I1. Environmental Microbiology and Biotechnology

P67. Hexadecane toxicity towards pure cultures of methanogens

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Petroleum industry generates large volumes of hydrocarbon-containing wastewater, that may be treated and valorized by anaerobic conversion to methane. This process is performed by complex microbial communities and is only thermodynamically feasible at low hydrogen partial pressure, which is generally accomplished by the activity of hydrogenotrophic methanogens. However, alkanes, polyaromatic hydrocarbons and BTEX were shown to inhibit methanogenesis in mixed microbial cultures. This may be due to a direct inhibition of the methanogens, or may result from indirect inhibition, by disrupting the microbial relationships in the complex communities. To get more insights on this topic, the toxicity of aliphatic hydrocarbons towards pure cultures of hydrogenotrophic methanogens was assessed in this work. Aliphatic hydrocarbons represent the largest fraction of crude oil or petroleum-derived products, and hexadecane (HC) was chosen as model compound. Methane production from H_2/CO_2 (80:20%, 1.7x105 Pa) by *Methanobacterium formicicum* and *Methanospirillum hungatei* was measured in the presence of increasing HC concentrations (1, 5, 15 and 30 mM), and was compared with the controls without HC. For both methanogens, the methane production rate was significantly lower (p30 mM could be estimated for *M. formicicum* and *M. hungatei*, respectively. Therefore, *M. hungatei* is more tolerant to the presence of HC than *M. formicicum*, possibly due to the differences in cell wall structure and membrane lipid composition of the two species. Moreover, the relatively high IC50 values obtained are most likely related with the low HC solubility. Considering the typical range of hydrocarbon concentrations in wastewater from the petroleum industry, toxic effects from aliphatic hydrocarbons towards hydrogenotrophic methanogens will not be expected to occur during the anaerobic treatment of these type of wastewater.

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