

The Dangers of Splenda: A Feasibility Report

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Abstract

Throughout the spring of 2014, a study was conducted to see whether or not it would be feasible for the company who owns—McNeils Nutritionals Splenda, the zero-calorie sweetener, to be required to put a warning label on the packaging so customers would be aware of the adverse side effects from using the product. This report shows findings from primary and secondary research including research from the University of Alaska Anchorage Consortium Online Database and online questionnaires from 20 students of the University of Alaska Anchorage. Through this process, the research as shown that it is feasible for Splenda to add a warning label to their packaging so that customers know there are adverse side effects from using the product. Although there is enough research to show adverse side effects from using Splenda, more laboratory experiments should be conducted to overpower all the findings that show Splenda is not a danger.

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Introduction

On February 9, 2014, I received permission to conduct a feasibility report to find out whether or not there was enough information to prove that Splenda is unsafe enough to need a warning label on the product's packaging. There is a lot of information on the internet showing people have experienced adverse side effects such as headaches, stomach cramps, diarrhea, mood swings and more just from consuming food and drinks that contain Splenda (Truth About Splenda, 2008). Since most of the information out there is not proven scientifically, I wanted to conduct research to find out if it can actually be proven from laboratory experiments that Splenda is the reason people have been experiencing the listed adverse side effects.

Within the last few decades, obesity has become an enormous problem within the United States since food is so much easier to come by than it ever was before. Not only is food much easier to come by, but a shopper can find almost anything they are looking for at any given moment regardless of the time of year. Since food is so easily accessible now, the competition between different food companies to have the best, easiest, cheapest food product for consumers has grown. To make this possible, most of our packaged food products are filled with fake ingredients that the average person has no knowledge about and can rarely pronounce. For example, high fructose corn syrup (HFCS) is an inexpensive way to sweeten food and beverages. The use of HFCS has risen since being introduced into the food market, "In 1970 HFCS represented <1% of all caloric sweeteners available for consumption in the United States... [B]y 2000 represented 42.0% of all caloric sweeteners" (Bray, 2004). Instead of eating healthy and exercising, most shoppers are now looking for the easy way to consume fewer calories; this is where Splenda becomes part of the problem. Splenda is a zero-calorie sugar substitute and is being replaced for sugar in many of the sugary products on the grocery store shelf. People are

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also using it to substitute for baking and cooking, flavored syrups in their coffee drinks (or just Splenda sugar packets), in food products and even in chewing gum. Sugar in general is not good for the body, but consuming a lab-made sugar replacement can be even more damaging than sugar to the person ingesting the product.

Before I started actual scientific research about the side effects of Splenda, I had heard and read many claims of adverse effects people were experiencing from consuming the product. Although there are numerous more side effects listed, the most common ones I heard about were migraines, dizziness, rashes, brain fog, weight gain, and sugar cravings. Since the website I found these claims at is not a reliable source, I wanted to conduct real research from scientific journals to see if any of these side effects came up in lab studies (Truth About Splenda, 2008).

The United States also has a growing number of people suffering with diabetes and other blood sugar issues. People suffering with these issues need to be careful about their sugar intake, so Splenda has been one of the 'go-to' replacements for sweetened food and drink options. Before there were sugar-free options, people who had blood-sugar issues would not have been able to eat and drink sweets, but now they have so many choices to pick from.

I have also read that Splenda causes detrimental damage to water ecosystems. There are many ways that Splenda can enter into the rivers, lakes and oceans causing damage to the life in the water. Splenda is dumped down the drain in drinks that aren't consumed, flushed down the toilet after someone uses the restroom, and by other food products that contain Splenda that are tossed in the trash. I would like to find out if scientific research can back up these claims that Splenda is not only hurting our body, but hurting our ecosystems as well.

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Methodology

After making sure there was enough information to support my claims that Splenda is unsafe, I was given permission on February 9, 2014 to start research on my feasibility project. I started on the UAA Consortium Library's Online Database to find information to begin my secondary research to find peer reviewed journals that supported my claim.

After watching the video that Professor Soria put on the assignment page, I started searching through Google Scholar. I was very vague in the search engine and just put in "splenda" and that produced almost 8,000 hits. I narrowed my topic to "splenda adverse side effects" and that narrowed the search to 903 hits. I decided after that to go to the UAA Consortium Library Online Database subject page instead to see if that would produce a more manageable number of hits. I went to the Public Health section and used "splenda cancer" and narrowed the search to only full text online and peer reviewed publications. That produced 14 hits. After reading through the titles of those 14 articles, only four of them were relevant to my topic, so I continued searching under other topics to find more sources.

