National Institute of Environmental Health Sciences
Your Environment. Your Health.

Superfund Research Program

The Superfund Research Program (SRP) has provided practical, scientific solutions to protect health, the environment, and communities since 1987. SRP works to learn more about ways to protect the public from exposure to hazardous substances, such as industrial solvents, arsenic, lead, and mercury, which can cause death, disease, and birth defects. These and other toxic substances are found in contaminated water, soil, and air at Superfund waste sites throughout the United States.

As part of the National Institute of Environmental Health Sciences, one of the National Institutes of Health, SRP funds grants on basic biological, environmental, and engineering processes to find real solutions to hazardous waste problems. In addition, SRP helps train the next generation of environmental health researchers.

Photo courtesy of the University of Arizona SRP Center.

Reducing contamination

SRP conducts research to reduce contaminants or keep them from spreading. For example, SRP research has:

- Demonstrated that natural microbial communities can be amended to break down chlorinated contaminants like trichloroethylene. [1]
- Developed a new sustainable technology that improves uranium removal from contaminated water. [2]
- Studied genes that allow plants to adapt to changing environmental conditions to enhance their ability to resist drought and efficiently take up metals from mine waste sites.[3]
- Explored how nanomaterials powered by solar electricity can accelerate the activity of bacteria to clean up PFAS and other contaminants.[4]

Protecting human health

As hazardous substances spread through the ground, water, and air, human exposure to them raises the risk of numerous diseases and serious ailments. SRP-funded research is leading to a better understanding of how these contaminants work, how people are exposed to them, and the dangers they may pose. SRP researchers have:

- Uncovered how the water contaminant N-nitrosodimethylamine is linked to DNA damage and cancer.[5]
- Developed a new approach to help risk assessors predict the toxicity of chemicals based on shared molecular changes that can lead to toxicity, called key characteristics.[6]
- Integrated urban planning and community science to make communities more resilient to extreme weather, frequent flooding, air pollution, and health concerns.[7]
- Linked combined exposures to PCBs and PFAS to heart disease and liver injury; discovered that diets high in certain nutrients can reduce cell damage caused by PCBs.[8, 9, 10]
- Identified a biological marker for cadmium exposure that can help predict progression of lung disease.[11]

Major health consequences studied by SRP

- Cardiovascular and respiratory diseases
- Cancers
- Impaired fetal development
- Immune dysfunction
- Liver diseases
- Neurological disorders
- Obesity and diabetes

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Making discoveries that make a difference

Dozens of SRP research programs have improved our understanding of the dangers of hazardous substances and led to better ways to protect our health. A few examples include:

COVID-19: Discovered that certain molecules in the blood of COVID-19 patients may predict disease severity and an enzyme may offer an opportunity for treatment.[12]

Informing decision making: Created environmental risk maps for the Navajo Nation that help classify potential risk based on integrated exposure pathways and proximity to abandoned uranium mines.[13]

Predicting toxicity: Developed a computational approach to predict how hazardous substances may affect health by linking key biological changes from high-throughput cell studies with health outcomes observed in animal studies.[14]

Immune dysfunction: Reported links from PFAS exposure to immune outcomes, such as increased prevalence of infectious disease hospitalizations in children, decreased effectiveness of hepatitis vaccine, and more severe COVID-19 among adults.[15, 16, 17]

Creating partnerships that lead to scientific discoveries

A hallmark of SRP is collaboration. The program brings together teams of scientists from major research universities and innovative small businesses with a range of expertise. SRP researchers include biologists, chemists, toxicologists, ecologists, epidemiologists, geoscientists, and engineers, who together tackle complex environmental health problems.

To maximize the effectiveness of SRP studies, they are required to work closely with local, state, and federal agencies, as well as individuals and communities near hazardous waste sites. Focusing on community priorities and needs fosters the design of culturally appropriate messages that advance equity and justice. It also encourages sharing research results and expertise to make science more accessible to a range of stakeholders and promotes actionable strategies to improve health and well-being.

Photo courtesy of the Louisiana State University SRP Center.

Photo courtesy of the University of Arizona SRP Center.

To promote research relevance and maximize the impact of program investments, SRP works closely with its sister programs at the U.S. Environmental Protection Agency and the Centers for Disease Control and Prevention's Agency for Toxic Substances and Disease Registry. It also partners with the U.S. Department of Energy and U.S. Department of Defense, as well as the National Science Foundation.

