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

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.

University of California, Davis (UC Davis)

Biomarkers of Exposure to Hazardous Substances

Biomarkers, or biological signs, link a specific environmental exposure to a health outcome. Researchers investigate many hazardous substances to find biomarkers in living organisms. They also seek to understand adverse health effects from exposures, particularly related to pulmonary and reproductive functions.

Led by Bruce D. Hammock, Ph.D., researchers at the University of California, Davis (UC Davis) SRP Center are working to:

- Develop systems to detect markers of exposure and toxicological effect in the body to better predict the effect of hazardous materials on humans and their environment.
- Develop rapid, accurate methods to measure Superfund priority chemicals in the environment.
- Explore new technologies for thermal and bioremediation of toxic waste, and address possible health risks associated with these technologies.
- Understand how hazardous materials are transported in groundwater, surface water, and air, as they move from toxic waste sites.
- Assess the effects of environmental exposures on reproductive and pulmonary health.

In partnership with government agencies, UC Davis SRP translates research and delivers information and technology products to federal and state agencies that are measuring contaminants and removing them from the environment. Drawing on interdisciplinary expertise, researchers identify and facilitate opportunities for research dissemination and collaboration in California and beyond.

Addressing Big Issues Related to Hazardous Exposures and Effects:

- Hazardous waste sites contain complex chemical mixtures. Therefore, the UC Davis SRP is developing rapid and inexpensive ways to detect those mixtures, using specific standardized systems.
- Tracing the movement of hazardous materials from Superfund sites through the environment and predicting the exposure or effect of these materials on the public and environment is difficult. UC Davis SRP is working to address these issues, as well as others.

UC DAVIS
UNIVERSITY OF CALIFORNIA

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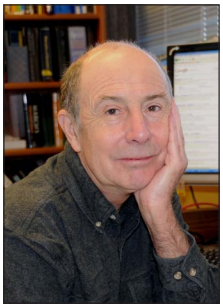
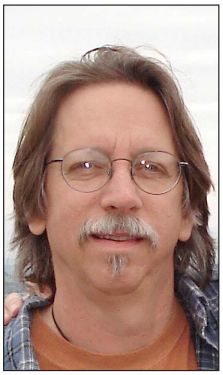
Section 311(a) of the Superfund Amendments and Reauthorization Act (SARA) of 1986

Research and Public Engagement Highlights

Hammock's Immunoassay Technologies Greatly Improve Detection of Hazardous Chemicals



Immunoassays can measure contaminants in a variety of media, such as water, air, and blood. Hammock opened new possibilities when he developed an immunoassay to test for the presence of pyrethroids, a class of pesticides. He saw great possibilities in antibodies being used to detect proteins and other large molecules and developed a way to use immunoassays to detect chemical compounds. These assays can be used on numerous samples for quick results, often on site and at low cost. His team is also developing immunoassays for other insecticides and emerging environmental contaminants.



Luciferase Assay Reveals Toxins

Michael Denison, Ph.D., tackled the difficult problem of tracking halogenated aromatic hydrocarbon (HAH) contamination by developing the Chemical-Activated Luciferase Gene Expression (CALUX®) bioassay. HAHs are global environmental contaminants present in food, water, and soil. The CALUX® bioassay is a sensitive and low-cost method for detecting and quantifying HAHs using cultured cells. Accepted by the international community, it is being used as a rapid and cost-effective tool for screening food and feed ingredients for dioxin and dioxin-like compounds in Europe. Additionally, a similar system developed by Denison, the BG1Luc estrogen receptor transactivation assay, was accepted by the U.S. Environmental Protection Agency's Tier 1 screening program for estrogenic chemicals.

Bioremediation Provides Powerful Solution to MTBE Groundwater Contamination

Methyl tertiary-butyl ether (MTBE) reduced air pollution when added to gasoline and was used for several years in California, before further studies revealed it also contaminated groundwater and is a probable carcinogen. Although California discontinued MTBE in 2002, many underground tanks at abandoned gas stations leaked the chemical into groundwater. When MTBE threatened to limit already strained water resources in California, Kate Scow, Ph.D., found a solution, based on her detailed understanding of bacterial metabolism and biodegradation of toxic compounds. Scow and her team worked with Tesoro Petroleum and Haley & Aldrich Engineers to develop a bioremediation platform based on a microbe that can degrade MTBE. Their water treatment process decreased peak levels of MTBE 10-fold in just two months and eventually brought the aquifers into compliance and back online.

Entrepreneurship Academy Teaches the Business of Environmentalism

Each year, UC Davis SRP sponsors the UC Entrepreneurship Academy. The three-day intensive program acts as a springboard to move research out of the lab, by educating researchers about potential business opportunities. Venture capitalists, entrepreneurs, university faculty, industry executives, and angel investors serve as mentors and guest speakers, providing participants with the knowledge and networks to commercialize their research.

Students learn about bringing research to market by participating in an activity at the entrepreneurship academy. *(Photo courtesy of the UC Davis SRP)*

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 University of California, Davis Center, visit **http://www-sf.ucdavis.edu**