



**CALIFORNIA STATE SCIENCE FAIR  
2011 PROJECT SUMMARY**

<b>Name(s)</b> <b>Elizabeth A. Hughes-Brown</b>	<b>Project Number</b> <b>J1712</b>
<b>Project Title</b> <b>A Monster Problem? The Effect of Caffeinated Drinks on Heart Rate</b>	
<b>Abstract</b> <b>Objectives/Goals</b> The objectives are to determine 1) if caffeinated drinks, specifically soda and energy drinks, affect heart rate; and 2) if hidden ingredients in energy drinks compound their affect on heart rate. <b>Methods/Materials</b> Daphnia magna were used as a control system to study changes in heart rate following consumption of caffeinated drinks. In my initial experiment, the caffeine content of three sodas (Dr. Pepper, Coke, and Pepsi) and three energy drinks (Monster, Red Bull, and Rockstar) was determined. Three diluted energy drink solutions were prepared to have a caffeine concentration similar to that of soda. Water was obtained for use as a control. Five sample vials were prepared for each drink solution.  I determined the baseline heart rate of Daphnia by observing it under a microscope, counting its heart beats in 6 seconds, and determining beats per minute. One drop of drink solution was placed on the slide with the Daphnia. I waited 30 seconds to allow the caffeinated drink to be absorbed by the Daphnia. Final heart rate was determined by another six-second observation.  In the second phase of my experiment, I pre-screened Daphnia by determining heart rate for all Daphnia before beginning the experiment. Only Daphnia with a baseline heartrate of 180-220 beats per minute were used to re-test each of the caffeinated drink solutions. <b>Results</b> In my initial experiment, I found that caffeine does affect the heart rate of Daphnia. All caffeinated drinks produced an increase in both mean and median heart rate. The largest effect was seen produced by the high-caffeine energy drinks.  When the caffeinated drinks were diluted so that caffeine concentration was similar to that of soda, there was no significant difference in the effect on heart rate between the two groups. <b>Conclusions/Discussion</b> Based on the data, I concluded that energy drinks do affect heart rate. However, the difference in heart rate between the soda and dilute energy drinks was too small to conclude that hidden ingredients in energy drinks have a definite compounding effect. The most likely reason for the inconclusive data was variation in the baseline heart rate of the Daphnia. For this reason, I designed a second phase of the experiment to retest each drink using pre-screened Daphnia.	
<b>Summary Statement</b> I studied the effects of caffeinated drinks, specifically soda and energy drinks, on heart rate using Daphnia magna as a model system.	
<b>Help Received</b> My science teacher helped obtain Daphnia, edit paper, and prepare backboard. My mother purchased supplies for the backboard.	