

The Potential Dangers of Sucralose (Splenda)

There's a new artificial sweetener on the block and it is already in a wide range of products ([CLICK HERE to see list](#)), some even sold in health food stores and manufactured by nutritionally-oriented companies. But is it proven safe? Does it provide any benefit to the public? Does it help with weight loss? Are there any long term human studies? Has it been shown to be safe for the environment?

The answer to all of these questions is unfortunately a resounding NO.

The artificial sweetener sucralose, which is sold under the name **Splenda**, is one of the up-and-coming "next generation" of high-intensity sugar substitutes. It is non-caloric and about 600 times sweeter than sucrose (white table sugar), although it can vary from 320 to 1,000 times sweeter, depending on the food application. The white crystalline powder tastes like a lot like sugar, but is more intense in its sweetness.

How it is Manufactured

Sucralose is produced by **chlorinating** sugar (sucrose). This involves chemically changing the structure of the sugar molecules by substituting three chlorine atoms for three hydroxyl groups.

History

Sucralose was discovered in 1976 by researchers working under the auspices of Tate & Lyle Ltd., a large British sugar refiner. In 1980, Tate & Lyle arranged with Johnson & Johnson, the world's largest health care company, to develop sucralose. Johnson & Johnson formed McNeil Speciality Products Company in 1980 to commercialize sucralose.

In 1991, Canada became the first nation to approve the use of sucralose.

In April, 1998 the US Food and Drug Administration granted approval for sucralose to be used in a variety of food products ([CLICK HERE](#) for complete list of products using sucralose). Diet RC cola was the first US product with sucralose, introduced in May 1998.

Sucralose is not yet approved for use in most European countries, where it is still under review.

Safety Concerns

Few human studies of safety have been published on sucralose. One small study of diabetic patients using the sweetener showed a statistically significant **increase in glycosylated hemoglobin (HbA1C)**, which is a marker of long-term blood glucose levels and is used to assess glycemic control in diabetic patients. According to the FDA, "increases in glycosylation in hemoglobin imply lessening of control of diabetes.

Research in animals has shown that sucralose can cause many problems in rats, mice, and rabbits, such as:

- Shrunken thymus glands (up to 40% shrinkage)
- Enlarged liver and kidneys.
- Atrophy of lymph follicles in the spleen and thymus
- Increased cecal weight
- Reduced growth rate
- Decreased red blood cell count

- Hyperplasia of the pelvis
- Extension of the pregnancy period
- Aborted pregnancy
- Decreased fetal body weights and placental weights
- Diarrhea

According to one source ([Sucralose Toxicity Information Center](#)), concerning the significant reduction in size of the thymus gland, "the manufacturer claimed that the sucralose was unpleasant for the rodents to eat in large doses and that starvation caused the shrunken thymus glands.

[Toxicologist Judith] Bellin reviewed studies on rats starved under experimental conditions, and concluded that their growth rate could be reduced by as much as a third without the thymus losing a significant amount of weight (less than 7 percent). The changes were much more marked in rats fed on sucralose. While the animals' growth rate was reduced by between 7 and 20 percent, their thymuses shrank by as much as 40 percent. (New Scientist 23 Nov 1991, pg 13)"

A compound chemically related to sucrose, 6-chloro-deoxyglucose, is known to have anti-fertility and neurotoxic effects, although animal studies of sucralose have not shown these effects.

According to the FDA's "Final Rule" report, "Sucralose was weakly mutagenic in a mouse lymphoma mutation assay". The FDA also reported many other tests as having "inconclusive" results.

Just how few studies currently exist on sucralose is an issue. Endurance News provides the following table illustrating this fact:

Sweetener	# of Studies*
Saccharin	2374
Aspartame	598
Cyclamates	459
Acesulfame-K	28
Sucralose	19

**Number of studies determined by MEDLINE search.*

In terms of safety, it is not just the original substance (sucralose) that one needs to worry about. As the FDA notes, "Because sucralose may hydrolyze in some food products...the resulting hydrolysis products may also be ingested by the consumer".

Is There Any Long-Term Human Research?

None. According to the Medical Letter on Drugs & Therapeutics, "**Its long-term safety is unknown**".

According to the [Sucralose Toxicity Information Center](#), the "Manufacturer's '100's of studies' (some of which show hazards) were clearly inadequate and do not demonstrate safety in long-term use".

Is Sucralose Absorbed or Metabolized?

Despite the manufacturer's claims to the contrary, sucralose is significantly absorbed and metabolized by the body. According to the FDA's "Final Rule" report, **11% to 27% of sucralose is absorbed** in humans, and the rest is excreted unchanged in feces. According to the Japanese Food Sanitation Council, **as much as 40% of ingested sucralose is absorbed**.

Plasma sucralose has been reported to have a half-life of anywhere from 2 to 5 hours in most studies, although the half-life in rabbits was found to be much longer at about 36 hours.

