



CALIFORNIA STATE SCIENCE FAIR 2014 PROJECT SUMMARY

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Project Title In Pursuit of a Major Breakthrough in Cryobiology	
Objectives/Goals If an applied electric field can affect the formation of hydrogen-bonds in water during freezing such that the molecules no longer align to form a crystalline lattice structure, then water frozen in an electric field will experience an increase in density and will no longer crystallize and puncture the tissues. Abstract Methods/Materials <ol style="list-style-type: none">1. Carefully measure two cups of water, fill the non-conductive bowl and freeze.2. Remove the ice and measure density using the water displacement method as a basis for comparison.3. Fully charge up the Van De Graff generator in a low humidity environment. (If you have access to an E-field meter, record the field at six inches from the charged surface)4. Measure out 2 cups of water and fill the non-conductive bowl (use the same type of water)5. Place both the water and generator in the freezer environment at -18 C or lower6. Suspend the water near the charged generator and freeze the entire assembly.7. Remove the ice and measure density using the water displacement method. (Observe whether the ice floats or sinks).8. Compare the volumes of the two frozen masses and record approximate densities.9. Repeat experiment 3 times to obtain averaged results. Results <p>The density of the water tested was largely unaffected in the presence of an electric field. Although there were slight fluctuations in the densities, they were well within the expected levels of variability. The results show that the water was not conclusively affected by an electric field.</p> Conclusions/Discussion <p>Unfortunately, the results of the experiment did not support the hypothesis. This most likely indicates that the hypothesis is incorrect, or that the E field was not strong enough to cause the water molecules to realign. Furthermore, the methods employed to measure the quantitative data collected were crude at best. When conducting future experiments it is advisable to instead use a high voltage transformer in conjunction with parallel plates, one acting as an anode and one as a cathode, and also to use more sophisticated tools and procedures when conducting and measuring the results of the experiment. If a similar experiment can be conducted with positive results, methods could be developed in the field of cryobiology to potentially prevent blood crystallization and consequent puncturing of the blood vessels.</p>	
Summary Statement This project attempts to create "dense ice" in a manner practical for application to the field of cryobiology, which could enable major scientific advancements.	
Help Received Inspired by Australian Chemistry and Physics class; Parents funded materials; Parents revised diction and syntax.	