The Effect of Bacterial Metabolism on the Redox-Potential of Microbial Fuel Cells

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This experiment was designed to determine if bacterial metabolism plays an important role in soil-based Microbial Fuel Cells based on its increase or decrease in voltage, amperage, wattage, and chemical process the soil microbes undergo. Using two controls (100% soil and Mililani Red Dirt) and six variables add soil mixtures accordingly into 8 mason jars. Put in copper and zinc electrodes on opposite ends in the soil. Soldered the wires to the electrodes and checked for the voltage and amperage until the 22 day period and repeat it. Did agar plating, gram staining, and microscopic viewing of bacteria and conducted an Oxidative-Fermentation test to see if the bacteria oxidized or fermented and to test motility. The variable soil+ peptone had the highest linear trend and the highest average in microwatts. Mililani Red Dirt glucose had the highest average in voltage. The soil microbes (bacteria) were all gram negative and the pH was neutral. The seven variables and one control were mostly fermentative except for 100% soil and soil + peptone which were oxidative. In conclusion, proteins, glucose, and organic matter along with bacterial metabolism do play an important role in soil-based MFC's. Soil microbes metabolize proteins and organic matter into smaller molecules to release energy or ATP using oxidation or fermentation. They undergo glycolysis and the Krebs cycle to metabolize. These chemicals then get transferred to the electrodes to make electricity. The more electron producing, metabolic bacteria are in the soil, the more electricity the soil-based MFC produces.