nearly half of all tested samples of commercial HFCS.³¹

The Institute for Agriculture and Trade Policy then did its own batch of tests and found mercury in nearly one-third of 55 popular brand-name food and beverages. That included products by Quaker, Hershey's, Kraft, and Smucker's.³²

I have reported on the dangers of mercury many times, including its connection to autism,³³ heart disease, Parkinson's disease, multiple sclerosis, and Alzheimer's.³⁴ Mercury is a neurotoxin that is already alarmingly present in everything from paints and pesticides, to fluorescent light bulbs, vaccines, seafood and silver amalgam dental fillings.

But not surprisingly, according to tests done in 2005 on HFCS, the FDA knew about the problem with mercury in HFCS back then, but sat on it. Why? I think it's safe to say that the large corn lobby and other commercial interests may have had a lot to do with this information never getting out to the public.

What Foods Contain HFCS?

HFCS is now routinely used in:

- Most carbonated beverages and other sweetened drinks
- Baked goods
- Candies
- Canned fruits
- Jams and jellies
- Crackers
- Salad dressings
- Dairy products



In addition, HFCS has been added to countless other processed foods. And then there is the problem of food labels that just say “flavorings,” such as some soups or dry mixes.

These general references to “flavorings” or “assorted seasonings,” or similar groups of ingredients, make it virtually impossible for you to know whether the product actually contains HFCS or not. Obviously, food processors are just as happy to keep you in the dark about it, because health-conscious shoppers may be more likely to buy the product if it's not listed.

The only solution is for you to avoid most, if not all, processed foods, unless you want to add HFCS to the list of ingredients that you already read labels for, such as soy, other added sugars, MSG, and the like.

How Can You Avoid HFCS?

The very best way I know to avoid ingesting any products containing HFCS is to prepare your own meals at home from unprocessed, fresh, organic ingredients. Finding a local farmer's market or food coop that sells organic produce will best serve your needs for this.³⁵

And while difficult, it is possible to find some healthy, non-HFCS-containing foods at your local supermarket. One method is to shop the perimeters where you will find fresh

produce and other non-processed foods. You should always keep this rule of thumb in mind: the more processed the ingredients in a product, the more likely there will be HFCS in them.

In order to lower your risk of buying and consuming HFCS-containing products when you shop, I have the following recommendations:

- Avoid commercial sodas. These are loaded with HFCS.
- Avoid purchasing any commercial fruit juices. Instead, choose whole fruit, or drink small amounts of organic, unpasteurized fruit juices with no added sugars. Diabetics should use these in extreme moderation.
- Begin reading food labels and avoid all products that contain: “high-fructose corn syrup,” “chicory,” “inulin,” “iso glucose,” “glucose-fructose syrup,” “dahlia syrup,” “tapioca syrup,” “glucose syrup,” “corn syrup,” “crystalline fructose,” “fruit fructose,” or “agave.”
- Avoid commercial ketchups, sauces, baked goods, crackers, cornflake crumbs, chicken broth, stuffing mixes, commercial cereals, and salad dressings, many of which contain HFCS.³⁶ Some of these you can make at home from scratch, and many can be bought wherever health foods are sold.
- Note that even so-called “organic” foods, such as ketchup or relish, may have fructose added to them. Ketchup without sugar is actually quite flavorful, so don’t be discouraged by thinking that unless it has sugar, it must taste bad. Plus, your taste buds can get used to less sugar, so just give them time to adjust.

And make sure you eat plenty of fresh, green, leafy vegetables, organic whenever possible, because they are full of B vitamins, which help detox your system, metabolize sugar, and stabilize your energy production.

How to Sweeten Your Life Up... Naturally

I know that after reading about all the dangers of HFCS, you may want to run straight to the artificial sweetener aisle of your grocery store and stock up, but please refrain from doing so. That is simply trading one danger for another danger.

Those products, like Splenda®³⁷ and Nutrasweet®³⁸, are very damaging to your health. As I mentioned earlier the evidence is very compelling that they are even worse than HFCS.

If you want more in-depth details of why these artificial sweeteners are so dangerous, you can [read more on my site](#), and you may also want to read my book, *Sweet Deception*. In the book, I expose the FDA's hidden truths about the dangers, risks, and

side effects of aspartame and other artificial sweeteners.

Healthy Alternative Sweeteners

Now that you know some of the dangers of artificial sweeteners, let me tell you the good news: there are some tasty, safe, and healthier alternatives.

Let me introduce you to a couple of them: stevia and xylitol. If you are familiar with my newsletter, you have heard me talk about these two sweeteners.

Stevia, an herb native to South and Central America, is widely grown for its sweet leaves. Virtually devoid of calories,³⁹ stevia extracts can have 200-300 times the sweetness of real sugar.

Because studies have shown that stevia has a negligible effect on blood glucose,⁴⁰ having a glycemic index of zero, it is attractive as a natural sweetener for the management of diabetes and metabolic syndrome.



Personally, stevia is my sweetener of choice.

Xylitol, which comes from birch trees, has been used as a sweetening agent in food since the 1960s.⁴¹ It is even produced by your body during normal metabolism. Xylitol has the same sweetness as sucrose, but is clearly healthier. Xylitol is currently used in chewing gum, gum drops, and hard candy. It is low in calories and has no unpleasant aftertaste.

