



**CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY**

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Project Title Neutralizing the Effects of Alcohol In the Body Using Citric and Acetic Acid	
Abstract Objectives/Goals In today's world, many instances of alcohol abuse and engagement are common and evident. There are various consequences of this behavior, ranging from a hangover the next day to drunk driving accidents that can have fatal consequences. More than 10,000 people died in drunk driving accidents in 2016. Because of these heartbreaking facts, we wondered whether there was a method that could minimize the effects of alcohol in the body. After subsequent research, we found that orange juice and vinegar were two substances that claimed to decrease the effects of alcohol without previous experimentation. Based off this claim, we decided to test citric and acetic acid. Methods/Materials In order to measure the effect of citric acid and acetic acid respectively, the hydrometer method was used. A hydrometer is an instrument that measures the specific gravity of liquids, which is related to density. We made our own hydrometer using three washers and a pipette. We used the hydrometer to measure the initial density and density after one hour. We added varying concentrations from 0-50% acetic acid, and 0-4.0g citric acid to a 100 mL 20% ethanol solution; We also performed trials with and without sulfuric acid acting as a catalyst. Results For acetic acid without the catalyst, the density increase peaked at 30%. After 30%, the effect of acetic acid on the neutralization of alcohol was not as productive. Citric acid's productivity without a catalyst peaked at .25 grams. We observed no increase, and therefore no reaction, from 1-4 grams. In comparing the non-catalyzed and catalyzed reactions for acetic acid, the non-catalyzed reaction was more effective at every concentration. In comparing the non-catalyzed and catalyzed reactions for citric acid, the reaction with the catalyst was much more effective. Conclusions/Discussion Acetic acid was more effective than citric acid without the catalyst, but citric acid was more effective with the catalyst. For one drink of alcohol, a 28.5% concentration of acetic acid is recommended, or a 2.05g concentration of citric acid. Using these concentrations will allow the alcohol to be most efficiently neutralized in the body.	
Summary Statement This project has given a novel method of neutralizing alcohol in the body through an esterification reaction that occurs between acetic and citric acid.	
Help Received Our chemistry teacher, Dr. Rano Sidhu, provided us with materials and guidance in our method.	