Superfund Research Program

The Superfund Research Program (SRP) supports practical research that creates benefits, such as lower environmental cleanup costs and reduced risk of exposure to hazardous substances, to improve human health. SRP funds colleges, universities, and small businesses, including the University of Iowa Superfund Research Program (ISRP), to advance this work across the nation.

The University of Iowa

Research Highlights

Using plants and bacteria together to clean contaminated soil

Researchers led by Jerald Schnoor, Ph.D., have shown that bacteria and switchgrass plants growing together can remove as much as 47 percent of polychlorinated biphenyls (PCBs) from contaminated soils by a process called phytoremediation.[1] Phytoremediation is the use of living plants to clean up contaminants in soils, sediments, and water. PCBs are a family of chemical compounds that were widely used in industrial applications and still persist in air, water, soil, and foods. PCB exposure can lead to severe skin rashes, liver damage, cancer, and other adverse health effects.[2] The ISRP researchers found that a specific type of bacteria improved phytoremediation by switchgrass, and together they may be a powerful, sustainable, and cost-effective method for cleaning up PCB-contaminated soils and sediments. Additionally, this method may be less disruptive than traditional cleanup methods involving large-volume soil removal and treatments.

Researchers have found that bacteria and switchgrass may help safely remove PCBs from the environment.

Measuring airborne exposures to PCBs

When shipping canals are dredged, PCBs in the sediment can be disturbed and released into the air.

Peter Thorne, Ph.D., and his research team found that certain schools had much higher indoor PCB concentrations than students' homes. PCB levels were also higher in homes and schools in an urban area than a rural area. School airborne PCB exposure accounted for the majority of the children's inhalation exposures.[3] The analysis compared groups of children and their mothers living in urban East Chicago, Indiana, and rural Columbus Junction, Iowa, who are enrolled in the Airborne Exposures to Semivolatile Organic Pollutants study. The Indiana site is close to refineries, steel mills, and a heavily polluted shipping canal that may release PCBs into the air. Thorne's team is also measuring the proportion of the children's PCB exposures that comes from the air versus their diet. Very few studies have examined airborne exposures, and understanding this exposure pathway is very important for reducing health risks from PCBs.

Researchers at ISRP are working to better understand how PCBs move through the environment via water, air, and other pathways, and how they affect human health. Their goal is to reduce exposures and prevent adverse health effects.

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Partnering to reduce PCB exposures

ISRP researchers have launched a partnership for using poplar trees as a phytoremediation strategy to clean up PCBs.[4] Working with the town of Altavista, Virginia, and Ecolotree Inc., a small business focusing on phytoremediation, scientists are using poplar trees to reduce PCB levels in a contaminated lagoon. They are also studying how poplar trees might keep PCBs contained and detoxify the water. By reducing PCB levels in the lagoon, researchers hope to reduce the amount of PCBs that vaporize into the air from the water, thus reducing exposures and health risks to the community.[5] Craig Just, Ph.D., and David Osterberg are helping coordinate efforts to implement this cost-effective and sustainable approach.

Poplar trees were planted on test plots next to a lagoon to reduce PCB contamination. (Photo courtesy of ISRP)

The importance of studying PCBs

- People are exposed to PCBs through eating or drinking contaminated food or water, breathing contaminated air, and skin contact.[2]
- Although the manufacturing of PCBs was stopped in 1977, PCBs do not readily break down, and can remain in the environment for long periods of time. PCBs are also found in dyes and paints as byproducts of manufacturing.[2,6]

Research overview

- Identifying the sources and fate of airborne PCBs. (Keri Hornbuckle, Ph.D., keri-hornbuckle@uiowa.edu)
- Measuring exposure to airborne PCBs in mothers and their children. (Peter Thorne, Ph.D., peter-thorne@uiowa.edu)
- Assessing health effects from inhalation of PCB mixtures. (Peter Thorne, Ph.D., peter-thorne@uiowa.edu)
- Studying toxic effects of airborne PCBs and how they metabolize in the body. (Michael Duffel, Ph.D., michael-duffel@uiowa.edu)
- Determining how airborne PCBs lead to gene damage, cancer, and other health effects. (Larry Robertson, Ph.D., larry-robertson@uiowa.edu)
- Investigating how plants can be used to clean up PCBs at contaminated sites. (Jerald Schnoor, Ph.D., jerald-schnoor@uiowa.edu)

Sharing results

- ISRP brings together scientists and community advisory boards from Iowa, Illinois, and Indiana to address environmental concerns about PCBs, provide educational programs at schools, and share research findings with communities. (Craig Just, Ph.D., craig-just@uiowa.edu)
- ISRP integrates strategic communication of science into activities intended to translate the findings of ISRP research projects into meaningful outcomes that will benefit the public at large. (David Osterberg, david-osterberg@uiowa.edu)

Other contributions to advance science

- The ISRP research support facilities provide vital access to expertise, research resources, and state-of-the-art instrumentation for its research projects. (Keri Hornbuckle, Ph.D., keri-hornbuckle@uiowa.edu; Hans-Joachim Lehmler, Ph.D., hans-joachim-lehmler@uiowa.edu)
- The ISRP integrated, multidisciplinary training experience provides early-career scientists access to teams of diverse professionals, and encourages innovation to develop solution-oriented approaches to complex environmental health problems. (Gabriele Ludewig, Ph.D., gabriele-ludewig@uiowa.edu)

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For more information on the National Institute of Environmental Health Sciences, visit **www.niehs.nih.gov**.

For more information on the Superfund Research Program, visit **www.niehs.nih.gov/srp**.

For more information on the University of Iowa Superfund Research Program, visit **http://iowasuperfund.uiowa.edu**.

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