



National Institute of Environmental Health Sciences | **Superfund Basic Research Program**

A LEGACY IN MULTIDISCIPLINARY RESEARCH

Charting a Course for Advancing Basic Research to Practice

VOLUME 2

Overview of SBRP-Funded Science and Outreach

National Institute of Environmental Health Sciences | **Superfund Basic Research Program**

A LEGACY IN MULTIDISCIPLINARY RESEARCH

Charting a Course for Advancing Basic Research to Practice

VOLUME 2

Overview of SBRP-Funded Science and Research

2003 SBRP External Advisory Group

A Working Group of the National Environmental Health Sciences Council

Research Triangle Park, N.C.

A PDF of Volume 2 can be accessed at the following link:

<http://www-apps.niehs.nih.gov/sbrp/eag/eagvol2.pdf>

Password: eag!2003

A LEGACY IN MULTIDISCIPLINARY RESEARCH

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VOLUME III:

4. SBRP CONTRIBUTIONS

3a. Overview of SBRP-Funded Science and Outreach

Section 3 of the briefing book provides basic information on the research that the SBRP supported between 1995-2002. The information in this section should be considered a resource. If you are interested in reviewing a particular topic, you can use this section to identify the types of research the SBRP conducts. The PDF version of this document contains links to each project description. You may also choose to review this section quickly to get an overview of the science that the Program supports.

The section begins with a listing of the research conducted at hazardous waste sites. Following the sites list is information on the research that the Program is conducting. This information has been categorized by topic. These topics focus on a variety of issues that are important to, and complement concerns of, the national Superfund program. As an example, one section is devoted to contaminants. These contaminants were selected because they are commonly found at Superfund sites and are of significant health concern. For each contaminant highlighted, a brief description is presented on why the contaminant is a problem, followed by a listing of all related SBRP research projects. For ease of assessment, these lists are divided by scientific discipline and include both biomedical and non-biomedical projects.

In addition to contaminants, we describe SBRP research in context of “single issue” topics that include groundwater, sediments and bioavailability. Again, these categories are important areas to the Superfund program. Then, in order to demonstrate the integrated nature of the Program, we present the research as cross-cutting topics such as remediation technologies, toxicology, biomarkers, risk/exposure assessment, susceptible populations and integrated ecological and human health studies.

You may note that most research projects are included on more than one list. Our intent is to demonstrate that the research being conducted has applications to various areas of science. Finally in this section, are descriptions of SBRP outreach activities and World Trade Center research and outreach.

Taken in total, this section demonstrates the depth and breath of approaches that multidisciplinary research programs bring to complex environmental health issues.

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3b. Potential Discussion Questions

We have developed some questions that you may wish to consider as you assess the contributions the SBRP has made to advance science to society's benefit and improve public health.

These same questions also will be applicable to section 4 of this briefing book.

1. Has the SBRP made a contribution to the advancement of science in these topic areas? (Or is the information provided inadequate to assess the contributions? If so, can we provide you more specific information to help you?)
2. Are there critical research areas that have been overlooked, or that need priority attention?
3. Within a topic area, are there specific aspects that should receive less emphasis? Why? (Given that we have limited resources, it would be beneficial to know if there are lower priority areas to offset the other higher priority areas.)
4. Based on the state of the science in the topic areas, are there major areas where concentrated effort is more likely to produce “breakthroughs” that would more dramatically advance our understanding of the field; limit exposures at hazardous waste sites; or improve public health?
5. Can we do a better job at communicating the results of the science and its potential implications to the general public and other involved stakeholders? If so, are there specific examples or approaches that we could use as models for communicating research results?
6. In particular, how can we communicate our research findings to the broader community of state site managers and professionals who are making decisions at hundreds of small or large hazardous waste sites around the country?
7. Are there other partnerships or venues that should receive priority attention by the SBRP in communicating its research results?
8. Are there additional outreach opportunities that we should explore for involving local communities or tribes in the understanding and application of our research results?
9. Are our efforts in multidisciplinary training effective? Are they filling a societal need? If so, is there anything else that we should be doing to advocate for multidisciplinary training?

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3c. SBRP Research at Hazardous Waste Sites

As the focus of the SBRP is to support fundamental basic research that enhances the infrastructure of environmental health sciences, investigators are not required to direct their research to specific sites. However, as many research projects have matured to field demonstration and application stages, the SBRP does encourage the investigators of these projects to apply their research findings at hazardous waste sites. The following list demonstrates the activities that the Program has supported at hazardous waste sites. These include site characterization, sample analysis, bench and field scale, applications of new remediation technologies, applications of GIS tools, fate and transport studies, epidemiology studies, ecology studies, and community outreach.

EPA REGION 1

Solvent Recovery Services of New England, Southington, CT

University of California – Berkeley, Kent Udell
 1995 – 2000
Thermally Enhanced Soil and Groundwater Remediation
 Steam enhanced remediation

Former Jo Whiten Co., Winchester, MA

Dartmouth College, Carol Folt
 1995 – 2000
Variation in Bioaccumulation and Biomagnification of metal in Lakes
 Fate and transport

New Bedford Estuary, New Bedford, MA

Harvard School of Public Health, Susan Korrick
 2000 – 2005
In utero Exposure to Polychlorinated Biphenyls, Pesticides and Metals in Relation to Cognitive Function in Childhood
 Epidemiology, exposure assessment

Harvard School of Public Health, Susan Korrick
 1995 – 2000
In Utero PCB and Metal Exposures and Infant Development
 Epidemiology, exposure assessment

Harvard School of Public Health, Timothy Ford

2000 – 2005

Assessment of Biological Responses to Organic and Metal Contaminants in New Bedford: Methods for Monitoring

Ecology, microbial

Harvard School of Public Health, Timothy Ford

1995 – 2000

Assessment of Contaminant Concentrations and Ecologic Implications

Ecology, microbial

New Bedford Harbor, New Bedford, MA

Boston University, Gloria Callard

1995 – 2000

Neurodevelopmental Effects of Xenoestrogens in Zebrafish

Ecology, resistance in invertebrates

Boston University, John Stegeman

1995 – 2000

Role of Two AHRs in Dioxin Sensitivity and Resistance

Ecology, resistance in invertebrates

Boston University, Mark Hahn

1995 – 2000

Mechanisms of chemical sensitivity and resistance

Ecology, resistance in invertebrates

Otis Air National Guard/Camp Edwards, Falmouth, MA

Boston University, Ann Aschengrau

2000 – 2005

PCE- Contaminated Drinking Water and Disorders of Reproduction and Development

Epidemiology

Boston University, Gloria Callard

2000 – 2005

Developmental Neurotoxicity of Xenoestrogens in Zebrafish

Ecology, effects of wildlife reproduction

Boston University, Ian Callard

2000 – 2005

Endocrine/Reproductive Disruption by Ground and Surface Waters

Ecology, effects of wildlife reproduction

Boston University, Ian Callard

1995 – 2000

Sentinel Species: Xenobiotics, Toxicity and Reproduction

Waste site characterization

Boston University, David Ozonoff

1995 – 2000

New Methods of Spatial Analysis

Epidemiology, exposure assessment

Woods Pond, Pittsfield, MA

Michigan State University, James Tiedje

2000 – 2005

PCB Bioremediation Strategies and Potential Intermediates of Toxicological Significance

Bioremediation

Loring AFB, Limestone, ME

University of California – Berkeley, Kent Udell

1995 – 2000

Thermally Enhanced Soil and Groundwater Remediation

Steam enhanced remediation

Winthrop Landfill, Winthrop, ME

Columbia University, James Simpson

2000 – 2005

Redistribution of Arsenic and Other Contaminants at Sites in NJ and Maine

Arsenic mobilization processes and transport

18 Superfund sites in the State of New Hampshire

Dartmouth College, Margaret Karagas

1995 – 2000

Epidemiology of Arsenic and Other Toxic Metals

Epidemiology, exposure assessment

Dartmouth College, Joel Blum

1995 – 2000

Sources, fate and transport of arsenic in New Hampshire Groundwater

Fate and transport

George Lay Property, Merrimack, NH

Dartmouth College, Carol Folt

1995 – 2000

Variation in Bioaccumulation and Biomagnification of metal in Lakes

Fate and transport

Elizabeth Copper Mine, Strafford, VT

Dartmouth College, Joshua Hamilton

2000 – 2005

Pilot Project: Elizabeth Copper Mine Outreach Project

Environmental, ecological and human health impact; education and outreach projects

EPA REGION 2

The American Cyanamid, Bound Brook, NJ

Michigan State University, Jerry Kukor

2000 – 2005

Processes Influencing the Natural Attenuation of Organic Contaminant Plumes: Transport, Enzymatic Regulation and Microbial Transformation Rates in Flowing Groundwater Systems

Bioremediation

The Ciba Chemicals, Toms River, NJ

Michigan State University, Jerry Kukor

2000 – 2005

Processes Influencing the Natural Attenuation of Organic Contaminant Plumes: Transport, Enzymatic Regulation and Microbial Transformation Rates in Flowing Groundwater Systems

Bioremediation

Picatinny Arsenal, NJ

Michigan State University, James Tiedje

2000 – 2005

PCB Bioremediation Strategies and Potential Intermediates of Toxicological Significance

Bioremediation

Vineland Chemical Co., Inc., Vineland, NJ

Columbia University, James Simpson

2000 – 2005

Redistribution of Arsenic and Other Contaminants at Sites in NJ and Maine

Arsenic mobilization processes and transport

Hudson River Harbor, NJ – NY

Michigan State University, Stephen Boyd

2000 – 2005

Bioremediation Products Evaluation Core

Bioremediation

Mount Sinai School of Medicine, Richard Bopp

2000 – 2005

Persistent Organochlorines in the Hudson River Watershed

Exposure assessment

Mount Sinai School of Medicine, Richard Bopp

1995 – 2000

Sources and Pathways of Persistent Chlorinated Hydrocarbon Exposure in New York Harbor

Exposure assessment

Mount Sinai School of Medicine, Avrom Caplan

2000 – 2005

Membrane efflux pumps and hormonal activity of organochlorine contaminants in New York Harbor Sediments

Exposure assessment

Mount Sinai School of Medicine, Anne Golden
 2000 – 2005
Exposure Levels of Persistent Pollutants in Urban Anglers
 Exposure assessment

Mount Sinai School of Medicine, David Sassoon
 2000 – 2005
Organochlorine Disruption of the Wnt Gene Pathway in the Female Reproductive Tract
 Exposure assessment

Mount Sinai School of Medicine, Luz Claudio
 1995 – 2000
Outreach
 Exposure assessment

Mount Sinai School of Medicine, Lloyd Sherman
 1995 – 2000
Training
 Exposure assessment

Mount Sinai School of Medicine, James Simpson
 1995 – 2000
Sources and Pathways of Urban Heavy Metal Exposure Using Elemental and Isotopic Composition of Environmental Samples
 Exposure assessment

Mount Sinai School of Medicine, James Wetmur
 1995 – 2000
Effects of Polychlorinated Biphenyls Polychlorinated Biphenyl-Containing River Sediments on Carcinogen Metabolism in Normal Human Mammary Epithelial Cells
 Exposure assessment

Mount Sinai School of Medicine, Mary Wolff
 1995 – 2000
Hormonal Activity of Chlorinated Hydrocarbons and Related Contaminants from New York Harbor Sediments
 Exposure assessment

HS7 and HS28, Hudson River, NY

Michigan State University, James Tiedje
 2000 – 2005
PCB Bioremediation Strategies and Potential Intermediates of Toxicological Significance
 Bioremediation

EPA REGION 3

Ciba-Geigy Corp. Site, Philadelphia, PA

University of North Carolina – Chapel Hill, James Swenberg
 2000 – 2005
DNA Adducts as Biomarkers of Exposure and Effect
 Biomarkers, mechanistically-based risk assessment

Drake Chemical, Loch Haven, PA

Texas A&M University, Kirby Donnelly
1995 – 2000
Site Assessment and Remediation
Site assessment and remediation

Iacavazzi Landfill, Scranton, PA

Texas A&M University, Kirby Donnelly
1995 – 2000
Site Assessment and Remediation
Site assessment and remediation

Atlantic Wood, Portsmouth, VA

Duke University, Richard DiGiulio and Dharni Vasudevan
2000 – 2005; Projects 4 and 5
(4) *Markers for Chemical Mixtures in Fundulus heteroclitus*
(5) *Fate, Transport, and Exposure Risk of Superfund Chemicals*
Mixture effects; biomarkers; Fate and transport

Boston University, Mark Hahn
1995 – 2000
Mechanisms of Chemical Sensitivity and Resistance
Mixture effects, biomarkers

Texas A&M University, Kirby Donnelly
1995 – 2000
Site Assessment and Remediation
Site assessment and remediation

Metals, PNAs, PCBs*

Superfund Site Not Disclosed

Texas A&M University, Kirby Donnelly
1995 – 2000
Site Assessment and Remediation
Reconnaissance

Mixed Industrial*

Superfund Site Not Disclosed

Texas A&M University, Kirby Donnelly
1995 – 2000
Site Assessment and Remediation
Leachate collection

* Superfund site not disclosed due to privacy agreements

Municipal*

Superfund Site Not Disclosed

Texas A&M University, Kirby Donnelly
 1995 – 2000
Site Assessment and Remediation
 Leachate collection

Pesticides*

Superfund Site Not Disclosed

Texas A&M University, Kirby Donnelly
 1995 – 2000
Site Assessment and Remediation
 Reconnaissance

EPA REGION 4**Ciba-Geigy Corp. Site, McIntosh, AL**

University of North Carolina – Chapel Hill, Michael Aitken
 1995 – 2000
Factors Influencing the Biodegradation of Polycyclic Aromatic Hydrocarbons in Contaminated Soil
 Bioremediation

University of Washington, Michael Hooper (Texas Tech)
 1995 – 2000
Wildlife Biomarker Applications to Remediation Decision Making
 Wildlife biomarkers, ecology

Olin Corporation, McIntosh, AL

University of Washington, Michael Hooper (Texas Tech)
 1995 – 2000
Wildlife Biomarker Applications to Remediation Decision Making
 Wildlife biomarkers, ecology

Tower Chemical Company Site, Clermont, FL

University of Florida, Timothy Gross and Nancy Denslow
 1995 – 2000
Endocrine-Disrupting Effects of Chlorinated Hydrocarbons on Wildlife
 Ecology

LCP Chemical, Brunswick, GA

Michigan State University, John Geisy
 1995 – 2000
Estrogenicity of Hydroxylated PCB Metabolites
 Risk assessment

* Superfund site not disclosed due to privacy agreements

Paducah Gaseous Diffusion Plant, Paducah, KY

University of Washington, Michael Hooper (Texas Tech)

1995 – 2000

Wildlife Biomarker Applications to Remediation Decision Making

Wildlife biomarkers, ecology

Cape Fear, Fayetteville, NC

Texas A&M University, Kirby Donnelly

1995 – 2000

Site Assessment and Remediation

Site assessment and remediation

Cherry Point Marine Corps Air Station, Cherry Point, NC

University of North Carolina – Chapel Hill, George Christakos

2000 – 2005

A Holistochastic Approach to Human Exposure Assessment

Risk assessment

FCX, Inc. (Washington Plant) Washington, Beaufort County, NC

Duke University, Richard DiGiulio and Dharni Vasudevan

2000 – 2005; Projects 4 and 5

(4) *Markers for Chemical Mixtures in Fundulus heteroclitus*

(5) *Fate, Transport, and Exposure Risk of Superfund Chemicals*

Mixture effects; biomarkers; Fate and transport

Georgia-Pacific Hardwood Sawmill, Plymouth, Washington County, NC

Duke University, Richard DiGiulio and Dharni Vasudevan

2000 – 2005; Projects 4 and 5

(4) *Markers for Chemical Mixtures in Fundulus heteroclitus*

(5) *Fate, Transport, and Exposure Risk of Superfund Chemicals*

Mixture effects; biomarkers; Fate and transport

Koppers Company, Inc., Morrisville, NC

University of North Carolina – Chapel Hill, Irva Hertz-Picciotto

1995 – 2000

Epidemiology

Epidemiology

Geiger Site, Charleston County, SC

University of Washington, Michael Hooper (Texas Tech)

2000 – 2005

Wildlife Applications to Remediation Decision Making

Wildlife biomarkers, ecology

Sangamo Weston, Inc/Twelve-Mile Creek/Lake Hartwell, Pickens, SC

University of Washington, Michael Hooper (Texas Tech)
 1995 – 2000
Wildlife Biomarker Applications to Remediation Decision Making
 Wildlife biomarkers, ecology

Savannah River Site, SC

University of Florida, Angela Lindner
 2000 – 2005
Natural Bioattenuation of PCE and TCE
 Microbiology as related to phytoremediation

University of California – Berkeley, Kent Udell
 1995 – 2000
Thermally Enhanced Soil and Groundwater Remediation
 Bioremediation

Wood Preserving*

Superfund Site Not Disclosed

Texas A&M University, Kirby Donnelly
 1995 – 2000
Site Assessment and Remediation
 Annual monitoring

Wood Preserving*

Superfund Site Not Disclosed

Texas A&M University, Kirby Donnelly
 1995 – 2000
Site Assessment and Remediation
 Remedial evaluation

EPA REGION 5**Du Quoin, Du Quoin, IL**

Texas A&M University, Kirby Donnelly
 1995 – 2000
Site Assessment and Remediation
 Site assessment and remediation

Jennison-Wright East, St. Louis, IL

Texas A&M University, Kirby Donnelly
 1995 – 2000
Site Assessment and Remediation
 Site assessment and remediation

* Superfund site not disclosed due to privacy agreements

Joliet Army, Joliet, IL

Texas A&M University, Kirby Donnelly
1995 – 2000
Site Assessment and Remediation
Site assessment and remediation

Savannah Army Depot, Savannah, IL

Texas A&M University, Kirby Donnelly
1995 – 2000
Site Assessment and Remediation
Site assessment and remediation

Mississinewia River, Union City, IN

Michigan State University, James Tiedje
2000 – 2005
PCB Bioremediation Strategies and Potential Intermediates of Toxicological Significance
Bioremediation

Federal Marine Terminal Site, MI

Michigan State University, John Giesy
1995 – 2000
Estrogenicity of Hydroxylated PCB Metabolites
Risk assessment

Kalamazoo River, Kalamazoo, MI

Michigan State University, James Tiedje
2000 – 2005
PCB Bioremediation Strategies and Potential Intermediates of Toxicological Significance
Bioremediation

Pointe Mouillee Confined Disposal Facility, Detroit, MI

Michigan State University, Walt Weber
2000 – 2005
Factors Controlling the Environmental Mobility, Microbial Transformation and Toxicity of Mixed Non-Aqueous Phase Liquids and Exposed Soils/Sediments in Subsurface Systems
Bioremediation

Portage Creek, Kalamazoo, MI

Michigan State University, Walt Weber
2000 – 2005
Factors Controlling the Environmental Mobility, Microbial Transformation and Toxicity of Mixed Non-Aqueous Phase Liquids and Exposed Soils/Sediments in Subsurface Systems
Bioremediation

Saginaw River, Saginaw, MI

Michigan State University, Walt Weber

2000 – 2005

Factors Controlling the Environmental Mobility, Microbial Transformation and Toxicity of Mixed Non-Aqueous Phase Liquids and Exposed Soils/Sediments in Subsurface Systems

Bioremediation

Scouter Pond, Kalamazoo, MI

Michigan State University, Walt Weber

2000 – 2005

Factors Controlling the Environmental Mobility, Microbial Transformation and Toxicity of Mixed Non-Aqueous Phase Liquids and Exposed Soils/Sediments in Subsurface Systems

Bioremediation

Velsicol Chemical Superfund Site, St. Louis, MI

Michigan State University, Stephen Boyd

2000 – 2005

Bioremediation Product Toxicity Evaluation Core

Bioremediation

Reilly Tar and Sand Site, Dover, OH

University of North Carolina – Chapel Hill, Frederic Pfaender

1995 – 2000

Microbial Degradation and Interactions of PAH and Soil

Biodegradation and bioremediation

Coal Tar*

Superfund Site Not Disclosed

Texas A&M University, Kirby Donnelly

1995 – 2000

Site Assessment and Remediation

Annual monitoring

Drum Storage Area (pesticides)*

Superfund Site Not Disclosed

Texas A&M University, Kirby Donnelly

1995 – 2000

Site Assessment and Remediation

Reconnaissance

Landfill (pesticides)*

Superfund Site Not Disclosed

Texas A&M University, Kirby Donnelly

1995 – 2000

Site Assessment and Remediation

Leachate collection

* Superfund site not disclosed due to privacy agreements

Landfill (PCBs)*

Superfund Site Not Disclosed

Texas A&M University, Kirby Donnelly
1995 – 2000
Site Assessment and Remediation
Exposure assessment

Munitions*

Superfund Site Not Disclosed

Texas A&M University, Kirby Donnelly
1995 – 2000
Site Assessment and Remediation
Annual monitoring

Munitions*

Superfund Site Not Disclosed

Texas A&M University, Kirby Donnelly
1995 – 2000
Site Assessment and Remediation
Reconnaissance

Pesticide Disposal*

Superfund Site Not Disclosed

Texas A&M University, Kirby Donnelly
1995 – 2000
Site Assessment and Remediation
Reconnaissance

Wood Preserving*

Superfund Site Not Disclosed

Texas A&M University, Kirby Donnelly
1995 – 2000
Site Assessment and Remediation
Exposure assessment

EPA REGION 6

Tar Creek, Miami, OK

Columbia University, Conrad Blum
2000 – 2005
Bioavailability of Soil Pb and As in Humans
Bioavailability

* Superfund site not disclosed due to privacy agreements

Harvard School of Public Health, Wright, Hu, and Spengler

2000 – 2005

Lead Exposure, Pathways, Biomarkers and Health Effects

Epidemiology

Baldwin Waste Oil, Kingsville, TX

Texas A&M University, Kirby Donnelly

1995 – 2000

Site Assessment and Remediation

Site assessment and remediation

McBay Oil, Grapeland, TX

Texas A&M University, Kirby Donnelly

1995 – 2000

Site Assessment and Remediation

Site assessment and remediation

Solvent Recovery Service, Arcola, TX

Texas A&M University, Kirby Donnelly

1995 – 2000

Site Assessment and Remediation

Site assessment and remediation

State Marine Port, Arthur, TX

Texas A&M University, Kirby Donnelly

1995 – 2000

Site Assessment and Remediation

Site assessment and remediation

Texarkana Wood, Texarkana, TX

Texas A&M University, Kirby Donnelly

1995 – 2000

Site Assessment and Remediation

Site assessment and remediation

Abandoned Refinery (PNAs and lead)*

Superfund Site Not Disclosed

Texas A&M University, Kirby Donnelly

1995 – 2000

Site Assessment and Remediation

Reconnaissance

* Superfund site not disclosed due to privacy agreements

Department of Energy (explosives)*

Superfund Site Not Disclosed

Texas A&M University, Kirby Donnelly

1995 – 2000

Site Assessment and Remediation

Exposure assessment

Marine Facility (PNAs)*

Superfund Site Not Disclosed

Texas A&M University, Kirby Donnelly

1995 – 2000

Site Assessment and Remediation

Reconnaissance

Oil Reclamation (PNAs)*

Superfund Site Not Disclosed

Texas A&M University, Kirby Donnelly

1995 – 2000

Site Assessment and Remediation

Reconnaissance

Solvent Recovery (PAHs and pesticides)*

Superfund Site Not Disclosed

Texas A&M University, Kirby Donnelly

1995 – 2000

Site Assessment and Remediation

Exposure assessment

Solvents and Metals*

Superfund Site Not Disclosed

Texas A&M University, Kirby Donnelly

1995 – 2000

Site Assessment and Remediation

Exposure assessment

Wood Preserving*

Superfund Site Not Disclosed

Texas A&M University, Kirby Donnelly

1995 – 2000

Site Assessment and Remediation

Exposure assessment

* Superfund site not disclosed due to privacy agreements

EPA REGION 7

Times Beach, MO

University of Washington, Michael Hooper (Texas Tech)
 1995 – 2000
Wildlife Biomarker Applications to Remediation Decision Making
 Wildlife biomarkers, ecology

Oronogo-Duenweg Mining Belt, Jasper County, MO

Columbia University, Conrad Blum
 2000 – 2005
Bioavailability of Soil Lead and Arsenic in Humans
 Bioavailability

EPA REGION 8

Rocky Mountain Arsenal, Commerce City, CO

University of Washington, Michael Hooper (Texas Tech)
 1995 – 2000
Wildlife Biomarker Applications to Remediation Decision Making
 Wildlife biomarkers, ecology

Anaconda Smelter Site, Deer Lodge County, MT

University of Washington, Michael Hooper (Texas Tech)
 1995 – 2000
Wildlife Biomarker Applications to Remediation Decision Making
 Wildlife biomarkers, ecology

Burlington Northern, Somers, MT

Texas A&M University, Kirby Donnelly
 1995 – 2000
Site Assessment and Remediation
 Site assessment and remediation

Libby Groundwater, Libby, MT

Texas A&M University, Kirby Donnelly
 1995 – 2000
Site Assessment and Remediation
 Site assessment and remediation

Montana Pole, Butte, MT

Texas A&M University, Kirby Donnelly
 1995 – 2000
Site Assessment and Remediation
 Site assessment and remediation

Jacobs Smelter, Tooele County, UT

University of Washington, Michael Hooper (Texas Tech)

1995 – 2000

Wildlife Biomarker Applications to Remediation Decision Making

Wildlife biomarkers, ecology

Wood Preserving (PNAs)*

Superfund Site Not Disclosed

Texas A&M University, Kirby Donnelly

1995 – 2000

Site Assessment and Remediation

Remedial evaluation

Wood Preserving (PNAs and PCP)*

Superfund Site Not Disclosed

Texas A&M University, Kirby Donnelly

1995 – 2000

Site Assessment and Remediation

Remedial evaluation

EPA REGION 9

Airforce Plant #44, Tucson, AZ

University of Arizona, Mark Brusseau

1995 – 2000

Bioavailability, Soil Heterogeneity, and In-Situ Biodegradation of Organic Compounds

Remediation

Apache Power, Benson, AZ

University of Arizona, Raina Maier

2000 – 2005 and 1995 – 2000

Biosurfactant-Enhanced In Situ Metal Remediation

Bioremediation

Avra Valley, AZ

University of Arizona, James Farrell

2000 – 2005

Electrochemical Remediation of Arsenic and Chromium

Remediation

Broadway-Pantano Landfill, Tucson, AZ

University of Arizona, Robert Arnold and Eric Betterton

2000 – 2005

Innovative Technologies for Remediation of Haloorganics

Remediation

* Superfund site not disclosed due to privacy agreements

Broken Hill, San Manuel, AZ

University of Arizona, Raina Maier
 2000 – 2005 and 1995 – 2000
Biosurfactant-Enhanced In Situ Metal Remediation
 Site characterization

Camp Navajo, Bellemont, AZ

University of Arizona, Ian Pepper and Raina Maier
 2000 – 2005: Projects 5 and 6 and 1995 – 2000: Project 1B
 (5) *Gene Enhanced Remediation of Co-contaminated Soils*
 (6/1B) *Biosurfactant-Enhanced In Situ Metal Remediation*
 Site characterization

Central Arizona Project Headquarters, Phoenix, AZ

University of Arizona, Raina Maier
 2000 – 2005 and 1995 – 2000
Biosurfactant-Enhanced In Situ Metal Remediation
 Biofiltration

City of Tucson Fuel Depot, Tucson, AZ

University of Arizona, Mark Brusseau
 2000 – 2005
Bioavailability and Remediation of Complex DNAPLs
 Remediation

