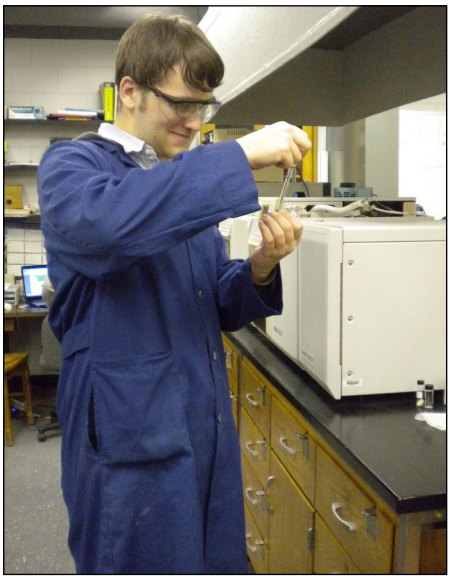
Superfund Research Program

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

Research Highlights

Understanding air pollutants containing free radicals



LSU SRC trainee Phillip Potter works with Dellinger to investigate the formation and reaction of EPFRs in thermal processing of Superfund waste. (Photo courtesy of LSU SRC)

LSU SRC researchers measured how fast certain small toxic particles, found in air and soil at Superfund sites and elsewhere, break down in the environment.[1] The particles, called environmentally persistent free radicals (EPFRs), are created when solid waste and fuel burn, and contain unstable chemical components that can damage cells in humans and animals.[2] Because EPFRs may pose risks for lung and cardiovascular diseases,[3,4] understanding where they can be found and how long they last is important.

William Gehling, Ph.D., and Barry Dellinger, Ph.D., identified three different rates of EPFR decay — fast (21 days or less), slow (21-5,028 days), and no decay.[1] The researchers are now working to understand why some EPFRs remain in the environment longer than others, posing greater risk to human health. LSU SRC researchers are also studying whether EPFRs are formed during certain types of cleanup processes at Superfund sites that involve burning toxic wastes.[5]

EPFR exposure and asthma in children

Stephania Cormier, Ph.D., and her research team reported that infants exposed to EPFRs show increased likelihood to develop asthma later in life. The researchers saw an increased allergic immune response after exposure to EPFRs. Other types of immune responses such as those responsible for fighting infections were decreased.[3]

In other studies, Kurt Varner, Ph.D., and his team demonstrated that EPFR exposure reduces heart function and increases the heart's sensitivity to ischemia, a reduction in blood supply to tissues.[4] This study suggests that EPFRs may pose an increased risk to people with cardiovascular disease.

EPFRs form in combustion and thermal processes, including hazardous waste incineration and diesel combustion.

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LSU SRC is studying EPFRs, a pollutant found in air, soil, and sediment. Researchers are studying how EPFRs are formed, how to reduce exposures, and how they may affect our health. They share their research findings to help inform environmental health decisions and put science to work.

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The importance of studying EPFRs

- Infants and children may be especially sensitive to the toxic effects of EPFRs and other air pollutant particles, and early life exposure may be linked to long-term, persistent lung disease.[6]
- Ongoing efforts to reduce air pollutants have economic merit. For example, the U.S. could save $15 million annually from fewer hospitalizations of urban infants with the lung disease bronchiolitis, if air pollution standards were cut by 7 percent.[7]

Research overview

- Uncovering toxicity pathways from inhalation exposure to EPFRs that may lead to lung disease and asthma. (Stephania Cormier, Ph.D., stephaniacormier@lsu.edu)
- Understanding how exposure to EPFRs alters lung and cardiac functions, and blood flow. (Kurt Varner, Ph.D., kvarne@lsuhsc.edu)
- Identifying what components in soils, contaminated with the wood preservative pentachlorophenol, are responsible for EPFR formation. (Robert Cook, Ph.D., rlcook@lsu.edu)
- Understanding how airborne EPFRs are formed during cleanup processes at Superfund sites. (Slawomir Lomnicki, Ph.D., slomni1@lsu.edu)
- Identifying pathways that link EPFR exposures to biological responses and toxicity. (Wayne Backes, Ph.D., wbacke@lsuhsc.edu)
- Determining structural and chemical interactions that occur at Superfund sites that lead to EPFR formation. (Erwin Poliakoff, Ph.D., epoliak@lsu.edu)

Sharing results

- LSU SRC researchers engage people in communities close to Superfund sites to learn about community concerns and communicate research findings. They also work with the Louisiana Environmental Action Network, a community organization with more than 100 affiliated groups. (Margaret Reams, Ph.D., mreams@lsu.edu)
- LSU SRC partners with health and environmental professionals, as well as the U.S. Environmental Protection Agency, to communicate the importance of their research on EPFRs. They serve as a resource for business and technology leaders who, in turn, help LSU SRC scientists develop and market intellectual property. (Maud Walsh, Ph.D., evwals@lsu.edu)

Other contributions to advance science

- The LSU SRC research support facility provides vital access to expertise, research resources, and state-of-the-art instrumentation for its research projects. (Randall Hall, Ph.D., rhall@lsu.edu; Slawomir Lomnicki, Ph.D., slomni1@lsu.edu; Tammy Dugas, Ph.D., tdugas@lsuhsc.edu)
- The LSU 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. (Robin McCarley, Ph.D., tunnel@lsu.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 Louisiana State University Superfund Research Center, visit **www.srp.lsu.edu**.

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