The NIEHS Superfund Research Program (SRP)

SRP enables university-based scientists, engineers, and public health workers, along with community members, to lessen the environmental health effects of hazardous waste sites across the nation.

Photo courtesy of Le Bonheur Children's Hospital and the University of Tennessee Health Science Center.

Louisiana State University (LSU)

Environmentally Persistent Free Radicals

Particles from the thermal remediation of hazardous wastes, called environmentally persistent free radicals (EPFRs), are all around, and the LSU Superfund Research Center is studying how they may affect our health.

Led by Barry Dellinger, Ph.D., researchers at the Louisiana State University (LSU) SRP Center are investigating how:

- EPFRs that formed during remediation processes at Superfund sites are released into the air and impact the environment and human health.
- Exposure to EPFRs affects lung function and blood flow, leading to asthma and worsening recovery after ischemic events, such as heart attacks.
- EPFRs can also be formed in soils that have been contaminated with pentachlorophenol, a chemical used to preserve wood.
- The structure and chemical properties of particles affect EPFR formation and reactivity.
- To prevent the formation of EPFRs and how to destroy existing EPFRs in an efficient and inexpensive manner.
- The biological mechanisms behind EPFR toxicity may lead to pulmonary and cardiovascular harm in people.

LSU researchers engage people in communities close to Superfund sites to learn about their concerns and communicate their research findings. They also work with the Louisiana Environmental Action Network, a community organization with more than 100 affiliated groups.

More About EPFRs:

- Recently discovered, their radical and regenerative nature and persistence in the environment suggests the potential for significant health consequences.
- Thermal remediation of hazardous wastes and other incomplete combustion processes produce EPFRs. Therefore, EPFRs are a global health concern, with children being especially vulnerable to such exposures.
- Reducing air pollution levels to just 7 percent below the current standard would save the U.S. about $15 million annually in healthcare costs, due to fewer hospitalizations of children with bronchiolitis.

LOUISIANA STATE UNIVERSITY

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Research and Public Engagement Highlights

Health Effects of a New Class of Airborne Pollutant

Clarifying the pulmonary and cardiac health effects associated with inhalation exposure to EPFRs is the focus of the LSU SRP. EPFRs are a novel class of pollutant, generated by the adsorption of halogenated hydrocarbons onto particulate matter (PM) formed during thermal remediation processes occurring at Superfund sites across the United States. Because the LSU SRP team only recently identified EPFRs, there are no air quality standards for EPFR-containing PM, and a better understanding of the health effects of EPFR exposure is needed.

LSU SRP trainee Phillip Potter works with Dellinger, the center director, to investigate the formation and reaction of EPFRs in thermal processing of Superfund waste. *(Photo courtesy of Maud Walsh)*

According to research led by Stephania Cormier, Ph.D., EPFR-containing PM is capable of inducing severe asthma. Asthma exacerbations in individuals with severe asthma are not responsive to steroid treatment and are more fatal. Kurt Varner, Ph.D., and his group have demonstrated that EFPR exposure diminishes baseline cardiac function and increases cardiac vulnerability to ischemia, a restriction in blood supply to tissues.

Identifying the mechanism by which EPFRs alter pulmonary and cardiac function and distinguishing EPFR-specific damage caused by PM will be critical for properly characterizing the health hazards they pose. This information will help develop air quality standards based on the presence and relative levels of EFPRs versus inactive PM.

LSU SRP trainees Cholena Ren and Elisabeth Feld serve as LSU "Environmentors" for a student at Scotlandville Magnet High School in north Baton Rouge. *(Photo courtesy of Maud Walsh)*

Connecting With the Community

Residents of south Louisiana face potential exposures to hazardous substances in air, soil, groundwater, and food. Work at the LSU SRP led by Margaret Reams, Ph.D., is building capacity for resilience among partner communities by encouraging self-organization among residents, providing scientific information concerning risks, and sharing information about specific adaptive strategies to reduce exposure to risks.

To improve knowledge of community resilience, the LSU SRP co-hosted with the Oregon State University Superfund Center a symposium and workshop, "Response, Recovery, and Resilience to Oil Spills and Environmental Disasters: Engaging Experts and Communities," for community stakeholders, researchers, and environmental professionals. Maud Walsh, Ph.D., coordinates workshops and visits with professional organizations, educators, and K-12 students to relate Center research to their interests and concerns. LSU trainees are active in local partner communities, presenting at teacher conferences and mentoring high school students.

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

For more information on SRP, visit **http://www.niehs.nih.gov/srp**

For more information on the Louisiana State University Center, visit **http://www.srp.lsu.edu**