Through the looking glass: the controls of volatile fatty acid oxidation by sulfate reducers in marine sediments

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Sulfate reducers use sulfate as terminal electron acceptor for the oxidation of organic matter such as volatile fatty acids (VFA). VFAs are key intermediates in the anaerobic microbial food chain, however we have a limited understanding of what controls their concentration *in situ*.

We used a laboratory based approach in order to examine the microbial controls on VFA concentration in marine sediments. Axenic cultures of environmentally relevant sulfate reducing bacteria were grown in batch or continuous reactors, while we monitored sulfate and VFA utilization.

The residual acetate concentration ranged from 44 μM to below the detection limit (0.19 μM) depending on the growth conditions, while the energy yield of the metabolic reaction (ΔG) was estimated to be equal to or fall below -30.3 kJ per mole of acetate. The residual propionate concentration ranged from 8 to 3 μM. We also report a half saturation constant (K_m) for propionate of 22 μM, this value is lower than the reported K_m values for acetate (600-70 μM) and matches the lower *in situ* propionate concentrations in marine sediments [1, 2]. Finally, we measured an extremely high affinity for lactate (K_m= 1.6 μM) which reflects the very low lactate concentrations reported previously [3].

We will discuss the role of the *in situ* microbial activity in controlling substrate concentrations in the environment, and address the physiological and energetic contraints involved.

[1] Ingvorsen *et al*. (1984) *Appl Environ Microbiol*, **47**, 403-408, [2] Glombitza *et al*. (2015) *Front Microbiol* **6**, 846, [3] Glombitza *et al*. (2014) *Limnol Oceanogr Methods*, **12**, 455-468