CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY

Name(s)
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Project Number
J0604

Project Title
The Effects of Acid and Heat on Fructose Content

Abstract

Objectives/Goals
The objective is to understand the fate of fructose during food preparation and digestion; therefore, the effects of both heat and acid on the fructose content in food were studied.

Methods/Materials
Three different foods were used: applesauce, carrots, and canned spaghetti. Each food was prepared by mixing a portion with phosphate buffer saline that would keep it at neutral pH. Then this solution was exposed to four conditions: control condition, experimental condition 1(heat, no acid), experimental condition 2(no heat, acid), and experimental condition 3(heat, acid). Next the samples were diluted so that the fructose amount would come down to a measurable range. Finally, the diluted samples were mixed with chemicals from an assay kit to measure its fluorescence in accordance with the food's fructose content.

Results
The results showed that there is less fructose at no heat condition(mean=29.85) mg/g) when compared to the heat condition(mean=43.9 mg/g). This implies that fructose content increases when exposed to heat. The second set of results showed that there was more fructose content in the neutral acidic condition(mean=43.17 mg/g) than the acidic condition(30.58 mg/g). These results proved that fructose content decreases when exposed to acid. Out of all the foods, applesauce was proven to have the most fructose(mean=73.66 mg/g) than spaghetti(mean=30.78 mg/g) and carrots(mean=6.19 mg/g).

Conclusions/Discussion
In conclusion, fructose content decreased when exposed to acid but increased when exposed to heat. These results were unexpected because heat was expected to decrease fructose, along with acid. Fructose content increased when exposed to heat because; (1) The fructose attached to the food can dissolve into the liquid, which is what the fluorometer measures; (2) The glucose in the food can isomerize to fructose, thus increasing the measurable fructose. Fructose content decreases when exposed to acid because the chemical bonds in sugars separate easier when exposed to acid. These results suggest to the public that acidic conditions are always more favorable than heat conditions for food containing fructose and that eating food raw whenever possible does not pose as much health risks.

Summary Statement
As an ingredient in our food, high consumption of fructose leads to major disorders; therefore, the effects of heat and acid were tested on fructose content.

Help Received
Father taught how to execute fructose assay beforehand; Mother taught statistical analysis, Mr. Briner also assisted along the way.