About 20% to 30% of absorbed sucralose is metabolized. Both the metabolites and unchanged absorbed sucralose are excreted in urine. The absorbed sucralose has been found to concentrate in the liver, kidney, and gastrointestinal tract. According to [The Sucralose Toxicity Information Center](#), sucralose is broken down "into small amounts of 1,6-dichlorofructose, a chemical which has not been adequately tested in humans".

Chlorinated Pesticides

According to Consumers Research Magazine "Some concern was raised about sucralose being a chlorinated molecule. Some chlorinated molecules serve as the basis for pesticides such as D.D.T., and accumulate in body fat. However, Johnson & Johnson emphasized that sucralose passes through the body unabsorbed".

Of course, this assertion about not being absorbed is complete nonsense. As shown above, a substantial amount of sucralose is absorbed, so the argument is not valid.

According to the HAD, "The manufacturer claims that the chlorine added to sucralose is similar to the chlorine atom in the salt (NaCl) molecule. That is not the case. Sucralose may be more like ingesting tiny amounts of chlorinated pesticides, but we will never know without long-term, independent human research".

Contaminants

The FDA acknowledges that sucralose "is produced at an approximate purity of 98%". While that may sound pretty pure, just what is in that other 2%? It turns out that the final sucralose product contains small amounts of potentially dangerous substances such as:

- Heavy Metals (e.g., Lead)
- Arsenic
- Triphenylphosphine Oxide
- Methanol
- Chlorinated Disaccharides
- Chlorinated Monosaccharide

Although manufacturing guidelines do specify limits on these substances there is no guarantee that such limits will always be met.

Environmental Concerns

Despite the fact that a portion of sucralose is metabolized into some chemicals of questionable safety, a majority of the consumed sucralose is excreted unchanged in the feces and urine. While that may be good for the person using the product, it may not be so great for the environment.

Although sucralose is being flushed down toilets wherever sucralose is approved for sale, what happens to it next is simply a matter for speculation. I know of no studies showing what happens to the chemical when the raw sewage is treated and then released back into the environment.

- Does it remain stable or react with other substances to form new compounds?
- Is the sucralose or any resulting chemicals safe for the environment?
- How will this chemical affect aquatic life such as fish, as well as other animals?
- Will sucralose begin to appear in our water supplies, just as some drugs are beginning to be found.

Of course, we will likely not know the answers to these questions for many years, if at all. One of the main reasons for this is that **the FDA did not require an Environmental Impact Statement for sucralose**, because in their words, "the action will not have a significant impact on the human environment".

One study did find that sucralose is metabolized by microorganisms in both the water and soil (Labare 94). However, the ecological impact of this new chemical being introduced into the environment is unknown.

Is There a Benefit for Consumers?

According to Consumers' Research Magazine, sucralose provides some benefits for the corporations making and using it, but not for consumers. They state:

But are such foods truly beneficial and desirable? Diabetics, weight watchers, and the general public might make better food choices by selecting basic, rather than highly processed foods; for example, apples, rather than turnovers; or plain, rather than sweetened, dairy foods.

They note that non-caloric artificial sweeteners are not replacing, but rather supplementing conventional sweeteners. They note that as of 1990 Americans were consuming an average of 20 pounds (sugar sweetness equivalency) of artificial sweeteners, and as consumption of sugar-substitutes has risen so too has consumption of sugar.

Does Sucralose Help with Weight Loss?

According to Consumers' Research Magazine "**There is no clear-cut evidence that sugar substitutes are useful in weight reduction. On the contrary, there is some evidence that these substances may stimulate appetite**".

Where is Sucralose Found?

In the United States, the FDA has granted approval for the use of sucralose in 15 food and beverage categories: (For a complete list of products containing sucralose [CLICK HERE](#))

- Baked goods and baking mixes
- Chewing gum
- Confections and frostings
- Fats and oils (salad dressings)
- Fruit and water ices
- Jams and jellies
- Processed fruits and fruit juices
- Sweet sauces, toppings and syrups
- Beverages and beverage bases
- Coffee and tea
- Dairy product analogs
- Frozen dairy desserts and mixes
- Gelatins, puddings and fillings
- Milk products
- Sugar substitutes

For a complete list of products containing sucralose [CLICK HERE](#)

Comparison to Other Sweeteners

Its promoters cite several benefits over other sweeteners, such as:

- Unlike saccharin, sucralose leaves no bitter aftertaste.
- Unlike other artificial sweeteners, it remains stable at high temperatures.
- Unlike sugar, it does not raise blood glucose levels

As a comparison to sucralose's 600-fold sweetness increase over sugar, consider the other artificial sweeteners on the market:

- Saccharin (Sweet-and -Low) - 300 to 500 times sweeter
- Aspartame (NutraSweet and Equal) - 150 to 200 times sweeter
- Acesulfame K (Sunette) - 200 times sweeter.

Big Business

A 1998 report in Chemical Week states that the high-intensity sweetener market is about **\$1.5-billion/year**. About 70%-80% of that market is made up of soft drink sweeteners, of which aspartame has a near monopoly. They note that although sucralose is 50% sweeter than aspartame, it will be difficult to persuade many soft drink producers to give up NutraSweet (aspartame) since it is widely accepted by consumers.

