Phytoremediation to Degrade Airborne PCB Congeners from Soil and Groundwater Sources

The overall goal of Project 5 is to understand the mechanisms whereby plants and associated rhizosphere bacteria may provide bioremediation of lower chlorinated PCBs from contaminated soils and sediments. Project 5 has four aims:

- Identify plant metabolites of selected PCB congeners (PCB 11, 52, 77, 101, 126, 153) that are semi volatile, persistent, and toxic; and also the uptake/selectivity/metabolism of chiral compounds (PCB 91 and 95).
- Elucidate the regulation of metabolism of PCBs by poplar plants (Populus trichocarpa) at the epigenetic and transcriptional levels.
- Identify microorganisms and functional genes associated with PCB dechlorination in enrichment cultures derived from PCB-contaminated soil and in un-enriched PCB-contaminated sediment.
- Characterize PCB-induced changes by plants and their associated rhizosphere microorganisms at a contaminated site (Altavista, Virginia) and in contaminated sediments using gene sequencing and transcriptomic responses.

Biodegradation of lower chlorinated PCBs to innocuous end-products is an overall goal of Project 5. This project provides a key element to the overall isrp center-investigating a public health strategy for intervention and reducing human exposure through research and understanding of bioremediation.

**Project Leader: Jerry L. Schnoor, PhD**
Dr. Schnoor will manage the project and guide the research as the Principal Investigator (PI). He has managed over $25 million of research projects since 1980, and has considerable experience as the Editor-in-Chief of Environmental Science and Technology, and serves as the Chair of the EPA-ORD Board of Scientific Counselors. Dr. Schnoor is an international leader in the field of phytoremediation, co-editor of the book Phytoremediation - Transformation and Control of
Contaminants (2003), and is the PI of the W.M. Keck PhytoTechnologies Laboratory [2] at the University of Iowa.

- **Benoit Van Aken, PhD**
  Dr. Van Aken, Temple University, leads our effort in the laboratory on molecular biological methods for analysis of catabolic enzymes and metabolic pathways of plants and microorganisms in phytoremediation. He has a background in environmental biotechnology and has published several key papers in the area of metabolite identification and enzymatic pathways. Dr. Van Aken led the discovery of a new endosymbiotic bacteria living inside hybrid poplar trees which mineralizes nitramine explosive compounds, Methylobacterium populi. This research was published in the International Journal of Systematics Evolutionary Microbiology [3] and Applied and Environmental Microbiology [4]

- **Timothy Mattes, PhD**
  Associate Professor, Civil and Environmental Engineering, The University of Iowa. Tim's research interests include environmental biotechnology, oxidative biocatalysis, evolution of microbial biodegradation pathways, and the application of genomics and proteomics techniques in the study of environmentally relevant microbial communities.

- **Hans J. Lehmler, PhD**
  Associate Professor (Research), the University of Iowa College of Public Health