University of Arizona, Mark Brusseau
 1995 – 2000
Bioavailability, Soil Heterogeneity, and In-Situ Biodegradation of Organic Compounds
 Remediation

El Camino del Cerro Landfill, Tucson, AZ

University of Arizona, Robert Arnold and Mark Brusseau
 2000 – 2005: Projects 7 and 10 and 1995–2000: Projects 1C, 3A
 (7) *Bioavailability and Remediation of Complex DNAPLs*
 (10) *Innovative Technologies for Remediation of Haloorganics*
 (1C) *Bioavailability, Soil Heterogeneity, and In-Situ Biodegradation of Organic Compounds*
 (3A) *Model for Catalytic Reductive Dehalogenation*
 Site characterization

GE Moreau Superfund Site, Phoenix, AZ

University of Arizona, Mark Brusseau
 1995 – 2000
Bioavailability, Soil Heterogeneity, and In-Situ Biodegradation of Organic Compounds
 Site characterization

Harrison Landfill, Tucson, AZ

University of Arizona, Robert Arnold and Eric Betterton
2000 – 2005: Project 10 and 1995 – 2000: Project 3A
(10) *Innovative Technologies for Remediation of Haloorganics*
(3A) *Model for Catalytic Reductive Dehalogenation*
Remediation

Klondyke Tailings, Klondyke, AZ

University of Arizona, Martha Conklin and Raina Maier
2000 – 2005: Projects 6 and 8 and 1995 – 2000: Project 1B
(6/1B) *Biosurfactant-Enhanced In Situ Metal Remediation*
(8) *Remediating Mine Waste Products*
Site characterization

University of Arizona, Raina Maier
2000 – 2005 and 1995 – 2000
Biosurfactant-Enhanced In Situ Metal Remediation
Site characterization

Mission Linen, (State Superfund site) Tucson, AZ

University of Arizona, Robert Arnold
1995 – 2000
Model for Catalytic Reductive Dehalogenation
Site characterization and remediation

Olive Grove Aluminum Dross Project, Tucson, AZ

University of Arizona, Ian Pepper
2000 – 2005
Gene Enhanced Remediation of Co-contaminated Soils
Bioaugmentation studies

University of Arizona, Ian Pepper
1995 – 2000
Biodegradation within Metal/Organic Contaminated Soils
Bioaugmentation studies

Page Ranch Landfill, Tucson, AZ

University of Arizona, M. Brusseau, R. Maier, M. Conklin, J. Farrell, and R. Arnold
2000 – 2005: Projects 6–10
(6) *Biosurfactant-Enhanced In Situ Metal Remediation*
(7) *Bioavailability and Remediation of Complex DNAPLs*
(8) *Remediating Mine Waste Products*
(9) *Electrochemical Remediation of Arsenic and Chromium*
(10) *Innovative Technologies for Remediation of Haloorganics*
Fate and transport

Park-Euclid, Tucson, AZ

University of Arizona, Mark Brusseau, Robert Arnold and Eric Betterton
 2000 – 2005
Bioavailability and Remediation of Complex DNAPLs
Innovative Technologies for Remediation of Haloorganics
 Site characterization and remediation

Phoenix-area NPL Superfund site, Phoenix, AZ

University of Arizona, Mark Brusseau
 2000 – 2005
Bioavailability and Remediation of Complex DNAPLs
 Site characterization

University of Arizona, Mark Brusseau
 1995 – 2000
Bioavailability, Soil Heterogeneity, and In-Situ Biodegradation of Organic Compounds
 Site characterization

Pinal Creek, Globe, AZ

University of Arizona, Martha Conklin
 2000 – 2005
Remediating Mine Waste Products
 Fate and transport

University of Arizona, Martha Conklin
 1995 – 2000
Transport of Trace Metals in a Polluted Aquifer
 Fate and transport

Raytheon Airforce Plant #44, Tucson, AZ

University of Arizona, Mark Brusseau
 2000 – 2005
Bioavailability and Remediation of Complex DNAPLs
 Remediation

Silverbell Landfill, Tucson, AZ

University of Arizona, Mark Brusseau
 2000 – 2005
Bioavailability and Remediation of Complex DNAPLs
 Site characterization

Silverbell Post Office, Tucson, AZ

University of Arizona, Raina Maier
 2000 – 2005
Biosurfactant-Enhanced In Situ Metal Remediation
 Bioremediation

Vulture Mill, AZ

University of Arizona, Martha Conklin

2000 – 2005

Transport of Trace Metals in a Polluted Aquifer

Site characterization

Aerojet General Corp., Rancho Cordova, CA

University of California – Davis, Dennis Rolston and Ellen Gold

1995 – 2000: Projects 1 and 9

(1) *Transport, Transformation and Remediation of Perchlorate and VOC's in the Vadose Zone and in Groundwater*

(9) *Epidemiology Studies*

Transport soil/water/Remediation; Biomarkers of reproductive health

Frontier Fertilizer, Davis, CA

University of California – Davis, Bruce Hammock and Michael Denison

2000 – 2005: Projects 3 and 5

(3) *Development and Implementation of Immunoassays for Human and Environmental Monitoring*

(5) *Development and Application of Integrated Cell-based Bioassays*

Bio/immunoassay development

Lawrence Livermore National Laboratory, Livermore, CA

University of California – Davis, Dennis Rolston

2000 – 2005

Transport, Transformation and Remediation of Perchlorate and VOC's in the Vadose Zone and in Groundwater

Transport/remediation of VOC's

University of California – Berkeley, Kent Udell

1995 – 2000

Thermally Enhanced Soil and Groundwater Remediation

Remediation

Mare Island Naval Shipyard Vallejo, CA

University of California – Davis, Dave Hinton and Daniel Chang

2000 – 2005

Aquatic Biomarkers in Site Characterization and Remediation

Biomarkers, sentinel species, site characterization

University of California – Davis, Dave Hinton and Daniel Chang

1995 – 2000

Training Core

Outreach, training

McCormick and Baxter, CA

University of California – Berkeley, Kent Udell
 1995 – 2000
Thermally Enhanced Soil and Groundwater Remediation
 Bioremediation

Sulphur Bank Mercury Mine, Clearlake, CA

University of California – Davis, Bruce Hammock
 1995 – 2000
Immunochemical Methods to Monitor Toxic Substances and/or Indicators of their Presence in Humans and other Species
 Biomarkers, exposure assessment

Naval Weapons Station, Seal Beach, CA

University of California – Berkeley, Lisa Alvarez-Cohen
 2000 – 2005
Development of Tools For Monitoring In Situ Bioremediation
 Bioremediation

Carson River Mercury Site, Carson City, NV

University of Washington, Michael Hooper (Texas Tech)
 1995 – 2000
Wildlife Biomarker Applications to Remediation Decision Making
 Wildlife biomarkers, ecology

EPA REGION 10

Coeur d'Alene, ID

University of Arizona, Raina Maier
 2000 – 2005
Biosurfactant-Enhanced In Situ Metal Remediation
 Site characterization

Idaho National Engineering Laboratory, ID

University of California – Berkeley, Lisa Alvarez-Cohen
 2000 – 2005
Development of Tools For Monitoring In Situ Bioremediation
 Bioremediation

University of California – Berkeley, Kent Udell
 1995 – 2000
Thermally Enhanced Soil and Groundwater Remediation
 Bioremediation

Silver Valley, Silver Valley, ID

University of Arizona, Raina Maier
1995 – 2000
Biosurfactant-Enhanced In Situ Metal Remediation
Site characterization

Portland Harbor, Portland, OR

Oregon Health and Science University, Peter Spencer and Greg Higgins
2000 – 2005
Administration Core
Exposure assessment

Coal Creek, Seattle, WA

Texas A&M University, Kirby Donnelly
1995 – 2000
Site Assessment and Remediation
Site assessment and remediation

Eagle Harbor, Seattle, WA

Texas A&M University, Kirby Donnelly
1995 – 2000
Site Assessment and Remediation
Site Assessment and Remediation

East Gate Disposal Yard, Fort Lewis Logistics Center, Ft. Lewis, WA

University of Washington, John Ferguson
2000 – 2005
Bioremediation of chlorinated solvent compounds: In situ remediation strategies and predictive tools for controlling contaminated plumes
Site remediation

Harbor Island, Seattle, WA

Texas A&M University, Kirby Donnelly
1995 – 2000
Site Assessment and Remediation
Site Assessment and Remediation

University of Washington, Donald Malins
1995 – 2000
DNA Biomarkers in Ecological Impact Assessments
Biomarkers, ecology, risk assessment

Lake Union, Seattle, WA

Texas A&M University, Kirby Donnelly
 1995 – 2000
Site Assessment and Remediation
 Site Assessment and Remediation

US Navy Whidbey Island Naval Air Station (Ault Field), Oak Harbor, WA

University of Washington, Michael Hooper (Texas Tech)
 1995 – 2000
Wildlife Biomarker Applications to Remediation Decision-Making
 Wildlife biomarkers, ecology

Vancouver, WA

University of Arizona, Raina Maier
 2000 – 2005 and 1995 – 2000
Biosurfactant-Enhanced In Situ Metal Remediation
 Site characterization

Wyckoff/Eagle Harbor, WA

University of California – Berkeley, Kent Udell
 1995 – 2000
Thermally Enhanced Soil and Groundwater Remediation
 Bioremediation

Auto Recycling (PCBs, metals)*

Superfund Site Not Disclosed

Texas A&M University, Kirby Donnelly
 1995 – 2000
Site Assessment and Remediation
 Reconnaissance

Coal Gasification*

Superfund Site Not Disclosed

Texas A&M University, Kirby Donnelly
 1995 – 2000
Site Assessment and Remediation
 Annual monitoring

Marine Dock (PCBs, PNAs, metals)*

Superfund Site Not Disclosed

Texas A&M University, Kirby Donnelly
 1995 – 2000
Site Assessment and Remediation
 Reconnaissance

* Superfund site not disclosed due to privacy agreements

Marine Sites (2)*

Superfund Site Not Disclosed

Texas A&M University, Kirby Donnelly

1995 – 2000

Site Assessment and Remediation

Contaminated sediments utilized for in vitro measurements of bioavailability

Waste Storage (PCBs)*

Superfund Site Not Disclosed

Texas A&M University, Kirby Donnelly

1995 – 2000

Site Assessment and Remediation

Reconnaissance

Wood Preserving (PNAs and PCP)*

Superfund Site Not Disclosed

Texas A&M University, Kirby Donnelly

1995 – 2000

Site Assessment and Remediation

Annual monitoring

* Superfund site not disclosed due to privacy agreements

3d. Contaminants Studied

3d.i SBRP Arsenic Research

Arsenic is listed first on the ATSDR 2001 CERCLA Priority List of Hazardous Substances and is found at over 70% of all Superfund sites. While both natural and anthropogenic sources contribute to arsenic contamination of soil, sediment, and water, contamination at Superfund sites primarily results from the disposal of arsenic containing compounds from industrial and mining practices. For example, due to improper industrial disposal, lake sediments from the Aberjona watershed area of Boston contain as much as 1-2% arsenic by weight.

Although exposure to arsenic has been associated with a variety of human health effects, the toxicity of arsenic is particularly difficult to characterize as a single element, because its chemistry is complex, and there are many arsenic compounds. Specifically:

- Arsenic is considered a probable human lung, skin, and bladder cancer carcinogen. Arsenic is unique in that it is the only known agent that increases lung cancer following systemic (drinking water) rather than inhalation exposure.
- Arsenic exposure has been implicated in lymphoma, nasopharyngeal, stomach, colon, kidney and prostate cancers.
- There is a strong synergistic association between arsenic exposure and cigarette smoking for the risk of lung cancer.
- One of the major concerns is that there is not an established dose-response curve for arsenic-induced cancer.
- Arsenic can contribute substantially to the development of vascular diseases.

Remediation of arsenic-contaminated sites is complicated by several factors:

- As an element, arsenic cannot be destroyed or broken down by biological or normal physical processes into simpler, less toxic substances.
- At Superfund sites, arsenic is generally present in complex mixtures, often with high levels of organic compounds.
- Some natural geologic formations contain high levels of arsenic that can leach into groundwater.

The body of knowledge built on SBRP-funded research and the associated base of data concerning the potential health effects of exposure to arsenic were taken into consideration by the USEPA in its review and action to reduce the Maximum Contaminant Level (MCL) of arsenic in drinking water from 50 ppb to 10 ppb.

SBRP-FUNDED RESEARCH ON ARSENIC INCLUDES:**Biomolecular Research***Arsenic Mode of Action in Cancer: Models of Epigenetic Mechanism***Karl Kelsey, Harvard School of Public Health**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=442&ONum=335>*Biological Fate of Arsenic Species***H. Vasken Aposhian, University of Arizona**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=476&ONum=340>*Detoxification of Metals: In Vitro and In Vivo Studies***H. Vasken Aposhian, University of Arizona**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=204&ONum=14>*Biomarkers of Carcinogenesis***Martyn Smith, University of California – Berkeley**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=487&ONum=341>*Effects of Carcinogenic Materials on Gene Expression***Joshua Hamilton, Dartmouth College**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/Getproj.cfm?ProjAutoNum=427&ONum=333>*Molecular Basis for Effects of Carcinogenic Metals on Inducible Gene Expression***Joshua Hamilton, Dartmouth College**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/Getproj.cfm?ProjAutoNum=149&ONum=4>*Epigenetic Effects on Individual Susceptibility to Heavy Metal and Polycyclic Aromatic Hydrocarbon- Induced DNA Damage***Eric Moon-Shong Tang, New York University School of Medicine**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=456&ONum=337>*Genotoxic Mechanisms of As in Mammalian Cells***Tom Hei, Columbia University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/Getproj.cfm?ProjAutoNum=420&ONum=332>*Identification and Genetic Analysis of the Human Arsenite Efflux Pump***Toby Rossman, New York University School of Medicine**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=459&ONum=337>

*Mechanism of Arsenic-Induced Vascular Disease***Aaron Barchowsky, Dartmouth College**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=426&ONum=333>*Mechanisms of Mutagenesis of Metals and PAH/Metal Mixtures***Kathleen Dixon, University of Cincinnati**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=607&ONum=361>*Molecular Analysis of Toxicant-Mediated Teratogenesis***Ornella Selmin, University of Arizona**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=479&ONum=340>*Molecular Effects of Low Level Exposure to Arsenic***A. Jay Gandolfi, University of Arizona**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=478&ONum=340>*Metal-Metal Interactions in the Kidney***A. Jay Gandolfi, University of Arizona**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=205&ONum=14>*Molecular Mechanisms of Complex Mixture Toxicity***Alavaro Puga, University of Cincinnati**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=609&ONum=361>*Mutation and Recombination in Mice Exposed to Toxic Metals***James Stringer, University of Cincinnati**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=608&ONum=361>*Susceptible Genotypes***Rick Finnell, Texas A&M University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=473&ONum=339>*Toxic Metal Interactions with Cellular Proteins***Dean Wilcox, Dartmouth College**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=430&ONum=333>*Effect of Heavy Metals on Heme and Cytochrome P450***Jacqueline Sinclair, Dartmouth College**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=315&ONum=4>

*Human Cell Culture Studies of Mutagens in the Aberjona Basin***William Thilly, Massachusetts Institute of Technology**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=171&ONum=6>*Induction of Oxidative Stress and Activation of Transcription Factors by Toxic Metals***Aaron Barchowsky, Dartmouth College**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=150&ONum=4>*Proteins and DNA – New Methods of Adduct Detection***Steven Tannenbaum, Massachusetts Institute of Technology**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=174&ONum=6>**Epidemiology Studies***Arsenic Biomarker Epidemiology***Allan Smith, University of California – Berkeley**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=489&ONum=341>

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=341&ONum=15>*Arsenic and Health in Taiwan and Bangladesh***David Christiani, Harvard University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=440&ONum=335>*A Cohort Study of Health Effects of Arsenic Exposure in Bangladesh***Habibul Ahsan, Columbia University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=421&ONum=332>*Environmental As, Pregnancy, and Children's Health***Joseph Graziano, Columbia University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=422&ONum=332>*Epidemiology of Arsenic (United States)***Margaret Karagas, Dartmouth College**

2000-2005

<http://www-apps.niehs.nih.gov/sbrp/Program/Getproj.cfm?ProjAutoNum=429&ONum=333>*Epidemiology of Arsenic and Other Toxic Metals***Margaret Karagas, Dartmouth College**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=151&ONum=4>

*Arsenic Exposure and Skin and Bladder Cancers***David Hunter, Harvard University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=160&ONum=5>*Analysis of Causes of Mortality in the Aberjona and Mystic Valley Populations: Comparison to Massachusetts and United States Experience***William Thilly, Massachusetts Institute of Technology**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=172&ONum=6>**Studies of Human Health Impacts***Mechanisms of Arsenic Transport in Kidney and Bladder***Stephen Wright, University of Arizona**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=477&ONum=340>*Metal-Induced Inflammatory Factors, Oxidative Stress and Suppression of their Effects***Krystyna Frenkel, New York University School of Medicine**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=458&ONum=337>*Chemical Mixtures as Promoters of Hepatocarcinogenesis***Stephen Benjamin, Colorado State University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=304&ONum=2>*Mechanisms of Toxic Chemical Interaction in the Liver: Interactive Hepatotoxicity***Ruth Billings, Colorado State University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=305&ONum=2>*Physiologically Based Pharmacokinetics/Pharmacodynamics (PB-PK/PD) Coupled with Statistical/Mathematical Modeling***Raymond Yang, Colorado State University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=296&ONum=2>**Studies of Arsenic Sources, Fate, and Transport***Arsenic Mobilization in Bangladesh Groundwater***Yan Zheng, Columbia University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=423&ONum=332>

*Assessment of Biological Responses to Organic and Metal Contaminants in New Bedford: Methods for Monitoring***Timothy Ford, Harvard University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=444&ONum=335>*Bioavailability of Soil Lead and Arsenic in Humans***Conrad Blum, Columbia University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=419&ONum=332>*Redistribution of Arsenic and Other Contaminants at Sites in NJ and Maine***James Simpson, Columbia University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=424&ONum=332>*Sources, Transport, and Fate of Arsenic in Groundwater (New Hampshire)***Carl Renshaw, Dartmouth College**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=431&ONum=333>*Trophic Transfer of Toxic Metals in Aquatic Food Webs***Carol Folt, Dartmouth College**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=432&ONum=333>*Variation in Bioaccumulation and Biomagnification of Metals in Lakes throughout the Northeastern Region of the U.S.A.***Carol Folt, Dartmouth College**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/Getproj.cfm?ProjAutoNum=316&ONum=4>*Water-Sediment Model and Criteria for Arsenic and Chrome***Dominic Di Toro, New York University School of Medicine**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=462&ONum=337>*Characterizing Ground Water Contamination of a Heterogeneous Field Site: The Aberjona River Watershed***Charles Harvey, Massachusetts Institute of Technology**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=170&ONum=6>*Chemical Transport, Transformation and Human Exposure on the Aberjona***Harold Hemond, Massachusetts Institute of Technology**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=165&ONum=6>

*Hydrodynamic Controls on Metal Remobilization from Sediments of The Mystic Lakes***Heidi Nepf, Massachusetts Institute of Technology**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=169&ONum=6>**Remediation Technology Studies***Assessment and Remediation of Arsenic Enrichments in Groundwater***Alexander Van Geen, Columbia University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=425&ONum=332>*Electrochemical Remediation of Arsenic and Chromium***James Farrell, University of Arizona**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=484&ONum=340>*Functional Nanostructures of Groundwater Remediation***Thomas Pinnavaia, Michigan State University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=447&ONum=336>*Microbial Biogeochemical Cycling of Arsenic and of Chromium Coupled to the Biodegradation of Aromatic Contaminant Compounds***Lily Young, New York University School of Medicine**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=461&ONum=337>*Phytoremediation of Contaminated Soils***Jodi Shann, University of Cincinnati**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=612&ONum=361>*Remediating Mine Waste Products***Martha Conklin, University of Arizona**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=483&ONum=340>*Water-Sediment Model and Criteria for Arsenic and Chrome***Dominic Di Toro, New York University School of Medicine**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=462&ONum=337>*Biosurfactant-Enhanced Remediation of Metal- Contaminated Soils***Raina Maier, University of Arizona**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=196&ONum=14>

Fundamental Studies of Thermal Decontamination of Soils

Jack Howard, Massachusetts Institute of Technology

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=177&ONum=6>

Wet Oxidation of Hazardous Chemicals in Sub- and Supercritical Water

Jefferson Tester, Massachusetts Institute of Technology

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=176&ONum=6>

Analytical Studies

Development and Applications of Integrated Cell-Based Bioassays

Michael Denison, University of California – [Davis

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=411&ONum=342>

Geochemistry Core Laboratory

Alexander Van Geen, Columbia University

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=523&ONum=332>

Hazard Identification Core

A. Jay Gandolfi, University of Arizona

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=553&ONum=340>

Molecular Biology Core

Joshua Hamilton, Dartmouth College

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=589&ONum=333>

Trace Metals Analysis Core

C. Page Chamberlain, Dartmouth College

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=590&ONum=333>

Trace Metals Core Laboratories

Joseph Graziano, Columbia University

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=522&ONum=332>

Chromatography/Plasma MS for Ultra-trace Analysis

Joseph Caruso, University of Cincinnati

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=245&ONum=17>

Outreach Programs

Community Outreach

Carol Folt and Nancy Serrell, Dartmouth College

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=592&ONum=333>

Community Outreach

Dean Carter, University of Arizona

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=209&ONum=14>

3d.ii SBRP Lead Research

Lead can be found in all parts of our environment. Much of it comes from human activities including burning fossil fuels, mining, and manufacturing. Due to past major reductions and now the elimination of lead in gasoline, there has been a significant decrease in public exposure to lead in outdoor air. Remaining air pollution sources include lead smelters, incineration of lead batteries, and burning lead-contaminated waste oil. However, the most common sources of current lead exposure come from old homes containing lead-based paints and lead contaminated soil.

Because lead persists in the environment, it continues to be a contaminant of concern to the USEPA and ATSDR. Lead has been found in at least 70% of the National Priorities List sites identified by the USEPA. Lead is listed second on the 2001 ATSDR Priority List and is one of six “Criteria Air Pollutants” for which the USEPA has developed health-based national air quality standards.

Lead overexposure is a leading cause of workplace illness. Exposure to high levels of lead can damage the blood, brain, nerves, kidneys, reproductive organs, and the immune system. Lead poisoning is still the leading environmentally induced illness in children. Children are particularly susceptible to the harmful effects of lead because they are undergoing rapid neurological and physical development. Even at repeated exposure to small doses, lead can be a problem because it accumulates in the body. Lower levels that are more commonly associated with current exposures can result in impaired cognitive functioning, subtle neurobehavioral effects, and developmental effects in children, and has been associated with higher blood pressure in middle-aged men.

Decades of research have been devoted to ascertaining the health effects associated with lead exposure and the underlying mechanisms for these detrimental effects. Even still, more research is needed. As the tools have become more sophisticated and sensitive, questions that could not even be considered in the past can now be studied. With this increased sensitivity, subtle health effects are now being detected. Because lead is persistent in the environment, continued SBRP research focused on low-level health effects and methods of prevention, including environmental remediation, is still necessary.

SBRP-FUNDED RESEARCH ON LEAD INCLUDES:**Biomolecular Research***Stress Gene Induction in Mammalian Cells***Ken Ramos, Texas A&M University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=472&ONum=339>*Toxic Metal Interactions with Cellular Proteins***Dean Wilcox, Dartmouth College**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=430&ONum=333>*The Influence of Previous Exposures to a Mixture of Heavy Metals on Tolerance: A Mechanistic Evaluation at Different Levels of Biological Organization***William Clements, Colorado State University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=307&ONum=2>*Mechanisms of Toxic Chemical Interaction in the Liver: Interactive Hepatotoxicity***Ruth Billings, Colorado State University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=305&ONum=2>**Epidemiology Studies***Controlled Trial in Pregnancy of Dietary Supplements for the Suppression of Bone Resorption and Mobilization of Lead into Plasma***Howard Hu, Harvard School of Public Health**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=438&ONum=335>*Lead Exposure, Accumulation in Bone, and Cognitive Toxicity among Elderly Men and Women***Howard Hu, Harvard School of Public Health**

1995-2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=155&ONum=5>*Lead Exposure, Accumulation in Bone, and Reproductive Toxicity among Men and Women in Mexico***Howard Hu, Harvard School of Public Health**

1995-2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=154&ONum=5>*Lead Mobilization During Pregnancy and Lactation in Urban Women***Jacqueline Moline, Mount Sinai School of Medicine**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/program/Getproj.cfm?ProjAutoNum=214&ONum=8>

Neuropsychologic Dysfunction, Lead Mobilization and Menopause

Gertrud Berkowitz, Mount Sinai School of Medicine

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/program/Getproj.cfm?ProjAutoNum=353&ONum=8>

Studies of Human Health Impacts

Bioavailability of Soil Lead and Arsenic in Humans

Conrad Blum, Columbia University

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=419&ONum=332>

Developmental Immunotoxicologic Appraisal of DMSA

Rodney Dietert, Cornell University

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=144&ONum=3>

Factors Modifying Behavioral Toxicity of Lead

Barbara Strupp, Cornell University

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=289&ONum=3>

Ecology Studies

Wildlife Applications to Remediation Decision-Making

Michael Hooper, University of Washington

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=514&ONum=347>

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=277&ONum=22>

Assessment of Contaminant Concentrations and Ecologic Implications

Timothy Ford, Harvard School of Public Health

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=159&ONum=5>

Studies of Lead Sources, Fate, and Transport

Chemical Transport, Transformation and Human Exposure on the Aberjona

Harold Hemond, Massachusetts Institute of Technology

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=165&ONum=6>

*Sources and Pathways of Urban Heavy Metal Exposure Using Elemental and Isotopic Composition of Environmental Samples***James Simpson, Mount Sinai School of Medicine**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=213&ONum=8>*Transport of Trace Metals in a Polluted Aquifer***Martha Conklin, University of Arizona**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=203&ONum=14>**Remediation Technology Studies***Bacterial Genes and Proteins Involved in Redox Transformation of Metals***Bradley Tebo, University of California – San Diego**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=395&ONum=343>*Biosurfactant-Enhanced in Situ Metal Remediation***Raina Maier, University of Arizona**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=481&ONum=340>*Combustion Processes – Emissions, Monitoring, and Intervention***Catherine Koshland, University of California – Berkeley**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=493&ONum=341>

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=344&ONum=15>*Functional Nanostructures of Groundwater Remediation***Thomas Pinnavaia, Michigan State University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=447&ONum=336>*Phytochelatin Synthase and Resistance to Heavy Metals***Julian Schroeder, University of California – San Diego**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=394&ONum=343>*Bioremediation of Soil***Jodi Shann, University of Cincinnati**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=247&ONum=17>

Coupled Processes in Bioavailability: Enhanced Pollutant Desorption Kinetics in Porous Media Mediated by Bacterial Extracellular Polymers

Leonard Lion and Michael Shuler, Cornell University

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=148&ONum=3>

Microscale Evaluation of Pollutant Bioavailability Leading to Structured Models for Contaminant Fate in Porous Media

William Ghiorse, Cornell University

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=147&ONum=3>

Analytical Studies

Geochemistry Core Laboratory

Alexander Van Geen, Columbia University

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=523&ONum=332>

Trace Metals Core Laboratories

Joseph Graziano, Columbia University

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=522&ONum=332>

Stable Lead Isotope and Trace Element Analysis

Steven Chillrud, Mount Sinai School of Medicine

1995 – 2000

[http://www-apps.niehs.nih.gov/sbrp/program/Getproj.cfm?ProjAutoNum=222&ONum=8&core="](http://www-apps.niehs.nih.gov/sbrp/program/Getproj.cfm?ProjAutoNum=222&ONum=8&core=)

Outreach Programs

Dissemination of Knowledge about Bioavailability of Soil Lead

Meredith Golden, Columbia University

2000 – 2005

GIS Spatial Analysis: Lead Exposure Risk Priority Maps

Marie Lynn Miranda, Duke University

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/Getproj.cfm?ProjAutoNum=529&ONum=334&core>

Lead Mapping Program for High Schools

Ann Backus, Harvard School of Public Health

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=532&ONum=335>

3d.iii SBRP Dioxin Research

“Dioxin” is a term commonly used to refer to the chemical 2,3,7,8-tetrachlorodibenzo-p-dioxin or TCDD. In all, there are 210 isomers of polychlorinated dibenzodioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs) – collectively these compounds are often referred to as dioxin-like compounds or “dioxins.” The toxicity of dioxins varies with the position and number of chlorine atoms – many dioxins are only slightly toxic and some are nontoxic. However, animal studies have shown that TCDD is very toxic – it causes cancer and is a known endocrine disruptor that can alter reproductive, developmental and immune function. Dioxins are among the 12 man-made chemicals targeted for global phase-out by the UN Treaty on Persistent Organic Pollutants (POPs).

