

SUBSTRAT-DEPENDENT CONTRIBUTION OF SULFATE-REDUCING BACTERIA TO DISSOLVED ORGANIC MATTER IN MARINE SEDIMENTS

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Key to the central role of sulfate-reducing bacteria (SRB) in the mineralization of organic matter in marine sediments is not only their capacity for complete oxidation but also their broad nutritional versatility. The latter comprises simple fermentation end products, long-chain fatty acids and even recalcitrant aromatic compounds and hydrocarbons (incl. crude oil). Therefore, SRB can be expected to significantly contribute to the compositional shaping of organic matter in marine sediments. However, systematic studies investigating comparatively the intracellular metabolites and the exometabolome of SRB are lacking.

With this in mind, we use targeted and non-targeted metabolite analysis to test the hypothesis that metabolism of *Desulfobacteraceae* exerts a key control on organic matter composition in marine sediments. Comparison of targeted metabolomes assessed upon cultivation with different substrates aims at providing detailed insights into the influence of an important environmental parameter, i.e. the availability of a specific substrate. Initial studies presented here were performed with the sulphate-reducing bacterium *Desulfobacula toluolica* Tol2, which was isolated from a sulfide-rich marine sediment (Rabus et al., 1993). For this bacterium, the complete genome has been published and the prediction of its catabolic network was refined by differential proteome analysis (Wöhlbrand et al., 2013). This research is being performed in the framework of the PhD Research Training Group "The ecology of molecules" („EcoMol“) at the University of Oldenburg.

Analysis of samples from incubation experiments with selected biogeochemically relevant substrates (toluene, *p*-cresol, phenylalanine, benzoic acid) by gas chromatography-mass spectrometry revealed a broad range of different metabolites formed by this bacterium. The observed metabolite patterns were substrate-specific and could be related to the apparent pathways employed by *D. toluolica* Tol2 for utilizing the respective organic compounds as sources of carbon and energy. Currently, we are characterizing exo- and endometabolomes under these substrate conditions using an array of analytical techniques including GC- and LC-MS as well as ultrahigh-resolution Fourier transform-ion cyclotron resonance mass spectrometry. We envisage that the integrated evaluation and interpretation of these results will contribute to the development of new conceptual approaches with respect to the use of unique molecular formula patterns in a comprehensive assessment of the "geometabolome".

References

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