I repeated the same steps I used before in the topics of Dietetics & Nutrition, Health & Nutrition and Medical Laboratory Science. For all of these topics, once I narrowed down the search, I had about 25 hits for each of them. The same four articles showed up on all of these search engines, which I will be using to show my research claim is relevant enough to continue trying to prove. After I finished searching for articles through the UAA Consortium Library Online Database, I went back to Google Scholar and used more narrowed down search topics in the search engine. I used "splenda carcinogenicity" as one of the main topics to find articles, but did not have any luck with that topic. I found that using the UAA Consortium Library Online

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Database was much more reliable as a search engine than the Google Scholar, so I mostly stuck to the UAA Consortium Library for my article search.

After I read through the articles I thought were going to help me with my feasibility project, I learned that most of them did not help me, so I had to brainstorm a little more about some search topics. I read through the articles that did help me and decided to search for some of the issues that were listed in my useful work. I found that a shrinking thymus gland is a side effect as well as IBS (irritable bowel syndrome) (Lacy, 2011). I also found that there are issues with Splenda in our water system that requires extra steps of cleaning the water (Kessler, 2009).

Finally, I read through the abstracts and conclusions of all the articles I thought would be helpful to my research. The articles that were more vague or I didn't quite understand through the abstracts or conclusions, I read through the articles to make sure they would be useful for the paper. I have located seven articles and one book that I believe will be extremely helpful in my feasibility project to show that for one reason or another, Splenda needs to have a warning label on the packing so people will know that it isn't a safer replacement for sugar.

Criteria

To drive my research about Splenda not being safe for human consumption, I completed research on these following questions:

- Is there proven health risks to consuming Splenda?
- If there is Splenda in water, is it damaging to the life in those ecosystems?
- Is it possible for the FDA to recognize the dangers of Splenda and put a warning label on the product?
- Is there enough research to prove Splenda is harmful enough to need a warning label?

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Results of Research

One of the main issues that I have found while reading through the articles is that consuming Splenda negatively alters the bacteria in the gut and intestine (Abou-Donia, 2008). The study that shows the altered intestinal bacteria used rats in their laboratory study. The experiment was a total of 24 weeks, including 12 weeks of feeding the rats Splenda and 12 weeks of recovery time without Splenda. Although no rats died from the experiment, changing the environment of the intestine can cause a lot of damage. The bacteria in the intestine have multiple jobs including the synthesis of vitamins, nutrient metabolism, normal immune system functioning, gastrointestinal mobility, and inhibition of pathogens. As you might imagine, this could have a damaging effect to the human body. The use of Splenda in this study also showed increased body weight over the 12-week study. The reason the weight increased is from the bacteria in the gut being altered, “the composition of intestinal bacteria plays a major role in body weight regulation” (Abou-Donia, 2008). This study shows that just switching to a zero-calorie sweetener does not help aid in weight loss, but actually does the opposite by increasing body weight.

Another side effect that has been reported from consuming Splenda are migraines. In one study, a lady had been suffering up to ten migraines a month, but was not sure what had changed in her diet and life style to produce these migraines since she didn't normally suffer from them. After realizing the migraines happened after she would drink a diet soda sweetened with Splenda, she participated in a lab experiment where she would drink some type of sweetened drink which was either sweetened with Splenda or regular sugar and list the reactions (Bigal, 2006). The lab experiment found that Splenda was the reason causing the migraines. Another

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article like the one just noted, also listed crampy abdominal pain and bloating as a side effect from Splenda (Patel, 2006).

In addition, one of the articles shows that different pathways are activated in the brain when consuming artificial sweetener compared to regular sweeteners (Frank, 2008). Although this isn't as important to the research as some of the other information listed, it does show that there is a difference in how the body responds to artificial sweeteners and usually leads to overeating since the human body isn't being satisfied the same way it would be with natural sugar.

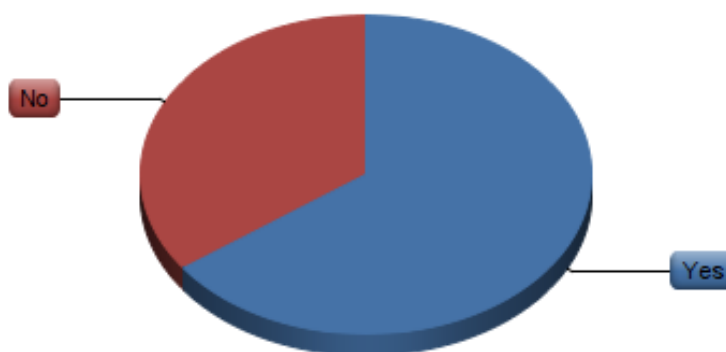
One of my research criteria questions was a little different than the others in that it didn't have to do with human consumption of Splenda. I had found during my research process that there were numerous studies conducted about how the waste products of Splenda affected the marine/aquatic ecosystems. One article in particular had shown that Splenda does not break down in the water, so there is waste left in the surface water. Before reading through the article, this sounded like a big deal that could really hurt the millions of organisms in the aquatic ecosystems, but as it turns out, the waste that does reach the water doesn't really affect the aquatic life. Even though some of the Splenda does not break down in the water, the amount that stays in the water is not enough to be dangerous, "As read-across from available mammalian toxicology information supports the current finding that sucralose does not cause toxic effects... In conclusion, the resulting conservative PEC/PNEC risk quotient is 0.08, thus indicating low risk to aquatic organisms" (Tollefsen, 2012). This section from the results of the study shows that even though there is a small amount of Splenda (sucralose) left in the water, it is such a small amount that it does not affect the aquatic organisms. Although Splenda is not a great

