Sustainable Energy and Water Purification through the Oxidation of Anaerobic Bacteria

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Our world is running out of fossil fuels! Scientists are continually looking for ways of producing the power needed to sustain our way of life. Solar, geothermal, wind, and nuclear power are alternative sources but have ecological consequences. This is where the microbial fuel cell (MFC) comes in. During my research I found that the microbial fuel cell is made of four parts: the anode which holds the waste material containing the bacteria, the cathode which holds a conductive saltwater solution, the proton-exchange membrane which is a salt bridge in which the electrons can travel and that separates the material from the anode and cathode, and the external circuit. As part of the digestive process, the bacteria create electrons and protons known as oxidation. The electrons are collected out of the solution onto an electrode and are then conducted through an external circuit. I decided to use a MFC to determine if the anaerobic bacteria (does not need oxygen) in pond mud/water that produce electric current will peak, then stop producing current as they die off from lack of fresh nutrients. I constructed three fuel cells, all filled with a sample of the pond mud/water. I tested each fuel cell using a multi-meter measuring the current in millivolts for 30 days. The data shows that my hypothesis is supported in that there was a peak production time (between 8 & 15 days) of each sample, however, the electrical current did not diminish as quickly as I expected. Although my experiment could not support all the electricity for a house in its current size, a proportionately larger system could be designed which could incorporate the anaerobic bacteria found in a pond in a configuration that could support a home such as my dream cabin in the mountains.

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