Dioxins are chemical contaminants that have no commercial use. They are formed as by-products in the burning of chlorine-based chemical compounds with hydrocarbons. Municipal waste incineration, forest fires, backyard trash burning, and manufacturing processes to produce herbicides and paper contribute to the production of dioxins. As a consequence, trace amounts of dioxins and furans are present in virtually all global ecosystems.

Because dioxins are present in low levels as environmental contaminants in food, people are constantly exposed to them through ingestion. Even though they are not found at high concentrations in food, over time dioxins accumulate in human tissues because they are not readily excreted or metabolized.

Factors impacting the remediation of dioxin-contaminated sites include:

- Dioxins are stable to heat, acids and alkali
- Dioxins bind tightly to soil and are virtually insoluble in water. This increases the difficulty of soil remediation but decreases the extent of groundwater contamination
- Dioxins can be broken down by ultraviolet light – most have a half life of 1-3 years
- Dioxin uptake by plants from soil is limited – no detectable amounts of dioxin are found in grain and soybeans.

SBRP-FUNDED RESEARCH ON DIOXIN INCLUDES:**Biomolecular Research***Environmental Influences of Ah Receptor Ligands on Gene Expression***Robert Tukey, University of California – San Diego**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=390&ONum=343>*Role of Two AHRs in Dioxin Sensitivity and Resistance***Mark Hahn, Boston University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=381&ONum=331>*Mechanisms of Chemical Sensitivity and Resistance***Mark Hahn, Boston University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=301&ONum=1>*Mechanisms of Resistance of Aquatic Vertebrate Populations to Mixtures of Aromatic Hydrocarbons and Metal Contaminants***Isaac Wirgin, New York University School of Medicine**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=460&ONum=337>*Chemical Mixtures as Promoters of Hepatocarcinogenesis***Stephen Benjamin, Colorado State University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=304&ONum=2>*Molecular Signals of Epigenetic Toxicity of Superfund Chemicals***Burra Madhukar, Michigan State University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=192&ONum=7>**Epidemiology Studies***Epidemiology Studies***Ellen Gold, University of California – Davis**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=415&ONum=342>

Studies of Human Health Impacts*Placental-Uterine and Prostate Effects of Organochlorines***Kathleen Shiverick, University of Florida**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=402&ONum=344>*Placental-Uterine Effects of Chlorinated Hydrocarbons***Kathleen Shiverick, University of Florida**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=251&ONum=18>*Dogs as a Model for Assessment of Immunotoxicity of Environmental Pollutants***Fred Quimby, Cornell University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=314&ONum=3>**Ecology Studies***Environmental Stress Indicators for Fish at Superfund Sites: GC-MS and FT-IR Markers of Contaminant-Induced Damage to Gill Tissue***Donald Malins, University of Washington**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=515&ONum=347>*Wildlife Biomarker Applications to Remediation Decision-Making***Michael Hooper, University of Washington**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=277&ONum=22>**Studies of PCDD/PCDF Sources, Fate, and Transport***Persistent Organochlorines in the Hudson River Watershed***Richard Bopp, Mount Sinai School of Medicine**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=595&ONum=362>*Sources and Pathways of Persistent Chlorinated Hydrocarbon Exposure in New York City***Richard Bopp, Mount Sinai School of Medicine**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=216&ONum=8>

Remediation Technology Studies*Innovative Technologies for Remediation of Haloorganics***Robert Arnold, University of Arizona**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=486&ONum=340>*Thermal Remediation***Ian Kennedy, University of California – Davis**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=413&ONum=342>

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=555&ONum=340>**Analytical Studies***Development and Applications of Integrated Cell-Based Bioassays***Michael Denison, University of California – Davis**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=411&ONum=342>

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=234&ONum=16>*Development and Implementation of Immunoassays for Human and Environmental Monitoring***Bruce Hammock, University of California – Davis**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=409&ONum=342>*Development of Rapid, Miniaturized Sensors for Use in the Detection of Environmental Toxins***Ian Kennedy, University of California – Davis**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=414&ONum=342>*Novel Cell-Based Toxicity Sensors Identified by Genome-Wide Screens***Roger Tsien, University of California – San Diego**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=389&ONum=343>*Sensing Superfund Chemicals with Recombinant Systems***Sylvia Daunert, University of Kentucky**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=498&ONum=345>

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=261&ONum=19>

*Technology Demonstration Core***A. Jay Gandolfi, University of Arizona**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=555&ONum=340>*Antibody Engineering Core***Prabahakara Choudary, University of California – Davis**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=239&ONum=16>*A Combined Bioassay-Chemical Fractionation Scheme for the Determination of Toxic Chemicals in Sediments from the St. Lawrence River***Patrick O' Keefe, University of Albany – SUNY**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=329&ONum=13>*Development of Novel Bioassay/Biomarker Systems for Detection of Estrogen Agonists in Complex Mixtures***John Giesy, Michigan State University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=190&ONum=7>*Exposure Assessment***Mary Wolff, Mount Sinai School of Medicine**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=221&ONum=8>*Immunochemical Methods to Monitor Toxic Substances and/or Indicators of their Presence in Humans and other Species***Bruce Hammock, University of California – Davis**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=232&ONum=16>**Outreach Programs***Outreach Core***Madeleine Scammell, Boston University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=518&ONum=331>

3d.iv SBRP Polychlorinated Biphenyls Research

Polychlorinated biphenyls (PCBs) are a family of 209 chemical compounds for which there are no known natural sources. Each consists of two benzene rings and one to ten chlorine atoms; PCBs vary in degrees of toxicity. Importantly, PCB-contaminated sites are usually contaminated with mixtures of PCBs and the toxicity of any mixture is dependent upon the interactions of the individual congeners.

Because of their stability, resistance to fire, and electrical insulating properties, PCBs were widely used in a variety of industrial applications. Unfortunately, the very characteristics of PCBs that made them applicable for industrial uses, make them problematic in the environment. PCBs are very persistent. They are generally unalterable by microorganisms or by chemical reaction. According to the ATSDR, PCBs have been found in approximately one third of the National Priorities List sites identified by the USEPA.

PCBs are extremely toxic – they are listed fifth on the ATSDR’s 2001 CERCLA Priority List of Hazardous Substances. PCBs have been demonstrated to cause a variety of adverse health effects in animal studies. PCBs not only cause cancer but can adversely effect the immune, reproductive, nervous or endocrine systems. Studies in humans provide supportive evidence for potential carcinogenic and non-carcinogenic effects of PCBs as well. It has been suggested that many of the adverse health effects associated with PCB exposure are a result of its ability to mimic the body’s natural hormones (e.g., estrogen), and that this “endocrine (hormone) disruption” can lead to infertility, certain types of cancer, and other hormone-related disorders.

SBRP-FUNDED RESEARCH ON PCBs INCLUDES:**Biomolecular Research**

Activation of AhR-Dependent and AhR-Independent Signaling Cascades in PCB-Induced Immune Dysfunction

Burra Madhukar, Norbert Kaminski, and Patricia Ganey, Michigan State University

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=452&ONum=336>

Activation of PCBs to Genotoxins in vivo

Larry Robertson, University of Kentucky

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=495&ONum=345>

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=258&ONum=19>

Bioavailability of Chlorinated Compounds

Margaret James, University of Florida

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=405&ONum=344>

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=253&ONum=18>

Environmental Influences of Ah Receptor Ligands on Gene Expression

Robert Tukey, University of California – San Diego

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=390&ONum=343>

An Integrated, Multidisciplinary, Multispecies Approach to Understanding the Endpoints and Mechanisms of Action of Endocrine Disrupting

Brent Palmer, University of Kentucky

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=500&ONum=345>

*Markers for Chemical Mixtures in *Fundulus heteroclitus**

Richard Di Giulio, Duke University

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=436&ONum=334>

Mechanisms of Hepatic Tumor Promotion by PCBs

Howard Glauert, University of Kentucky

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=497&ONum=345>

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=260&ONum=19>

CONTAMINANTS STUDIED

Mechanisms of Resistance of Aquatic Vertebrate Populations to Mixtures of Aromatic Hydrocarbons and Metal Contaminants

Isaac Wirgin, New York University School of Medicine

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=460&ONum=337>

Placental-Uterine and Prostate Effects of Organochlorines

Kathleen Shiverick, University of Florida

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=402&ONum=344>

1995 – 2000

[http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=251&ONum=18 ?](http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=251&ONum=18)

Mechanisms and Consequences of Neutrophil Activation by Hazardous Chemicals

Robert Roth, Michigan State University

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=186&ONum=7>

Mechanisms of Chemical Sensitivity and Resistance

Mark Hahn, Boston University

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=301&ONum=1>

Molecular Signals of Epigenetic Toxicity of Superfund Chemicals

Burra Madhukar, Michigan State University

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=192&ONum=7>

PCB Estrogenicity in Human Breast Cells

John Gierthy, University of Albany – SUNY

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=328&ONum=13>

Studies of the Alterations in Estrogen Metabolism Caused by Exposure to PCBs

David Spink, University of Albany – SUNY

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=327&ONum=13>

Studies on the Mechanisms Responsible for the Cognitive Impairment Caused by Exposure to PCBs

David Carpenter, University of Albany – SUNY

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=322&ONum=13>

Epidemiology Studies

In utero Exposure to Polychlorinated Biphenyls, Pesticides and Metals in Relation to Cognitive Function in Childhood

Susan Korrick, Harvard School of Public Health

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=439&ONum=335>

In utero PCB and Metal Exposures and Infant Development

Susan Korrick, Harvard School of Public Health

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=158&ONum=5>

Biophysical Well-being among Akwesasne Residents

Azara Santiago-Rivera, University of Albany – SUNY

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=325&ONum=13>

Serum PCB as a Risk Indicator for Breast Cancer in Women

Philippe Grandjean, Boston University

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=297&ONum=1>

Studies of Human Health Impacts

Environmental Contaminants and the Neuroecology of Reproductive Behavior

Lynwood Clemens, Michigan State University

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=453&ONum=336>

PCB Effects on Uterine Muscle

Rita Loch Caruso, Michigan State University

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=455&ONum=336>

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=188&ONum=7>

PCBs, ICAM-1 Expression and Cancer Metastasis

Michal Toborek, University of Kentucky

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=501&ONum=345>

Superfund Chemicals, Nutrition, and Endothelial Cell Dysfunction

Bernhard Hennig, University of Kentucky

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=496&ONum=345>

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=259&ONum=19>

Effects of Polychlorinated Biphenyls & Polychlorinated Biphenyl-Containing River Sediments on Carcinogen Metabolism in Normal Human Mammary Epithelial Cells

James Wetmur, Mount Sinai School of Medicine

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=218&ONum=8>

Hormonal Activity of Chlorinated Hydrocarbons and Related Contaminants from New York Harbor Sediments

Mary Wolff, Mount Sinai School of Medicine

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=217&ONum=8>

Neurochemical, Neurobehavioral, and Endocrine Effects of Developmental Exposure of Rats to Individual PCB Congeners

Richard Seegal, University of Albany – SUNY

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=326&ONum=13>

PCBs and the Well-being of Mohawk Children and Youth, Growth, Development and Cognitive Behavioral Functioning

Lawrence Schell, University of Albany – SUNY

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=324&ONum=13>

Toxic Chemical Influences on In Vivo and In Vitro Reproduction

Lynwood Clemens, Michigan State University

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=351&ONum=7>

Ecology Studies

Assessment of Biological Responses to Organic and Metal Contaminants in New Bedford: Methods for Monitoring

Timothy Ford, Harvard School of Public Health

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=444&ONum=335>

Wildlife Applications to Remediation Decision-Making

Michael Hooper, University of Washington

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=514&ONum=347>

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=277&ONum=22>

Studies of PCBs Sources, Fate, and Transport*Persistent Organochlorines in the Hudson River Watershed***Richard Bopp, Mount Sinai School of Medicine**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=595&ONum=362>*Sources and Pathways of Persistent Chlorinated Hydrocarbon Exposure in New York City***Richard Bopp, Mount Sinai School of Medicine**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=216&ONum=8>**Remediation Technology Studies***Dehalogenation of Chlorinated Hazardous Organics***Dibakar Bhattacharyya, University of Kentucky**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=499&ONum=345>*PCB Bioremediation Strategies and Potential Intermediates of Toxicological Significance***James Tiedje, Michigan State University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=449&ONum=336>*Bioremediation of PCB-contaminated Sediments in the St. Lawrence River***G-Yull Rhee, University of Albany – SUNY**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=330&ONum=13>*Detection, Prioritization and Detoxification of Developmental Toxicants Associated with Chemical Wastes***Timothy Phillips, Texas A&M University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=226&ONum=11>*Photocatalytic Remediation of PCB-contaminated Water and Sediment: Novel Catalysts and Potential Solar Applications***Chia-Swee Hong, University of Albany – SUNY**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=332&ONum=13>*Supercritical Fluid Technology for Remediation of PCB/PAH Contaminated Soils and Sediments***Lawrence Tavlarides, University of Albany – SUNY**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=333&ONum=13>

Analytical Studies*Development and Applications of Integrated Cell-Based Bioassays***Michael Denison, University of California – Davis**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=411&ONum=342>*Environmental and Biological Chemistry Core***John Spengler, Harvard School of Public Health**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=530&ONum=335>*Environmental Statistics Core***Louise Ryan, Harvard School of Public Health**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=531&ONum=335>*Exposure Assessment***Mary Wolff, Mount Sinai School of Medicine**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=602&ONum=362>*Remediation Product Toxicity Evaluation***Stephen Boyd, Michigan State University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=536&ONum=336>*Sensing Superfund Chemicals with Recombinant Systems***Sylvia Daunert, University of Kentucky**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=498&ONum=345>

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=261&ONum=19>*Synthesis Core***Larry Robertson, University of Kentucky**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=585&ONum=345>*A Combined Bioassay-Chemical Fractionation Scheme for the Determination of Toxic Chemicals in Sediments from the St. Lawrence River***Patrick O' Keefe, University of Albany – SUNY**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=329&ONum=13>*Determination of Toxic Metal Species in Environmental and Biological Matrices with High Energy Ion Beams***Quintus Fernando, University of Arizona**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=206&ONum=14>

Outreach Programs

Hudson River Education Project

Luz Claudio, Mount Sinai School of Medicine

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=605&ONum=362>

Partnerships to Disseminate Information Regarding Chemical Contamination

Sandra Bastin, University of Kentucky

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=586&ONum=345>

Technology Transfer and Outreach Core: Communication Among the Residents of Akwesasne

Ronald J. Scudato, University of Albany – SUNY

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=336&ONum=13>

3d.v SBRP Volatile Organic Compounds Research

Organic compounds that evaporate easily are collectively referred to as volatile organic compounds (VOCs). VOCs are widely used as cleaning and liquefying agents in fuels, degreasers, solvents, polishes, cosmetics, drugs, and dry cleaning solutions. VOCs can have direct adverse effects on human health. Many VOCs have been classified as toxic and carcinogenic. VOCs of particular significance to human and environmental health include benzene, toluene, ethylbenzene, and xylenes (BTEX), methyl t-butyl ether (MTBE) methylene chloride, chlorobenzene, trichloroethylene (TCE) and perchloroethylene.

Most VOCs found in the environment result from human activity – as the result of spills or inappropriate disposal, or as uncontrolled emissions from industrial processes. When VOCs are spilled or improperly disposed of, a portion will evaporate, but some will soak into the ground. Water can transport VOCs in soil, potentially carrying them to the groundwater table. When VOCs migrate underground to nearby wells, they can end up in drinking water supplies.

VOC contamination is recognized as a critical issue for both air and water:

- USEPA estimates that VOCs are present in one-fifth of the nation's water supplies.
- Because VOCs are considered a precursor for ground-level ozone (smog), they are one of the six "Criteria Air Pollutants" for which the USEPA has developed health-based national air quality standards.

Remediation of VOC-contaminated soils and groundwater is complicated because it is common for the component organic pollutants to exist as separate liquid phases. Also, the migration of the dissolved plume is unique to each site. VOC contaminant transport is governed by the quantity of VOC in the plume; its relation to biological and chemical properties of soils and groundwater; the hydraulic properties of the geologic materials; and any structural features which can act as barriers or conduits for fluids. Therefore, it is difficult to generalize properties of VOC transport from one site to another.

SBRP-FUNDED RESEARCH ON VOCs INCLUDES:**Biomolecular Research***PPAR, Hormones, and Xenobiotics***David Waxman, Boston University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=379&ONum=331>*Activation Of Orphan Receptors By Chlorinated Hydrocarbons***David Waxman, Boston University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=300&ONum=1>*Cardiac Teratogenicity of Halogenated Hydrocarbons***Paula Johnson, University of Arizona**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=207&ONum=14>*Protein and DNA Adducts Following Low-Dose Exposure by Accelerator Mass Spectrometry***Kenneth Turteltaub, University of California – Berkeley**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=337&ONum=15>**Epidemiology Studies***Chemical Exposures and Leukemia Risk***Patricia Buffler, University of California – Berkeley**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=488&ONum=341>*Molecular Epidemiology of Childhood Leukemia***Patricia Buffler, University of California – Berkeley**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/program/Getproj.cfm?ProjAutoNum=340&ONum=15>*Perchloroethylene (PCE) in Drinking Water and Cancer Risk***Ann Aschengrau, Boston University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=285&ONum=1>**Studies of Human Health Impacts***Assessment of Human VOC Exposure Near Superfund Sites***Karla Thrall, Oregon Health and Science University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=463&ONum=338>

Biomarkers of Neurotoxicant Exposure and Neurodegeneration

Mohammed Sabri, Oregon Health and Science University

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=464&ONum=338>

Human Dosimetry for Assessment of Exposure to Volatile Compounds

Michael Morgan, University of Washington

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=513&ONum=347>

Human Dosimetry for Assessment of Exposure to Volatile Compounds

David Kalman, University of Washington

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/program/Getproj.cfm?ProjAutoNum=364&ONum=22>

Studies of VOC Sources, Fate, and Transport

Chemical Transport, Transformation and Human Exposure on the Aberjona

Harold Hemond, Massachusetts Institute of Technology

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=165&ONum=6>

Fate of Semivolatile Organic Compounds Discharged to Surface Drainage Systems from Superfund Sites

Phillip Gschwend, Massachusetts Institute of Technology

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=166&ONum=6>

Site Core: Intermediate Scale Site

Roger Bales, University of Arizona

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=211&ONum=14>

Transport and Biodegradation of VOCs in the Vadose Zone

Dennis Rolston, University of California – Davis

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=230&ONum=16>

Transport of Hydrophobic Organic Contaminants in the Vadose Zone

Roger Bales, University of Arizona

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=202&ONum=14>

Remediation Technology Studies*Assessment of Natural Bioattenuation of PCE and TCE***Angela Lindner, University of Florida**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/proj.cfm?ONum=344>*Bioavailability and Remediation of Complex DNAPLs***Mark Brusseau, University of Arizona**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=482&ONum=340>*Bioavailability, Soil Heterogeneity, and In-Situ Biodegradation of Organic Contaminants***Mark Brusseau, University of Arizona**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=197&ONum=14>*Bioremediation of Chlorinated Solvent Compounds: In Situ Remediation Strategies and Predictive Tools for Controlling Contaminated Plumes***John Ferguson, University of Washington**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=517&ONum=347>*Anaerobic and Aerobic Bioremediation of Chlorinated Organic Compounds: Processes and Enhanced In Situ Removal***John Ferguson, University of Washington**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=276&ONum=22>*Dehalogenation of Chlorinated Hazardous Organics***Dibakar Bhattacharyya, University of Kentucky**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=499&ONum=345>*Enhanced Remediation of Heterogeneous Subsurface***Cass T. Miller, University of North Carolina – Chapel Hill**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=506&ONum=346>*An Investigation of Multiphase Mass Transfer Phenomena***Cass T. Miller, University of North Carolina – Chapel Hill**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=267&ONum=21>

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*Innovative Technologies for Remediation of Haloorganics***Robert Arnold, University of Arizona**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=486&ONum=340>*Model for Catalytic Reductive Dehalogenation***Robert Arnold, University of Arizona**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=200&ONum=14>*Phytoremediation of Toxic Wastes***Milton Gordon, University of Washington**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=516&ONum=347>

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=275&ONum=22>*Remediating Mine Waste Products***Martha Conklin, University of Arizona**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=483&ONum=340>*Transport, Transformation, and Remediation of Perchlorate and VOCs in the Vadose Zone and Groundwater***Dennis Rolston, University of California – Davis**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=407&ONum=342>*Biodegradation within Metal/Organic Contaminated Soils***Ian Pepper, University of Arizona**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=195&ONum=14>*Ecology and Diversity of BTEX Degrading Bacteria in Bioreactors and Aquifers***James Tiedje, Michigan State University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=180&ONum=7>*Ecology, Physiology, Molecular Genetics and Evolution of Microorganisms that Degrade Aromatic Xenobiotic Pollutants***Jerry Kukor, Michigan State University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=179&ONum=7>*Effect of Aging of Pollutants in Soil on Bioavailability, Extractability and Toxicity***Martin Alexander, Cornell University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=146&ONum=3>

*Enhanced Bioventing with Gas-Phase Nutrient Amendments***Roberto Guzman, University of Arizona**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=201&ONum=14>*Fundamental Studies of Thermal Decontamination of Soils***Jack Howard, Massachusetts Institute of Technology**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=177&ONum=6>*Modified Clays for Environmental Remediation***Stephen Boyd, Michigan State University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=182&ONum=7>*Thermal Remediation***Ian Kennedy, University of California – Davis**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=236&ONum=16>*Thermally Enhanced Soil and Groundwater Remediation***Kent Udell, University of California – Berkeley**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=343&ONum=15>**Analytical Studies***Remediation Product Toxicity Evaluation Core***Stephen Boyd, Michigan State University**

2000 – 2005

[http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=536&ONum=336&core="](http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=536&ONum=336&core=)*Core Laboratory***Arthur Laffleur, Massachusetts Institute of Technology**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=178&ONum=6>*Core Laboratory***Dean Carter, University of Arizona**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=208&ONum=14>*Laboratory Core***Robert Gensemer, Boston University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=303&ONum=1>

CONTAMINANTS STUDIED

Site Core: Lysimeter Site

Peter Wierenga, University of Arizona

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=210&ONum=14>

3d.vi SBRP Mercury Research

Exposure to mercury occurs from inhalation, ingestion and absorption. Primary sources of exposure are spills, incineration, contaminated water and food, and dental or medical treatments. Mercury is listed third on the ATSDR 2001 CERCLA Priority List of Hazardous Substances. Mercury is found at approximately 50% of all Superfund sites.

Mercury enters aquatic and terrestrial systems from the atmosphere primarily in an inorganic form. However, under conditions that favor bacterial sulfate-reduction, inorganic mercury is methylated to form methylmercury, a potent neurotoxin that bioaccumulates in fish. Wetlands, lake sediments, and anoxic bottom waters are three locations where methylmercury is rapidly formed as an incidental by-product of bacterial sulfate-reduction. As a consequence of atmospheric deposition of inorganic mercury, its metabolized form, methylmercury, can be found in fish from lakes remote from the initial point sources of contamination.

Mercury contaminants are present in the environment in three forms – elemental mercury, inorganic mercury salts (ex., chlorine, sulfur), and organic mercury compounds such as methylmercury. The nervous system is very sensitive to all forms of mercury. Exposure to high levels of elemental, inorganic, or organic mercury can permanently damage the brain, kidneys, and developing fetus. Methylmercury and elemental mercury vapors are more harmful than other forms, because more mercury in these forms reaches the brain. Effects on brain function may result in irritability, shyness, tremors, or changes in vision, hearing, or memory. The human cancer data available for all forms of mercury are inadequate to draw conclusions as to its carcinogenic potential.

On March 1, 2002, the Food and Drug Administration (FDA) announced that it will soon schedule a meeting of its Foods Advisory Committee to review issues surrounding methylmercury in commercial seafood. This review will include a re-examination of FDA's most recent Consumer Advisory for pregnant women and women of child-bearing age who may become pregnant. SBRP research will play an important role in these proceedings.

Soils contaminated with mercury present unique challenges for remediation due to the variety of chemical forms in which mercury can occur, and because of the challenge in meeting cleanup concentration goals set by regulation or risk assessment. Phytoremediation is not a viable option for mercury-contaminated soils. While thermal treatment (retorting) based on the unique volatility of mercury is listed by the USEPA as the Best Demonstrated Available Technology for mercury-contaminated wastes, typically high costs, limited capacity, and potential for atmospheric releases have restricted wide application of this technology.

SBRP-FUNDED RESEARCH ON MERCURY INCLUDES:**Biomolecular Research***Effects Related Biomarkers of Toxic Exposures***Terrance Kavanagh, University of Washington**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=509&ONum=347>*Heme Pathway Polymorphisms in Mercury-Induced Porphyrinuria and Toxicity***James Woods, University of Washington**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=510&ONum=347>*Porphyrin Profiles as Biological Indicators of Trace Metal Exposure and Toxicity***James Woods, University of Washington**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=143&ONum=22>*Stress Gene Induction in Mammalian Cells***Ken Ramos, Texas A&M University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=472&ONum=339>*Immunochemical Methods to Monitor Toxic Substances and/or Indicators of their Presence in Humans and other Species***Bruce Hammock, University of California – Davis**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=232&ONum=16>*Mechanisms of Toxic Chemical Interaction in the Liver: Interactive Hepatotoxicity***Ruth Billings, Colorado State University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=305&ONum=2>*Molecular Genetic Bioreporting of Environmental Pollutants***Barry Beaty, Colorado State University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=306&ONum=2>**Epidemiology Studies***Exposure Levels of Persistent Pollutants in Urban Anglers***Anne Golden, Mount Sinai School of Medicine**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=598&ONum=362>

Studies of Human Health Impacts

Detoxification of Metals: In Vitro and In Vivo Studies

H. Vasken Aposhian, University of Arizona

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=204&ONum=14>

Metal-Metal Interactions in the Kidney

A. Jay Gandolfi, University of Arizona

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=205&ONum=14>

Ecology Studies

Trophic Transfer of Toxic Metals in Aquatic Food Webs

Carol Folt and Celia Chen, Dartmouth College

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=432&ONum=333>

Variation in Bioaccumulation and Biomagnification of Metals in Lakes throughout the Northeastern Region of the U.S.A.