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option for humans to consume, this is one risk that can be scratched off the list adverse side effects from Splenda.

During the semester in which I conducted my research, I also created a questionnaire that 20 students at the University of Alaska Anchorage completed about their thoughts and opinions of Splenda. The age group of the participants mainly fell between ages 18-27 years old with a mixture between males and females. I wanted to gather information from the participants to find out the general overview of what the students know about Splenda and how they feel about the product.

One of the first questions the students were asked was if they are aware that ingesting Splenda has known side effects. I found through that survey that more people are aware of the side effects than not. **Figure 1** illustrates the findings that 65% of the students answered yes and 35% of the students answered no. Since we can see more students know that Splenda can cause side effects, it shows that there is a possibility that a majority of the population would probably not be against putting a warning label on Splenda's packaging if it can be scientifically proven that there are adverse side effects to ingesting Splenda.

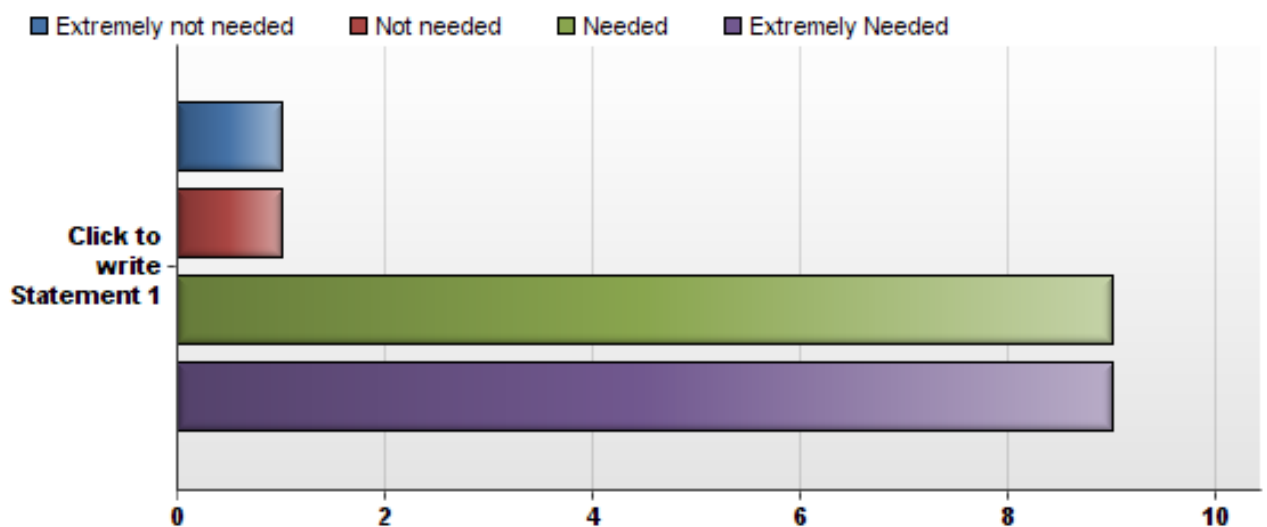


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Figure 1. Percentage of students aware of the side effects from ingesting Splenda.

65% of the students surveyed said they know about the side effects.

The same questionnaire gathered data from the participants about whether or not they believed Splenda should require a warning label about the possible side effects from using the product. Since we already know that a majority of the students are aware of side effects, it makes sense that a majority of the students also believe Splenda needs a warning label. As you can see from **Figure 2**, 18 out of the 20 students surveyed chose that Splenda either needs or extremely needs to have a warning label, opposed to the two students who think Splenda does not need or extremely does not need a warning label about the possible side effects. This survey question does confirm there is a correlation between the number of students feeling the importance of putting a warning label on Splenda about the side effects and knowing there are side effects from ingesting Splenda.



