Adaptation to toxicants and ecological functioning of microbial communities

Due to human activities, the environment is exposed to mixtures of contaminants spread over large areas. Current policies are however, mostly directed to individual contaminants. There is limited insight on effects of low concentrations of contaminants on ecosystems functioning. Microbial communities are key organisms in aquatic and terrestrial ecosystems because they constitute a major part of the biomass and contribute to all nutrient cycles. Micro-organisms live in close contact with their environment and are therefore continuously exposed to contamination.

This project focuses on the effect of contamination on the relationship between physiological and genetic adaptation and functioning of microbial communities in aquatic and terrestrial ecosystems. Together with other research projects in SSEO consortium, we will obtain insight on functional effects of chronic exposure to contaminants in the environment.

We are using three different methods to analyse microbial communities:

1. The community structure is analysed from the microbial DNA in soil, sediment and water samples. A general DNA primer of 16S RNA will be used in combination with polymerase chain reaction (PCR). The amplified products, consisting of a collection of different sequences of equal length will then be separated with denaturing gradient gel electrophoresis (DGGE).

2. Physiological profiles are based on metabolic activity determination of microbial communities using Biolog multiwell plates. These plates contain a freeze-dried mineral medium, a standard set of carbon substrates, and a redox dye for monitoring microbial activity. This method yields so-called community-level physiological profiles (CLPP) providing community specific information about the potential catabolic conversion of different substrates.

3. Biolog plates are also used for PICT (pollution-induced community tolerance) determination. This is based on adaptation at community level allowing consortia to function at increased concentrations of contaminants. After extraction, the micro-organisms are inoculated in a series of Biolog-plates with increasing levels of contaminant. From the colour development, EC50 values describing the sensitivity for different microbial reactions are derive.

Duration:

4 years (December 2000-December 2004)

Participants:

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