Carol Folt, Dartmouth College

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=316&ONum=4>

3d.vii SBRP Mixtures Research

Historically, toxicity and carcinogenicity testing as well as mechanistic research on environmental chemicals has focused on single agents. Over the years this approach on environmental chemicals has been critical in providing information which has led to a better understanding of the interactions of exposure and susceptibility in relation to time. Indeed, the setting of standards for single substances is seen as an important and generally accepted tool in the protection of human health. However, it is becoming increasingly recognized that humans are not exposed to single chemicals. Rather, humans are exposed either concurrently or sequentially by various routes of exposure, to a large number of chemicals from a wide variety of sources over varying periods of time. Therefore, researchers, environmental policy-makers, and public health officials are faced with the challenge to design and implement strategies to reduce human disease and dysfunction resulting from exposure to chemical mixtures. Scientific approaches that have been used to assess the effects of single chemicals on biological systems are inadequate to address the potential health consequences that may arise from exposure to chemical mixtures.

Several factors contribute to the uncertainty of our understanding of the toxic effects of environmental exposure to chemical mixtures:

- Many of the effects of exposure are subtle and difficult to quantify.
- Many environmental contaminants are changed to metabolites or conjugates in the body, and these new products may also have biologic activity that may or may not be similar to the parent compound. Thus, even a single compound may become a functional mixture.
- A single environmental contaminant may lead to different effects when exposure occurs at different ages. Researchers need to design studies that will evaluate long-term, delayed and potential trans-generational health effects resulting from environmental or occupational exposures.
- Humans may be exposed to a nearly infinite number of combinations of contaminants, and we do not know what dose ranges or which biologic endpoints should be studied.

SBRP-FUNDED RESEARCH ON MIXTURES INCLUDES:**Biomolecular Research**

Activation of AhR-Dependent and AhR-Independent Signaling Cascades in PCB-Induced Immune Dysfunction

Burra Madhukar, Norbert Kaminski, and Patricia Ganey, Michigan State University

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=452&ONum=336>

Environmental Influences of Ah Receptor Ligands on Gene Expression

Robert Tukey, University of California – San Diego

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=390&ONum=343>

Environmental Pollutants and Oxidative Stress: Protective Responses and Animal Models

Michael Karin, University of California – San Diego

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=387&ONum=343>

Genotoxic Effects

Kirby Donnelly, Texas A&M University

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=471&ONum=339>

Hazardous Chemicals and Brain Developmental Plasticity

Christopher Wallace, Oregon Health and Science University

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=466&ONum=338>

An Integrated, Multidisciplinary, Multispecies Approach to Understanding the Endpoints and Mechanisms of Action of Endocrine Disrupting Compounds

Brent Palmer, University of Kentucky

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=500&ONum=345>

Mechanisms of Mutagenesis of Metals and PAH/Metal Mixtures

Kathleen Dixon, University of Cincinnati

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=607&ONum=361>

Mechanisms of Resistance of Aquatic Vertebrate Populations to Mixtures of Aromatic Hydrocarbons and Metal Contaminants

Isaac Wirgin, New York University School of Medicine

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=460&ONum=337>

Membrane efflux pumps and hormonal activity of organochlorine contaminants in New York Harbor sediments

Avrom Caplan, Mount Sinai School of Medicine

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=596&ONum=362>

Molecular Mechanisms of Complex Mixture Toxicity

Alavaro Puga, University of Cincinnati

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=609&ONum=361>

Role of Two AHRs in Dioxin Sensitivity and Resistance

Mark Hahn, Boston University

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=381&ONum=331>

Mechanisms of Chemical Sensitivity and Resistance

Mark Hahn, Boston University

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=301&ONum=1>

Chemical Mixtures as Promoters of Hepatocarcinogenesis

Stephen Benjamin, Colorado State University

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=304&ONum=2>

Genotoxicity

Kurt Randerath, Texas A&M University

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=227&ONum=11>

The Influence of Previous Exposures to a Mixture of Heavy Metals on Tolerance: A Mechanistic Evaluation at Different Levels of Biological Organization

William Clements, Colorado State University

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=307&ONum=2>

Mechanisms and Consequences of Neutrophil Activation by Hazardous Chemicals

Robert Roth, Michigan State University

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=186&ONum=7>

Mechanisms of Toxic Chemical Interaction in the Liver: Interactive Hepatotoxicity

Ruth Billings, Colorado State University

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=305&ONum=2>

Modulated Gap Junctional Intercellular Communication as a Biomarker for Epigenetic Toxicants after Remediation

James Trosko, Michigan State University

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=191&ONum=7>

PCB Estrogenicity in Human Breast Cells

John Gierthy, University of Albany – SUNY

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=328&ONum=13>

Studies on the Mechanisms Responsible for the Cognitive Impairment Caused by Exposure to PCBs

David Carpenter, University of Albany – SUNY

1995 – 2000 – SUNY

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=322&ONum=13>

Studies of Human Health Impacts

Endocrine Disruptors: Mechanistic Studies

Steven Safe, Texas A&M University

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=470&ONum=339>

Halogenated Aromatics

Steven Safe, Texas A&M University

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=225&ONum=11>

Biomarkers of Exposure to Pulmonary Toxicants

Alan Buckpitt, University of California – Davis

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=233&ONum=16>

Human Cell Culture Studies of Mutagens in the Aberjona Basin

William Thilly, Massachusetts Institute of Technology

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=171&ONum=6>

Toxic Chemical Influences on In Vivo and In Vitro Reproduction

Lynwood Clemens, Michigan State University

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=351&ONum=7>

Toxicologic Interaction Studies in Chemical Mixtures Using Physiologically Based Pharmacokinetics/Pharmacodynamics (PB-PK/PD) Coupled with Statistical/Mathematical Modeling

Raymond Yang, Colorado State University

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=296&ONum=2>

Epidemiology Studies

Molecular Epidemiology of Childhood Leukemia

Patricia Buffler, University of California – Berkeley

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=340&ONum=15>

Ecology

Aquatic Biomarkers in Site Characterization and Remediation

David Hinton, University of California – Davis

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=408&ONum=342>

Endocrine/Reproductive Disruption by Ground and Surface Waters

Ian Callard, Boston University

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=385&ONum=331>

Wildlife Applications to Remediation Decision-Making

Michael Hooper, University of Washington

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=514&ONum=347>

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=277&ONum=22>

The Influence of Previous Exposures to a Mixture of Heavy Metals on Tolerance: A Mechanistic Evaluation at Different Levels of Biological Organization

William Clements, Colorado State University

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=307&ONum=2>

Studies of Sources, Fate, and Transport

Coupled Processes in Bioavailability: Enhanced Pollutant Desorption Kinetics in Porous Media Mediated by Bacterial Extracellular Polymers

Leonard Lion and Michael Shuler, Cornell University

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=148&ONum=3>

Environmental Biotechnology: Kinetics of Microbial Degradation of Organic Pollutant Mixtures

Kenneth Reardon, Colorado State University

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=308&ONum=2>

*An Investigation of Multiphase Mass Transfer Phenomena***Cass T. Miller, University of North Carolina – Chapel Hill**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=267&ONum=21>*Wet Oxidation of Hazardous Chemicals in Sub- and Supercritical Water***Jefferson Tester, Massachusetts Institute of Technology**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=176&ONum=6>**Remediation***Bioavailability and Remediation of Complex DNAPLs***Mark Brusseau, University of Arizona**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=482&ONum=340>*Biosurfactant-Enhanced in Situ Metal Remediation***Raina Maier, University of Arizona**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=481&ONum=340>*Enhanced Remediation of Heterogeneous Subsurface***Cass T. Miller, University of North Carolina – Chapel Hill**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=506&ONum=346>*Exposure Assessment, Modeling and Applied Studies on Remediation of Complex Mixtures***Robin Autenrieth, Texas A & M University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=475&ONum=339>*Factors Influencing the Biodegradation of High Molecular Weight PAHs in Contaminated Soil***Michael Aitken, University of North Carolina – Chapel Hill**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=504&ONum=346>*Bacterial Degradation of High Molecular Weight PAH***Michael Aitken, University of North Carolina – Chapel Hill**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=265&ONum=21>*Functional Nanostructures of Groundwater Remediation***Thomas Pinnavaia, Michigan State University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=447&ONum=336>

*PCB Bioremediation Strategies and Potential Intermediates of Toxicological Significance***James Tiedje, Michigan State University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=449&ONum=336>*Phytoremediation of Contaminated Soils***Jodi Shann, University of Cincinnati**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=612&ONum=361>*Bioremediation of Soil***Jodi Shann, University of Cincinnati**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=247&ONum=17>*Transport and Biodegradation of Toxic Organics in Biofilms***Paul Bishop, University of Cincinnati**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=610&ONum=361>*The Bioavailability, Dissolution and Sorption of Insoluble Mixtures (NAPLs) in Subsurface Systems***Walter Weber, Michigan State University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=191&ONum=7>*Combustion Processes***Catherine Koshland, University of California – Berkeley**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=344&ONum=15>*Detection, Prioritization and Detoxification of Developmental Toxicants Associated with Chemical Wastes***Timothy Phillips, Texas A&M University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=226&ONum=11>*Microbial Degradation and Interactions of PAH and Soil***Frederic Pfaender, University of North Carolina – Chapel Hill**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=266&ONum=21>*Microbial Degradation of PAH Mixtures***David Warshawsky, University of Cincinnati**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=242&ONum=17>*Modified Clays for Environmental Remediation***Stephen Boyd, Michigan State University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=182&ONum=7>

*P450 Systems and Microbial Biodegradation***Jagjit Yadav, University of Cincinnati**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=241&ONum=17>*Thermally Enhanced Soil and Groundwater Remediation***Kent Udell, University of California – Berkeley**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=343&ONum=15>**Analytical Studies***Development and Implementation of Immunoassays for Human and Environmental Monitoring***Bruce Hammock, University of California – Davis**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=409&ONum=342>*Immunochemical Methods to Monitor Toxic Substances and/or Indicators of their Presence in Humans and other Species***Bruce Hammock, University of California – Davis**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=232&ONum=16>*Field Studies***Kirby Donnelly, Texas A&M University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=554&ONum=339>*Improving Ecological Risk Assessment: Development and Application of Methods to Determine the Bioavailability of Contaminants in Aquatic Sediments – New Bedford SF Site***James Shine, Harvard School of Public Health**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=443&ONum=335>*Markers for Chemical Mixtures in *Fundulus Heteroclitus****Richard Di Giulio, Duke University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=436&ONum=334>*Novel Cell-Based Toxicity Sensors Identified by Genome-Wide Screens***Roger Tsiens, University of California – San Diego**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=389&ONum=343>*Remediation Product Toxicity Evaluation Core***Stephen Boyd, Michigan State University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=536&ONum=336>

CONTAMINANTS STUDIED

Analytical Chemistry/Instrumentation Core

James Hunt, University of California – Berkeley

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=347&ONum=15>

Analytical Chemistry/Molecular Biology Core

John Tessari and William Black, Colorado State University

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=310&ONum=2>

Aquatic Biomarkers in Site Characterization and Remediation

Dave Hinton, University of California – Davis

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=231&ONum=16>

A Combined Bioassay-Chemical Fractionation Scheme for the Determination of Toxic Chemicals in Sediments from the St. Lawrence River

Patrick O' Keefe, University of Albany – SUNY

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=329&ONum=13>

Laboratory Core

Arthur Lafleur, Massachusetts Institute of Technology

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=178&ONum=6>

Development of Novel Bioassay/Biomarker Systems for Detection of Estrogen Agonists in Complex Mixtures

John Giesy, Michigan State University

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=190&ONum=7>

Statistical Analysis of Toxics Measurement Data

David Rocke, University of California – Davis

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=238&ONum=16>

3e. Groundwater

The Safe Drinking Water Act gives the USEPA the responsibility for setting national drinking water standards to protect the health of the people who get their water from public water systems. Roughly half of Americans get their drinking water from groundwater sources – either from private wells or public water systems that rely on groundwater. The USEPA has set drinking water health standards for more than 80 contaminants that may occur in drinking water and pose a risk to human health. Additionally, the USEPA has health advisories for some contaminants for which it has not set standards.

Groundwater quality can be compromised as a result of human activities that introduce contaminants into the environment. Four broad categories describe the most important anthropogenic sources of groundwater contamination:

- Fuel storage practices
- Waste disposal practices
- Agricultural practices
- Industrial practices

These practices have contributed to the creation of hazardous waste sites which, in turn, have introduced chemical contaminants into groundwater supplies. For example, fuel storage practices have allowed petrochemicals such as benzene, MTBE, and others to infiltrate aquifers; contaminants to leach from inadequately designed and constructed landfills into groundwater supplies; and pesticides and other chemicals applied to agricultural lands to migrate into groundwater and drain to surface waters. Industrial practices have long been major sources of groundwater contamination with metals, solvents such as TCE and PCE, and other organic contaminants including PAHs. Groundwater can also be affected by natural processes that result in elevated concentrations of certain constituents in the groundwater. For example, elevated metal concentrations can result when metals leach into the groundwater from naturally occurring minerals in the surrounding rocks and soils. High levels of arsenic and uranium are frequently found in groundwater and attributed to these natural sources in certain areas of the country.

Protection of this important public resource is vital. Given the multidisciplinary nature of the SBRP, the Program is ideal for investigating groundwater protection issues including the fate and transport of contaminants, human health and ecological risk assessment, and remediation of contaminated aquifers. Geochemists, geophysicists, hydrologists, hydrogeologists, engineers, and public health specialists are some of the specialists involved in SBRP-funded research on groundwater.

SBRP-FUNDED RESEARCH ON GROUNDWATER INCLUDES:**Studies of Fate and Transport of Contaminants in Groundwater***Arsenic Mobilization in Bangladesh Groundwater***Yan Zheng, Columbia University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=423&ONum=332>*Fate, Transport, and Exposure Risk of Superfund Chemicals***Dharni Vasudevan, Duke University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=437&ONum=334>*Processes Influencing the Natural Attenuation of Organic Contaminant Plumes: Transport, Enzymatic Regulation and Microbial Transformation Rates in Flowing Groundwater Systems***Linda Abriola, Michigan State University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=451&ONum=336>*Redistribution of Arsenic and Other Contaminants at Sites in NJ and Maine***James Simpson and Martin Stute, Columbia University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=424&ONum=332>*Sources, Transport and Fate of Arsenic in Groundwater***Carl Renshaw and Joel Blum, Dartmouth College**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=431&ONum=333>*Transport, Transformation, and Remediation of Perchlorate and VOCs in the Vadose Zone and Groundwater***Dennis Rolston, University of California – Davis**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=407&ONum=342>*Transport and Biodegradation of VOCs in the Vadose Zone***Dennis Rolston, University of California – Davis**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=230&ONum=16>*Assessment of Contaminant Concentrations and Ecologic Implications***Timothy Ford, Harvard School of Public Health**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=159&ONum=5>*Bacterial Transport in Saturated, Unsaturated, and Air-Sparged Porous Media***Bruce Logan, University of Arizona**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=199&ONum=14>

*The Bioavailability, Dissolution and Sorption of Insoluble Mixtures (NAPLs) in Subsurface Systems***Walter Weber, Michigan State University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=185&ONum=7>*Characterizing Ground Water Contamination of a Heterogeneous Field Site: The Aberjona River Watershed***Charles Harvey, Massachusetts Institute of Technology**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=170&ONum=6>*Chemical Transport, Transformation and Human Exposure on the Aberjona***Harold Hemond, Massachusetts Institute of Technology**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=165&ONum=6>*Fate of Semivolatile Organic Compounds Discharged to Surface Drainage Systems from Superfund Sites***Phillip Gschwend, Massachusetts Institute of Technology**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=166&ONum=6>*Geologic and Geophysical Characterization***Herbert Einstein, Massachusetts Institute of Technology**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=168&ONum=6>*Microscale Evaluation of Pollutant Bioavailability Leading to Structured Models for Contaminant Fate in Porous Media***Eugene Madsen, Michael Shuler, and William Ghiorse, Cornell University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=147&ONum=3>*Transport and Degradation of Toxic Agents in Biofilms***Paul Bishop, University of Cincinnati**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=246&ONum=17>*Transport of Hydrophobic Organic Contaminants in the Vadose Zone***Roger Bales, University of Arizona**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=202&ONum=14>*Transport of Trace Metals in a Polluted Aquifer***Martha Conklin, University of Arizona**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=203&ONum=14>

Site Core: Intermediate Scale Site

Roger Bales, University of Arizona

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=211&ONum=14>

Stochastic Analysis of Flow and Transport Phenomena

George Christakos, University of North Carolina – Chapel Hill

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=268&ONum=21>

Integrated Approaches to Groundwater Studies

A Cohort Study of Health Effects of Arsenic Exposure in Bangladesh

Habibul Ahsan, Columbia University

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/Getproj.cfm?ProjAutoNum=421&ONum=332>

Detecting and Analyzing Patterns in Spatial Data

David Ozonoff, Boston University

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=378&ONum=331>

New Methods of Spatial Analysis for Epidemiologic Data

David Ozonoff, Boston University

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=295&ONum=1>

Endocrine/Reproductive Disruption by Ground and Surface Waters

Ian Callard, Boston University

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/Getproj.cfm?ProjAutoNum=385&ONum=331>

Sentinel Species: Xenobiotics, Toxicity, and Reproduction

Ian Callard, Boston University

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=302&ONum=1>

Environmental As, Pregnancy, and Children's Health

Joseph Graziano, Columbia University

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/Getproj.cfm?ProjAutoNum=422&ONum=332>

*Epidemiology of Arsenic***Margaret Karagas, Dartmouth College**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=429&ONum=333>*Epidemiology of Arsenic and Other Toxic Metals***Margaret Karagas, Dartmouth College**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=151&ONum=4>**Remediation Technology Studies***Assessment and Remediation of AS Enrichments in Groundwater***Alexander Van Geen and Ponisseril Somasundaran, Columbia University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=425&ONum=332>*Bacterial Genes and Proteins Involved in Redox Transformation of Metals***Bradley Tebo, University of California – San Diego**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=395&ONum=343>*Biosurfactant-Enhanced in Situ Metal Remediation***Raina Maier, University of Arizona**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=481&ONum=340>*Bioremediation of Chlorinated Solvent Compounds: In Situ Remediation Strategies and Predictive Tools for Controlling Contaminated Plumes***John Ferguson, University of Washington**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=517&ONum=347>*Anaerobic and Aerobic Bioremediation of Chlorinated Organic Compounds: Processes and Enhanced In Situ Removal***John Ferguson, University of Washington**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=276&ONum=22>*Chemical Intervention Strategies***Timothy Phillips, Texas A&M University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=474&ONum=339>*Detection, Prioritization and Detoxification of Developmental Toxicants Associated with Chemical Wastes***Timothy Phillips, Texas A&M University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=226&ONum=11>

*Dehalogenation of Chlorinated Hazardous Organics***Dibakar Bhattacharyya, University of Kentucky**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=499&ONum=345>*Functional Nanostructures of Groundwater Remediation***Thomas Pinnavaia, Michigan State University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=447&ONum=336>*Innovative Technologies for Remediation of Haloorganics***Robert Arnold, University of Arizona**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=486&ONum=340>*Model for Catalytic Reductive Dehalogenation***Robert Arnold, University of Arizona**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=200&ONum=14>*Iron-Dependent Oxidative Remediation of Chlorethylenes***Pericles Stavropoulos, Boston University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=386&ONum=331>*Microbial Transformation of TCE in Anaerobic Groundwater***Jennifer A. Field, Oregon Health and Science University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=467&ONum=338>*PCB Bioremediation Strategies and Potential Intermediates of Toxicological Significance***James Tiedje, Michigan State University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=449&ONum=336>*Ecology and Diversity of BTEX Degrading Bacteria in Bioreactors and Aquifers***James Tiedje, Michigan State University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=180&ONum=7>*Phytoremediation of Contaminated Soils***Jodi Shann, University of Cincinnati**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=612&ONum=361>*Bioremediation of Soil***Jodi Shann, University of Cincinnati**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=247&ONum=17>

*Phytoremediation of Toxic Wastes***Milton Gordon, University of Washington**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=516&ONum=347>

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=275&ONum=22>*Remediating Mine Waste Products***Martha Conklin, University of Arizona**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=483&ONum=340>*Transport and Biodegradation of Toxic Organics in Biofilms***Paul Bishop, University of Cincinnati**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=610&ONum=361>*Transport and Degradation of Toxic Agents in Biofilms***Paul Bishop, University of Cincinnati**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=246&ONum=17>*Bacterial Transport in Saturated, Unsaturated, and Air-Sparged Porous Media***Bruce Logan, University of Arizona**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=199&ONum=14>*Ecology, Physiology, Molecular Genetics and Evolution of Microorganisms that Degrade Aromatic Xenobiotic Pollutants***Jerry Kukor and R.H. Olsen, Michigan State University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=179&ONum=7>*Enhanced Bioventing with Gas-Phase Nutrient Amendments***Roberto Guzman, University of Arizona**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=201&ONum=14>*Kinetic, Ecological and Genetic Factors Affecting Bioaugmentation of Carbon Tetrachloride-Contaminated Sites with *Pseudomonas* sp. Strain KC***Craig Criddle, Michigan State University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=181&ONum=7>*Modified Clays for Environmental Remediation***Stephen Boyd, Michigan State University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=182&ONum=7>

*Photocatalytic Remediation of PCB-contaminated Water and Sediment: Novel Catalysts and Potential Solar Applications***Chia-Swee Hong, University of Albany – SUNY**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=332&ONum=13>*Site Assessment, Cleanup, Analysis and Bioremediation***Kirby C. Donnelly, Texas A&M University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=228&ONum=11>*Site Core: Lysimeter Site***Peter Wierenga, University of Arizona**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=210&ONum=14>*Technology Demonstration Core***A. Jay Gandolfi, University of Arizona**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=555&ONum=340>*Thermally Enhanced Soil and Groundwater Remediation***Kent Udell, University of California – Berkeley**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=343&ONum=15>*Wet Oxidation of Hazardous Chemicals in Sub- and Supercritical Water***Jefferson Tester, Massachusetts Institute of Technology**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=176&ONum=6>**Analytical Studies***Geochemistry Core Laboratory***Alexander Van Geen and Steven Chillrud, Columbia University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=523&ONum=332>*Hydrogeology Core Laboratory***Martin Stute, Columbia University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=524&ONum=332>

*Sensing Superfund Chemicals with Recombinant Systems***Sylvia Daunert, University of Kentucky**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=498&ONum=345>

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=261&ONum=19>*Analytical Chemistry/Molecular Biology Core***John Tessari and William Black, Colorado State University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=310&ONum=2>*Determination of Toxic Metal Species in Environmental and Biological Matrices with High Energy Ion Beams***Qunitus Fernando, University of Arizona**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=206&ONum=14>*Halogenated Aromatics***Stephen Safe**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=225&ONum=11>*Immunochemical Methods to Monitor Toxic Substances and/or Indicators of their Presence in Humans and other Species***Bruce Hammock, University of California – Davis**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=232&ONum=16>*Laboratory Core***Robert Gensemer, Boston University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=303&ONum=1>*Toxicologic Interaction Studies in Chemical Mixtures Using Physiologically Based Pharmacokinetics/ Pharmacodynamics (PB-PK/PD) Coupled with Statistical/Mathematical Modeling***Raymond Yang, Colorado State University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=296&ONum=2>

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3f. Sediments

Sediment – the “muck” at the bottom of rivers and other bodies of water – is composed of materials transported and then deposited by water or wind and represents a surprisingly rich and productive environment. The organisms that live in it form the base of a food chain that stretches all the way up to humans.

Areas of sediment contamination occur in coastal and inland waterways, in clusters around larger municipal and industrial centers, and in regions affected by agricultural and urban runoff. The USEPA’s Report to Congress on Contaminated Sediment (prepared in conjunction with the NOAA, the Army Corps of Engineers, and other federal, state, and local agencies) states that sediment contamination exists in every region and state of the country and that approximately 10% of the sediment underlying U.S. surface waters is sufficiently contaminated with toxic pollutants to pose potential risks to fish and to humans and wildlife who eat fish.

Much of the contaminated sediment in the United States was polluted years ago by improper disposal or run-off of chemicals including PCB’s, pesticides, and mercury which have since been banned or restricted. Sediments constitute a major source of persistent bioaccumulative toxic chemicals which may pose threats to ecological and human health even after contaminants are no longer released from point and nonpoint sources. Documented adverse ecological effects of contaminants in sediments include skin lesions, increased tumor frequency, and reproductive toxicity in fish; reproductive failure in fish-eating birds and mammals; and decreased biodiversity in aquatic ecosystems. Threats to human health occur when sediment contaminants bioaccumulate in fish and shellfish tissues consumed by humans. Fish advisories have been issued for more than 1,500 water bodies in 46 states for pollutants such as mercury, dioxins, PCBs, PAHs and pesticides such as chlordane and chlorpyrifos.

More than 10 federal statutes provide authority to the USEPA program offices to address the problem of contaminated sediment. SBRP-funded researchers are providing critical information that will assist the USEPA in its efforts to prevent further sediment contamination, develop methodologies to improve the assessment of sediment contaminants, and design remediation technologies to clean up existing sediment contamination.

