



**CALIFORNIA STATE SCIENCE FAIR  
2011 PROJECT SUMMARY**

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| <b>Name(s)</b><br>Naomi S. Menezes   | <b>Project Number</b><br><br>31700 |
| <b>Project Title</b><br>The Effect of Urea on Archaea Microbes' Consumption of Gasoline  |                                    |
| <p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b><br/>This purpose was to find a way to increase the rate that bacteria bio-remediate an area polluted with gasoline. Oil spills put 37 million gallons of oil in the ocean each year and some bacteria can consume it. It was hypothesized that the Archaea microbes mixed with 1.5 grams of urea would consume the most gas over an hour.</p> <p><b>Methods/Materials</b><br/>Materials used: beaker, graduated cylinders, stir plate, funnel, separation flask<br/>First 20 mL of water, 2 grams of bacteria, and either 0, 0.5, 1 or 1.5 grams of urea were mixed and put on a stir plate for 30 minutes. Then 20 mL of gasoline was added to this mixture for an hour. The mixture was then separated with a separatory funnel. The amount of gasoline separated was recorded and the amount of bacteria and water was recorded. This procedure was repeated five times for each amount of urea.</p> <p><b>Results</b><br/>For zero grams of urea an average of 1.3 mL of gasoline was consumed with a 0.4 mL deviation and a 1.1% deviation. 0.5 grams of urea had an average of 0.6 mL of gas consumed, a 0.8 mL deviation and a 1.0% deviation. For 1.0 grams of urea 3.3 milliliters was the average gas consumed with 0.7 mL average deviation and 0.9% deviation. The 1.5 gram of urea trial's average amount of gas consumed was 3.7 mL with a 1.1 mL average deviation and a 1.0% deviation.</p> <p><b>Conclusions/Discussion</b><br/>The hypothesis that the 1.5 grams of urea trials would consume most of the bacteria was supported. The 1.5 grams of urea trials had an average of 3.7 mL of gasoline consumed with a 1.1 mL average deviation and a 1.0% deviation. This was higher than the other three averages. When comparing 0.5 grams of urea trials and the 0 grams of urea trials the hypothesis was not supported. The 0.5 grams of urea trial had an average consumption of 0.6 mL while the zero grams of urea trials had an average of 1.3 mL of gasoline consumed. This data suggests that 0.5 grams of urea was not enough to stimulate the bacterial consumption of the oil. There is no pattern when adding more urea to the bacteria mixture, there is not a steady increase, only more gasoline was consumed. When comparing the bacteria and water, in order of increasing gasoline consumption, the data shows that more gasoline consumed yields more bacteria and water. Future research for this experiment could be to test the amount of urea or nitrogen to be added to an ocean environment to stimulate the oil consuming bacteria.</p> |                                    |
| <b>Summary Statement</b><br>800 ENVIRONMENTAL SCIENCE/ ECOLOGY   |                                    |
| <b>Help Received</b><br>My science teacher helped with the experimental design   |                                    |