



**CALIFORNIA STATE SCIENCE FAIR  
2012 PROJECT SUMMARY**

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<b>Project Title</b> <b>Biodegradable Plastics: Our Environmental Solution?</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> The US produces eighty-two million football fields of trash every year. Over 90% of this trash ends up in oceans and landfills, and 80% of this is plastic. Society needs a true, biodegradable plastic to replace petroleum-based plastic. The goal of this project was to create two homemade, biodegradable plastics and compare them to a homemade petroleum-based plastic control.</p> <p><b>Methods/Materials</b> I created homemade plastics from gelatin, glycerin and water, milk and vinegar, and Styrofoam treated with acetone. They were molded into strips 10 cm x 2 cm x 0.3 cm and disks 0.3 cm thick x 6 cm in diameter and tested for breaking strength, shatter resistance and biodegradability. To test break resistance, the strips were clamped to a workbench and the other end stressed with weight until they broke. This was done four times for the gelatin-plastic, three times for the polystyrene, and twice for the milk-plastic. For the shatter test, two disks of each plastic were placed on concrete and a brick was dropped from increasing heights, starting at 5 cm, until the disks shattered. For biodegradability, four grams of each plastic was placed in a loaf pan filled with moist garden soil at 150 degrees. The weight of the plastic was measured hourly for three hours.</p> <p><b>Results</b> In the breaking strength test, the gelatin-based plastic was 10x stronger than the polystyrene control. The polystyrene did slightly better than the gelatin and significantly better than the milk-plastic in the shatter test. The gelatin-based plastic degraded completely; the milk-plastic slowly; and the polystyrene not at all.</p> <p><b>Conclusions/Discussion</b> The gelatin plastic appeared to perform as well, if not better than, the polystyrene. This may be due to its flexibility, which allowed it to bend before breaking. The milk plastic was a poor performer overall. The gelatin did seem to get harder as time went on, and further testing is needed to determine the ideal mixture of gelatin/glycerin and time to dry before testing. Also, though adding low-heat to the degradation was used to aid the microbial breakdown of the organic plastic, it may have added a component of thermal degradation that wasn't accounted for. Next time I will give myself more time and use both low heat and outside soil. The bottom line is that these results show that it is possible to create a degradable plastic that is strong enough to compete with petroleum-based plastic.</p>	
<b>Summary Statement</b> The experiment investigated whether it was possible to create a biodegradable plastic that can effectively compete with a petroleum-based plastic such as polystyrene.	
<b>Help Received</b> My mom purchased the materials needed to make the plastics as well as the display board.	