SBRP-FUNDED RESEARCH ON SEDIMENTS INCLUDES:**Biomolecular Research**

Effects of Polychlorinated Biphenyls and Polychlorinated Biphenyl-Containing River Sediments on Carcinogen Metabolism in Normal Human Mammary Epithelial Cells

James Wetmur, Mount Sinai School of Medicine

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=218&ONum=8>

Human Cell Culture Studies of Mutagens in the Aberjona Basin

William Thilly, Massachusetts Institute of Technology

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=171&ONum=6>

Epidemiology Studies

Exposure Levels of Persistent Pollutants in Urban Anglers

Anne Golden, Mount Sinai School of Medicine

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=598&ONum=362>

Studies of Human Health Impacts

Membrane Efflux Pumps and Hormonal Activity of Organochlorine Contaminants in New York Harbor Sediments

Avrom Caplan, Mount Sinai School of Medicine

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=596&ONum=362>

Hormonal Activity of Chlorinated Hydrocarbons and Related Contaminants from New York Harbor Sediments

Mary Wolff, Mount Sinai School of Medicine

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=217&ONum=8>

Ecology Studies

Assessment of Biological Responses to Organic and Metal Contaminants in New Bedford: Methods for Monitoring

Timothy Ford, Harvard School of Public Health

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=444&ONum=335>

Ecological Genetics of PAH- and Metal-Transforming Bacteria

Brian Kinkle, University of Cincinnati

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=611&ONum=361>

*Trophic Transfer of Toxic Metals in Aquatic Food Webs***Carol Folt and Celia Chen, Dartmouth College**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=432&ONum=333>*Variation in Bioaccumulation and Biomagnification of Metals in Lakes throughout the Northeastern Region of the U.S.A.***Carol Folt, Dartmouth College**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=316&ONum=4>*A Combined Bioassay-Chemical Fractionation Scheme for the Determination of Toxic Chemicals in Sediments from the St. Lawrence River***Patrick O' Keefe, University of Albany – SUNY**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=329&ONum=13>*Sentinel Species: Xenobiotics, Toxicity, and Reproduction***Ian Callard, Boston University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=302&ONum=1>**Studies of Sediment Contaminant Sources, Fate, and Transport***Factors Controlling the Environmental Mobility, Microbial Transformation and Toxicity of Mixed Non-Aqueous Phase Liquids and Exposed Soils/Sediments***Walter Weber, Michigan State University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=450&ONum=336>*The Bioavailability, Dissolution and Sorption of Insoluble Mixtures (NAPLs) in Subsurface Systems***Walter Weber, Michigan State University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=185&ONum=7>*Improving Ecological Risk Assessment: Development and Application of Methods to Determine the Bioavailability of Contaminants in Aquatic Sediments - New Bedford SF Site***James Shine, Harvard School of Public Health**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=443&ONum=335>

*Persistent Organochlorines in the Hudson River Watershed***Richard Bopp, Mount Sinai School of Medicine**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=595&ONum=362>*Sources and Pathways of Persistent Chlorinated Hydrocarbon Exposure in NY City***Richard Bopp, Mount Sinai School of Medicine**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=216&ONum=8>*Redistribution of Arsenic and Other Contaminants at Sites in NJ and Maine***James Simpson, Columbia University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=424&ONum=332>*Sources and Pathways of Urban Heavy Metal Exposure Using Elemental and Isotopic Composition of Environmental Samples***James Simpson, Mount Sinai School of Medicine**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=213&ONum=8>*Water-Sediment Model and Criteria for Arsenic and Chrome***Dominic Di Toro, New York University School of Medicine**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=462&ONum=337>*Chemical Transport, Transformation and Human Exposure on the Aberjona***Harold Hemond, Massachusetts Institute of Technology**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=165&ONum=6>*Fate of Semivolatile Organic Compounds Discharged to Surface Drainage Systems from Superfund Sites***Phillip Gschwend, Massachusetts Institute of Technology**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=166&ONum=6>*Geologic and Geophysical Characterization***Herbert Einstein, Massachusetts Institute of Technology**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=168&ONum=6>*Hydrodynamic Controls on Metal Remobilization from Sediments of The Mystic Lakes***Heidi Nepf, Massachusetts Institute of Technology**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=169&ONum=6>

*Microscale Evaluation of Pollutant Bioavailability Leading to Structured Models for Contaminant Fate in Porous Media***Eugene Madsen, Michael Shuler, and William Ghiorse, Cornell University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=147&ONum=3>**Remediation Technology Studies***Biosurfactant-Enhanced in Situ Metal Remediation***Raina Maier, University of Arizona**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=481&ONum=340>*Phytoremediation of Contaminated Soils***Jodi Shann, University of Cincinnati**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=612&ONum=361>*Bioremediation of Soil***Jodi Shann, University of Cincinnati**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=247&ONum=17>*Bioremediation of PCB-contaminated Sediments in the St. Lawrence River***G-Yull Rhee, University of Albany – SUNY**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=330&ONum=13>*Detection, Prioritization and Detoxification of Developmental Toxicants Associated with Chemical Wastes***Timothy Philips, Texas A&M University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=226&ONum=11>*Ecology and Diversity of BTEX Degrading Bacteria in Bioreactors and Aquifers***James Tiedje, Michigan State University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=180&ONum=7>*Photocatalytic Remediation of PCB-contaminated Water and Sediment: Novel Catalysts and Potential Solar Applications***Chia-Swee Hong, University of Albany – SUNY**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=332&ONum=13>*Supercritical Fluid Technology for Remediation of PCB/PAH Contaminated Soils and Sediments***Lawrence Tavlarides, University of Albany – SUNY**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=333&ONum=13>

Analytical Studies*Geochemistry Core Laboratory***Alexander Van Geen and Steven Chillrud, Columbia University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=523&ONum=332>*Exposure Assessment Core***Mary Wolff, Mount Sinai School of Medicine**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=221&ONum=8>*Genotoxicity***Kurt Randerath, Texas A&M University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=227&ONum=11>*Laboratory Core***Robert Gensemer, Boston University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=303&ONum=1>*Laboratory Core***Arthur Laffleur, Massachusetts Institute of Technology**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=178&ONum=6>*Remediation Product Evaluation Core***Stephen Boyd, Michigan State University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=183&ONum=7>*Site Assessment, Cleanup, Analysis and Bioremediation***Kirby C. Donnelly, Texas A&M University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=228&ONum=11>*Stable Lead Isotope and Trace Element Analysis***Steven Chillrud, Mount Sinai School of Medicine**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=222&ONum=8>*Training Core***Mark Brusseau, University of Arizona**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=198&ONum=14>

Outreach Programs

Community Outreach Core

Lloyd Sherman, Mount Sinai School of Medicine

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=223&ONum=8>

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3g. Bioavailability

The bioavailability of an environmental contaminant – the degree to which it can be assimilated by an organism – is a critical factor in decision-making processes related to both public health and remediation strategies. While it seems like a simple concept, bioavailability has the potential to affect:

- **Risk assessment** – Incomplete understanding of the bioavailability of a contaminant is a significant factor complicating the evaluation of the risk of exposure to a toxic contaminant. Historically, exposure to hazardous materials in the environment has been quantified through the use of standard laboratory analytical techniques geared towards determining the total amount of material found in the sample under consideration. It may not be appropriate to measure total concentrations in the environment, as different contaminants or different species of an elemental contaminant may exhibit different levels of mobility, both in the environment and once inhaled, ingested, or placed in contact with the skin. If a contaminant is sequestered in the soil or sediment, or has limited mobility in tissues, it may not represent a significant human or environmental risk.
- **Identification of remediation goals** – Bioavailability is one of the many complex elements that may be taken into consideration when cleanup criteria are determined for a contaminated site. The question “How clean is clean enough?” is made even more difficult by an incomplete understanding of the bioavailability of contaminants at a site and the factors that influence bioavailability.
- **Selection of appropriate remediation strategies** – Bioremediation is often less expensive and more efficient than conventional remediation techniques. However, for bioremediation methods to work, the contaminant must be available to the bacteria or plant used in the cleanup effort.
- **Fate and transport** – Bioavailability of contaminants in soils is a complex process that is influenced by the interplay of both chemical and biological factors. For example, the chemical process of adsorption is generally thought to decrease the bioavailability of certain contaminants in soils, while some evidence suggests that the presence of bacteria in soils may increase the accessibility of soil contaminants to living organisms.

SBRP-funded multidisciplinary research, involving molecular biology, environmental chemistry, microbial ecology, and chemical engineering modeling is working towards the goal of providing new methods of analysis that will lead to a better assessment of the fraction of pollutant in the environment that influences human health.

SBRP-FUNDED RESEARCH ON BIOAVAILABILITY INCLUDES:**Biomolecular Research***Bioavailability of Chlorinated Hydrocarbons***Margaret James, University of Florida**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=405&ONum=344>

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=253&ONum=18>*Gene Enhanced Remediation of Co-Contaminated Soils***Ian Pepper, University of Arizona**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=480&ONum=340>**Studies of Human Health Impacts***Bioavailability of Soil Lead and Arsenic in Humans***Conrad Blum, Columbia University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=419&ONum=332>*Mechanisms of Arsenic Transport in Kidney and Bladder***Stephen Wright, University of Arizona**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=477&ONum=340>**Ecology Studies***Assessment of Biological Responses to Organic and Metal Contaminants in New Bedford: Methods for Monitoring***Timothy Ford, Harvard School of Public Health**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=444&ONum=335>*Assessment of Contaminant Concentrations and Ecologic Implications***Timothy Ford, Harvard School of Public Health**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=159&ONum=5>*Improving Ecological Risk Assessment: Development and Application of Methods to Determine the Bioavailability of Contaminants in Aquatic Sediments - New Bedford SF Site***James Shine, Harvard School of Public Health**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=443&ONum=335>

Bioavailability: Effects on Fate and Transport

Factors Controlling the Environmental Mobility, Microbial Transformation and Toxicity of Mixed Non-Aqueous Phase Liquids and Exposed Soils/Sediments

Walter Weber, Michigan State University

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=450&ONum=336>

The Bioavailability, Dissolution and Sorption of Insoluble Mixtures (NAPLs) in Subsurface Systems

Walter Weber, Michigan State University

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=185&ONum=7>

Coupled Processes in Bioavailability: Enhanced Pollutant Desorption Kinetics in Porous Media Mediated by Bacterial Extracellular Polymers

Leonard Lion, Cornell University

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=148&ONum=3>

Effect of Aging of Pollutants in Soil on Bioavailability, Extractability and Toxicity

Martin Alexander, Cornell University

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=146&ONum=3>

Microscale Evaluation of Pollutant Bioavailability Leading to Structured Models for Contaminant Fate in Porous Media

William Ghiorse, Cornell University

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=147&ONum=3>

Bioavailability: as a Consideration in Remediation Technologies

Bacterial Degradation of High Molecular Weight PAH

Michael Aitken, University of North Carolina – Chapel Hill

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=504&ONum=346>

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=265&ONum=21>

Bioavailability and Remediation of Complex DNAPLs

Mark Brusseau, University of Arizona

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=482&ONum=340>

Bioavailability, Soil Heterogeneity, and In-Situ Biodegradation of Organic Contaminants

Mark Brusseau, University of Arizona

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=197&ONum=14>

*Exposure Assessment, Modeling and Applied Studies on Remediation of Complex Mixtures***Robin Autenrieth, Texas A&M University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=475&ONum=339>*Microbial Degradation and Interactions of PAH and Soil***Frederic Pfaender, University of North Carolina – Chapel Hill**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=505&ONum=346>

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=266&ONum=21>*Phytoremediation of Contaminated Soils***Jodi Shann, University of Arizona**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=612&ONum=361>*Bioremediation of Soil***Jodi Shann, University of Cincinnati**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=247&ONum=17>*Bioremediation of PCB-contaminated Sediments in the St. Lawrence River***G-Yull Rhee, University of Albany – SUNY**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=330&ONum=13>*Biosurfactant-Enhanced Remediation of Metal- Contaminated Soils***Raina Maier, University of Arizona**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=196&ONum=14>**Analytical Studies***Site Assessment, Cleanup, Analysis and Bioremediation***Kirby Donnelly, Texas A&M University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/Getproj.cfm?ProjAutoNum=228&ONum=11>

3h. Remediation Technologies

The SARA legislation mandates that the research funded by the SBRP should include development of advanced techniques for the detection and assessment of hazardous wastes, and basic biological, chemical and physical methods to reduce the amount and toxicity of Superfund hazardous substances. The knowledge developed in this Program not only serves as the basis for subsequent basic or applied research in these areas, but also provides a foundation for practical benefits such as lower cleanup costs on hazardous waste sites and improvements in human and ecological health risk assessments.

SBRP-funded remediation research covers the spectrum of technologies being developed for the cleanup of groundwater, sediments, soil and other environmental media contaminated with hazardous substances. With primary prevention as the goal, researchers are developing innovative biological, chemical and physical methods that effectively reduce the amount and toxicity of hazardous wastes. Remediation research also includes development of new and improved methods of hazardous waste containment, recovery and separation. This broad area of research includes laboratory and bench studies, and applied field research once a technology has reached an advanced level.

To develop novel remediation technologies, basic knowledge regarding the physical and chemical processes involved in each strategy is needed. For example, an in-depth understanding of sorption and desorption processes is necessary for many remediation technologies. Kinetic data, such as the rates and extent of hazardous waste conversion, are needed for thermal, chemical oxidation, and supercritical fluid technologies. Thus, the remediation research conducted by SBRP grantees is an exceptional example of the value of the multidisciplinary approach that the Program strives to foster. The development of efficient and economical remediation strategies requires collaboration among a wide spectrum of diverse fields. For example, a microbiologist alone does not have all of the knowledge required to design and implement a bioremediation system – but requires support from experts in fields such as ecology, soil science, hydrogeology, geologic engineering, geophysics, and geochemistry.

Remediation research has been a very strong and successful component of the Program. SBRP remediation projects cover the full spectrum of research from basic scientific advances to applied technologies. Many of these projects are very practical, frequently with direct applications to Superfund sites, including field testing and patented cleanup technologies.

SBRP-FUNDED RESEARCH ON REMEDIATION INCLUDES:**Chemical/Physical Remediation Studies***Chemical Intervention Strategies***Timothy Phillips, Texas A&M University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=474&ONum=339>*Detection, Prioritization and Detoxification of Developmental Toxicants Associated with Chemical Wastes***Timothy Philips, Texas A&M University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=226&ONum=11>*Dehalogenation of Chlorinated Hazardous Organics***Dibakar Bhattacharyya, University of Kentucky**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=499&ONum=345>*Electrochemical Remediation of Arsenic and Chromium***James Farrell, University of Arizona**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=484&ONum=340>*Enhanced Remediation of Heterogeneous Subsurface***Cass T. Miller, University of North Carolina – Chapel Hill**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=506&ONum=346>*Factors Controlling the Environmental Mobility, Microbial Transformation and Toxicity of Mixed Non-Aqueous Phase Liquids and Exposed Soils/Sediments***Walter Weber, Michigan State University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=450&ONum=336>*The Bioavailability, Dissolution and Sorption of Insoluble Mixtures (NAPLs) in Subsurface Systems***Walter Weber, Michigan State University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=185&ONum=7>*Functional Nanostructures of Groundwater Remediation***Thomas Pinnavaia, Michigan State University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=447&ONum=336>*Innovative Technologies for Remediation of Haloorganics***Robert Arnold, University of Arizona**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=486&ONum=340>

*Iron-Dependent Oxidative Remediation of Chlorethylenes***Pericles Stavropoulos, Boston University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=386&ONum=331>*Remediating Mine Waste Products***Martha Conklin, University of Arizona**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=483&ONum=340>*Modified Clays for Environmental Remediation***Stephen Boyd, Michigan State University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=182&ONum=7>*Supercritical Fluid Technology for Remediation of PCB/PAH Contaminated Soils and Sediments***Lawrence Tavlarides, University of Albany – SUNY**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=333&ONum=13>*Wet Oxidation of Hazardous Chemicals in Sub- and Supercritical Water***Jefferson Tester, Massachusetts Institute of Technology**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=176&ONum=6>**Photodegradation Studies***Photocatalytic Remediation of PCB-contaminated Water and Sediment: Novel Catalysts and Potential Solar Applications***Chia-Swee Hong, University of Albany – SUNY**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=332&ONum=13>**Thermal Remediation Studies***Combustion Processes: Emissions, Monitoring, and Intervention***Catherine Koshland, University of California – Berkeley**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=493&ONum=341>*Combustion Processes***Catherine Koshland, University of California – Berkeley**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/Getproj.cfm?ProjAutoNum=344&ONum=15>

Thermal Remediation

Ian Kennedy, University of California – Davis

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program/Getproj.cfm?ProjAutoNum=413&ONum=342>

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=236&ONum=16>

Fundamental Studies of Thermal Decontamination of Soils

Jack Howard, Massachusetts Institute of Technology

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=177&ONum=6>

Thermally Enhanced Soil and Groundwater Remediation

Kent Udell, University of California – Berkeley

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=343&ONum=15>

Bioremediation Studies

Assessment and Remediation of Arsenic Enrichments in Groundwater

Alexander Van Geen and Ponisseril Somasundaran, Columbia University

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=425&ONum=332>

Assessment of Natural Bioattenuation of PCE and TCE

Angela Lindner, University of Florida

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=406&ONum=344>

Bacterial Genes and Proteins Involved in Redox Transformation of Metals

Bradley Tebo, University of California – San Diego

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=395&ONum=343>

Bioavailability and Remediation of Complex DNAPLs

Mark Brusseau, University of Arizona

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=482&ONum=340>

Bioavailability, Soil Heterogeneity, and In-Situ Biodegradation of Organic Contaminants

Mark Brusseau, University of Arizona

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=197&ONum=14>

Bioremediation of Chlorinated Solvent Compounds: In Situ Remediation Strategies and Predictive Tools for Controlling Contaminated Plumes

John Ferguson, University of Washington

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=517&ONum=347>

Anaerobic and Aerobic Bioremediation of Chlorinated Organic Compounds: Processes and Enhanced In Situ Removal

John Ferguson, University of Washington

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=276&ONum=22>

Biosurfactant-Enhanced in Situ Metal Remediation

Raina Maier, University of Arizona

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=481&ONum=340>

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=196&ONum=14>

Development of Tools for Monitoring in Situ Bioremediation

Lisa Alvarez-Cohen, University of California – Berkeley

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=494&ONum=341>

Epigenetic Effects of Pre- and Post-Remediated Environmental Toxicants

James Trosko, Michigan State University

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=454&ONum=336>

Exposure Assessment, Modeling and Applied Studies on Remediation of Complex Mixtures

Robin Autenrieth, Texas A&M University

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=475&ONum=339>

Factors Influencing the Biodegradation of High Molecular Weight PAHs in Contaminated Soil

Michael Aitken, University of North Carolina – Chapel Hill

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=504&ONum=346>

Bacterial Degradation of High Molecular Weight PAH

Michael Aitken, University of North Carolina – Chapel Hill

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=265&ONum=21>

Gene Enhanced Remediation of Co-Contaminated Soils

Ian Pepper, University of Arizona

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=480&ONum=340>

Biodegradation within Metal/Organic Contaminated Soils

Ian Pepper, University of Arizona

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=195&ONum=14>

Mechanisms of Bioavailability Regulation in Soil

Frederic Pfaender, University of North Carolina – Chapel Hill

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=505&ONum=346>

Microbial Degradation and Interactions of PAH and Soil

Frederic Pfaender, University of North Carolina – Chapel Hill

1995-2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=266&ONum=21>

Microbial Transformation of TCE in Anaerobic Groundwater

Jennifer Field, Oregon Health and Science University

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=467&ONum=338>

PCB Bioremediation Strategies and Potential Intermediates of Toxicological Significance

James Tiedje, Michigan State University

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=449&ONum=336>

Ecology and Diversity of BTEX Degrading Bacteria in Bioreactors and Aquifer

James Tiedje, Michigan State University

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=180&ONum=7>

Processes Influencing the Natural Attenuation of Organic Contaminant Plumes: Transport, Enzymatic Regulation and Microbial Transformation Rates in Flowing Groundwater Systems

Linda Abriola, Michigan State University

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=451&ONum=336>

*Reductive Processes for Bioremediation of Chlorinated Solvent-Metal Mixtures***Craig Criddle, Michigan State University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program/Getproj.cfm?ProjAutoNum=446&ONum=336>*Kinetic, Ecological and Genetic Factors Affecting Bioaugmentation of Carbon Tetrachloride-Contaminated Sites with Pseudomonas sp. Strain KC***Craig Criddle, Michigan State University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=181&ONum=7>*Transport and Biodegradation of Toxic Organics in Biofilms***Paul Bishop, University of Cincinnati**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=610&ONum=361>*Transport and Degradation of Toxic Agents in Biofilms***Paul Bishop, University of Cincinnati**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=246&ONum=17>*Transport, Transformation, and Remediation of Perchlorate and VOCs in the Vadose Zone and Groundwater***Dennis Rolston, University of California – Davis**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=407&ONum=342>*Bacterial Transport in Saturated, Unsaturated, and Air-Sparged Porous Media***Bruce Logan, University of Arizona**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=199&ONum=14>*Bioremediation of PCB-contaminated Sediments in the St. Lawrence River***G-Yull Rhee, University of Albany – SUNY**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=330&ONum=13>*Bioremediation of Soil***Jodi Shann, University of Cincinnati**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=247&ONum=17>*Coupled Processes in Bioavailability: Enhanced Pollutant Desorption Kinetics in Porous Media Mediated by Bacterial Extracellular Polymers***Leonard Lion and Michael Shuler, Cornell University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=148&ONum=3>

Ecology, Physiology, Molecular Genetics and Evolution of Microorganisms that Degrade Aromatic Xenobiotic Pollutants

Jerry Kukor and R. H. Olsen, Michigan State University

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=179&ONum=7>

Enhanced Bioventing with Gas-Phase Nutrient Amendments

Roberto Guzman, University of Arizona

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=201&ONum=14>

Environmental Fate of Azo Dyes and Related Products

M. Wilson Tabor, University of Cincinnati

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=243&ONum=17>

Lysimeter Site

Peter Wierenga, University of Arizona

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=210&ONum=14>

Microbial Degradation of PAH Mixtures

David Warshawsky, University of Cincinnati

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=242&ONum=17>

P450 Systems and Microbial Biodegradation

Jagjit Yadav, University of Cincinnati

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=241&ONum=17>

Transport and Biodegradation of VOCs in the Vadose Zone

Dennis Rolston, University of California – Davis

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/Getproj.cfm?ProjAutoNum=230&ONum=16>

Phytoremediation Studies

Phytochelatin Synthase and Resistance to Heavy Metals

Julian Schroeder, University of California – San Diego

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=394&ONum=343>

Phytoremediation of Contaminated Soils

Jodi Shann, University of Cincinnati

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=612&ONum=361>

*Phytoremediation of Toxic Wastes***Milton Gordon, University of Washington**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program/Getproj.cfm?ProjAutoNum=516&ONum=347>

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=275&ONum=22>**Modeling Studies***Factors Controlling the Environmental Mobility, Microbial Transformation and Toxicity of Mixed Non-Aqueous Phase Liquids and Exposed Soils/Sediments***Walter Weber, Michigan State University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=450&ONum=336>*Processes Influencing the Natural Attenuation of Organic Contaminant Plumes: Transport, Enzymatic Regulation and Microbial Transformation Rates in Flowing Groundwater Systems***Linda Abriola, Michigan State University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=451&ONum=336>*Environmental Biotechnology: Kinetics of Microbial Degradation of Organic Pollutant Mixtures***Kenneth Reardon, Colorado State University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=308&ONum=2>*Model for Catalytic Reductive Dehalogenation***Robert Arnold, University of Arizona**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=200&ONum=14>**Outreach Programs***Technology Transfer and Outreach Core***Ronald Scudato, University of Albany – SUNY**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=336&ONum=13>

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3i. Toxicology and Health Effects

There is great concern about the effects of exposures to hazardous substances on human health. The uncertainties and unknowns surrounding exposures present a huge challenge for decision-makers, especially for those dealing with hazardous waste sites. Accordingly, a basic, mechanistic understanding of the cellular, molecular and biochemical processes that are affected by the exposures can enhance the scientific base used in the decision process.

There are many aspects to developing a fuller understanding of the relationship between exposures and disease processes such as the identification of the causative agent(s); determination of the minimum dose where adverse health effects are manifested; and elucidation of the mechanisms by which these substances cause toxicity. The more we learn, the better understanding we will have of carcinogenesis, cardiovascular toxicity, reproductive toxicity, neurotoxicity and other toxic effects. Clearly, these are all important public health concerns.

A major component of the SBRP research effort is directed towards improving the understanding of the health effects from exposures to contaminants. Of all of the Superfund-related research enterprises, the SBRP is the primary program charged with conducting basic biomedical research as it relates to hazardous substances. Given this role, the Program has invested heavily in health effects research. Our health effects research includes very basic mechanistic studies, toxicological investigations, as well as biomarker development and molecular epidemiology studies. Compilations that identify the full range of SBRP biomedical research can be found in this section and in the biomarkers and risk/exposure assessment sections.

This section demonstrates that the Program's basic toxicology studies include not only cancer but other important health endpoints, and have evolved to incorporate more mechanistic understanding of the toxicological event. One important aspect of toxicology studies is dose. In our Program studies are being conducted to better define the toxicity at real world concentrations.

It is anticipated that the knowledge acquired in these studies can be incorporated into the risk assessment of hazardous waste sites, as well as strategies for preventing adverse human health effects.

SBRP-FUNDED RESEARCH ON TOXICOLOGY AND HEALTH EFFECTS INCLUDES:**Cancer***Activation of PCBs to Genotoxins in vivo***Larry Robertson, University of Kentucky**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=495&ONum=345>*Arsenic and Health in Taiwan and Bangladesh***David Christiani, Harvard School of Public Health**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=440&ONum=335>*Arsenic Mode of Action in Cancer: Models of Epigenetic Mechanism***Karl Kelsey, Harvard School of Public Health**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=442&ONum=335>*Biological Fate of Arsenic Species***H. Vasken Aposhian, University of Arizona**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=476&ONum=340>*Detection of Cr-DNA Adducts in Human***Max Costa, New York University School of Medicine**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=457&ONum=337>*Effects of Carcinogenic Materials on Gene Expression***Joshua Hamilton, Dartmouth College**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=427&ONum=333>*Epigenetic Effects on Individual Susceptibility to Heavy Metal and Polycyclic Aromatic Hydrocarbon- Induced DNA Damage***Eric Moon-Shong Tang, New York University School of Medicine**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=456&ONum=337>*Genotoxic Effects***Kirby Donnelly, Texas A&M University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=471&ONum=339>*Genotoxic Mechanisms of As in Mammalian Cells***Tom Hei, Columbia University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/Getproj.cfm?ProjAutoNum=420&ONum=332>

*Glutathione Conjugation of Environmental Toxins***Michael Kelner, University of California – San Diego**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=391&ONum=343>*Identification and Genetic Analysis of the Human Arsenite Efflux Pump***Toby Rossman, New York University School of Medicine**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=459&ONum=337>*Mechanisms of Arsenic Transport in Kidney and Bladder***Stephen Wright, University of Arizona**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=477&ONum=340>*Mechanisms of Hepatic Tumor Promotion by PCBs***Howard Glauert, University of Kentucky**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=497&ONum=345>*Mechanisms of Mutagenesis of Metals and PAH/Metal Mixtures***Kathleen Dixon, University of Cincinnati**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=607&ONum=361>*Molecular Mechanisms of Chromium Mutagenesis***Kathleen Dixon, University of Cincinnati**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=244&ONum=17>*Metal-Induced Inflammatory Factors, Oxidative Stress and Suppression of their Effects***Krystyna Frenkel, New York University School of Medicine**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=458&ONum=337>*Molecular Effects of Low Level Exposure to Arsenic***A. Jay Gandolfi, University of Arizona**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=478&ONum=340>*Mutation and Recombination in Mice Exposed to Toxic Metals***James Stringer, University of Cincinnati**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=608&ONum=361>*Neurotoxic and Mutagenic Actions of Superfund Chemicals***Glen Kisby, Oregon Health and Science University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=465&ONum=338>

*PCBs, ICAM-1 Expression and Cancer Metastasis***Michal Toborek, University of Kentucky**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=501&ONum=345>*PPAR, Hormones, and Xenobiotics***David Waxman, Boston University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/Getproj.cfm?ProjAutoNum=379&ONum=331>*Activation of Orphan Receptors by Chlorinated Hydrocarbons***David Waxman, Boston University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?projautonum=300&conum=1>*Stress Gene Induction in Mammalian Cells***Ken Ramos, Texas A&M University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=472&ONum=339>*The Aryl Hydrocarbon Receptor/Transcription Factor as a Regulator of Hydrocarbon Bioactivity***David Sherr, Boston University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/Getproj.cfm?ProjAutoNum=380&ONum=331>*Chemical Mixtures as Promoters of Hepatocarcinogenesis***Stephen Benjamin, Colorado State University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=304&ONum=2>*Effects of Polychlorinated Biphenyls and Polychlorinated Biphenyl-Containing River Sediments on Carcinogen Metabolism in Normal Human Mammary Epithelial Cells***James Wetmur, Mount Sinai School of Medicine**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=218&ONum=8>*Molecular Signals of Epigenetic Toxicity of Superfund Chemicals***B.V. Madhukar, Michigan State University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=192&ONum=7>*Serum PCB as a Risk Indicator for Breast Cancer in Women***Philippe Grandjean, Boston University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=297&ONum=1>

