



CALIFORNIA STATE SCIENCE FAIR 2011 PROJECT SUMMARY

Name(s) Justin W. Winslow	Project Number 31380
Project Title Microbial Fuel Cells: An Alternative Electricity Source from Mud?	
Abstract Objectives/Goals Objective/Goals: To design a microbial fuel cell using decomposing anerobic organic sediment and test which of two sources of sediment, fresh water or salt-water, can generate more microbial fuel cell electric current. Methods/Materials Methods/Material: Sediment microbial fuel cells were designed by first showing that the electrodes, electric circuit and detection system worked in a microbial fuel cell kit positive control. Deep fresh water sediments from 3 sites, and salt-water sediments from 2 sites, were collected as was the water above each sediment. Using 14 cm x 14cm x 22cm plastic jars, sediment was placed in half the jar, with a carbon fiber electrode as the anode placed in the middle of the sediment. A similar piece as the cathode was placed in water from the same source above the sediment. An electrical circuit was set up, and current and voltage was measured every 8 hours for five days using a multimeter. Results Results: Current (uA) and voltage increased over 3-4 days following setting up of each microbial fuel cell and then leveled off during days 4-5. Greater final current (uA) was observed from the 2 salt water sediment microbial fuel cells and water than from 3 made from fresh water sediment. The voltage was higher in fresh water sediment fuel cells. A negative control made by killing the bacteria by boiling the sediment had lower current and voltage, suggesting that the fuel cell electricity was produced by microbes. Conclusions/Discussion Conclusions/Discussion: The data I collected was different than my hypothesis as I thought the fresh water sediment would have richer anerobic nutrients and generate more bacteria and electrical current, but salt-water sediment produced more current. This may be useful as an electrical source in the ocean and for organic sediment recycling. Although the current was low (~200mA), it appears to be biologically generated as the current increased with time, and the current was greatly reduced in a negative control fuel cell made with boiled sediment.	
Summary Statement My project tested whether an alternative electrical source can be generated by sediment bacteria, and which sediment produced the most electricity.	
Help Received My science teacher and dad discussed parts of my project; A scientist advised me on one of the challenges that arose- filters for colloidal suspension and background current; Dad drove/helped pay for supplies.	