Bachelor thesis

Isolation and characterization of electroactive microorganisms from the Leipzig New Lake District

Electroactive microorganisms have the unique ability to exchange electrons with electrodes. The underlying process is called extracellular electron transfer (EET). By means of EET, microbial metabolism can be coupled with the flow of electric current in microbial electrochemical systems. Electroactive microorganisms therefore have great potential for biotechnological applications. For example, they can be used in microbial fuel cells to degrade organic material in wastewater and transfer electrons to anodes, thereby providing electrical energy.

With the help of EET, electroactive microorganisms also influence many natural processes such as the redox cycles of metals, the carbon cycle and the nitrogen cycle, so that they can be found in the diverse habitats and numerous microbial communities. More than 100 electroactive species are now known. Due to the intensified search, new electroactive microorganisms are constantly being discovered or already known species are attributed electroactive properties. It can be assumed that there is a much greater variety of electroactive microorganisms than we can currently imagine. The recultivated post-mining landscapes of central Germany with its coal deposits and water bodies containing metal and sulphurous slag heaps that still exist in some areas offer ideal growth conditions for electroactive microorganisms. They therefore represent potential habitats for previously unknown and uncharacterized electroactive microorganisms.

For this reason, several bodies of water and sediment layers in the Leipzig New Lakes region are to be sampled as part of this B.Sc. thesis. Subsequently, standardized bioelectrochemical reactors will be used to cultivate electroactive microorganisms from the samples under various experimental conditions. In addition to electrochemical methods and anaerobic cultivation techniques, analytical (HPLC) and molecular biological (PCR, T-RFLP) methods will also be used. The work will be carried out with modern laboratory equipment in an international and multidisciplinary team and excellent supervision is guaranteed during the entire preparation of the Bachelor thesis.

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