Indian Institute of Technology Delhi

DEPARTMENT OF BIOCHEMICAL ENGINEERING & BIOTECHNOLOGY

Faculty Candidate Seminar

3 PM, Tuesday, Nov 27, 2018

DBEB Committee Room (I-230)

"Electromicrobiology: Following the extracellular electrons"

Dr. Lucinda Elizabeth Doyle

Singapore Centre for Environmental Life Sciences Engineering

Nanyang Technological University, Singapore

All are welcome

Electromicrobiology: Following The Extracellular Electrons

Lucinda Elizabeth Doyle
Research Fellow
Singapore Centre for Environmental Life Sciences Engineering (SCELSE)
Nanyang Technological University, Singapore

The field of electromicrobiology focuses on extracellular electron transfer (EET); an unusual mode of microbial respiration involving the use of solid external electron acceptors, such as metal oxides in nature and electrodes in the laboratory. This is in contrast with more conventional respiration that relies upon soluble molecules, such as oxygen or nitrate, that diffuse inside the cell to accept electrons. Microorganisms capable of EET are often termed “electroactive” as their activities result in an extracellular flow of electrons. Research in this area has primarily been application-driven in an effort to capture the extracellular current through use of bioelectrochemical devices such as microbial fuel cells. However, this technology has not been developed to the point of widespread industrial implementation due to limited power output, likely related to a lack of fundamental understanding of how and why EET occurs in nature.

In this talk, I will discuss my research which has focused on enhancing our understanding of EET by shifting the perspective from which we view electroactive microorganisms. The application of microbial electrochemistry techniques to detect EET in unconventional contexts has resulted in the isolation of novel microorganisms, the real-time monitoring of redox-active metabolites in a live culture of *Pseudomonas aeruginosa*, and the finding that EET is affected by pressure, with implications for deep-sea microbial research. Perhaps most unexpectedly, the approach led to the discovery of a new form of metabolism in the human commensal *Enterococcus faecalis*, whereby it uses EET to power its biofilm. This was the first case of EET outside of environmental microbiology and potentially implicates the process in medical microbiology. Each of these findings will be discussed in depth, with commentary on the foundation they lay for a new direction in electromicrobiology and microbial electrochemistry research.