Evaluating Feasibility of Using Microbial Fuel Cells as Power Supply for Implantable Medical Devices

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Microbial fuel cells (MFCs) have been shown to efficiently generate electricity from organic compounds and to serve as a method for waste treatment. Another possible application for this technology that has currently gained little attention is to generate power within the human body. Numerous implanted biomedical devices require power that is generally supplied by batteries with a finite life, necessitating another surgery to replace the power source. A method for continuously generating electricity within the body would revolutionize biomedical devices and enhance patient care. This experiment sought to find a new way to provide lasting and secure power for implantable medical devices (IMDs) using a MFC to be placed in human large intestine and one that could utilize intestinal contents and microorganisms to generate electricity. The hypothesis was the operation of the microbial fuel cell in the simulated intestinal fluid would not have a significant effect on pH and DO levels. The average current over the half hour was .42 milliamps, the average top dissolved oxygen level was 1.33 mg/L while the bottom was 1.02, the average top pH was recorded at 7.33 while the bottom pH was recorded around 7.84. In conclusion, a microbial fuel cell can be operated in simulated intestinal fluid without altering both pH and DO levels. This new generation of sustainable power source in a human body will nearly eliminate the expense and risk of replacing conventional implanted batteries, resulting in extended longevity of implantable medical devices.