Neurotoxicity*Developmental Neurotoxicity of Chlorpyrifos: Mechanism and Consequences***Theodore Slotkin, Duke University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=433&ONum=334>*Developmental Neurotoxicity of Xenoestrogens in Zebrafish***Gloria Callard, Boston University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/Getproj.cfm?ProjAutoNum=384&ONum=331>*Environmental and Biochemical Risk Factors for Parkinson's Disease***Harvey Checkoway, University of Washington**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=512&ONum=347>*Hazardous Chemicals and Brain Developmental Plasticity***Christopher Wallace, Oregon Health and Science University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=466&ONum=338>*Heme Pathway Polymorphisms in Mercury-Induced Porphyrinuria and Toxicity***James Woods, University of Washington**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=510&ONum=347>*Organophosphate Pesticide Exposure: Analysis of Disposition in the Body and Target Inactivation in Relation to Gene Expression***Palmer Taylor, University of California – San Diego**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=393&ONum=343>*Biophysical Well-being among Akwesasne Residents***Azara Santiago-Rivera, University of Albany – SUNY**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=325&ONum=13>*Factors Modifying Behavioral Toxicity of Lead***Barbara Strupp, Cornell University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=289&ONum=3>*Genetic Susceptibility to Environmental Lead Intoxication***Karl Kelsey, Harvard School of Public Health**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=153&ONum=5>

*Neurochemical, Neurobehavioral, And Endocrine Effects of Developmental Exposure of Rats to Individual PCB Congeners***Richard Seegal, University of Albany – SUNY**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=326&ONum=13>*Studies on the Mechanisms Responsible for the Cognitive Impairment Caused by Exposure to PCBs***David Carpenter, University of Albany – SUNY**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=322&ONum=13>**Reproductive and Developmental Toxicity***Assessing Adverse Effects of Environmental Hazards on Reproductive Health in Human Populations***Bill Lasley, University of California – Davis**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=412&ONum=342>*Cytochrome P450 in Developmental Toxicity***John Stegeman, Boston University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=383&ONum=331>*Determinants for Chromosomally Defective Human Sperm***Andrew Wyrobek and Brenda Eskanazi, University of California – Berkeley**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=490&ONum=341>*Endocrine/Reproductive Disruption by Ground and Surface Waters***Ian Callard, Boston University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/Getproj.cfm?ProjAutoNum=385&ONum=331>*Sentinel Species: Xenobiotics, Toxicity, and Reproduction***Ian Callard, Boston University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=302&ONum=1>*Environmental Contaminants and the Neuroecology of Reproductive Behavior***Lynwood Clemens, Michigan State University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=453&ONum=336>*Toxic Chemical Influences on In Vivo and In Vitro Reproduction***Lynwood Clemens, Michigan State University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=351&ONum=7>

*Mechanism of Stress-Induced Developmental Abnormalities***Jonathan Freedman, Duke University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=434&ONum=334>*Molecular Analysis of Toxicant-Mediated Teratogenesis***Ornella Selmin, University of Arizona**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=479&ONum=340>*Organochlorine Disruption of the Wnt Gene Pathway in the Female Reproductive Tract***David Sassoon, Mount Sinai School of Medicine**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=597&ONum=362>*Organochlorine Pesticides and Development Mortality***Timothy Gross, University of Florida**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=401&ONum=344>*PCB Effects on Uterine Muscle***Rita Loch Caruso, Michigan State University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=455&ONum=336>

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=188&ONum=7>*PCE-Contaminated Water and Disorders of Reproduction and Development***Ann Aschengrau, Boston University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=377&ONum=331>*Placental-Uterine and Prostate Effects of Organochlorines***Kathleen Shiverick, University of Florida**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=402&ONum=344>*Placental-Uterine Effects of Chlorinated Hydrocarbons***Kathleen Shiverick, University of Florida**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=251&ONum=18>*Role of Two AHRs in Dioxin Sensitivity and Resistance***Mark Hahn, Boston University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/Getproj.cfm?ProjAutoNum=381&ONum=331>

*Susceptible Genotypes***Rick Finnell, Texas A&M University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=473&ONum=339>*Cardiac Teratogenicity of Halogenated Hydrocarbons***Paula Johnson, University of Arizona**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=207&ONum=14>*Lead Mobilization During Pregnancy and Lactation in Urban Women***Jacqueline Moline, Mount Sinai School of Medicine**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=214&ONum=8>*PCBs and the Well-being of Mohawk Children and Youth, Growth, Development and Cognitive Behavioral Functioning***Lawrence Schell, University of Albany – SUNY**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=324&ONum=13>*PCB Estrogenicity in Human Breast Cells***John Gierthy, University of Albany – SUNY**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/Getproj.cfm?ProjAutoNum=328&ONum=13>*Stage-specific Actions of Cadmium During Spermatogenesis***Gloria Callard, Boston University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/Getproj.cfm?ProjAutoNum=362&ONum=1>**General/Other Toxicity***Activation of AhR-Dependent and AhR-Independent Signaling Cascades in PCB-Induced Immune Dysfunction***Burra Madhukar, Norbert Kaminski, and Patricia Ganey, Michigan State University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=452&ONum=336>*An Integrated, Multidisciplinary, Multispecies Approach to Understanding the Endpoints and Mechanisms of Action of Endocrine Disrupting Compounds***Brent Palmer, University of Kentucky**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=500&ONum=345>*Autoimmune Toxicity of Chlorinated Compounds***Joel Schiffenbauer, University of Florida**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=404&ONum=344>

*Bioavailability of Chlorinated Compounds***Margaret James, University of Florida**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=405&ONum=344>*Effects of Arsenic on Cytochrome P450***Jacqueline Sinclair, Dartmouth College**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=428&ONum=333>*Endocrine Disruptors in the Environment and their Influence***Christopher Glass, University of California – San Diego**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=392&ONum=343>*Endocrine Disruptors: Mechanistic Studies***Steven Safe, Texas A&M University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=470&ONum=339>*Halogenated Aromatics***Steven Safe, Texas A&M University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=225&ONum=11>*Environmental Influences of Ah Receptor Ligands on Gene Expression***Robert Tukey, University of California – San Diego**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=390&ONum=343>*Environmental Pollutants and Oxidative Stress: Protective Responses and Animal Models***Michael Karin, University of California – San Diego**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=387&ONum=343>*Epigenetic Effects of Pre- and Post-Remediated Environmental Toxicants***James Trosko, Michigan State University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=454&ONum=336>*Mechanism of Arsenic-Induced Vascular Disease***Aaron Barchowsky, Dartmouth College**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/Getproj.cfm?ProjAutoNum=426&ONum=333>

Mechanisms of Resistance of Aquatic Vertebrate Populations to Mixtures of Aromatic Hydrocarbons and Metal Contaminants

Isaac Wirgin, New York University

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=460&ONum=337>

Membrane efflux pumps and hormonal activity of organochlorine contaminants in New York Harbor sediments

Avrom Caplan, Mount Sinai School of Medicine

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=596&ONum=362>

Molecular Mechanisms of Complex Mixture Toxicity

Alavaro Puga, University of Cincinnati

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=609&ONum=361>

Molecular Mechanisms of Endocrine Disruption

Nancy Denslow, University of Florida

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=400&ONum=344>

Pharmacology of Trichloroethylene Metabolites

Peter Stacpoole, University of Florida

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=403&ONum=344>

Dichloroacetate Kinetics, Metabolism and Human Toxicology

Peter Stacpoole, University of Florida

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=252&ONum=18>

Remediation Product Toxicity Evaluation Core

Stephen Boyd, Michigan State University

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=536&ONum=336&core>

Superfund Chemicals, Nutrition, and Endothelial Cell Dysfunction

Bernhard Hennig, University of Kentucky

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=496&ONum=345>

Superfund Chemicals and Endothelial Cell Dysfunction

Bernhard Hennig, University of Kentucky

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=259&ONum=19>

*Toxic Metal Interactions with Cellular Proteins***Dean Wilcox, Dartmouth College**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=430&ONum=333>*Yeast Genetics and Stress Response Genes***Paul Russell, University of California – San Diego**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=388&ONum=343>*The Ah Receptor as a Regulator of Hydrocarbon Bioactivity***David Sherr, Boston University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=299&ONum=1>*Detoxification of Metals: In Vitro and In Vivo Studies***H. Vasken Aposhian, University of Arizona**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=204&ONum=14>*Developmental Immunotoxicologic Appraisal of DMSA***Rodney Dietert, Cornell University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=144&ONum=3>*Hepatotoxicant-Induced Immune Suppression through TGF-beta Release***Norbert Kaminski, Michigan State University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=187&ONum=7>*Hormonal Activity of Chlorinated Hydrocarbons and Related Contaminants from New York Harbor Sediments***Mary Wolff, Mount Sinai School of Medicine**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=217&ONum=8>*Induction of Oxidative Stress and Activation of Transcription Factors by Toxic Metals***Aaron Barchowsky, Dartmouth College**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=150&ONum=4>*Mechanisms and Consequences of Neutrophil Activation by Hazardous Chemicals***Robert Roth, Michigan State University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=186&ONum=7>*Mechanisms of Chemical Sensitivity and Resistance***Mark Hahn, Boston University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=301&ONum=1>

Mechanisms of Toxic Chemical Interaction in the Liver: Interactive Hepatotoxicity

Ruth Billings, Colorado State University

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=305&ONum=2>

Metal-Metal Interactions in the Kidney

A. Jay Gandolfi, University of Arizona

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=205&ONum=14>

Pathogenesis of Toxicity of Vanadium Compounds

John Godleski, Harvard School of Public Health

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=157&ONum=5>

3j. Biomarkers

The majority of diseases are the consequence of both environmental exposures and genetic factors. To understand the relationship between exposure and adverse health effects, scientists are working to identify biomarkers - key molecular or cellular events that link a specific environmental exposure to a health outcome. The identification, validation and use of biomarkers in environmental medicine and biology will depend fundamentally on an increased understanding of the mechanism of action and the role of molecular and biochemical functions in disease processes. For environmentally-induced diseases, molecular biomarkers will play a key role in understanding the relationships between exposure to toxic environmental chemicals, the development of chronic human diseases and identifying those individuals at increased risk for disease. Although much progress has been made to identify potential biomarkers, the challenge still remains to validate, in a robust manner, the accuracy, reproducibility, specificity, and sensitivity of biomarkers, and to assess the feasibility and cost-effectiveness of applying biomarkers in large population-based studies. Such validated biomarkers will be invaluable in the prevention, early detection and early treatment of disease.

There are three broad categories of molecular biomarkers that are commonly used in the field of environmental health:

- Biomarkers of exposure – quantify body burden of chemicals or metabolites and are usually applied early in the exposure-disease paradigm. These markers are powerful tools for epidemiologists, allowing relatively accurate measurement of external and/or internal dose of an environmental agent. However, the applicability of biomarkers of exposure is often limited by their relatively short-half life, providing information on exposure over a period of days to months compared to the natural history of the disease that spans years or decades. There are noteworthy exceptions to the transient nature of exposure biomarkers, such as pesticide residues in body fat and blood that can persist over months and years. Nevertheless, the timing of sample acquisition for measurement of environmental exposures and the study of interactions with genetic susceptibilities is a critical factor in study design.
- Biomarkers of effect – detect functional change in the biological system under study, and allow investigators to predict the outcome of exposure. DNA damage (e.g. adducts, chromosomal aberrations, loss of heterozygosity at specific chromosome loci) is frequently used as biomarkers of effect, although there is often no clear delineation from biomarkers of exposure. For example, DNA adducts can be interpreted as biomarkers both of exposure and biological effect.
- Biomarkers of susceptibility – indicates the inter-individual variation in mechanistic processes on the continuum between exposure and effect. An individual's susceptibility to environmentally-mediated disease may arise from genetic causes or from non-genetic factors such as age, gender, disease state, or dietary intake. Genetic polymorphisms may function as biomarkers of susceptibility; but it is important to keep in mind that it is actually the phenotype that is of importance for the final response to the hazardous insult.

The SBRP has made a large investment in biomarker research over the years and, in fact, this Program has supported some of the leaders in the field. Early research supported by the Program focused on the identification of potential biomarkers. These studies involved animal models and human samples. Promising biomarkers have been further validated in limited human studies. As the Program has matured, we are beginning to realize the payoff for these earlier investments. We are seeing a shift in the SBRP portfolio from biomarker development to the application of these biomarkers in molecular epidemiology studies, and in some cases, biomarkers that have been developed with SBRP support are moving to clinical application. Biomarker development, validation and application clearly require a long-term commitment to realize the benefits of our investment. We intend to continue strong support in this area of research.

SBRP-FUNDED RESEARCH ON BIOMARKERS INCLUDES:**Biomolecular Research***Activation of PCBs to Genotoxins in vivo***Larry Robertson, University of Kentucky**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=495&ONum=345>*Detection of Cr-DNA Adducts in Human***Max Costa, New York University School of Medicine**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=457&ONum=337>*Development and Application of Biomarkers of Exposure***Stephen Rappaport, University of North Carolina – Chapel Hill**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=503&ONum=346>

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=264&ONum=21>*Development and Applications of Integrated Cell-Based Bioassays***Michael Denison, University of California – Davis**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=411&ONum=342>*DNA Adducts as Biomarkers of Exposure and Effect***James Swenberg, University of North Carolina – Chapel Hill**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=502&ONum=346>

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=262&ONum=21>*Effects Related Biomarkers of Toxic Exposures***Terrance Kavanagh, University of Washington**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=509&ONum=347>*Glutathione Biosynthesis as a Biomarker of Toxic Exposures***Terrance Kavanagh, University of Washington**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=273&ONum=22>*Heme Pathway Polymorphisms in Mercury-Induced Porphyrinuria and Toxicity***James Woods, University of Washington**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=510&ONum=347>

*Molecular Analysis of Toxicant-Mediated Teratogenesis***Ornella Selmin, University of Arizona**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=479&ONum=340>*Molecular Mechanisms of Complex Mixture Toxicity***Alavaro Puga, University of Cincinnati**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=609&ONum=361>*Paraoxonase (PON-1): A Biomarker of Susceptibility to Environmentally-Induced Diseases***Lucio Costa, University of Washington**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=511&ONum=347>*Toxic Metal Interactions with Cellular Proteins***Dean Wilcox, Dartmouth College**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=430&ONum=333>*Biomarkers of Exposure to Pulmonary Toxicants***Alan Buckpitt, University of California – Davis**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=233&ONum=16>*Biomarkers of Human Susceptibility to Vinyl Chloride***David Kaufman and Howard Liber, University of North Carolina – Chapel Hill**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=263&ONum=21>*DNA Biomarkers in Ecological Impact Assessments***Donald Malins, University of Washington**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=278&ONum=22>*Fingerprinting of Cytochrome P-450 Profiles as Biomonitors of Chemical Exposure and Risk in Humans***Curtis Omiecinski, University of Washington**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=274&ONum=22>*Genetic Susceptibility to Environmental Lead Intoxication***Karl Kelsey, Harvard School of Public Health**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=153&ONum=5>

Immunochemical Methods to Monitor Toxic Substances and/or Indicators of their Presence in Humans and other Species

Bruce Hammock, University of California – Davis

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=232&ONum=16>

Modulated Gap Junctional Intercellular Communication as a Biomarker for Epigenetic Toxicants after Remediation

James Trosko, Michigan State University

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=191&ONum=7>

Molecular Basis for Effects of Carcinogenic Metals on Inducible Gene Expression

Joshua Hamilton, Dartmouth College

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=149&ONum=4>

Molecular Genetic Bioreporting of Environmental Pollutants

Barry Beaty, Colorado State University

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=306&ONum=2>

Protein and DNA Adducts Following Low-Dose Exposure by Accelerator Mass Spectrometry

Kenneth Turteltaub, University of California – Berkeley

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=337&ONum=15>

Proteins and DNA - New Methods of Adduct Detection

Steven Tannenbaum, Massachusetts Institute of Technology

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=174&ONum=6>

The Ah Receptor as a Regulator of Hydrocarbon Bioactivity

David Sherr, Boston University

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?projautonum=299&onum=1>

Epidemiology Studies

A Cohort Study of Health Effects of Arsenic Exposure in Bangladesh

Habibul Ahsan, Columbia University

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=421&ONum=332>

*Arsenic and Health in Taiwan and Bangladesh***David Christiani, Harvard School of Public Health**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=440&ONum=335>*Vanadium and Human Health***David Christiani, Harvard School of Public Health**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=156&ONum=5>*Assessing Adverse Effects of Environmental Hazards on Reproductive Health in Human Populations***Bill L. Lasley, University of California – Davis**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=412&ONum=342>*Biomarkers of Carcinogenesis***Martyn Smith, University of California – Berkeley**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=487&ONum=341>*Biomarkers of Genetic Damage in Human Cells***Martyn Smith, University of California – Berkeley**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=339&ONum=15>*Determinants for Chromosomally Defective Human Sperm***Andrew Wyrobek, University of California – Berkeley**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=490&ONum=341>*Environmental As, Pregnancy, and Children's Health***Joseph H. Graziano, Columbia University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=422&ONum=332>*Epidemiology of Arsenic***Margaret Karagas, Dartmouth College**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=429&ONum=333>*Epidemiology of Arsenic and Other Toxic Metals***Margaret Karagas, Dartmouth College**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=151&ONum=4>*Exposure Levels of Persistent Pollutants in Urban Anglers***Anne Golden, Mount Sinai School of Medicine**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=598&ONum=362>

*Epidemiology Studies***Ellen Gold, University of California – Davis**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=415&ONum=342>*In utero Exposure to Polychlorinated Biphenyls, Pesticides and Metals in Relation to Cognitive Function in Childhood***Susan Korrick, Harvard School of Public Health**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=439&ONum=335>*Analysis of Causes of Mortality in the Aberjona and Mystic Valley Populations: Comparison to Massachusetts and United States Experience***William Thilly, Massachusetts Institute of Technology**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=172&ONum=6>*Arsenic Biomarker Epidemiology***Allan Smith, University of California – Berkeley**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=341&ONum=15>*Biomarkers of Cancer Susceptibility in Human Populations***John Wiencke, University of California – Berkeley**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=338&ONum=15>*Genetic Biomarkers in Human Sperm: Application in Reproductive Epidemiology***Brenda Eskenazi, University of California – Berkeley**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=342&ONum=15>*Neurobehavioral Performance Indices as Biomarkers of Styrene Exposure***Diana Echeverria, University of Washington**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=281&ONum=22>*Perchloroethylene (PCE) in Drinking Water and Cancer Risk***Ann Aschengrau, Boston University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?projautonum=285&onum=1>*Porphyryn Profiles as Biological Indicators of Trace Metal Exposure and Toxicity***James Woods, University of Washington**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=143&ONum=22>

Studies of Human Health Impacts*Biomarkers of Neurotoxicant Exposure and Neurodegeneration***Mohammed Sabri, Oregon Health and Science University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=464&ONum=338>*Developmental Neurotoxicity of Chlorpyrifos: Mechanism and Consequences***Theodore Slotkin, Duke University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=433&ONum=334>*Hazardous Chemicals and Brain Developmental Plasticity***Christopher Wallace, Oregon Health and Science University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=466&ONum=338>*Placental-Uterine and Prostate Effects of Organochlorines***Kathleen Shiverick, University of Florida**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=402&ONum=344>*Placental-Uterine Effects of Chlorinated Hydrocarbons***Kathleen Shiverick, University of Florida**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=251&ONum=18>**Ecology Studies***Aquatic Biomarkers in Site Characterization and Remediation***David Hinton, University of California – Davis**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=408&ONum=342>

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=231&ONum=16>*Assessment of Biological Responses to Organic and Metal Contaminants in New Bedford: Methods for Monitoring***Timothy Ford, Harvard School of Public Health**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=444&ONum=335>*Assessment of Contaminant Concentrations and Ecologic Implications***Timothy Ford, Harvard School of Public Health**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=159&ONum=5>

Environmental Stress Indicators for Fish at Superfund Sites: GC-MS and FT-IR Markers of Contaminant-Induced Damage to Gill Tissue

Donald Malins, University of Washington

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=515&ONum=347>

Markers for Chemical Mixtures in Fundulus Heteroclitus

Richard Di Giulio, Duke University

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=436&ONum=334>

Wildlife Biomarker Applications to Remediation Decision Making

Michael Hooper, University of Washington

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=514&ONum=347>

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=277&ONum=22>

Development of Novel Bioassay/Biomarker Systems for Detection of Estrogen Agonists in Complex Mixtures

John Giesy, Michigan State University

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=190&ONum=7>

Endocrine-Disrupting Effects of Chlorinated Hydrocarbons on Wildlife

Timothy Gross, University of Florida

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=250&ONum=18>

Mechanisms of Chemical Sensitivity and Resistance

Mark Hahn, Boston University

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=301&ONum=1>

Sentinel Species: Xenobiotics, Toxicity, and Reproduction

Ian Callard, Boston University

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=302&ONum=1>

Analytical Studies

Analytical Chemistry

Bruce Hammock, University of California – Davis

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=416&ONum=342>

*Biostatistics and Data Management***Tor Tosteson, Dartmouth College**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=591&ONum=333>*Development and Implementation of Immunoassays for Human and Environmental Monitoring***Bruce Hammock, University of California – Davis**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=409&ONum=342>*Image Analysis and Bioassays***Robert Burghardt, Texas A&M University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=549&ONum=339>*Molecular Biology Core***Joshua Hamilton, Dartmouth College**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=589&ONum=333>*Statistics and Computing Core***Robert Spear, University of California – Berkeley**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=560&ONum=341>*Analytical Chemistry Core***A. Daniel Jones, University of California – Davis**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=237&ONum=16>*Biomarkers for Assessing the Effects of Reproductive Toxins***Bill Lasley, University of California – Davis**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=235&ONum=16>*Toxicologic Interaction Studies in Chemical Mixtures Using Physiologically Based Pharmacokinetics/ Pharmacodynamics (PB-PK/PPD) Coupled with Statistical/Mathematical Modeling***Raymond Yang, Colorado State University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=296&ONum=2>

3k. Risk and Exposure Assessment

Risk assessment is a structured methodology that is used to evaluate the possible effects of Superfund sites on human health and ecosystem health. The USEPA uses this process both to view the extent of a problem at a Superfund site and to inform decision-makers from the pre-remedial through the post-remedial phases of a Superfund site cleanup. An integral component of risk assessment is exposure assessment, which is the process of measuring or estimating exposures to chemical contaminants. The general goal of risk/exposure assessment research is to improve and validate the measurements, modeling, instrumentation and study designs that are used to analyze the health risks and exposure pathways from Superfund sites. Some key areas of research include epidemiological studies that evaluate the relationship between exposure and disease in a population; the development of new risk assessment tools; use of models and biomarkers to measure exposure and effect; and studies elucidating the environmental pathways in which environmental contaminants are transported from the release site to possible points of contact with humans. The advances made in these studies can assist remedial project managers and other decision-makers in protecting the environment and meeting the public health needs of the communities affected by Superfund sites.

SBRP-FUNDED RESEARCH ON RISK AND EXPOSURE ASSESSMENT INCLUDES:**Epidemiology***A Cohort Study of Health Effects of Arsenic Exposure in Bangladesh***Habibul Ahsan, Columbia University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=421&ONum=332>*Arsenic Biomarker Epidemiology***Allan Smith, University of California – Berkeley**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=489&ONum=341>

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=341&ONum=15>*Chemical Exposures and Leukemia Risk***Patricia Buffler, University of California – Berkeley**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=488&ONum=341>*Molecular Epidemiology of Childhood Leukemia***Patricia Buffler, University of California – Berkeley**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=340&ONum=15>*Detecting and Analyzing Patterns in Spatial Data***David Ozonoff, Boston University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=378&ONum=331>*New Methods of Spatial Analysis***David Ozonoff, Boston University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/Getproj.cfm?ProjAutoNum=295&ONum=1>*Environmental As, Pregnancy, and Children's Health***Joseph Graziano, Columbia University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=422&ONum=332>

*Epidemiology of Arsenic***Margaret R. Karagas, Dartmouth College**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/proj.cfm?ONum=333>*Epidemiology of Arsenic and other Toxic Metals***Margaret R. Karagas, Dartmouth College**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/Getproj.cfm?ProjAutoNum=151&ONum=4>*In utero Exposure to Polychlorinated Biphenyls, Pesticides and Metals in Relation to Cognitive Function in Childhood***Susan Korrick, Harvard School of Public Health**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=439&ONum=335>*PCE-Contaminated Water and Disorders of Reproduction and Development***Ann Aschengrau, Boston University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=377&ONum=331>*Perchloroethylene (PCE) in Drinking Water and Cancer Risk***Ann Aschengrau, Boston University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=285&ONum=1>*Arsenic Exposure and Skin and Bladder Cancers***David Hunter, Harvard School of Public Health**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=160&ONum=5>*Analysis of Causes of Mortality in the Aberjona and Mystic Valley Populations: Comparison to Massachusetts and United States Experience***William Thilly, Massachusetts Institute of Technology**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=172&ONum=6>*Epidemiology***Irva Hertz-Picciotto, University of North Carolina – Chapel Hill**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/Getproj.cfm?ProjAutoNum=270&ONum=21&core>*Epidemiology/Biostatistics Core***Maria Schymura, University of Albany – SUNY**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=334&ONum=13>

*Genetic Susceptibility to Environmental Lead Intoxication***Karl Kelsey, Harvard School of Public Health**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/Getproj.cfm?ProjAutoNum=153&ONum=5>*Lead Exposure, Accumulation in Bone, and Cognitive Toxicity among Elderly Men and Women***Howard Hu, Harvard School of Public Health**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=155&ONum=5>*Lead Exposure, Accumulation in Bone, and Reproductive Toxicity among Men and Women in Mexico***Howard Hu, Harvard School of Public Health**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=154&ONum=5>*Lead Mobilization During Pregnancy and Lactation in Urban Women***Jacqueline Moline, Mount Sinai School of Medicine**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=214&ONum=8>*Neuropsychologic Dysfunction, Lead Mobilization and Menopause***Gertrud S Berkowitz, Mount Sinai School of Medicine**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/program/Getproj.cfm?ProjAutoNum=353&ONum=8>*Serum PCB as a Risk Indicator for Breast Cancer in Women***Philippe Grandjean, Boston University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=297&ONum=1>*Vanadium and Human Health***David Christiani, Harvard School of Public Health**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/Getproj.cfm?ProjAutoNum=156&ONum=5>**Risk Assessment/Exposure Assessment***Assessment of Biological Responses to Organic and Metal Contaminants in New Bedford: Methods for Monitoring***Timothy Ford, Harvard School of Public Health**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=444&ONum=335>*Assessment of Contaminant Concentrations and Ecologic Implications***Timothy Ford, Harvard School of Public Health**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=159&ONum=5>

*Assessment of Human VOC Exposure Near Superfund Sites***Karla Thrall, Oregon Health and Science University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=463&ONum=338>*Endocrine Disruptors: Mechanistic Studies***Steven Safe, Texas A&M University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=470&ONum=339>*Exposure Assessment***Mary Wolff, Mount Sinai School of Medicine**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=602&ONum=362&core>
1995 – 2000<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=221&ONum=8>*Exposure Assessment, Modeling and Applied Studies on Remediation of Complex Mixtures***Robin Autenrieth, Texas A&M University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=475&ONum=339>*Exposure Levels of Persistent Pollutants in Urban Anglers***Anne Golden, Mount Sinai School of Medicine**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=598&ONum=362>*Fate, Transport, and Exposure Risk of Superfund Chemicals***Dharni Vasudevan, Duke University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=437&ONum=334>*Historical Exposure Assessment***Jim Hunt, University of California – Berkeley**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=492&ONum=341>*Human Dosimetry for Assessment of Exposure to Volatile Compounds***Michael Morgan, University of Washington**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=513&ONum=347>*Improving Ecological Risk Assessment: Development and Application of Methods to Determine the Bioavailability of Contaminants in Aquatic Sediments - New Bedford SF Site***James Shine, Harvard School of Public Health**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=443&ONum=335>

