CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)

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Project Number

35121

Project Title

Swimming In Sweetness: The Effects of Artificial Sweeteners on Daphnia magna

Abstract

Objectives/Goals

The objective of this project was to see if daphnia are affected by artificial sweeteners since some of these compounds have been detected in waste water, landfill leachate, watersheds.

Methods/Materials

The following sweeteners were tested at 0.25 and 25 mg/l: sucrose, saccharine, aspartame, stevia, sucralose and Truvia#. Spring water and caffeine were used as controls. Daphnia heart rates were measure after exposure to 0.25 and 25 mg/l of sweeteners for either 2 min or 24 hours. Long-term survival and reproduction studies were preformed by culturing daphnia in 25 mg/l sweetener solutions for 1 week, counting the daphnia and starting a new culture with the 10 largest daphnia. This was done for a total of 3 weeks.

Results

In the 2 minute, 0.25 mg/l study, sucrose and aspartame decreased the heart rate, while saccharine, sucralose, stevia and Truvia# increase the heart rate compared to spring water alone. In the 2-minute, 25 mg/l study, all sweeteners decreased the heart rate with the exception of stevia. In the 24-hour, 25 mg/l study, all the sweeteners significantly increased the heart rate, with saccharine increasing it the most. The generational study proved to be inconclusive since daphnia are very sensitive to culture conditions. In the two studies, high temperatures caused bacteria growth in cultures and many died off before the end of the experiments. For the third test, temperatures were better for daphnia growth, and all cultures had high population numbers and survived through the third week.

Conclusions/Discussion

In the 2-minute, 0.25 mg/l study sucralose, saccharine and stevia increased the heart rate slightly more than predicted at 11.8%, 7.8% and 16.3%. Truvia# had a less dramatic effect on heart rate than predicted at 25.1%, but it had the greatest impact overall. Interestingly, aspartame decreased the heart rate by 12.1% in contrast to the 19% reported. The hypothesis of the 2-minute, 25 mg/l studies was that the higher concentrations of sweeteners would increase the heart rates more than the 0.25 mg/l solutions. However, the heart rates decreased by 3.2%- 11.9% except stevia, with saccharine having the most dramatic effect. In contrast, exposure for 24 hours led to dramatic increases in heart rates ranging from 22.2%- 42.4%, suggesting stressful environments for the daphnia. The long-term generation studies were inconclusive due to limited results at optimal culture temperatures.

Summary Statement

A study on the effects of artificial sweeteners and natural non-nutritive sweeteners on Daphnia magna.

Help Received

Dad created app to slow recorded heart beat videos; Borrowed microscope from Marshall Middle; Mom helped with back ground literature and editing paper.

Preliminary