An added bonus to these sweeteners is that research has shown they both inhibit tooth decay. Imagine that in a sweetener!

Two tests conducted by Purdue University's Dental Science Research Group confirmed that stevia "significantly" inhibited the development of plaque.⁴² Research on xylitol has shown that it not only helps to prevent tooth decay, but it also improves gum health.⁴³

Both of these sweeteners are readily available. If they are not at your grocery store in the health food aisle, then you can find them at your local health food store. Both sweeteners are generally available in liquid, drop-by-drop dispensers, and also in packets or bulk.

The packets are extremely convenient for when you travel or go out to eat. Carrying them with you will also keep you from the temptation of using the sugar or artificial sweeteners that are on almost every restaurant table.

Your Sources for Fresh, Healthy, No-HFCS Food

Here are some general guidelines for finding healthy, wholesome food without added preservatives or unhealthy HFCS in them:

- Whenever possible, buy foods from organic and “locally grown” sections of grocery stores. Make sure the item says “organic” on it, as many grocery stores lump “natural” foods in with the organics. Natural only means it is made of natural ingredients and says nothing about the way it was processed afterwards. Still, even if a food is “organic,” be sure to read the label and watch out for added fructose.
- Buy foods at an organic food coop, farmer’s market,⁴⁴ or a health food store. And while you may not have to be as careful as in a regular grocery store, you should still be careful to read labels and make sure that you are getting pure and truly organic locally grown products.

Is There a GOOD Sugar?

While all forms of sugar should be used with a great deal of moderation, there is one form of unprocessed sugar that I actually DO recommend in limited quantities: [raw organic honey](#).

Honey is different from other forms of sugar because it has some established health benefits, which may help:

- Increase memory
- Diminish signs of aging
- Reduce stress

Honey contains a number of health-promoting antioxidants, as well as the vitamins thiamine, riboflavin, niacin, vitamin B-12, and biotin. Along with minerals and amino acids, honey also contains a number of live enzymes that most people don’t receive enough of in their diets.

Honey is also known to help with occasional insomnia or diarrhea.



Although honey is somewhat of an exception in the category of sugar, you still must exercise caution in the quantity you use because it is about 70 percent fructose. Fructose is fructose, and if you are challenged with obesity, diabetes, cardiovascular disease, kidney disease, or even if you’re simply insulin resistant, fructose is NOT your friend.

Easy Does It

All forms of fructose need to be used in moderation especially if you have any of the above listed conditions it would seem more prudent to limit your intake to a teaspoon of honey per day. It would probably be better for you to use herbal sweeteners like stevia or even glucose which is sold commercially as dextrose. While dextrose is only 70% as sweet as regular sugar (which is 50% fructose) it does not stimulate the same toxic metabolic pathways as fructose, and is thus far safer to use.

In any case, you should limit your total grams of fructose to less than 25 grams per day. This means that you should avoid using more than two tablespoons of honey per day, as an absolute maximum. This is the level that would be acceptable only if you had no additional forms of fructose in your diet which is difficult to do because fructose is pervasive and found in fruits and most all processed foods.

*Please note that honey should not be given to children under 1 year of age. Infants less than 12 months old are at risk for infant botulism from eating honey that contains bacterial spores that produce *Cloridium botulinim* bacteria, and in a baby, this can result in nervous system damage or even death. Adults and older children are not affected by these spores.*

Some Demonstrated Benefits of Honey

Honey has been shown to have anti-infective/anti-inflammatory properties and can actually help improve your energy and stamina.

In fact, honey can be used topically to fight multiple kinds of infections. Honey was actually a conventional therapy in fighting infection up until the early 20th century, at which time its use slowly faded away as penicillin took center stage.

Not all honey is equal—the antibacterial activity in some honeys is 100 times more potent than in others.

Good quality honey can offer the following benefits for [wound healing](#) when used topically:

- Drawing fluid away from your wound
- Suppressing microorganism growth
- Worker bees secrete an enzyme (glucose oxidase) into the nectar, which then releases low levels of hydrogen peroxide when the honey makes contact with your wound

- Makes healing wounds smell good, resulting from a chemical reaction between the honey and your tissue

[For these benefits, the honey MUST be raw.](#) Nearly all of the honey from stores is processed to some degree—most of it very heavily.

There is one honey that stands out above the rest—Manuka honey from New Zealand, made with pollen gathered from the Manuka bush (a medicinal plant). Clinical trials have found that Manuka honey can effectively eradicate more than 250 clinical strains of bacteria, including resistant varieties such as:

- MRSA (methicillin resistant Staphylococcus aureus)
- MSSA (methicillin sensitive Staphylococcus aureus)
- VRE (vancomycin-resistant enterococci)
- Helicobacter Pylori (which can cause stomach ulcers)

With the increasing threat of antibiotic-resistant infections and drug overuse, the return to honey as a natural, multi-purpose healing therapy makes all the sense in the world.

Final Thoughts

Hopefully I've given you some "food for thought" here about the dangers of high-fructose corn syrup, why you should keep it entirely out of your diet, and how you can make wiser, more healthful food choices.

There are many tasty, nutrient-rich foods that can be incorporated into your diet that will diminish or even eliminate your existing health problems, instead of worsening them as HFCS does. Make the decision today to start giving your body the foods it needs to grow and thrive, and the rewards will be increased energy, vitality, and well being.