*Quantification and Assessment of Dermal Exposure to Benzene and Naphthalene Using a Noninvasive Sampling of Skin***Leena Nylander-French, University of North Carolina – Chapel Hill**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=508&ONum=346>*Chemical Transport, Transformation and Human Exposure on the Aberjona***Harold Hemond, Massachusetts Institute of Technology**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=165&ONum=6>*Sources and Pathways of Persistent Chlorinated Hydrocarbon Exposure in New York City***Richard Bopp, Mount Sinai School of Medicine**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=216&ONum=8>*Sources and Pathways of Urban Heavy Metal Exposure Using Elemental and Isotopic Composition of Environmental Samples***James Simpson, Mount Sinai School of Medicine**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=213&ONum=8>**Modeling***A Holistochastic Approach to Human Exposure Assessment***George Christakos, University of North Carolina – Chapel Hill**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=507&ONum=346>*Stochastic Analysis of Flow and Transport Phenomena***George Christakos, University of North Carolina – Chapel Hill**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=268&ONum=21>*Assessment of Human VOC Exposure Near Superfund Sites***Karla Thrall, Oregon Health and Science University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=463&ONum=338>*Bioavailability and Remediation of Complex DNAPLs***Mark Brusseau, University of Arizona**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=482&ONum=340>*Bioavailability, Soil Heterogeneity, and In-Situ Biodegradation of Organic Contaminants***Mark Brusseau, University of Arizona**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=197&ONum=14>

*Enhanced Remediation of Heterogeneous Subsurface***Cass T. Miller, University of North Carolina – Chapel Hill**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=506&ONum=346>*An Investigation of Multiphase Mass Transfer Phenomena***Cass T. Miller, University of North Carolina – Chapel Hill**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=267&ONum=21>*Exposure Assessment, Modeling and Applied Studies on Remediation of Complex Mixtures***Robin Autenrieth, Texas A&M University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=475&ONum=339>*Factors Controlling the Environmental Mobility, Microbial Transformation and Toxicity of Mixed Non-Aqueous Phase Liquids and Exposed Soils/Sediments***Walter Weber, Michigan State University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=450&ONum=336>*Fate, Transport, and Exposure Risk of Superfund Chemicals***Dharni Vasudevan, Duke University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=437&ONum=334>*Hazardous Chemicals and Brain Developmental Plasticity***Christopher Wallace, Oregon Health and Science University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=466&ONum=338>*Hydrogeology Core Laboratory***Martin Stute, Columbia University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=524&ONum=332>*Mathematical and Statistical Analysis and Modeling Core***Cass T. Miller, University of North Carolina – Chapel Hill**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=571&ONum=346>*Processes Influencing the Natural Attenuation of Organic Contaminant Plumes: Transport, Enzymatic Regulation and Microbial Transformation Rates in Flowing Groundwater Systems***Linda Abriola, Michigan State University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=451&ONum=336>

*Sources, Transport and Fate of Arsenic in Groundwater***Carl Renshaw and Joel Blum, Dartmouth College**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=431&ONum=333>*Transport, Transformation, and Remediation of Perchlorate and VOCs in the Vadose Zone and Groundwater***Dennis Rolston, University of California – Davis**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=407&ONum=342>*Water-Sediment Model and Criteria for Arsenic and Chrome***Dominic Di Toro, New York University School of Medicine**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=462&ONum=337>*Anaerobic and Aerobic Bioremediation of Chlorinated Organic Compounds: Processes and Enhanced In Situ Removal***John Ferguson, University of Washington**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=276&ONum=22>*Bacterial Transport in Saturated, Unsaturated, and Air- Sparged Porous Media***Bruce Logan, University of Arizona**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=199&ONum=14>*Biostatistics, Modeling and Computing Core***Robert Spear, University of California – Berkeley**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=345&ONum=15>*Characterizing Ground Water Contamination of a Heterogeneous Field Site: The Aberjona River Watershed***Charles Harvey, Massachusetts Institute of Technology**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=170&ONum=6>*Environmental Biotechnology: Kinetics of Microbial Degradation of Organic Pollutant Mixtures***Kenneth Reardon, Colorado State University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=308&ONum=2>*Fate of Semivolatile Organic Compounds Discharged to Surface Drainage Systems from Superfund Sites***Phillip Gschwend, Massachusetts Institute of Technology**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=166&ONum=6>

*Geologic and Geophysical Characterization***Herbert Einstein, Massachusetts Institute of Technology**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=168&ONum=6>*Microscale Evaluation of Pollutant Bioavailability Leading to Structured Models for Contaminant Fate in Porous Media***William Ghiorse, Cornell University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=147&ONum=3>*Model for Catalytic Reductive Dehalogenation***Robert Arnold, University of Arizona**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=200&ONum=14>*Spatial Information System/Statistics Core***John Nuckols and Thomas Keefe, Colorado State University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=312&ONum=2>*Toxicologic Interaction Studies in Chemical Mixtures Using Physiologically Based Pharmacokinetics/Pharmacodynamics (PB-PK/PD) Coupled with Statistical/Mathematical Modeling***Raymond Yang, Colorado State University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=296&ONum=2>*Transport and Biodegradation of VOCs in the Vadose Zone***Dennis Rolston, University of California – Davis**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=230&ONum=16>*Transport and Degradation of Toxic Agents in Biofilms***Paul Bishop, University of Cincinnati**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=246&ONum=17>*Transport of Hydrophobic Organic Contaminants in the Vadose Zone***Roger Bales, University of Arizona**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=202&ONum=14>*Transport of Trace Metals in a Polluted Aquifer***Martha Conklin, University of Arizona**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=203&ONum=14>

Site Characterizations

Persistent Organochlorines in the Hudson River Watershed

Richard Bopp, Mount Sinai School of Medicine

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=595&ONum=362>

Redistribution of Arsenic and Other Contaminants at Sites in NJ and Maine

James Simpson and Martin Stute, Columbia University

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/Getproj.cfm?ProjAutoNum=424&ONum=332>

Wildlife Applications to Remediation Decision-Making

Michael Hooper, University of Washington

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=514&ONum=347>

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/Getproj.cfm?ProjAutoNum=277&ONum=22>

A Combined Bioassay-Chemical Fractionation Scheme for the Determination of Toxic Chemicals in Sediments from the St. Lawrence River

Patrick O'Keefe, University of Albany – SUNY

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=329&ONum=13>

Aquatic Biomarkers in Site Characterization and Remediation

Dave Hinton, University of California – Davis

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=231&ONum=16>

Chemical Transport, Transformation and Human Exposure on the Aberjona

Harold Hemond, Massachusetts Institute of Technology

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=165&ONum=6>

Site Assessment, Cleanup, Analysis and Bioremediation

Kirby Donnelly, Texas A&M University

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/Getproj.cfm?ProjAutoNum=228&ONum=11>

3I. Susceptible Populations

An area of great concern is reducing the burden of environmentally induced disease in populations that may be more susceptible to the effects of exposures to contaminants, particularly those common to Superfund sites. These populations may be defined as having unique characteristics that make them more susceptible to the effects of pollutants. For example, there are particular concerns about the influence of genetic susceptibility, metabolic capacity, immune function or even gender differences. Two populations who have unique susceptibilities are women and children.

Women's unique vulnerabilities may be attributed, to a great extent, to the influence of their hormones and reproductive years on cellular processes. As a result, not only do they share many of the same diseases as men and children but women also have particular environmental diseases related to their gender. Diseases such as breast cancer, endometriosis, uterine fibroids, osteoporosis and autoimmune disorders are all women's health issues which may have environmental etiologies associated with them.

Furthermore, some diseases, involve women's role in reproduction and in the bearing and nursing of children. One contributing factor is that women tend to carry more fat. Substances that accumulate in fat (lead, PCBs, etc.) become bioavailable during times of high metabolic activity, such as pregnancy. As a result, when these chemicals are released into the woman's circulation, they may affect not only the woman's health, but may affect the developing fetus or nursing child.

In addition to the exposures that occur in utero, children continue to be vulnerable to exposures. Childhood is a time of rapid growth and development. According to the National Research Council, children's unique susceptibilities to environmental insults are based on the following factors:

- Children have greater exposures to environmental toxicants than adults: pound for pound they eat, drink and breathe more; they play closer to the ground and exhibit hand to mouth activity
- Children's metabolic pathways are immature and in many cases are less able to metabolize toxic chemicals
- Children are growing and developing very rapidly – during in utero, first months and early years of life their organ systems not well adapted to repair damage
- Children have more future years of life therefore they have more time to develop chronic diseases that may be triggered by early exposures

Throughout the history of the SBRP, we have been out front in supporting women's and children's health studies. In fact, through the outreach component of the SBRP, the Program contributed to the national awareness of the particular vulnerabilities of children. Ultimately, this awareness led to a national research agenda to protect the environmental health of children.

SBRP-FUNDED RESEARCH ON WOMEN'S HEALTH STUDIES INCLUDES:**Biomolecular Research**

Assessing Adverse Effects of Environmental Hazards on Reproductive Health in Human Populations

Bill Lasley, University of California – Davis

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=412&ONum=342>

Autoimmune Toxicity of Chlorinated Compounds

Joel Schiffenbauer, University of Florida

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=404&ONum=344>

Organochlorine Disruption of the Wnt Gene Pathway in the Female Reproductive Tract

David Sassoon, Mount Sinai School of Medicine

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=597&ONum=362>

Placental-Uterine and Prostate Effects of Organochlorines

Kathleen Shiverick, University of Florida

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=402&ONum=344>

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=251&ONum=18>

Serum PCB as a Risk Indicator for Breast Cancer in Women

Philippe Grandjean, Boston University

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=297&ONum=1>

Epidemiology Studies

Controlled Trial in Pregnancy of Dietary Supplements for the Suppression of Bone Resorption and Mobilization of Lead into Plasma

Howard Hu, Harvard School of Public Health

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=438&ONum=335>

Lead Exposure, Accumulation in Bone, and Cognitive Toxicity among Elderly Men and Women

Howard Hu, Harvard School of Public Health

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=155&ONum=5>

Environmental As, Pregnancy, and Children's Health

Joseph Graziano, Columbia University

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=422&ONum=332>

*Epidemiology Studies***Ellen Gold, University of California – Davis**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=415&ONum=342>*PCE-Contaminated Water and Disorders of Reproduction and Development***Ann Aschengrau, Boston University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=377&ONum=331>*Perchloroethylene (PCE) in Drinking Water and Cancer Risk***Ann Aschengrau, Boston University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=285&ONum=1>*Biomarkers for Assessing the Effects of Reproductive Toxins***Bill Lasley, University of California – Davis**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=235&ONum=16>*Lead Mobilization During Pregnancy and Lactation in Urban Women***Jacqueline Moline, Mount Sinai School of Medicine**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=214&ONum=8>*Neuropsychologic Dysfunction, Lead Mobilization and Menopause***Gertrud Berkowitz, Mount Sinai School of Medicine**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/program/Getproj.cfm?ProjAutoNum=353&ONum=8>**Studies of Human Health Impacts***PCB Effects on Uterine Muscle***Rita Loch Caruso, Michigan State University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=455&ONum=336>

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=188&ONum=7>*Biophysical Well-being among Akwesasne Residents***Azara Santiago-Rivera, University of Albany – SUNY**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=325&ONum=13>

Effects of Polychlorinated Biphenyls and Polychlorinated Biphenyl-Containing River Sediments on Carcinogen Metabolism in Normal Human Mammary Epithelial Cells

James Wetmur, Mount Sinai School of Medicine

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=218&ONum=8>

PCB Estrogenicity in Human Breast Cells

John Gierthy, University of Albany – SUNY

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=328&ONum=13>

SBRP-FUNDED RESEARCH ON CHILDREN'S HEALTH STUDIES INCLUDES:

Biomolecular Research

Biomarkers of Carcinogenesis

Martyn Smith, University of California – Berkeley

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=487&ONum=341>

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=339&ONum=15>

Developmental Neurotoxicity of Chlorpyrifos: Mechanism and Consequences

Theodore Slotkin, Duke University

2000 - 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=433&ONum=334>

Pharmacology of Trichloroethylene Metabolites

Peter Stacpoole, University of Florida

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=403&ONum=344>

Dichloroacetate Kinetics, Metabolism and Human Toxicology

Peter Stacpoole, University of Florida

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=252&ONum=18>

Genetic Susceptibility to Environmental Lead Intoxication

Karl Kelsey, Harvard School of Public Health

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=153&ONum=5>

Epidemiology Studies*Arsenic Biomarker Epidemiology***Allan Smith, University of California – Berkeley**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=489&ONum=341>*Controlled Trial in Pregnancy of Dietary Supplements for the Suppression of Bone Resorption and Mobilization of Lead into Plasma***Howard Hu, Harvard School of Public Health**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=438&ONum=335>*Chemical Exposures and Leukemia Risk***Patricia Buffler, University of California – Berkeley**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=488&ONum=341>*Molecular Epidemiology of Childhood Leukemia***Patricia Buffler, University of California – Berkeley**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=340&ONum=15>*Environmental As, Pregnancy, and Children's Health***Joseph Graziano, Columbia University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=422&ONum=332>*In utero Exposure to Polychlorinated Biphenyls, Pesticides and Metals in Relation to Cognitive Function in Childhood***Susan Korrick, Harvard School of Public Health**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=439&ONum=335>*In utero PCB and Metal Exposures and Infant Development***Susan Korrick, Harvard School of Public Health**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=158&ONum=5>*PCE-Contaminated Water and Disorders of Reproduction and Development***Ann Aschengrau, Boston University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/program2000/Getproj.cfm?ProjAutoNum=377&ONum=331>

Studies of Human Health Impacts*Hazardous Chemicals and Brain Developmental Plasticity***Christopher Wallace, Oregon Health and Science University**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=466&ONum=338>*Factors Modifying Behavioral Toxicity of Lead***Barbara Strupp, Cornell University**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=289&ONum=3>*Lead Exposure and Accumulation in Bone in Adolescents***P. Barry Ryan, Harvard School of Public Health**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=321&ONum=5>*Lead Mobilization During Pregnancy and Lactation in Urban Women***Jacqueline Moline, Mount Sinai School of Medicine**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=214&ONum=8>*PCBs and the Well-being of Mohawk Children and Youth, Growth, Development and Cognitive Behavioral Functioning***Lawrence Schell, University of Albany – SUNY**

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=324&ONum=13>**Outreach Programs***Outreach - Children's Environmental Health Network***Daniel Swartz, University of California – Berkeley**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=594&ONum=341>

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=346&ONum=15>*Outreach to Educate Children and Young Adults in Basic Scientific Concepts***Thomas Burbacher, University of Washington**

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=574&ONum=347>

3m. Relationship Between Ecological and Human Health Research

USEPA's Superfund statutory authority mandates that it protect both human and ecological health at hazardous waste sites. The protection of human health has received more attention by the public, the USEPA, and other federal and state site managers. However, recently increased emphasis has been placed on the development of technologies and data to better assess ecological health. Now, a risk assessment is prepared for each site that includes separate assessments of human health and the ecological impacts of a site.

The Program's broad mandates enable its investigators to conduct ecological research that is enhancing our ability to assess or predict the damage that hazardous substances cause to ecosystems. Multidisciplinary SBRP investigators are positioned to use the tools and approaches developed for human studies and apply them to ecological studies. In turn, not only are human studies used to advance ecological studies, but the converse is also applicable. Understanding changes at an ecological level can also be predictors of health effects in humans.

Significant areas of study that need to be addressed include:

- Conduct wildlife impact studies that more fully assess complex ecological conditions that can then be used to 1) develop remedial options that are protective and cost-effective; and 2) assess whether the remedial action was effective in reducing risk to ecological systems.
- Identify wildlife species that can be used as biomonitors of chemical exposure and potentially apply them to human health risk assessments.
- Conduct bioavailability studies in sentinel species, particularly at large complex sites, such as contaminated sediment sites
- Conduct food web studies to evaluate how toxic contaminants in water and sediments travel through the food chain, which can impact entire ecosystems and pose a potential human health threat.

SBRP-FUNDED RESEARCH ON RELATIONSHIPS BETWEEN ECOLOGICAL AND HUMAN HEALTH RESEARCH INCLUDES:

Mechanistic Studies

An Integrated, Multidisciplinary, Multispecies Approach to Understanding the Endpoints and Mechanisms of Action of Endocrine Disrupting Compounds

Brent Palmer, University of Kentucky

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=500&ONum=345>

Endocrine/Reproductive Disruption by Ground and Surface Waters

Ian Callard, Boston University

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=385&ONum=331>

Mechanisms of Resistance of Aquatic Vertebrate Populations to Mixtures of Aromatic Hydrocarbons and Metal Contaminants

Isaac Wirgin, New York University School of Medicine

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=460&ONum=337>

Organochlorine Pesticides and Development Mortality

Timothy Gross, University of Florida

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=401&ONum=344>

Endocrine-Disrupting Effects of Chlorinated Hydrocarbons on Wildlife

Timothy Gross, University of Florida

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=250&ONum=18>

Mechanisms of Chemical Sensitivity and Resistance

Mark Hahn, Boston University

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=301&ONum=1>

The Influence of Previous Exposures to a Mixture of Heavy Metals on Tolerance: A Mechanistic Evaluation at Different Levels of Biological Organization

William Clements, Colorado State University

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=307&ONum=2>

Site Characterization Studies

Assessment of Biological Responses to Organic and Metal Contaminants in New Bedford: Methods for Monitoring
Timothy Ford, Harvard School of Public Health

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=444&ONum=335>

Assessment of Contaminant Concentrations and Ecologic Implications

Timothy Ford, Harvard School of Public Health

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=159&ONum=5>

Environmental Stress Indicators for Fish at Superfund Sites: GC-MS and FT-IR Markers of Contaminant-Induced Damage to Gill Tissue

Donald Malins, University of Washington

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=515&ONum=347>

DNA Biomarkers in Ecological Impact Assessments

Donald Malins, University of Washington

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=278&ONum=22>

Wildlife Applications to Remediation Decision-Making

Michael Hooper, University of Washington

2000 – 2005

<http://www-apps.niehs.nih.gov/sbrp/Program2000/getproj.cfm?ProjAutoNum=514&ONum=347>

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=277&ONum=22>

Aquatic Biomarkers in Site Characterization and Remediation

Dave Hinton, University of California – Davis

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=231&ONum=16>

Studies of Indicator Species

Molecular Genetic Bioreporting of Environmental Pollutants

Barry Beaty, Colorado State University

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=306&ONum=2>

Sentinel Species: Xenobiotics, Toxicity, and Reproduction

Ian Callard, Boston University

1995 – 2000

<http://www-apps.niehs.nih.gov/sbrp/Program/getproj.cfm?ProjAutoNum=302&ONum=1>

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3n. SBRP-Funded Outreach Projects

The SBRP supports a wide range of research to address the broad public health concerns arising from the release of hazardous substances into the environment. In addition to supporting basic scientific research, the SBRP funds a variety of outreach projects which are designed to facilitate the translation of the Program's results to the communities and organizations most concerned with hazardous substances, with the ultimate goal of improving public health.

To address the public health need to link members of the professional community with environmental health and environmental technology research, SBRP-funded outreach projects involve collaborative partnerships between environmental researchers and other parties actively involved with hazardous waste issues including government agencies, community groups, journalists, and industry. Examples of SBRP outreach activities include developing printed and audio visual education materials; training health care providers in the recognition of environmental exposures; and providing training in risk assessment or risk communication methodologies for local communities.

A compilation of information about the personnel and activities at each of the SBRP outreach cores is provided on the following pages.

Columbia University

Outreach Core Focus:

The Columbia University Outreach Activities are part of the Columbia SBRP Administrative Core. The focus is to make available to researchers, decision-makers, and the public new knowledge generated from the interdisciplinary suite of projects related to the bioavailability of soil lead in humans and the bioavailability, health effects, and geochemistry of arsenic.

Outreach Core Director: Meredith Golden, FTE – 37%

Additional Outreach Core Personnel:

- | | | |
|----|---|--|
| 1. | Personnel
Outreach Role
Email Address | Hans Bosch, Sr., FTE – 5%
System Administrator
bosch@ciesin.columbia.edu |
| 2. | Personnel
Outreach Role
Email Address | Annie Gerard, FTE – 18%
Web Designer
agerard@ciesin.columbia.edu |

Specific Outreach Activities:

- | | | |
|----|--|--|
| 1. | Description

Audience

Mechanism/Product | Increase interactions and discussions among scientists, policy-makers, and other stakeholders with diverse perspectives on issues related to arsenic in drinking water around the country and world

Educators, students, research scientists, government staff and officials, international agencies, private companies, public non-profit organizations, and community groups

<i>Arsenic in Drinking Water: An International Conference</i> – a two day meeting (Nov '01) with presentations, posters, and discussions (see http://superfund.ciesin.columbia.edu/reg_frameset.html?agenda.html&2) |
| 2. | Description

Audience

Mechanism/Product | Provide an opportunity for program scientists to present and discuss updates on ongoing research with a broad audience

Other project scientists with diverse disciplinary backgrounds, students, government staff, and the public

Monthly Columbia SBRP Seminar Series (see Calendar of Events for details – http://superfund.ciesin.columbia.edu/frameset3.html?NIEHS_calendar_srch2.html&2) |

3.	Description	Highlight issues related to GIS applications in environmental health by inviting experts from academia, local government, and commercial companies to share their insights
	Audience	Public, educators, students, government staff and officials
	Mechanism/Product	Columbia SBRP “GIS Luncheon Talks”: 1) <i>FGDC MetaData: What is it Good For?</i> – Presented by Greg Yetman, GIS Specialist at CIESIN; 2) <i>Using Technology to Combat the West Nile Virus in Rockland County</i> – Presented by Elqyemedo Oscar Alleyne, MPH, Rockland County Department of Health; 3) <i>Overview of GIS Applications in Public Health</i> – Presented by Peggy Harper, ESRI Health and Human Services Group (August 28-30,'02)
<hr/>		
4.	Description	Host the ESRI authorized “Intro to ArcView GIS” class with a series on the basics of using ArcView GIS software and encourage the development of GIS applications for actual project data
	Audience	Columbia SBRP project scientists/graduate students and other university researchers from the health, social, and natural sciences
	Mechanism/Product	Columbia SBRP Training Core “GIS in Environmental Health Workshop” (8/27/01-8/31/02)
<hr/>		
5.	Description	Provide a week-long, intensive course of studies for an interdisciplinary group from academia and government covering aspects of risk assessment
	Audience	Columbia SBRP researchers, other Columbia faculty, staff, and students, and government staff
	Mechanism/Product	Columbia SBRP Training Core “Risk Assessment Workshop” (8/19/02-8/24/02)

Outreach Web Pages:

1. <http://superfund.ciesin.columbia.edu>
2. http://superfund.ciesin.columbia.edu/frameset3.html?NIEHS_calendar_srch.html&2
3. <http://superfund.ciesin.columbia.edu/frameset2.html>
4. http://superfund.ciesin.columbia.edu/niehs1_lmenu2.html
5. http://superfund.ciesin.columbia.edu/frameset3.html?pubs_srch.html&2
6. <http://superfund.ciesin.columbia.edu/frameset2.html>

Dartmouth College

OUTREACH HAS BEEN A PART OF THE PROGRAM FOR 2 YEARS.

Outreach Core Focus:

Our focus is translating our science and sharing our expertise on toxic metals with the regional community. We facilitate communication through public symposia, classroom visits, web sites, by writing nontechnical articles for the news media and other lay outlets and by working with journalists. We also engage in discussions on metals and their environmental health effects with policymakers, including legislators, and we collaborate on projects that foster environmental science education.

Outreach Core Directors: Carol Folt, FTE – 5%
 Nancy Serrell, FTE – 60%

Additional Outreach Core Personnel:

1. Personnel: Lou-Anne Conroy, FTE – 20%
 Outreach Role: Science Educator/Collaborator
 Email Address: Lou-Anne.C.Conroy@Dartmouth.edu
2. Personnel: Greg DeFrancis, FTE – 10%
 Outreach Role: Science Educator/Collaborator
 Email Address: Greg.DeFrancis@Montshire.org
3. Personnel: David Goudy, FTE – 10%
 Outreach Role: Co-PI/Collaborator
 Email Address: David.Goudy@Montshire.org
4. Personnel: Laura Turner, FTE – 60%
 Outreach Role: Webmaster
 Email Address: Laura.Turner@Dartmouth.edu

Specific Outreach Activities:

1. Description: Collaborating with teachers and science museum educators to develop effective methods for teaching middle school environmental science
 Audience: Teachers
 Mechanism/Product: Curriculum modules, summer workshop and lab camp and classroom participation of Dartmouth scientists
2. Description: Formation of a regional arsenic consortium to facilitate communication and collaboration on a state-wide environmental health risk
 Audience: Resource managers, policy-makers, scientists, public health workers
 Mechanism/Product: Brochure; bi-monthly meetings; interdisciplinary scientific conference on arsenic

3.	Description	Creating a comprehensive information source on metal toxicology
	Audience	General public, journalists, teachers
	Mechanism/Product	Interactive website
4.	Description	Creating a mechanism for document sharing related to a new Superfund site
	Audience	The Elizabeth Mine Community Advisory Group, the local middle school
	Mechanism/Product	A stakeholder designed website for community members; a school site for sharing students research on the mine
5.	Description	Sharing research, fostering interaction on drinking water arsenic
	Audience	Scientists, students, resource managers, policy-makers, health professionals
	Mechanism/Product	Interdisciplinary 2½ day scientific conference on arsenic

Outreach Web Pages:

1. <http://www.dartmouth.edu/~toxmetal/>
2. <http://www.dartmouth.edu/%7Ecehs/ElizabethMine/indexEM.html>
3. <http://www.dartmouth.edu/%7Ecehs/CAGsite/index.html>
4. <http://www.dartmouth.edu/~cehs/ArsenicConference/IndexAS.html>
5. <http://www.dartmouth.edu/%7Etoxmetal/OUED.htm>
6. <http://www.dartmouth.edu/%7Etoxmetal/OUNH.htm>
7. <http://www.dartmouth.edu/%7Etoxmetal/OUTM.htm>
8. <http://www.dartmouth.edu/%7Etoxmetal/OU.htm>
9. <http://www.loe.org/archives/010323.htm>

Significant Publications:

1.	Publication Title	<i>NH Arsenic Consortium</i>
	Publication Type	Brochure on arsenic consortium
	Audience	General public, policy-makers, resource managers, public health workers
2.	Publication Title	<i>Arsenic in New England</i>
	Publication Type	Poster
	Audience	Students, research community, general public
3.	Publication Title	<i>Water Under Fire</i>
	Publication Type	Valley News and Dartmouth Alumni Magazine/Magazine op-ed article
	Audience	General NH/VT news audience, Dartmouth alumni
4.	Publication Title	<i>Toxic Metals in our Lakes</i>
	Publication Type	Newsletter article (NH Lakes Association)
	Audience	Ecologists, resource managers, researchers

Duke University

OUTREACH HAS BEEN A PART OF THE PROGRAM FOR 1 YEAR.

Outreach Core Focus:

The Outreach Core is using GIS spatial analysis of Superfund and TRI sites and chemical toxic equivalency data to categorize exposure hotspots in 4 North Carolina counties. Upon completion, the maps plus summaries of relevant toxicologic information will be made available to state and country health departments as well as community based organizations. This information will allow public health professionals to better serve their clients while simultaneously empowering communities.

