



# CALIFORNIA STATE SCIENCE FAIR 2014 PROJECT SUMMARY

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<b>Project Title</b> <b>The Effects of Various Marinades on the Denaturation of the Carcinogen PhIP Found in Grilled Chicken</b>	
<b>Objectives/Goals</b> This experiment's primary objective is to investigate how various marinades ranging in pH can denature the concentration of PhIP (a carcinogen and heterocyclic amine) prevalent in cooked chicken meat. This project comprises of the following components: (1) finding a correlation between an increased concentration of PhIP over time through cooking, (2) Exhibiting how various pH's of tested marinades can denature the concentration of PhIP, and (3) Utilizing spectrophotometry to analyze the percentage of light transmittance and concentration of PhIP through marinade samples over time. <b>Abstract</b> <b>Methods/Materials</b> A spectrophotometer was utilized to analyze light transmittance (%) and concentration in (g/L) of PhIP in cooked chicken samples. Each of these samples had been marinated for an hour under refrigerated conditions, the following marinade samples were tested: lemon juice, orange juice, soy sauce, teriyaki sauce, brown sugar, and plain chicken breasts. The control applied was orthotolidine, a carcinogen, diluted with water. This chemical component was utilized due to its similarities in composition and structure to that of PhIP. There were three trials conducted for each marinade and three additional cooking times of 5, 8, and 11 minutes were evaluated. The average values of the light transmittance and concentration were calculated and plotted for each tested cooking interval to compare which samples contained the greatest correlation to PhIP's concentration. <b>Results</b> The light transmittance (%) and concentration of diluted orthotolidine was 100% and 0.118 g/L respectively. The accuracy of these models may be reflected by the averages of the samples in comparison to that of the measured control. Additionally, it was found that the lower the pH of a given marinade, the concentration of PhIP would also reduce, however, the concentration of PhIP would increase over cooking time with additional exposure to sugars. <b>Conclusions/Discussion</b> The analysis of the following marinades in regards to the denaturation of PhIP through its protein structure and formation in creatine is essential towards the analysis of carcinogens and their effects on the structure of DNA. Furthermore, this study conducted could be incorporated towards the inquiry of heterocyclic amines and how organic compounds such as acetic acid found in lemon juice may lead to the development of inhibitors that can prove to be promising for cancer research.	
<b>Summary Statement</b> We developed an experiment to identify a marinade that would most effectively denature the concentration of the carcinogen, PhIP, in grilled chicken; likewise, correlations between carcinogenic content, pH, and cooking time were considered.	
<b>Help Received</b> The science department at our school provided us with the equipment needed to perform our experiment in addition to critique of our board and report.	