Preventing Urushiol (Poison Oak) Induced Dermatitis by Deactivating the Allergen

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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. The objective of my research is to find a way to polymerize urushiol, as the polymerized form does not affect humans. Last year I attempted to follow the literature by using laccase, an enzyme, to polymerize urushiol. The reaction efficiency was too low. I observed, however, that ruptured poison oak leaves secrete a yellow oil, which turns brown and sticky shortly after exposure to air. I deduced that urushiol oil could be extracted by physically damaging the leaves in an oxygen-free environment (to prevent oxidation). I further hypothesized that an oxidizer stronger than atmospheric oxygen could polymerize urushiol more effectively than laccase. Following these hypotheses, 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 as determined by quantitative Liquid Chromatography Mass Spectrometry analysis. I demonstrated that with my new scheme I can reduce the estimated amount of urushiol people come into contact with to less than one third of the sensitivity level of an average adult. Benzoyl peroxide therefore can be used as a preventative measure against poison oak on humans.

Awards Won:

Second Award of $2,000