



# CALIFORNIA STATE SCIENCE FAIR 2015 PROJECT SUMMARY

<b>Name(s)</b> <b>Akshay K. Srivastava</b>	<b>Project Number</b> <b>S1528</b>
<b>Project Title</b> <b>The Effects of Temperature on Exoelectrogenic Bacteria with Applications to Microbial Fuel Cell Performance</b>	
<b>Abstract</b> <b>Objectives/Goals</b> The purpose of this experiment was to determine the sensitivity of exoelectrogenic bacteria to temperature, especially with regards to their abilities to facilitate electron deposition on extracellular electrodes at high temperatures. <b>Methods/Materials</b> In this experiment, a two chamber microbial fuel cell was constructed by immersing one iron electrode into a 200 mL. solution rich in exoelectrogenic bacteria and another identical electrode in a solution of distilled water. The two electrodes were then connected to a multimeter, which measured potential difference, and the two chambers of the fuel cell were connected using a KNO <sub>3</sub> salt bridge to allow an exchange of charges between the two chambers. This apparatus was then heated at a constant rate using a hot plate, and periodic temperature and voltage readings were taken. <b>Results</b> It was found that in the early stages of heat treatment, microbial fuel cells display a strictly increasing set of voltage outputs. However, at some specific temperature, which varied largely from trial to trial, voltage output sharply decreases to zero. After this point, no further voltage was produced by the fuel cell, suggesting that the bacteria themselves had been permanently damaged at this point. <b>Conclusions/Discussion</b> In this experiment, it was found that exoelectrogenic bacteria display a high sensitivity to temperature, but one that also exhibits a large variance. This suggests that cell death is not the main cause of the sudden loss voltage observed, as bacteria were shown to survive beyond the temperatures of some of the voltage drops, but rather some sort of premature damage to the bacterial structures involved in electron mediation. However, in order to confirm these findings and further understand possible solutions to this problem, further studies on the structures of exoelectrogens involved specifically in electron mediation, such as the nanowires of Geobacter, would have to be conducted.	
<b>Summary Statement</b> The electron mediation structures of exoelectrogens are sensitive to temperature.	
<b>Help Received</b> Worked in high school laboratory under supervision of Kathleen Meyer; Had some discourse with Professors Glenn Hicks and David Carter at UCR	