



Description of the internship

Laboratory :

Environmental microbiology Lab, Department of Civil & Environmental Engineering
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Supervising :

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Title : Cometabolic degradation of chlorinated ethene by acidophilic methanotroph bacteria isolated from acid peat bogs

Keywords :

Methanotroph - Bioremediation - chlorinated ethene

Context :

Soils are at the heart of major environmental issues: despite their recognized essential role and slow regeneration, they undergo multiple environmental degradation. Sometimes the soil is contaminated down to a great depth, to the point where it can reach the aquifer. Contaminants are one of the main environmental causes of their pollution. Due to the growing concern about pollution, methanotrophs have increasingly gained attention for their capacity in bioremediation.

Methanotrophic bacteria are a group of microorganisms that use methane for energy and biomass synthesis (they use methane as an electron donor and carbon source). They are studied for their capacity of degrading chlorinated hydrocarbons contaminants like chlorinated ethenes.

The methanotrophs thrive in moderately acidic environments, and acidic soils with $\text{pH} < 5.5$ are commonly found in the environment; acidic peat bogs constitute a great example for such conditions.

Chlorinated ethene (like carbon tetrachloride (CT), perchloroethene (PCE), trichloroethene (TCE), and vinyl chloride (VC)) can be very toxic, such as vinyl chloride which is used in industry for metal-washing, dry cleaning and cigarette filters. As a consequence, chlorinated ethenes have become abundant in the environment.

The methanotrophs oxidize the methane to convert it into methanol. This process requires methane monooxygenase (MMO) which is capable of co-oxidizing a broad range of organic pollutants. It's the only identified enzyme capable of catalyzing CH_4 oxidation to CH_3OH . Interestingly, the MMO found in methanotrophs can also metabolise chlorinated ethenes.

The internship project will aim at testing the bioremediation potential of chlorinated ethenes by acidophilic methanotrophs (more specifically methylocystis sp. and MJC1 methylomonas

sp. JS1) isolated from peat bogs. Using the lab's most recent study on vinyl chloride as a framework,

This project includes :

- (1) a screening to choose which one of chlorinated ethenes will be used.
- (2) the development of a protocol to test the ability of acidophilic methanotrophs to degrade our chlorinated ethene chosen.
- (3) Evaluation of the kinetic degradation in different environments by our acidophilic methanotroph

knowledge, skills, and competences to be acquired at the end of the internship will include :

- Isolation and culture of acidophilic methanotroph from the peat bog sample collection
- DNA extraction from peat bog sample, DNA sequencing and analyze with QIIME
- Monitoring of chlorinated ethenes consumption with GC-MS
- Basics techniques of molecular biology (qPCR)