



**CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY**

Name(s) Anna D. de la Rosa	Project Number J1606
Project Title Bacterial-Busting Tea Bags? Effect of Caffeine Extracted from Used Tea Bags on Growth of Escherichia coli	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The experiment aimed to determine the effect of caffeine extracted from used tea bags on the growth of E. coli. My hypothesis was that caffeine would inhibit E. coli growth with higher caffeine concentration resulting in greater inhibition. My objective was to see if caffeine from a waste product could be used as an antibacterial agent against E. coli.</p> <p>Methods/Materials Each of six agar plates was divided into quadrants and inoculated with E. coli. Each quadrant (Q) had a 7 mm filter paper disk soaked in a specific concentration of caffeine. Caffeine used was extracted from steeped tea bags using 10 g of sodium carbonate and 15 mL of methylene chloride. The highest caffeine concentration solution (D) in Q4 was based on caffeine's solubility of 0.0217 g/mL at 77°F. Solution A in Q1 was 0% (control), Solution B in Q2 was 50% and Solution C in Q3 was 75% of Solution D, respectively. After incubating the plates at around 37°C for 48 hours, the zone of inhibition in each quadrant was measured.</p> <p>Results After 48 hours, five out of six agar plates formed a bacterial colony. The control quadrant (Q1) displayed the most E. coli growth. A zone of inhibition formed around disks soaked in most of the solutions with caffeine. Zone of inhibition was smallest in the quadrant with the least concentrated solution (Q2) and largest in the quadrant with the most concentrated solution (Q4).</p> <p>Conclusions/Discussion My results support the hypothesis that caffeine extracted from used tea bags can inhibit E.coli growth and that higher concentrations of caffeine would be most effective. This experiment shows that used tea bags could possibly be recycled to develop an everyday caffeine-containing household, as an ingredient to fertilizers in produce, and as a safer alternative to artificial preservatives in foods.</p>	
Summary Statement My project was to determine if caffeine extracted from used tea bags could inhibit the growth of Escherichia coli.	
Help Received Parents helped with purchase of materials; Science teacher and adviser provided guidance throughout the experiment.	