## O.338. Facultative anaerobic bacteria: key players in syntrophic fatty acids degradation under microaerophilic conditions

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Anaerobic digestion (AD) is a mature technology that contributes to the sustainable development through the production of energy and products, using microbes as key players.
Oxygen, formerly thought as the nemesis of AD, has been shown to benefit the AD processes when provided in vestigial doses [1]. The beneficial effects of micro-aeration have been attributed to the increased activity of facultative anaerobic bacteria (FAB). Besides being involved in fermentation and acidogenesis, FAB have been referred to act as a protective shield against the damaging effects of oxidative stress to the strict anaerobic communities [2]. However, their role in the syntrophic degradation of fatty acids is not clear. In this work, the relationship between syntrophic bacteria (*Syntrophomonas wolfei (Sw) and S. zehnderi (Sz))*, methanogens (*Methanospirillum hungatei (Mh) and Methanobacterium formicicum* (Mf)) and FAB (*Pseudomonas* strains (Ps)) was investigated, during the degradation of short (C4, butyrate), medium (C8, octanoate) and long (C16, hexadecanoate). The syntrophic co-cultures were pre-grown and the *Pseudomonas* spp. were further added, along with each substrate, over a range of $O_2$ concentrations (0-2 % v/v). A second transfer was performed, exposing each of the cultures to $O_2$ concentrations between 0-2% (v/v).
In the presence of $O_2$ (even at the lower concentrations) the activity of the syntrophic co-cultures sharply decreased or even disappeared. However, in the presence of *Pseudomonas*, methane production occurred, reaching the theoretically expected at days 3, 8 and 28 under 0%, 1% and 2% $O_2$, respectively. These results were obtained for C8 degradation in the presence of Sw+Mh+Ps. The same tendency was observed for C4 and C16 degradation with both consortia. Additionally, in the 2$^{nd}$ transfer, the cultures previously exposed to $O_2$, maintained their activity being able of completely convert substrates to methane, under anoxic and microaerophilic conditions.
These results show the essential role of *Pseudomonas* in the protection of syntrophic co-culture activity allowing fatty acids degradation under microaerophilic conditions. Therefore, in real AD systems, where vestigial $O_2$ can be detected, the presence of FAB may result in more stable, resilient, and functional syntrophic communities.

***References***

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