

Friday, Nov 02, 2007
1:40 PM – 2:30 PM
Room 126
Engineering & Architecture Building

All are invited to attend
Pizza will be served

Environmental Seminar Series

Phytoremediation of Arsenic Contaminated Groundwaters: The Role of Rhizosphere Microbiota

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Phytoremediation is an emerging treatment technology that relies on plants to remove contaminants from water or soil. In some cases, a plant plays host to symbiotic bacteria that facilitate the conversion of a contaminant to its less toxic form. In other cases, a contaminant is sequestered by adsorption to its root surface, translocated and volatilized to air or stored in its upper biomass.

Several *Pteris* fern species are effective at removing arsenic from soil and water and the mechanism of arsenic hyper-accumulation is of great importance for the optimization of the treatment process for small-scale or point of use applications in the developing world. Because the trivalent arsenic species are often prevalent in the environment and can be much more toxic than pentavalent species, this study was designed to determine the role of speciation in arsenic uptake by the arsenic hyper-accumulator *Pteris cretica*.

Oxidation of trivalent arsenic plays an important role in the overall arsenic uptake. In the presence of *Pteris* ferns, arsenite is completely oxidized as it is being removed from the solution. Experiments with *Boston* fern (*Nephorlepis exaltata*), a non-accumulating fern that is sensitive to arsenic, revealed that all of the arsenite was converted to arsenate without any loss of arsenic from the solution. Given that these plant species do not have the ability to oxidize arsenite, it is concluded that the microbial community of the rhizosphere is responsible for arsenite oxidation as a first step in arsenic uptake by the plant. Studies with a non-accumulating Boston fern in the presence of the antibiotic cocktail to suppress microbiological activity in the rhizosphere revealed a reduction in arsenite oxidation rates.

These results provide evidence of a symbiotic relationship between arsenic oxidizing microorganisms and arsenic hyper-accumulating plants. Further optimization of this symbiotic relationship could lead to additional improvement in the performance of this emerging technology for arsenic remediation.