



POSTER

## What is the role of *Pseudomonas* sp. in the anaerobic digestion of long-chain fatty acids?

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### Abstract

Palmitate accumulation in continuous bioreactors fed with oleate appears to be the cause for frequent reports of process failure during the anaerobic treatment of lipids or LCFA-rich wastewaters. In these reactors, oleate can be converted to palmitate by microorganisms other than syntrophic bacteria (facultative anaerobic bacteria), and do not depend on the presence of active hydrogenotrophic methanogens. To study non-syntrophic oleate conversion to palmitate, methanogens were selectively eliminated by applying low hydraulic retention time in a continuous stirred tank reactor (CSTR) fed with oleate. A small plug flow reactor (PFR) was installed in series with the CSTR to allow growth of some of the washed out microorganisms in the form of a biofilm. The high amount of palmitate in the biofilm samples indicated the presence of the key microorganisms on oleate conversion to palmitate. A sample of the PFR biofilm rich in palmitate, collected after 22 days of operation, was subjected to Illumina sequencing showing that *Pseudomonas* was the predominant (42%) genus present.

Two *Pseudomonas* isolates obtained from the same biofilm were used to study the role of these microorganisms on oleate biotransformation. Two bioreactors were inoculated with isolates 1 (reactor RI1) and 2 (reactor RI2) and fed with oleate at an organic loading rate of 1 g L<sup>-1</sup> d<sup>-1</sup> (period I) and 4 g L<sup>-1</sup> d<sup>-1</sup> (period II) in chemical oxygen demand (COD).

In period I, oleate concentration in COD varied between 0.258 g L<sup>-1</sup> and 0.740 g L<sup>-1</sup> in reactor RI1, and between 0.192 g L<sup>-1</sup> and 0.642 g L<sup>-1</sup> in reactor RI2. In period II oleate concentration in COD was close to 1.500 g L<sup>-1</sup> in RI1 and 1.000 g L<sup>-1</sup> in RI2. Apparently oleate is being used by *Pseudomonas* isolates, however no intermediate product was detected. Probably some intermediate metabolite is being produced and is not being quantified. This hypothesis is currently under study, and may bring some light on the puzzling bioconversion of oleate into palmitate.