

National Institute of Environmental Health Sciences
Division of Extramural Research and Training
Center for Risk and Integrated Systems/Superfund Research Program

NATIONAL ADVISORY ENVIRONMENTAL HEALTH SCIENCES COUNCIL

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Concept Clearance

Superfund Research Program Individual Research Project Program (R01)

Introduction

The Superfund Hazardous Substance Research and Training Program, or Superfund Research Program (SRP), was initiated under the Superfund Amendments Reauthorization Act (SARA) in 1986 and has funded university-based research in biomedical and environmental science/engineering to address implications associated with hazardous substances in the environment. The scope of the SRP is taken directly from the SARA mandates and includes: (1) advanced techniques for the detection, assessment, and evaluation of the effect on human health of hazardous substances; (2) methods to assess the risks to human health presented by hazardous substances; (3) methods and technologies to detect hazardous substances in the environment; and (4) basic biological, chemical, and physical methods to reduce the amount and toxicity of hazardous substances. For two decades, these broad mandates primarily were accomplished through one funding mechanism, the Superfund Hazardous Substance Research and Training Program (P42), known as the Multi-Project P42 Centers or, simply, "P42s Centers."

In 2006, the SRP initiated an Individual Research Project (R01) Program to address significant research needs of the non-biomedical mandate areas of high priority for the SRP, EPA and ATSDR; to support high risk- high payoff projects, and to respond quickly to emerging issues in targeted areas. At the February 2006 National Advisory Environmental Health Sciences (NAEHS) Council meeting, a program plan was presented under [RFA ES 05-001](#) that included several P42 Center applications under consideration as well as a concept clearance for initiation of an individual research project program. Following the plan approved by NAEHS Council, the first eight SRP R01 awards were made in 2006 and specialized in novel methods for environmental exposure assessment and site characterization; remediation and characterization of contaminants and or mixtures in sediments; and bioavailability. Subsequent Requests for Applications included seven awards in sediment remediation ([RFA ES 06-006](#)), four awards in bioremediation mechanisms ([RFA ES 07-007](#)) and five awards in bioavailability assays ([RFA ES 11-005](#)).

The SRP Individual Research Project program has been in existence for just over 6 years yet has resulted in numerous outputs from the 20 three year awards made. The

impact of the research conducted through these awards is evident from the publication record, the patents filed, field application activities, and grant spin-offs. One notable success story is the 2011 work by Isaac Wirgin published in *Science* that identified the mechanistic basis of resistance to polychlorinated biphenyl (PCB) contaminants in Atlantic tomcod from the Hudson River. They unveiled extraordinarily strong selective pressures driving genetic evolution in dozens of generations, as opposed to thousands of generations. Another mechanistic R01 project, led by Gemma Reguera, resulted in several patents for biomimetic devices based on metal reduction by *Geobacter* spp. (Reguera *et al.* 2010, 2011a, 2011b, 2012). These devices are needed to design effective *in situ* bioremediation strategies for uranium and other toxic metals and for long-term stewardship of contaminated sites. Research by Upal Ghosh published in *Environmental Science and Technology* demonstrated that addition of activated carbon to PCB-contaminated sediments greatly reduces PCB bioavailability and demonstrated this at a contaminated site at Fort Eustis, VA (Ghosh *et al.* 2011). Another SRP R01 project led by Barry Dellinger discovered that toxic persistent free radicals are formed – *de novo* – as a result of interactions between particles in combustion by-products, thus presenting a potentially overlooked mechanism of toxicity of hazardous substances (Lomnicki *et al.*, 2008). This discovery eventually led to the formation of the Louisiana State University SRP P42 research center which is investigating the formation and toxicological implications of these radicals.

These are some examples indicating the R01 program has been responsive to the intended objective to address research needs for the EPA, fill research portfolio gaps, and support emerging and or risky research issues. At this juncture, the current SRP R01 awards are in the final year of funding, presenting an opportunity to release a new RFA. As has been the case for all the SRP RFAs, and particularly after the release of the [2010 SRP Strategic Plan](#), consultation with partners from the EPA and Agency for Toxicology and Disease Registry (ATSDR) is a key process for development of highly relevant funding announcements. In addition, the 2010 Strategic Plan stresses the importance of problem-based, solution oriented research and places a high value on investigator-initiated research translation. Lastly, the ability for the SRP to maximize its programmatic investment is an important consideration for the continuation of the SRP R01 program.

Research Goals and Scope

Building on the past R01 grantee achievements, SRP intends to issue another Funding Opportunity Announcement (FOA) to complement the science emerging from the previous RFAs while maintaining our commitment to focus on research that is highly relevant to Superfund stakeholders. Through a standing SRP-EPA-ATSDR working group known as “Research to Risk Assessment”, the SRP has been able to identify pressing issues that require basic research in order to fulfill site assessment and management challenges of our Superfund stakeholders. Through this working group, critical emerging issues surface for which new SRP could potentially to address. For

example, lack of knowledge of the mechanisms of contaminant bioavailability mechanisms has implications for site assessment and management.

The SRP intends to develop an FOA to explore the complex biological, geological and chemical processes that have implications for exposure risk by living systems. By understanding the mechanisms of these complex interactions, we are better equipped to establish science-based decision making for site management, priority-setting, and remedy selection. This proposed FOA would feature advanced imaging technologies, analytical methodologies, and empirical evidence of the biological, geological, and chemical processes that alter the availability and or toxicity of environmental contaminants to living systems.

Applicants will be asked to provide a clear description of how the hazardous substance(s) being studied and subsequent results are relevant to Superfund and how their research will lead to better decision making for risk assessors and remediation managers at Superfund sites.

Mechanism and Justification

This funding announcement will utilize the R01 grant mechanism. SRP currently has a FY 2013 allocation of \$1,500,000 for the support of five R01 grants. As this is the final year of these R01 grants, SRP will, in FY 2014, utilize this same level of funding for making new awards under this upcoming solicitation. It is anticipated that up to 6 – 8 awards may be funded under this announcement.

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