



CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s) Amy C. Dunphy	Project Number 36431
Project Title Preventing Urushiol (Poison Oak) Induced Dermatitis by Deactivating the Allergen	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Approximately 80-90% of Americans develop allergic reactions upon contact with poison oak or poison ivy. The allergen in both of these plants is a molecule known as urushiol, which binds to skin cells and triggers an autoimmune response. Currently there is no effective countermeasure available to chemically deactivate the urushiol allergen. The objective of my research is to find a way to polymerize urushiol, as the polymerized form does not affect humans.</p> <p>Methods/Materials Tested new method to isolate urushiol from poison oak leaves by using vacuum, dry ice and chloroform. Explored benzoyl peroxide as urushiol polymerization agent at varying concentration, reaction time and temperature. Characterized polymerization reactions with Fourier Transform Infrared Spectroscopy (FTIR). Quantified urushiol polymerization efficiency by Liquid Chromatography Mass Spectroscopy (LCMS).</p> <p>Results The new urushiol extraction method I developed produced urushiol in 1/10 of the time as used in literature. Benzoyl peroxide could effectively polymerize urushiol, as supported by FTIR signatures and LCMS results. Quantitative LCMS analysis further showed that less than 2% of urushiol monomer remained after reacting with benzoyl peroxide under optimal condition.</p> <p>Conclusions/Discussion I successfully developed a far more efficient method to isolate urushiol from poison oak leaves than published procedures. I discovered that a known oxidizer, benzoyl peroxide, is capable of effectively polymerizing urushiol to up to 98% under optimal conditions. I demonstrated that with my new scheme I can reduce the active urushiol content extracted from one whole poison oak leaf to less than one third of the sensitivity level of an average adult.</p>	
Summary Statement I found a way to chemically deactivate the allergen in poison oak and poison ivy to below 1/3 of the sensitivity of an average adult.	
Help Received Dr. Nick Conley showed me how to use FTIR and LCMS, allowed me to conduct my research in his lab at Epibiome Inc. He also reviewed my results at end of my research and provided valuable discussions.	