Is Anyone Monitoring Post-Approval Reactions?

Apparently not. With no established system for monitoring and tracking post-approval adverse effects, how can it ever be established whether large-scale and long-term consumption of sucralose is safe?

Technical Information

Sucralose is made from sucrose by substituting three chlorine atoms for three hydroxyl groups to yield 1,6-dichloro-1,6-dideoxy-BETA-D-fructofuranosyl-4-chloro-4-deoxy-alpha-D-galactopyranoside. This is accomplished in a five-step process.

Prolonged storage, particularly at high temperatures and low pH, causes the sucralose to break down into 4-chloro-4-deoxy-galactose (4CG) and 1,6-dichloro-1,6-dideoxyfructose (1,6 DCF),
The Chemical Abstracts Service Registry number (CAS Reg. No.) for sucralose is 56038-13-2.

Science Behind Sucralose Toxicity

Here are some of the specific biochemical reasons why you will want to give serious consideration to consuming sucralose.

Much of the concern is related to the fact that the manufacturer of sucralose claims that it is derived from sugar that contains the monosaccharide sucrose.

Look at the chemical name of sucralose: 1,6-Dichloro-1,6-dideoxy-beta-D-fructofuranosyl-4-chloro-4-deoxy-alpha-D-galactopyranoside. One would have expected that a product "made form sugar" as they say on the box, would be called: 1,6-Dichloro-1,6-dideoxy-beta-D-fructofuranosyl-4-chloro-4-deoxy-alpha-D-glucopyranoside.

Why does this molecule contain a chlorinated galactose moiety rather than a chlorinated glucose moiety if it is made from sucrose? When the molecule is hydrolyzed, chlorinated monosaccharides are produced from the product. Could it be that sucrose is not used due to the toxicity of chlorinated glucose?

Should Sucralose be Avoided?

The [Holistic Medicine](#) Web Page cites the following reasons to avoid sucralose:

- Pre-approval tests indicated potential toxicity of sucralose.
- There are no *independent* controlled human studies on sucralose (similar to 15 years ago for aspartame).
- There are no long-term (12-24 months) human studies of sucralose's effects.
- There is no monitoring of health effects. It took government agencies decades to agree that there were countless thousands of deaths from tobacco. Why? Simply because there had been no monitoring or epidemiological studies. Without such monitoring and studies, huge effects can easily go unnoticed.

Do Products with Sucralose Carry Any Warning Labels Or Information Statements?

No. The regulatory agencies and scientific review bodies that have endorsed the safety of sucralose have not required any warning information to be placed on the labels of products sweetened with sucralose.

Conclusions

The [Sucralose Toxicity Information Center](#) concludes that:

While it is unlikely that sucralose is as toxic as the poisoning people are experiencing from Monsanto's aspartame, it is clear from the hazards seen in pre-approval research and from its chemical structure that years or decades of use may contribute to serious chronic immunological or neurological disorders.

The **Consumer's Research Magazine** concludes that:

As Americans continue to choose ever-increasing amounts of such foods and beverages, sweeteners may soar to higher consumption levels. The long-range health effects from such escalation need careful evaluation. Do additional approved sweetening agents truly contribute to good health? Do they really meet special dietary needs? Or, do they merely further encourage poor dietary choices?

DR. MERCOLA'S COMMENT:

Don't let these large companies fool you. There is no magic alternative to sugar when it comes to sweeteners. You simply can not have your cake and eat it too when it comes to this area. It is far too early to tell, as not enough people have consumed this product to observe large numbers of adverse effects.

Over 200,000 people, including 25,000 health care professionals, receive the newsletter twice a week, and 2 million pages are viewed every month to help people find the answers to their health care questions.

However, I have had a number of patients in our Wellness Center who have had some severe migraines and even seizures possibly from consuming this product.

My advice?

AVOID Sucralose.

I am fond of telling people that if something tastes sweet you probably should spit it out as it is not likely to be good for you. This of course, is a humorous exaggeration, but for most people who struggle with chronic illness, it is likely to be a helpful guide.

PLEASE note this article is being written in 2000. This is one of the first comprehensive clear investigative reports and warnings on sucralose on the Internet.

Related Articles:

[The Dangers of Chlorine and Issues With Sucralose](#)

[12 Questions You Need to Have Answered Before You Eat Splenda](#)

Sources:

Food and Drug Administration "Final Rule " for Sucralose, 21 CFR Part 172, Docket No. 87F-0086.

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Q&A: Is newly FDA approved sweetener sucralose good for you? Executive Health's Good Health Report, Nov98, Vol. 35 Issue 2, p6, 1p, 1c.

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[Sucralose Toxicity Information Center](#)

[Splenda Product Web Site](#)

[Official Tate & Lyle Sucralose Web Site](#)

[Endurance News, Issue 26.](#)

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