Application of Microbial Fuel Cell Biosensors in Detecting Water Pollution

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The purpose of the experiment was to expand upon the ultimate goal of creating a Microbial Fuel Cell (MFC) -based biosensor through a Proof of Principle. The MFC was tested with an opening and closing anode and an open cathode in the controlled environment of a backyard pond. The student utilized a self-built single-chamber (open-cathode) MFC to discover the effect of different amounts of liquid fertilizer in water samples on the electrical output of an open-cathode microbial fuel cell. The anode and cathode were connected together by a salt bridge, and both sides were exposed to carbon cloth electrodes. To test the electrical output, the students used a multimeter to record electric voltage and adjusted the nitrogen and phosphorous content in the pond in intervals of 0, 10, 20, 30, 40, 50 drops of liquid fertilizer, administered in intervals every week during a 6 week period. The voltage, weather, and water temperature were recorded every 24 hours from the start of the experiment. The first week was important in determining that the electrical values could sustain a constant electrical voltage to provide a comparative baseline for subsequent tests with agricultural fertilizer. This test proved that an open-cathode MFC can provide a constant electrical voltage, though within a certain range and only after an acclimation period and revealed that the novel MFC responded to changes in agricultural fertilizer with significant sensitivity. This experiment ultimately indicated the MFC's feasibility as a biosensor.

Awards Won:

Fourth Award of $500

Drexel University: Full tuition scholarship $200,000