



**CALIFORNIA STATE SCIENCE FAIR
2011 PROJECT SUMMARY**

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Project Title Stopping the Impact: Impact Resistance of Liquid Body Armor	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals The purpose of this experiment was to test the impact resistance of an STF (shear-thickening fluid) at different temperatures. STFs have been investigated as possible replacements for Kevlar in body armor, however the effects of temperature have not been looked at. Determining the effect of temperature on the ability of the STF to reduce impact may allow the use of STFs in body armor or pierce-resistant materials.</p> <p>Methods/Materials The STF was prepared by mixing cornstarch and water in a 2-1 ratio. I dropped a pointed, heavy object into a 14-millimeter layer of STF and measured the impact in a thin layer of clay that was placed behind it. By measuring the depth of impact with and without the STF, I could determine the impact resistance. The temperatures of both the clay and the STF were then varied over the temperature range of 8 C - 45 C, and the impact resistance again measured.</p> <p>Results When the temperature increased, the percent of impact resistance decreased, and when the temperature was lowered below room temperature, the impact resistance went up. This was consistent with my hypotheses.</p> <p>Conclusions/Discussion For use as liquid body armor, we need to know that this STF has less impact resistance in warmer temperatures, and more impact resistance in colder temperatures. For use in hot climates, this STF will not protect as well as in cold climates. In ocean diving, pierce-resistant materials are often used as shark suits, and this STF would work better in lower temperature waters than warm tropical waters.</p>	
Summary Statement I examined the effect of temperature on the impact resistance of a cornstarch/water suspension, which can be used as liquid body armor.	
Help Received My father helped me make the recipe for the shear-thickening fluid and took the photographs of the experiment's results.	