SRP contributes to advancing science

- Grantees have worked at more than 325 hazardous waste sites in 40 states.
- SRP-funded researchers have patented more than 200 inventions to detect and clean up waste.
- SRP has funded more than 1,300 researchers at 250 institutions and small businesses.
- SRP has trained more than 2,500 environmental scientists.
- More than 14,350 peer-reviewed articles have documented SRP breakthroughs.

Small business innovation making a unique contribution

While most SRP grants go to university-based centers, the program recognizes that much of the nation's innovation comes from cutting-edge small businesses. The Small Business Innovation Research (SBIR) program supports the commercialization of innovative monitoring and cleanup technologies and products that can be used at Superfund and other contaminated sites.

New technologies include:

- A slow-release technology that provides a long-term solution that degrades chlorinated contaminants in groundwater.[18]
- Commercialized PFAS water filtration units and mobile PFAS-destruction unit to clean up soil and water.[19, 20]
- New sustainable platform to degrade organic compounds into harmless byproducts, without producing residual waste.[21]
- Cutting-edge tools to test for hazardous contaminants in water and soil following extreme weather events.[22, 23]

Sharing results to keep you informed

SRP teams actively share research results so cutting-edge breakthroughs are relayed to a wide audience, including scientists, policymakers, and the public.

- **Science Digest:** A quarterly compilation of SRP high-impact topics, research highlights, and leadership activities that is sent to more than 11,000 stakeholders.
- **Research Briefs:** Monthly summaries of SRP research findings are sent to more than 10,500 health and environmental experts.
- **Seminars:** SRP conducts interactive web-based seminars, called Risk e-Learning, each with more than 400 participants from government, industry, and academia. Topics range from introducing new cleanup methods, to communication tools for communities facing environmental health challenges.
- **Connecting with communities:** SRP regularly conducts workshops and training with communities near hazardous waste sites.

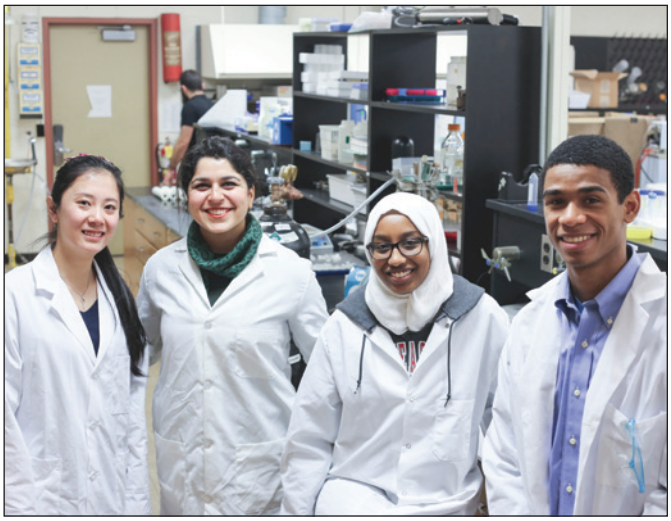


Photo courtesy of the Northeastern University SRP Center.

Photo courtesy of the University of Iowa SRP Center.

How SRP works

Recognizing the threat posed by dangerous chemicals and other pollutants left in toxic waste dumps nationwide, Congress created the landmark Superfund program in 1980, to clean up the sites. SRP was created by the Superfund Amendments and Reauthorization Act of 1986, which directs SRP to develop:

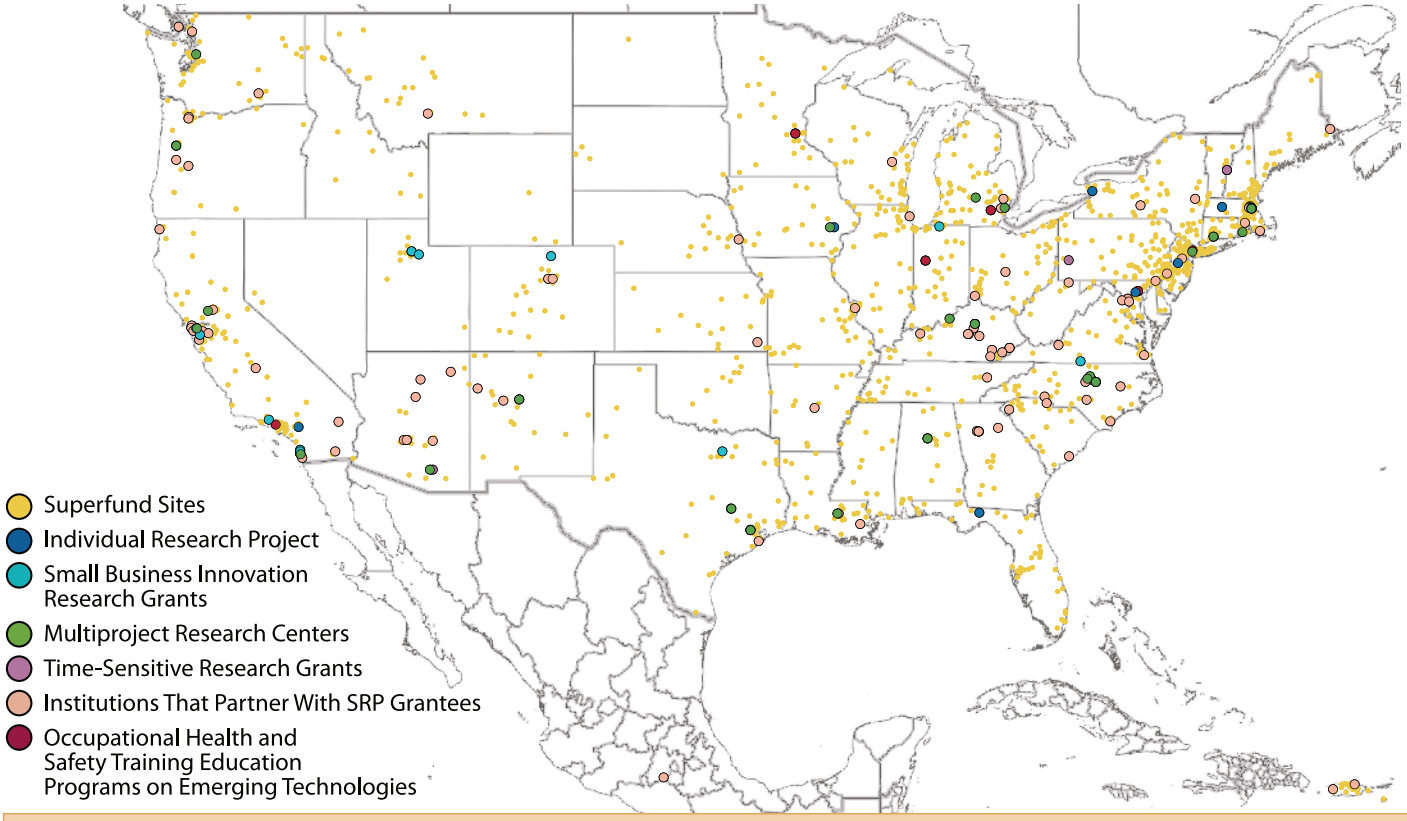
- Advanced techniques to detect, assess, and evaluate the health effects of hazardous substances.
- Methods to assess risks to human health posed by hazardous substances.
- Methods and technologies to detect hazardous substances and their toxicity.
- Basic biological, chemical, and physical methods to reduce the amount and toxicity of hazardous substances.

SRP funds four types of grants to meet research goals

- Multiproject research centers where teams of scientists from different disciplines, usually at major universities, work together to address complex challenges from hazardous waste sites.
- Individual research projects complement multiproject centers with research that meets critical detection and cleanup technology needs.
- Small business grants fund small businesses to develop monitoring and cleanup technologies.
- Training programs develop occupational health and safety training related to emerging contaminants and cleanup technologies.
- Time-sensitive research grants support environmental health research when there is a limited window of opportunity to collect human biological samples or environmental exposure data, such as after a sudden natural disaster.

Superfund sites and related research and training activities

There are nearly 1,400 hazardous waste sites across the country. This map shows their location, along with locations of SRP grantees and the institutions with which they collaborate.



For more information on the Superfund Research Program, visit **https://niehs.nih.gov/srp**.
To subscribe to the SRP monthly research briefs, contact **srpinfo@niehs.nih.gov**.

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