



**CALIFORNIA STATE SCIENCE FAIR  
2010 PROJECT SUMMARY**

<b>Name(s)</b> <b>Julia N. Daniel</b>	<b>Project Number</b> <b>S0503</b>
<b>Project Title</b> <b>Protecting Our Water: The Effects of Common Household Chemicals on the Decomposition of Acetaminophen</b>	
<p style="text-align: center;"><b>Abstract</b></p> <p><b>Objectives/Goals</b> To determine whether household chemicals can be used to decompose acetaminophen, which would allow consumers to treat their expired medications so they will not pollute local aquatic ecosystems after disposal.</p> <p><b>Methods/Materials</b> I made a stock acetaminophen solution and added to a sample of this solution a common household chemical that I was testing for effectiveness against acetaminophen - methanol, hydrogen peroxide, household bleach, or nothing (control). I used thin-plate chromatography and an iodine chamber to see whether a reaction had occurred and to obtain Rf values (distance spot traveled divided by distance solvent front traveled) for the products. The amount of treated solution applied to the plates and amount of acetaminophen in the treated solution before treatment were constants.</p> <p><b>Results</b> More than one Rf value was always obtained from a spot of bleach-treated acetaminophen, and the acetaminophen solution fizzed and formed a brown precipitate upon contact with the bleach. This happened no matter how many drops of bleach were used; when I used ten drops per milliliter, however, the effects were much more sudden. I found that no matter how many drops of methanol or hydrogen peroxide were used, the methanol had no effect on the acetaminophen, and the Rf values obtained for the untreated solution and for a methanol- or hydrogen peroxide-treated solution were consistently the same.</p> <p><b>Conclusions/Discussion</b> From the multiple Rf values obtained after bleach treatment, I concluded that more than one product was produced when pure acetaminophen was treated with bleach; the bleach decomposed the acetaminophen into simpler chemicals. It was clear that a reaction occurred between the bleach and the acetaminophen, due to the release of gas and the formation of a precipitate. Consumers may be able to treat their acetaminophen-containing drugs with bleach so they pollute less, and sewage treatment agencies may want to investigate treating sewage in a way that could decompose acetaminophen and possibly other pharmaceuticals as well.</p>	
<b>Summary Statement</b> I treated acetaminophen to see if a common household chemical could be used to decompose acetaminophen, which is a pollutant to aquatic environments. I found that chlorine bleach decomposes acetaminophen, and could be used before disposal.	
<b>Help Received</b> Chromatography advice from Mr. Oscar Acevedo; advice and photography help from my father; some experimentation done at Tamalpais High School chemistry lab under supervision of Dr. Leslie Hart, chemistry teacher. No help was received for experimentation, data collection/analysis or project assembly,	