



**CALIFORNIA STATE SCIENCE FAIR
2004 PROJECT SUMMARY**

Name(s) Rebecca A. Chan	Project Number J0804
Project Title Effects of Perchlorate and Turmeric on Daphnia Heart Rate	
Abstract Objectives/Goals Perchlorate contamination in the Colorado River is a pollution problem that has been recently identified. The objective of this project was to evaluate whether perchlorate salts would increase the heart rate of <i>Daphnia magna</i> and, if so, could turmeric, an antioxidant, reverse this effect? Methods/Materials <i>Daphnia magna</i> were exposed to three different concentrations of perchlorate solutions, 0.001 M, 0.01 M, and 0.1 M. In each test solution, the <i>Daphnia</i> were removed from the culture using a plastic disposable pipette. They were placed on a cavity slide and viewed under a 40X magnification video microscope. The time for 100 heart beats (contractions) was recorded using a stopwatch. This count was repeated twice for each result. Results An increase in heart rate was demonstrated upon exposure of <i>Daphnia</i> to perchlorate solutions. In spring water (the control), <i>Daphnia</i> heart rate averaged 215 beats per minute. In 0.001M perchlorate, the average heart rate was 221 bpm after 1 minute; 217 bpm after 15 minutes, and 215 bpm at 30 minutes. In 0.01M perchlorate, the average heart rate increased from 247 to 274 bpm after one minute, 297 beats after 15 minutes and 289 beats at 30 minutes. In 0.1M perchlorate the average <i>Daphnia</i> heart rate after 1 minute increased to 383 bpm, and to 403 bpm after 15 minutes. Addition of the antioxidant turmeric to <i>Daphnia</i> that had been exposed to 0.01M perchlorate for 15 minutes lowered the average heart rate from 369 to 331 bpm within 1 minute; the heart rate continued to decrease to 114 bpm after fifteen minutes. When <i>Daphnia</i> were exposed to a solution containing both 0.01M perchlorate and turmeric, the average heart rate dropped from 381 bpm to 269 bpm in just 1 minute. After 15 minutes the heart rate had dropped to 181 bpm. Conclusions/Discussion This study demonstrated an increase in heart rate in <i>Daphnia magna</i> upon short-term exposure to the oxidant contaminant perchlorate in water. The results also showed a dramatic reversal of this increase with the addition of the antioxidant turmeric. In the event of a toxic exposure to high perchlorate levels, turmeric may represent a natural, economic, and readily available antidote. These tests should be repeated to confirm the results.	
Summary Statement My project studies the short-term effects of perchlorate and turmeric on the heart rate of <i>Daphnia magna</i> .	
Help Received My teacher, Ms. Hunker, gave me wonderful advice. My father, Dr. Chan, helped me with the experiments.	