



**CALIFORNIA STATE SCIENCE FAIR  
2002 PROJECT SUMMARY**

<b>Name(s)</b> <b>Holly A. Miles</b>	<b>Project Number</b> <b>S0805</b>
<b>Project Title</b> <b>Using Gas Chromatography to Analyze the Ability of <i>O. anthropi</i>, <i>B. cereus</i> and <i>P. putida</i> to Degrade Petroleum Oil</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> The objective of this study is to analyze the three bacteria's efficiency and characteristics concerning biodegradation, and determine the potential for application in oil spill clean-up. Also, to draw relationships between the rate of hydrocarbon degradation, time, and the number of carbons in the hydrocarbon chains.</p> <p><b>Methods/Materials</b> Nineteen 25ml saltwater samples were prepared in test tubes to simulate the salinity of the ocean. Three bacteria, <i>P.putida</i>, <i>B.cereus</i> and <i>O.anthropi</i>, were inoculated into four different tubes (12 samples ). The samples were contaminated with 1.25 ml of Exxon Crude Oil. After 18 days, the hydrocarbons were extracted from 2 samples of each bacteria and then analyzed with a Gas Chromatograph (GC). After 35 days, the analytical process was repeated using the remaining samples. Three sets of controls were run: one determining the original composition of the oil, one testing the composition after 18 days and one to determine the composition of the samples before contamination.</p> <p><b>Results</b> Data from this study is based upon chromatograms, the result of a gas chromatograph test. The bacteria were found to degrade the oil in the following order of efficiency: <i>P.putida</i>, <i>B.cereus</i>, <i>O.anthropi</i>. <i>P.putida</i> proved to be dramatically more effective than the other bacteria. All bacteria degraded more oil in the second interval of 18 days than in the first.</p> <p><b>Conclusions/Discussion</b> It was concluded that all three bacteria are capable of degrading petroleum hydrocarbons however <i>P.putida</i> is the most effective. It was found that the rate of degradation increases over time as the bacteria population increases exponentially. An inverse relationship was found between the number of carbons in a hydrocarbon and its biodegradability. This study also suggests that a prominent unifying characteristic of aerobic oleophilic bacteria is an oxygenase enzyme. Finally, it has been concluded that <i>P.putida</i> could effectively be used to clean up marine oil spills in its natural environment.</p>	
<b>Summary Statement</b> This project analyzes the ability of <i>O.anthropi</i> , <i>B.cereus</i> and <i>P.putida</i> to degrade petroleum hydrocarbons after a marine oil spill.	
<b>Help Received</b> Used Gas Chromatograph equipment at UCLA under the supervision of Dr.Indira Venkatesan and Professor Edward C. Ruth	