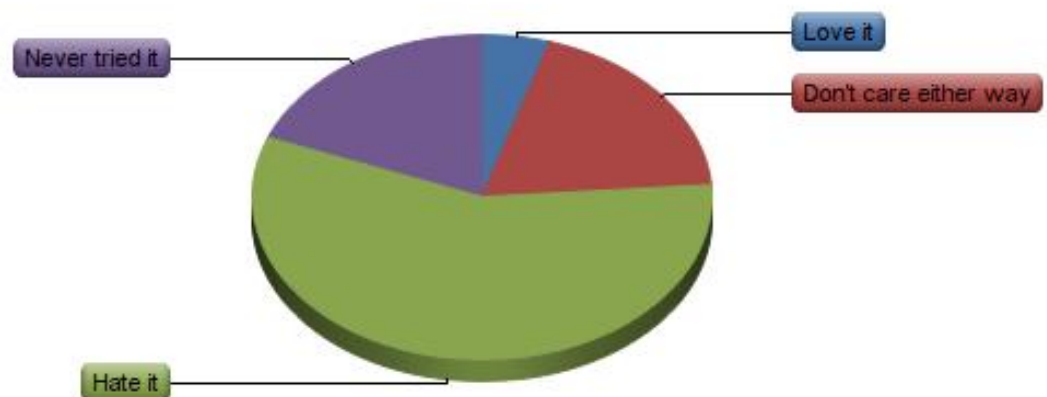
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Figure 2. Survey question about if Splenda needs to have a warning label on the packaging. 18 out of 20 students believe Splenda needs to have a warning label

In a different question in the survey, the students were asked how much they liked using Splenda. The options that students could pick from were:

- Love it (5%)
- Never tried it (19%)
- Don't care either way (19%)
- Hate it (57%)

The information shows that over 50% of the students surveyed hate the product. If you tie this survey question together and the one from **Figure 2**, you can see that although only 57% of those surveyed have very strong feelings against using the products, 90% of the participants still believe that there should be a warning label on the product about the side effects.



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Figure 2. Students were asked how much they like using Splenda. 53% of the students surveyed answered they hate Splenda, while only 5% love it.

Conclusion

Now that I have completed my research, I can prove that there are enough facts to show that Splenda is not safe for human consumption. Even though I would like to see a warning about the adverse side effects put on the Splenda packaging, I don't believe there is enough information to show that it is necessary for that to happen. As you can see through my research, there are plenty of adverse side effects; yet none of the reported side effects are bad enough to cause extreme danger for humans to consume. Although I do not recommend the use of Splenda in a person's diet, I do not think it is necessary that Splenda is required to put a warning label on the packaging about the negative side effects.

Recommendation

After reviewing my research, I do recommend that more laboratory experiments are conducted to find out if there are more long term side effects or just more side effects in general from using Splenda instead of real sugar. There are only a handful of long term studies conducted, and from those long term studies, all of them are on rats, not humans. Also, there should be more human studies done because even though our bodies are very similar in the way we process food, it is not exactly the same, so we don't know how human bodies will react in the long term.

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Appendix A: Questionnaire

Hi everyone, thanks for taking the time to take my survey. This survey will help me gather information about awareness of Splenda and the side effects. The survey will also help me find out how people feel about using the product. All of your answers will be kept confidential! If you have any questions about the survey, please contact Professor Soria. Thanks again!

-Nicole Britzman

What age group do you fall in?

- 18-22
- 23-27
- 28-32
- 33-37
- 38-42
- 43-47
- 48-58
- 59-69
- 70 and older

What gender are you?

- Male

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- Female

When you go to the grocery store, what generally influences you the most to purchase a certain food product over another?

- I pick the least expensive product
- I pick the more nutritious product
- I pick the brand name, regardless of price or nutrition
- I don't pay attention to price, brand or nutrition.

How important is it to you to eat healthy?

- Very important
- Neither Important nor Unimportant
- Very Unimportant

What are your thoughts about using Splenda?

- Love it
- Don't care either way
- Hate it
- Never tried it

Most diet and 'zero calorie' drinks are sweetened with Splenda.

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- True
- False

Are you aware that ingesting Splenda has known side effects?

- Yes
- No

If you answered yes to the above question, what are some of the side effects you know about.

Have you ever experienced adverse side effects from using Splenda?

- Yes
- No
- Does not apply, never tried it

If you answered yes to the previous question, please describe what your side effects were.

How important would it be to you that Splenda has a warning label of the side effects on the packaging?

___ Extremely Not Needed

___ Not Needed

___ Needed

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__Extremely Needed

Do you have another sugar-free product you would rather use instead of Splenda? If you do, what is it called?