



Lipids and Molecular Tools as Biomarkers in Monitoring Air Sparging Bioremediation Processes

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The fluctuation of membrane lipids offers a promising tool as biomarkers for the analysis of microbial population changes as well as for the physiological status of micro-organisms. The investigation of changes in lipid composition is of common use for the assessment of physiological conditions in pure cultures. However, as lipid composition does not show drastic diversity among living organisms the use of lipids as biomarkers in mixed cultures and environmental samples has certain limitations. Therefore, special marker phospholipid fatty acids as well as modern statistical analysis of the results are necessary to receive certain information about the qualitative and quantitative changes of e.g. a soil microflora due to a contamination with organic compounds and its bioremediation.

The use of lipids as biomarker in monitoring bioremediation are shown at the Hradčany site, a former Russian air force base in the Czech Republic that operated until 1990. In this time in an area of 32 ha soil and groundwater were contaminated with kerosene and BTEX compounds in an amount of 7,150 tons. This highly contaminated site is treated with the so-called air sparging method to clean-up the contamination by aerobic biodegradation.

The results of PLFA analysis demonstrated a community shift to a gram-negative bacterial biomass with time. The results, including a principal component analysis (PCA) of the obtained fatty acid profiles, showed that the air sparging leads to substantial differences in microbial communities depending on the contamination levels and length of treatment, respectively. Obviously, the length of air sparging treatment controlling the BTEX concentration in soils causes temporal changes of bacterial community and adaptations of its respective members.

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