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 Michigan State University Superfund Research Center (MSU SRC), to advance this work across the nation.

Research Highlights

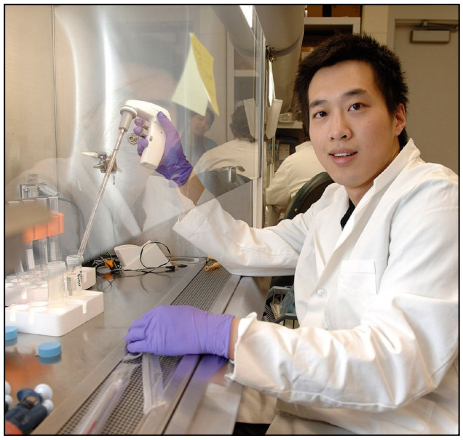
Using clay to immobilize dioxins in soils

Boyd uses state-of-the-art technology to chemically analyze organoclays and soils to improve cleanup of dioxins and other contaminants in soils.
(Photo courtesy of MSU SRC)

Stephen Boyd, Ph.D., and his research team at MSU SRC improved the ability of a type of clay, called organoclay, to bind dioxins and dioxin-like compounds in soils, preventing them from moving into water, plants, and animals.[1] Dioxins and dioxin-like compounds are byproducts of various industrial processes. They are also produced during improper incineration, such as burning municipal waste, and natural events, such as forest fires and volcanoes. People are primarily exposed through food and air.[2] Dioxin-like compounds are toxic and can cause severe skin rashes, altered immune responses, hormonal disruption, and cancer.[3] Boyd's team compared their organoclay to other soil additives, such as granular activated carbon, and found that the organoclay performed better. They are currently studying several other soil additives to find the ones that work best, to help reduce human exposures to dioxins.

New models help determine toxicity levels of contaminants

As part of efforts to reduce the need for animal testing, Norbert Kaminski, Ph.D., and his colleagues used sophisticated mathematical models to help understand the potential toxicity of environmental contaminants in the body.[4] Traditionally, animals have been used to test contaminants, but more alternatives to animal testing are now becoming available. Using in vitro testing data combined with mathematical models, Kaminski and his team identified patterns of biological responses to help quantify health risks at different doses. This data may help inform government regulatory agencies about safe levels of contaminants in the environment.



MSU SRC scientists, including Haitian Lu, do laboratory testing, as well as computer modeling, to find new approaches to reduce animal testing.
(Photo courtesy of MSU SRC)

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Research at MSU SRC focuses on reducing exposures and human health risks related to dioxins and dioxin-like compounds, which are considered highly toxic. They use a state-of-the-art systems approach that integrates computer modeling and computational approaches with biomedical research to understand how dioxins affect complex biological systems.

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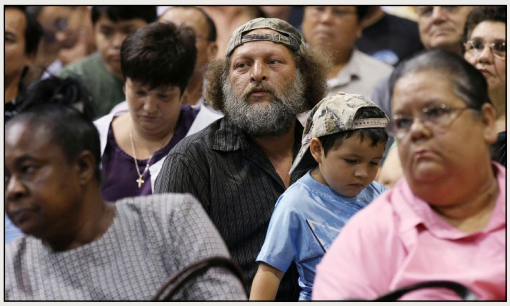
Engaging communities and government agencies



MSU SRC members facilitate dialogue with stakeholders by partnering with U.S. Environmental Protection Agency Region 5, Michigan Department of Agriculture and Rural Development, Michigan Department of Environmental Quality, local governments, and industry groups. They are also building community-university partnerships through meetings, community fairs, and educational experiences in the schools and community. To enhance communication, MSU SRC is conducting social science research to understand how factors such as trust, social networks, and math literacy, can affect local residents' understanding of dioxin contamination and cleanup in their community.

Research overview

- Uncovering relationships between genetic differences in a population and their response to different amounts of dioxins, to better predict health risks. (John LaPres, Ph.D., lapres@msu.edu)
- Studying additives to soils that can immobilize dioxins, to prevent exposures. (Stephen Boyd, Ph.D., boyds@msu.edu)
- Understanding the role of microbes in the gut, how they affect the biological response to dioxin exposure, and how they might protect the body from dioxin toxicity. (Syed Hashsham, Ph.D., hashsham@egr.msu.edu)
- Studying bacteria that can degrade dioxins to help clean up contaminated sites. (Gerben Zylstra, Ph.D., zylstra@aesop.rutgers.edu)
- Determining ways that dioxins alter immune responses and susceptibility to disease. (Norbert Kaminski, Ph.D., kamins11@msu.edu)
- Finding connections between dioxin exposure, and development of metabolic syndrome and diabetes. (Timothy Zacharewski, Ph.D., tzachare@msu.edu)

Sharing results

- MSU SRC facilitates dialogue with stakeholders by organizing conferences and workshops, and partnering with federal and local government agencies. (Brad Upham, Ph.D., upham@msu.edu)
- MSU SRC has developed a strong partnership with communities in the Michigan Tri-Cities area (Saginaw, Midland, and Bay City) to engage community members in issues related to dioxin contamination. (James Dearing, Ph.D., dearjim@msu.edu)

Other contributions to advance science

- The MSU SRC research support facility provides vital access to expertise, research resources, and state-of-the-art instrumentation for its research projects. (James Tiedje, Ph.D., tiedjej@msu.edu; Rory Conolly, Sc.D., conolly.rory@epa.gov)
- The MSU SRC 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. (Jay Goodman, Ph.D., goodman3@msu.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 Michigan State University Superfund Research Center, visit **http://cit.msu.edu/superfund2013**.

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[3] NIEHS (National Institute of Environmental Health Sciences). 2012. Dioxins Fact Sheet. Available: www.niehs.nih.gov/health/materials/dioxins_new_508.pdf [accessed 1 June 2015].

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