



**CALIFORNIA STATE SCIENCE FAIR
2013 PROJECT SUMMARY**

Name(s) Bristol Hume; Ava Sierra	Project Number J0607
Project Title The Effect of Surface Area on Reaction Time	
Objectives/Goals How does the diameter of a test tube affect the time it takes for the Elephants Toothpaste reaction to occur? Knowing how to control chemical reaction times by changing the diameter of a test tube could prove to be a valuable tool in a wide variety of scientific experiments. Our hypothesis is that the tube with the wider diameter will have a faster reaction time because there will be more molecular contact.	
Abstract How does the diameter of a test tube affect the time it takes for the Elephants Toothpaste reaction to occur? Knowing how to control chemical reaction times by changing the diameter of a test tube could prove to be a valuable tool in a wide variety of scientific experiments. Our hypothesis is that the tube with the wider diameter will have a faster reaction time because there will be more molecular contact.	
Methods/Materials <ol style="list-style-type: none">1. Label the 8 cm tube #Tube A# and the 5 cm tube #Tube B#.2. Put 1 teaspoon of active dry yeast dissolved in 2 Tablespoons of very warm water in Tube A.3. Put 50 mL of Dawn detergent in Tube A.4. Put 5-6 drops of food coloring into Tube A.5. Put 50 mL of 12% hydrogen peroxide in Tube A.6. Repeat steps 2-5 ten times in Tube A recording the reaction time each time beginning with the addition of the hydrogen peroxide and ending with the stopping of foam movement. Rinse the tube well with cold water between each test.7. Repeat steps 2-6 using Tube B.	
Results <p>For the smaller tube, Tube B, we averaged out the times to be 102.6 seconds. The range of times for all ten trials was 81-130 seconds. The foam created in the small tube came out smooth and steaming.</p> <p>In our bigger tube, Tube A, the average time was 69.95 seconds. The range of times for all ten trials was 45-105.2 seconds. The foam came out smooth and steaming.</p> <p>In trials 2 and 8 the reactions in Tube B actually took less time than the reactions in Tube A. We believe this occurred because Mr. Hume timed these two trials. He used a different timing method than all other trials that were timed by us.</p>	
Conclusions/Discussion <p>We found that the bigger test tube, with the larger diameter, worked as expected. The three centimeter difference between the two diameters was enough to show differences with our time results. Our hypothesis was correct because the chemical reaction in the small tube took longer to occur than the large tube. Knowing how to control reaction times by controlling surface area will be helpful in many laboratory experiments.</p>	
Summary Statement <p>In our project, we studied how surface area affects a chemical reaction called Elephants Toothpaste.</p>	
Help Received <p>The parents of Bristol Hume and Ava Sierra supervised the chemical reactions and collection of timing data. Kevin Hume built the test tube stands.</p>	