



**CALIFORNIA STATE SCIENCE FAIR
2003 PROJECT SUMMARY**

Name(s) Elysse M. Applebaum	Project Number S1402
Project Title The Telltale Heart: The Effect of Various Stimulants on the Heart Rate of Daphnia magna	
Objectives/Goals Problem Statement: Which stimulant will initially raise the heart rate of Daphnia the most, and which will stimulate heart rates the most over time: nicotine, caffeine, or Ritalin? Hypothesis: I think that the Ritalin will affect the heart rate the most, since it is a controlled substance and therefore is probably the most potent.	
Abstract Methods/Materials Materials: 12 250 mL beakers, 1 Wards set of large Daphnia magna for 35 students, 1 Bag of Scotts Sphagnum Peat Moss, 6 Slides with depressions and glass slide covers, 1 Container Ritalin pills, 1 Compound bifocal microscope, 1 Container of Roti-Rich Liquid Invertebrate Food, 12 Pipettes, 1 Rite Aid Extra Strength Stay Awake! (caffeine pills), 1 Carton of Marlboro Filter Cigarettes (nicotine), Hot tap water/pot/stovetop, 1 Filter Procedure: A. Fill 12 250-mL beakers with 6 mL peat moss. Add 200 mL hot tap water. Allow solution to stagnate overnight. Designate 3 beakers each for caffeine, nicotine, Ritalin, and the control. B. Add 5-10 Daphnia to each beaker. Add one drop of Roti-Rich Food to each beaker 3 times a week. C. Crush caffeine pills and Ritalin and add 10 mg, 100 mg, respectively, to 1 L water to make a 10 ppm, 100 ppm, and solution. Make a tea out of the cigarettes, and boil off the hydrocarbons and filter the brew. Then add 300 and 3 mL, respectively, to 300 mL containers of water to create 100,000 and 10,000 ppm (the nicotine is not likely as concentrated as the pills). D. Observe Daphnia from each solution under the microscope prior to adding the stimulants and record it in the data. Count the heartbeat for 10 seconds and multiply by 6 for beats/minute. Add one drop of the nicotine, caffeine, or Ritalin solution, observe the change in heart rate, and record it in the data. Add 10 mL of the higher concentration to 1 beaker, 20 mL to the second and 15 mL of the lower concentration solution to 2 beakers for each respective test group. Measure the heart rates again after 24 hours.	
Results Results: Initially Ritalin raised the heart rate the most, but after 24 hours the beakers with the nicotine/tobacco brew still had high, consistent heart rate elevation.	
Conclusions/Discussion Conclusions: Ritalin will raise the heart rate the most initially, but a nicotine/tobacco brew (e.g. cigarettes) will stimulate the heart rate most during extended exposure.	
Summary Statement Observe how different concentrations of the stimulants caffeine, nicotine, and Ritalin affect the heart rate of Daphnia upon initial exposure and 24 hours later.	
Help Received Mr. Paul Hunt and Christine Yang provided advice/equipment; Dad (Dr. Jay Applebaum) provided the microscope, wrangled the Daphnia, took digital photographs, obtained Ritalin; Mom purchased cigarettes and caffeine pills; Dad and my sisters Dana and Nicole timed 10-sec intervals on timer while I counted	