Poster

Comparison of oleate conversion under microaerophilic and anaerobic conditions

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Abstract
Excessive accumulation of Long Chain Fatty Acids (LCFA) in methanogenic bioreactors fed with lipids or mixtures of LCFA is the cause of process failure associated to a severe decrease in methane production. In particular, the fast and persistent accumulation of palmitate is critical and still not elucidated. Bacteria known as aerobes or facultative anaerobes are commonly detected in those reactors, suggesting that they may be involved in the conversion of lipids/LCFA to palmitate. To get insight into the influence of oxygen in this process, two bioreactors were operated in parallel under microaerophilic and anaerobic conditions, with applied organic loading rates of oleate of 1 and 4 g COD L^{-1} d^{-1}. Palmitate accumulated up to 2 g COD L^{-1} and 16 g COD L^{-1} in the anaerobic and microaerophilic reactor, respectively, which suggests that oxygen is important for oleate conversion to palmitate. A second experiment was designed to get insight into the dynamics of oleate to palmitate conversion in continuous bioreactors. A continuous stirred tank reactor (CSTR) and a plug flow reactor (PFR) were assembled in series and were fed with oleic acid at a COD of 4 g L^{-1} under microaerophilic conditions and increasing hydraulic retention times from 6 to 24 hours in the CSTR and 14 to 52 minutes in the PFR. Growth of the target bacteria was not affected by the HRT in the CSTR. However in the PFR, a biofilm was formed where palmitate accounted for 82 % of the total LCFA. Bacterial community composition of the PFR biofilm was evaluated by 16S rRNA gene sequencing using the Illumina MiSeq platform. Pseudomonas was the predominant genus (42 %) in the sample, highlighting the role of aerobic and facultative anaerobic bacteria in LCFA bioconversion.