



# CALIFORNIA STATE SCIENCE FAIR 2006 PROJECT SUMMARY

<b>Name(s)</b> <b>Bryanna E. Paulson</b>	<b>Project Number</b> <b>J0813</b>
<b>Project Title</b> <b>The Effectiveness of Enzymes as Degradation Agents in Motor Oil</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> One day after a rain I noticed motor oil run-off from cars in the street drain. I wondered if there was a way to clean up the pollution without hurting the environment even more. I found a product on the internet created to clean motor oil stains. The cleaner contained bromelain, papain, and various other types of enzymes and chemicals. I decided to design experiments using bromelain and papain enzymes to break down motor oil. The goal of my project was to see whether bromelain or papain enzymes were effective in degrading motor oil on the water's surface or in a shore environment. I believed both would work, and that bromelain would be more effective than papain. I also believed that in the shore tests, the soil microbes might also help with cleanup.</p> <p><b>Methods/Materials</b> I carried out this project by using Chevron motor oil, distilled water, and samples of moist soil in small, clear cups. I performed four trials of the experiment, each with 20 samples: bromelain in a shore environment, papain in a shore environment, bromelain on water's surface, and papain on water's surface. I recorded the weight of the samples. I assessed the effectiveness of the degradation process by calculating the differences between the beginning weight measurements and the ending weight measurements. Biodegradation, a decay process performed by organisms, diluted the oil into carbon dioxide and water (water soluble compounds), causing the weight loss.</p> <p><b>Results</b> When papain was tested on the water's surface, the weight difference was 3.50%. When bromelain was tested on the water's surface, the weight difference was 0.70%. In the shore environment simulations, the papain mixtures had a weight difference of 18.74%. The bromelain mixtures in the shore environment simulations had a weight difference of 2.40%. My final results showed a significant difference in the effectiveness of the enzymes in the two environments. The results also showed papain to be much more effective in degrading oil.</p> <p><b>Conclusions/Discussion</b> My findings showed that the papain enzymes were more effective in degrading the oil in both environments. The results also showed that both kinds of enzymes were more effective in the soil environment. Using papain enzyme as an agent of degradation appeared to be an effective, nontoxic method for cleaning up motor oil.</p>	
<b>Summary Statement</b> The goal of my project was to discover which enzyme, bromelain or papain, is more effective in degrading motor oil in two different environments.	
<b>Help Received</b> I would like to thank the people that helped me to complete this project. I thank my mother for assisting me during my experiments. I also thank my father for his support and my sister for helping me set up my board.	