



**CALIFORNIA STATE SCIENCE FAIR  
2015 PROJECT SUMMARY**

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| <b>Name(s)</b><br>Amy C. Dunphy  | <b>Project Number</b><br><br>35172 |
| <b>Project Title</b><br>Preventing Urushiol (Poison Oak) Induced Dermatitis by Deactivating the Allergen   |                                    |
| <b>Objectives/Goals</b><br>Urushiol-Induced Contact Dermatitis, usually called Poison Oak, is a allergenic reaction that afflicts over 80% of Americans following contact with the Poison Oak plant, as well as Poison Ivy and Poison Sumac. Currently, there is no existing treatment on the market to counteract the effects of the allergen. My objective was to find an effective countermeasure for poison oak. My strategy to do this was to polymerize the allergen, which is an oil called Urushiol. Literature suggests that polymerized Urushiol will not have an effect on humans.<br><b>Abstract</b><br><b>Methods/Materials</b><br>I hypothesized that a naturally occurring enzyme, Laccase, would polymerize the Urushiol allergen. First, I followed a procedure I found in literature to extract pure Urushiol from fresh poison oak leaves. Then, I experimented with varying the amounts of Urushiol and Laccase. I also added pH buffer to stabilize the Laccase and used 2-Propanol as an emulsifier. The polymerization efficiency was monitored using Liquid Chromatography Mass Spectrometry.<br><b>Results</b><br>I found that Laccase requires optimum mediums to function properly. Organic solvents such as Acetonitrile denature Laccase. In an aqueous environment with PH value properly controlled, Laccase successfully causes dimerization, and possibly polymerization, of Urushiol. Emulsifiers, such as 2-Propanol, assist the reaction by allowing Urushiol, an oil, to mix freely with the aqueous solution that Laccase functions in. I further propose a polymerization mechanism in which Laccase increases the degree of saturation of the alkene carbon chain and facilitates dimerization or polymerization.<br><b>Conclusions/Discussion</b><br>My results supported my hypothesis. Laccase is definitely a feasible way to prevent the rash. For future research, I would like to experiment with reacting the Urushiol and Laccase on a thin layer, as they would be reacting on skin, rather than in a vial. This would allow me to further optimize the reaction. In the long run, I could develop my findings into a product that would be a preventative measure for Poison Oak. |                                    |
| <b>Summary Statement</b><br>I found that under certain conditions, a naturally occurring enzyme, Laccase, effectively polymerizes the allergen in Poison Oak, which would then prevent it from affecting humans.   |                                    |
| <b>Help Received</b><br>Dr. Nicholas Conley showed me how to use the lab equipment and allowed me use of his lab.  |                                    |