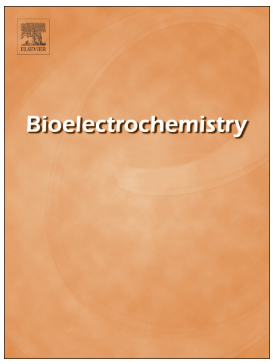

Microbial anodic consortia fed with fermentable substrates in microbial electrolysis cells: Significance of microbial structures

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Microbial anodic consortia fed with fermentable substrates in microbial electrolysis cells: significance of microbial structures

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ABSTRACT

Microbial community structure of anodic biofilms plays a key role in bioelectrochemical systems (BESs). When ecosystems are used as inocula, many bacterial species having interconnected ecological interactions are present. The aim of the present study was to identify these interactions for the conversion of single substrates into electrical current. Dual-chamber reactors were inoculated with activated sludge and fed in batch mode with acetate, lactate, butyrate and propionate at 80 mMe^- equivalents in quadruplicate. Analyses of biofilms and planktonic microbial communities showed that the anodic biofilms were mainly dominated by the *Geobacter* genus (62.4 % of the total sequences). At the species level, *Geobacter sulfurreducens* was dominant in presence of lactate and acetate, while *Geobacter toluenoxydans* and *Geobacter pelophilus* were dominant with butyrate and propionate as substrates. These results indicate for the first time a specificity within the *Geobacter* genus towards the electron donor, suggesting a competitive process for electrode colonization and the implementations of syntrophic interactions for complete oxidation of substrates such as propionate and butyrate. All together, these results provide a new insight into the ecological relationships within electroactive biofilms and suggest eco-engineering perspectives to improve the performances of BESs.

Keywords: Anodic consortia – Microbial Electrolysis Cells – Fermentable substrates – Ecological relationships