Outreach Core Director: Marie Lynn Miranda, FTE – 5%

Additional Outreach Core Personnel:

- | | |
|---------------|-----------------------------|
| 1. Personnel | Chrissy Bradshaw, FTE – 75% |
| Outreach Role | Superfund Project |
| Email Address | cnb@duke.edu |

Harvard School of Public Health

OUTREACH HAS BEEN A PART OF THE PROGRAM FOR 7 YEARS.

Outreach Core Focus:

The keystone of our outreach program is The Visiting Scholars Program in Environmental Health. Through this program we invite academicians, and personnel from corporations, nonprofits, and state and federal government agencies to participate. There are presently 15 environmental health scholars. Scholars have initiated new degree programs, worked with the World Bank on health care waste, created environmental health curricula for undergraduate and graduate nursing programs, established their college as a certified lead abatement training center, published a public health bibliography, joined community-based Superfund site committees.

We also work collaboratively with the Dartmouth, and BU Superfund programs to provide three seminars per year in conjunction with the US EPA Region I office. At the high school level, we provide a Lead Mapping Program that teaches students how to use GIS to plot environmental data, in this case lead concentrations in their drinking water. Our Superfund trace metals laboratory provides the analysis for lead in drinking water, and Dr. Howard Hu provides some of the education about the risks of lead exposure.

Outreach Core Director: Ann Backus, FTE – 55%

Additional Outreach Core Personnel:

1. Personnel: Richard Monson, FTE – 5%
 Outreach Role: Advisory
 Email Address: monsoon@hohp.harvard.edu
2. Personnel: Rachel Pescatore, FTE – 85%
 Outreach Role: Program Assistant
 Email Address: rjpescat@hohp.harvard.edu

Specific Outreach Activities:

1. Description: Provide knowledge about environmental hazards, health effects, and prevention/remediation measures in order to reduce hazardous waste in the environment
 Audience: Adults from academia, corporations, non-profit organizations, state and federal government agencies
 Mechanism/Product: Visiting Scholars Program involving monthly conferences and projects implemented by the scholars and supported by the Superfund faculty
2. Description: Provide experience with the process of science in the context of analysis of lead in drinking water while utilizing a new tool of science (GIS Mapping)
 Audience: High school teachers and students
 Mechanism/Product: Lead Mapping Program for high school students

3. Description	Report on current research findings that may be useful for EPA risk assessors and project managers
Audience	U.S. EPA Region I risk assessors and project managers, personnel from departments of health and environmental protection in the New England area
Mechanism/Product	EPA seminar series At U.S. EPA Region I offices

Outreach Web Page:

1. www.hsph.harvard.edu/superfund

Significant Publications:

1. Publication Title	<i>Visiting Scholars Annual Report</i>
Publication Type	Annual Report
Audience	Visiting scholars, funders, potential visiting scholars
2. Publication Title	<i>Lead Mapping (GIS) Program for High Schools</i>
Publication Type	Curriculum Outline
Audience	High school teachers
3. Publication Title	<i>Love Canal Slide Show</i>
Publication Type	PowerPoint Presentation
Audience	Public audiences and students

Other Sources of Support:

1. Program Title	Visiting Scholars Program in Occupational Health
Sponsor	NIOSH Education and Research Center Program
Product/Goal	Initiate and implement occupational safety and health programs throughout the New England area
2. Program Title	Environmental Health Education Program K-12
Sponsor	NIEHS Centers Program and private foundations
Product/Goal	Classroom-based curriculum enrichment in environmental health
3. Program Title	Got Air?
Sponsor	NIEHS Centers Program
Product/Goal	Education for community health nurses, social workers, on asthma using peak flow meters
4. Program Title	Photographic exhibits
Sponsor	NIEHS Centers Program, NIOSH, Alicia Patterson Foundation
Product/Goal	Raise awareness about occupational and environmental health through professional photographs of workplaces and the environment

Michigan State University

OUTREACH HAS BEEN A PART OF THE PROGRAM FOR 8 YEARS.

Outreach Core Focus:

EnviroTools.org focuses on publishing educational materials like fact sheets and presentations which are aimed at empowering community assistance leaders, outreach assistance providers and citizen leaders in educating the citizens who have contaminated sites in their neighborhoods.

Outreach Core Directors: Susan Masten, FTE – 34%
Thomas Voice, FTE – 33%

Additional Outreach Core Personnel:

1. Personnel Saradhi Balla, FTE – 33%
Outreach Role Co-PI
Email Address ballasar@egr.msu.edu

Specific Outreach Activities:

1. Description	Publishing educational materials like fact sheets and presentations and providing other resources like glossary and other web links
Audience	Community assistance leaders, outreach assistance providers and citizen leaders
Mechanism/Product	www.envirotools.org

Outreach Web Page:

1. <http://www.envirotools.org>

Mount Sinai School of Medicine

OUTREACH HAS BEEN A PART OF THE PROGRAM FOR I YEAR.

Outreach Core Focus:

The Community Outreach Core of the Mount Sinai SBRP is focused on educating the public about human health hazards associated with PCB contamination of the Hudson River.

Outreach Core Director: Luz Claudio, FTE – 5%

Additional Outreach Core Personnel:

- | | |
|---------------|-------------------------------|
| 1. Personnel | Nwazota, Kristina, FTE – 100% |
| Outreach Role | Outreach Coordinator |
| Email Address | kristina.nwazota@mssm.edu |

Specific Outreach Activities:

- | | |
|-------------------|---|
| 1. Description | Increase awareness among urban fishermen and fisherwomen of health hazards associated with eating fish caught in the Hudson River and other local waterways |
| Audience | Urban anglers |
| Mechanism/Product | Direct outreach materials and on-site presence at fishing locations |
| 2. Description | Increase public awareness about the Hudson River as an educational resource |
| Audience | Students, teachers, urban community members |
| Mechanism/Product | Web-based information, direct outreach materials, presence at community events |
| 3. Description | Educate students and teachers about environmental health issues |
| Audience | Teachers and middle and high school students |
| Mechanism/Product | Environmental Health Training Lab and in-class presentations |
| 4. Description | Recruit study participants |
| Audience | Local fishermen and fisherwomen |
| Mechanism/Product | Outreach fliers, partnerships with community liaisons, on-site information distribution at fishing sites |

Outreach Web Page:

1. http://www.mssm.edu/cpm/program_outreach.shtml

Significant Publications:

-
- | | |
|----------------------|--|
| 1. Publication Title | <i>The Hudson: A River Runs Through an Environmental Controversy</i> |
| Publication Type | Journal Article: Environmental Health Perspectives |
| Audience | Environmental health community |
-
- | | |
|----------------------|--|
| 2. Publication Title | <i>Chemical Contaminants in the Hudson River</i> |
| Publication Type | Brochure |
| Audience | General public and urban anglers |

Texas A & M University

OUTREACH HAS BEEN A PART OF THE PROGRAM FOR 3 YEARS.

Outreach Core Focus:

There are two arenas of activities: one is with 7-12 math and science teachers coupled to the Fort Worth Science and History Museum and the other is with education programs in underserved communities.

Outreach Core Director: Robin Autenrieth, FTE – 15%

Additional Outreach Core Personnel:

- | | |
|---------------|---------------------------|
| 1. Personnel | Kirby Donnelly, FTE – 15% |
| Outreach Role | Schools |
| Email Address | kcdonnelly@tamu.edu |

Specific Outreach Activities:

- | | |
|-------------------|---|
| 1. Description | Facilitate the education of children regarding the application of math and science to solve environmental problems, particularly those related to hazardous waste sites |
| Audience | Teachers and children (7-12) |
| Mechanism/Product | Museum display to tour the U.S.; classroom presentations |

Outreach Web Page:

1. http://baen.tamu.edu/users/haan/ITS2002/ITS_Environmental_Science_Main.htm

Other Sources of Support:

- | | |
|------------------|-------------------------------|
| 1. Program Title | Information Technology Center |
| Sponsor | National Science Foundation |
| Product/Goal | 7-12 Math/science educators |

University of Arizona

OUTREACH HAS BEEN A PART OF THE PROGRAM FOR 10 YEARS.

Outreach Core Focus:

- » US-Mexico Environmental Border Health
- » Training Mexican Graduate Students
- » Educating Local Interest Groups
- » Interacting with State Environmental Agencies

Outreach Core Directors: Dean Carter, FTE – 5%
James Field, FTE – 10%

Additional Outreach Core Personnel:

1. Personnel Jay Gandolfi, FTE – 5%
Outreach Role Investigator
Email Address gandolfi@pharmacy.arizona.edu
2. Personnel Maier Raina, FTE – 30%
Outreach Role Investigator
Email Address rmaier@ag.arizona.edu

Specific Outreach Activities:

1. Description Training U.S. and Mexican graduate students to tackle environmental border health problems
Audience Graduate students
Mechanism/Product M.S. and Ph.D. trained scientists

Outreach Web Page:

1. <http://superfund.pharmacy.arizona.edu/outreach.html>

Significant Publications:

1. Publication Title *Toxicologia Ambiental*
Publication Type Spanish textbook on environmental toxicology
Audience Spanish speaking countries and U.S. hispanic groups

University of California-Berkeley

OUTREACH HAS BEEN A PART OF THE PROGRAM FOR 8 YEARS.

Outreach Core Focus:

The Children's Environmental Health Network promotes the development, dissemination, and use of research on children's unique vulnerabilities to environmental health hazards. We bring the findings of the Berkeley SBRP and related programs to the attention of diverse researchers, clinicians, policy-makers, and community leaders, with an emphasis on outreach to communities of color and lower income communities. We have conducted outreach to approximately 200 California and 100 national organizations.

Outreach Core Director(s): Renee Robin, FTE – 12%

Additional Outreach Core Personnel:

- | | |
|---------------|---|
| 1. Personnel | LaToya Harrington, FTE – 5% |
| Outreach Role | Administration |
| Email Address | latoya@cehn.org |
| 2. Personnel | Rebecca Love, FTE – 5% |
| Outreach Role | Web Administration |
| Email Address | cehn@cehn.org |
| 3. Personnel | Nse Obot, FTE – 10% |
| Outreach Role | Outreach to African American, Hispanic community groups |
| Email Address | nobot@cehn.org |
| 4. Personnel | Renee Robin, FTE – 10% |
| Outreach Role | California Program Director |
| Email Address | rlrobin@cehn.org |

Specific Outreach Activities:

- | | |
|-------------------|--|
| 1. Description | Highlight children's vulnerabilities to environmental health hazards and Internet sources of information on them |
| Audience | Health care professionals (doctors, nurses, and public health officials) |
| Mechanism/Product | Seminar with web experience |
| 2. Description | Develop research agenda for children's environmental health concerns in California |
| Audience | Researchers in many fields, policy-makers |
| Mechanism/Product | Individual and group meetings |
| 3. Description | Highlight the state of the science on children's environmental health research on leukemia and other health outcomes |
| Audience | General public |
| Mechanism/Product | Articles in popular media, radio PSAs, and a web page |

4.	Description	Development of web resources targeting concerns of African-American communities
	Audience	Parents and community leaders
	Mechanism/Product	Partnership with BET.com
5.	Description	Maintain 2 listserves (for science and community leaders) on children's environmental health concerns
	Audience	1) researchers and clinicians 2) community leaders and policy-makers
	Mechanism/Product	Listserves
6.	Description	Increase "environmental health literacy" of faith community leaders and the populations they serve
	Audience	Faith community leaders and congregations
	Mechanism/Product	Seminars and conferences; web-based resources

Outreach Web Page:

1. <http://www.cehn.org>

Significant Publications:

1.	Publication Title	<i>Resource Guide on Children's Environmental Health</i>
	Publication Type	Organizational directory and overview articles
	Audience	Community leaders
2.	Publication Title	<i>Pediatric Clinics of North America: Children's Environmental Health, vol. 48</i>
	Publication Type	Anthology
	Audience	Clinicians

Other Sources of Support:

1.	Program Title	Outreach to environmental justice communities
	Sponsor	Various foundations
	Product/Goal	Database of experts and resources
2.	Program Title	Outreach coordination for NIEHS pediatric centers
	Sponsor	NIEHS
	Product/Goal	Newsletters and web materials
3.	Program Title	Briefings on state of the science for policy-makers
	Sponsor	Various foundations
	Product/Goal	Seminars and papers

University of California-San Diego

OUTREACH HAS BEEN A PART OF THE PROGRAM FOR 3 YEARS.

Outreach Core Focus:

Connect research on Superfund toxics to the needs of community-based partners engaged in education and cross-border (U.S.-Mexico) regional development. Key initiatives include environmental science curriculum development, student research internships, teacher training, and the creation of a Web-based Geographic Information System (GIS) useful for linking Superfund-related science to water quality and public health issues in the larger San Diego-Tijuana bi-national border region.

Outreach Core Directors: Keith Pezzoli, FTE – 25%
Hyam Leffert, FTE – 15%

Additional Outreach Core Personnel:

- | | |
|---------------|--------------------------------------|
| 1. Personnel | Richard Marciano, FTE – 5% |
| Outreach Role | Information Integration |
| Email Address | marciano@SDSC.EDU |
| | |
| 2. Personnel | Ilya Zaslavsky, FTE – 20% |
| Outreach Role | Geographic Information Systems (GIS) |
| Email Address | zaslavsk@SDSC.EDU |

Specific Outreach Activities:

- | | |
|-------------------|---|
| 1. Description | Create integrated views of toxics and water quality data on a cross-border (U.S.-Mexico) regional scale |
| Audience | Researchers, planners, policy-makers and decision-makers, general public |
| Mechanism/Product | GIS and interactive web-based mapping of toxics and water quality |
| | |
| 2. Description | Provide mentoring and training to students in experimental research design and methods |
| Audience | Disadvantaged high school students |
| Mechanism/Product | Student Basic Research Internships in SBRP labs; science fair and merit awards |
| | |
| 3. Description | Develop environmental science curriculum |
| Audience | Teachers |
| Mechanism/Product | Teacher training in series of workshop meetings |

4. Description	Link science and technology to policy and planning for sustainable development
Audience	Researchers, planners, policy-makers and decision-makers, general public
Mechanism/Product	Regional Workbench Consortium, a web-based portal and site with planning and decision support tools

Outreach Web Pages:

1. <http://superfund.sdsc.edu/outreach/index.html>
2. <http://regionalworkbench.org>

Significant Publications:

1. Publication Title	<i>Promoting Sustainability Science Through Education and Regional Ecology</i> http://superfund.ucsd.edu/news/outreach_brochure.pdf
Publication Type	Brochure
Audience	Researchers, planners, policy-makers, general public
2. Publication Title	<i>Promoting Sustainability Science Through Education and Regional Ecology</i> http://superfund.ucsd.edu/news/outreach_news_dec01.pdf
Publication Type	Report
Audience	Researchers, planners, policy-makers, general public
3. Publication Title	<i>Transborder City-Regions and the Quest for Integrated Regional Planning</i> http://www.regionalworkbench.org/sequence/prof/15004_final.htm
Publication Type	Conference paper
Audience	Researchers, community organizers, planners

Additional Comments:

UCSD's SBRP Regional Workbench Consortium (RWBC) is a collaborative network of university and community-based partners dedicated to enabling sustainable city-region development. We focus on the Southern California-Northern Baja California transborder region – especially the San Diego-Tijuana city-region and coastal zone. The RWBC is building a trusted Internet-based research portal and toolkit (i.e., workbench) to facilitate problem-driven projects that require region-wide data integration and information sharing. Currently we are placing a major emphasis on GIS, Quality of Life Indicators and on-line interactive mapping.

University of Cincinnati

OUTREACH HAS BEEN A PART OF THE PROGRAM FOR 12 YEARS.

Outreach Core Focus:

- » To disseminate information and facilitate interaction with regional environmental professionals by the maintenance and expansion of the UC SBRP homepage, and by the use of an advisory board of regional professionals
- » To teach educators through a collaboration with the HealthRICH program
- » To provide interactive communication with health consumers by development of an environmental health website to communicate information with local and regional health professionals and the community.

Outreach Core Director: Amanda Stroupe, FTE – 50%

Specific Outreach Activities:

1. Description	Work with educators to provide environmental health sciences based training programs and create supporting materials
Audience	Educators
Mechanism/Product	HealthRICH grant
2. Description	Communicate environmental health information & SBRP research
Audience	Local & regional environmental health officials
Mechanism/Product	Website
3. Description	Collaboration of SBRP Research between the University of Cincinnati and Central State University
Audience	Krisnakumar Nedumuri's laboratory at Central State University
Mechanism/Product	Collaboration on SBRP research

Outreach Web Pages:

1. <http://www.med.uc.edu/sbrp/sbrp.html>
2. http://www.eh.uc.edu/allweb/outreach/outreach_programs.htm

Additional Comments:

The HealthRICH grant is listed on the Outreach activity page, but is not listed in the Other Support section. The funding for this has been approved but receipt of monies is still pending.

University of Florida

OUTREACH HAS BEEN A PART OF THE PROGRAM FOR 8 YEARS.

Outreach Core Focus:

To integrate human and environmental toxicology into classrooms and communities, teachers from schools near Superfund sites learn from UF SBRP scientists and students in an intensive one-week laboratory workshop. The teachers prepare action plans to translate research approaches and findings for their school/community, and report the outcomes of the action plans, via poster and oral presentations, at a statewide science symposium.

Outreach Core Directors: Stephen Roberts, FTE – 10%
Mary Jo Koroly, FTE – 10%

Additional Outreach Core Personnel:

1. Personnel: Julie Bokor, FTE – 20%
Outreach Role: Science Coordinator
Email Address: julie@cpet.ufl.edu
2. Personnel: Charles Lawrence, FTE – 10%
Outreach Role: Media Specialist
Email Address: lawrence@cpet.ufl.edu

Specific Outreach Activities:

1. Description: Human and ecological risk assessment – several interactive lectures
Audience: Teachers
Mechanism/Product: Career information, background for classroom activities
2. Description: Ecotoxicology project: hands on activities working with mussels, fish, alligators and alligator eggs
Audience: Teachers
Mechanism/Product: Field experiments using mussels and lecture/slides of polluted sites and effects on animal “biosensors”
3. Description: Biotechnology laboratory using vitellogenin as a biomarker for minnows treated with birth control pills and known concentrations of estrogen
Audience: Teachers
Mechanism/Product: Hands-on protein labs, understanding and use of bioassays, dose-response curves and their importance, regulatory aspects

4.	Description	Exploration of aquifer in Florida
	Audience	Teachers
	Mechanism/Product	Major impact on classrooms for field trips, chemical and bioassays of local bodies of water, understanding of flow of pollutants from communities into waterways, and mechanisms for clean-up
5.	Description	Laboratory rotations with different Superfund researchers
	Audience	Teachers
	Mechanism/Product	Career exploration plus hands-on experience in analytical toxicology, histology and pathology, and in reproductive biology (cell culture)
6.	Description	Environmental Engineering and its role in landfills
	Audience	Teachers
	Mechanism/Product	Use of analytical tools in the field to test for bioavailability, etc.; information on waste management and landfill leachate, with ideas about class and Internet activities
7.	Description	Environmental Sciences curriculum development, implementation and evaluation
	Audience	Teachers
	Mechanism/Product	Development and implementation of action plans, and presentation of class/ community outcomes to scientists, teachers and students from throughout Florida

Outreach Web Page:

1. <http://www.cpet.ufl.edu/ehp>

Significant Publications:

1.	Publication Title	<i>Environmental Health Partnership at University of Florida: UF SBRP Outreach Program</i>
	Publication Type	Brochure
	Audience	Teachers
2.	Publication Title	<i>Environmental Health Partnership: Linking Teachers and Superfund Researchers for Outreach to Schools and Communities</i>
	Publication Type	Meeting Abstract
	Audience	NIEHS Superfund Basic Research Program Annual Symposium
3.	Publication Title	<i>Environmental Health Partnership: A Model Program for Integrating Human and Environmental Toxicology into Classrooms and Communities</i>
	Publication Type	Presentation Abstract
	Audience	NIEHS Superfund Basic Research Program Annual Symposium

4.	Publication Title	<i>Environmental Health Partnership at University of Florida</i>
	Publication Type	Presentation Abstract
	Audience	Florida Association of Science Teachers annual meeting
<hr/>		
5.	Publication Title	<i>Laboratory Experiments and Demonstrations in Environmental Pollution, Bioassay and Bioremediation</i>
	Publication Type	Compendium of new, modified and Internet laboratory activities for secondary school classrooms
	Audience	Teachers and classrooms
<hr/>		
6.	Publication Title	<i>The Schema of the Superfund Program; The Floridan Aquifer; Ground Water Tutorial</i>
	Publication Type	Compendium of Internet, literature and new program resources
	Audience	Teachers and classrooms

Other Sources of Support:

1.	Program Title	University of Florida Center for Precollegiate Education and Training
	Sponsor	University of Florida
	Product/Goal	Outreach to teachers and secondary school students

University of Kentucky

OUTREACH HAS BEEN A PART OF THE PROGRAM FOR 3 YEARS.

Outreach Core Focus:

The mission of the Superfund Outreach Program for Kentucky is to build partnerships with public and private sectors and to disseminate pertinent information regarding chemical concerns at individual sites, especially as it relates to nutritional implications. Community action groups, healthcare professionals, children and their teachers are receiving educational programs and exhibits to help them make informed choices about environmental issues.

Outreach Core Director: Sandra Bastin, FTE - 10%

Specific Outreach Activities:

1. Description	Increase the awareness of school children of how their everyday actions affect the environment
Audience	School children and teachers
Mechanism/Product	Interactive exhibits entitled Recycle City (modeled after EPA's web model); Garbage Mania (timeline puzzle); and The Evolution of Trash (lifesize models with poetry about the evolution of trash and how it's changed)
2. Description	Increase public understanding of human health concerns related to waste sites
Audience	Community members
Mechanism/Product	Public forums and educational programming especially as it relates to nutrition
3. Description	Increase public awareness of how hazardous chemicals get into the water
Audience	Community members
Mechanism/Product	16-page newspaper insert mailed to Superfund site affected counties; follow up with flyers and postcards with a request for more information
4. Description	Increase communication between researchers regarding research conducted on PCBs and related compounds
Audience	Researchers, scientists and educators
Mechanism/Product	Held international conference and published a book entitled <i>PCBs: Recent Environmental Toxicology and Health Effects</i>

Significant Publications:

1. Publication Title	<i>Eating to Live...Not Living to Eat</i>
Publication Type	Presentation Abstract
Audience	Dietitians and other healthcare professionals

2.	Publication Title Publication Type Audience	<i>Newspaper Tabloids as an Effective Way to Educate and Communicate Water Science</i> Poster Presentation Multidisciplinary Water Resources Management and Researchers
<hr/>		
3.	Publication Title Publication Type Audience	<i>Outreach as an Integral Part of Basic Research</i> Poster Abstract Dietitians and other healthcare professionals
<hr/>		
4.	Publication Title Publication Type Audience	<i>Outreach as an Integral Part of Basic Research</i> Poster Presentation Extension and other nutrition educators

University of North Carolina-Chapel Hill

OUTREACH HAS BEEN A PART OF THE PROGRAM FOR 3 YEARS.

Outreach Core Focus:

The purpose of this Outreach Core is to increase public awareness of the research conducted at the UNC-CH Superfund Basic Research Program (SBRP) and, more generally, to improve awareness of public health issues arising from the release of hazardous substances into the environment.

Outreach Core Directors: Kathleen Gray, FTE - 10%
 Frances Lynn, FTE - 10%

Additional Outreach Core Personnel:

- | | | |
|----|---------------|------------------------------|
| 1. | Personnel | Michele Kloda, FTE – 10% |
| | Outreach Role | Environmental Educator |
| | Email Address | mkloda@email.unc.edu |
| 2. | Personnel | Melanie Miller, FTE – 20% |
| | Outreach Role | Communications Specialist |
| | Email Address | melaniem@email.unc.edu |
| 3. | Personnel | Alyssa Wittenborn, FTE – 40% |
| | Outreach Role | Research Associate |
| | Email Address | awitten@email.unc.edu |

Specific Outreach Activities:

- | | | |
|----|-------------------|---|
| 1. | Description | Conduct workshops for North Carolina teachers on issues related to UNC-CH SBRP research. |
| | Audience | Middle school teachers |
| | Mechanism/Product | Interactive curriculum |
| 2. | Description | Provide technical assistance and education to communities facing problems with hazardous wastes |
| | Audience | North Carolina community and environmental organizations |
| | Mechanism/Product | Research, fact sheets |
| 3. | Description | Disseminate the results of SBRP research to the professional community |
| | Audience | Other SBRP grantees and researchers |
| | Mechanism/Product | Newsletter, articles |

4. Description	Increase public awareness of SBRP research and outreach
Audience	General public
Mechanism/Product	Newsletter, website, brochure

Outreach Web Pages:

1. <http://www.sph.unc.edu/sfcoep/>
2. <http://www.sph.unc.edu/erp/sbrp.htm>

Significant Publications:

1. Publication Title	<i>A Guide to Assisting Citizens with Technical Issues at Superfund Sites</i>
Publication Type	Report
Audience	NC community and environmental organizations, general public
2. Publication Title	<i>Superfund Scoop</i>
Publication Type	Newsletter
Audience	General public
3. Publication Title	<i>CASE News</i>
Publication Type	Newsletter
Audience	Professional community

Other Sources of Support:

1. Program Title	CEHS COEP
Sponsor	NIEHS
Product/Goal	Educational materials, undergraduate internships

University of Washington

OUTREACH HAS BEEN A PART OF THE PROGRAM FOR 3 YEARS.

Outreach Core Focus:

The mission of the UW SBRP Outreach Core is to increase the public understanding of the many scientific, technical, social and political issues that surround human health concerns related to hazardous waste sites, and to increase community awareness of program research. Such knowledge is important because it increases the likelihood of “evidence based” decision-making by all stakeholders.

Outreach Core Director: Thomas Burbacher, FTE – 10%

Additional Outreach Core Personnel:

- | | | |
|----|---------------|----------------------------|
| 1. | Personnel | Chetana Acharya, FTE – 25% |
| | Outreach Role | Program Manager |
| | Email Address | cacharya@u.washington.edu |
| 2. | Personnel | Jon Sharpe, FTE – 25% |
| | Outreach Role | Curriculum Manager |
| | Email Address | jsharp@u.washington.edu |

Specific Outreach Activities:

- | | | |
|----|-------------------|--|
| 1. | Description | Increase public awareness of health disparity issues |
| | Audience | Community members |
| | Mechanism/Product | Participation in the Health Justice Network, a coalition working to raise awareness of health disparity issues |
| 2. | Description | Assess environmental health needs of refugee and immigrant communities |
| | Audience | Refugee and immigrant communities in King County |
| | Mechanism/Product | Partner with grassroots social service agencies to reach community members |
| 3. | Description | Raise awareness of environmental health issues in youth |
| | Audience | K-12 students |
| | Mechanism/Product | Utilize technology (such as videoconferences, web-based modules and on-line chats) and in-class presenters to reach students |
| 4. | Description | Increase public understanding of environmental health concerns at contaminated sites |
| | Audience | Residents near the Everett Smelter and the Lower Duwamish Waterway |
| | Mechanism/Product | Reach community members with educational presentataions and language appropriate publications |

Outreach Web Pages:

1. New site in development
2. <http://depts.washington.edu/sfund/research.html#outsum>

Significant Publications:

- | | | |
|----|-------------------|------------------------------|
| 1. | Publication Title | <i>EH Voices</i> |
| | Publication Type | Newsletter |
| | Audience | Teachers, community partners |
| 2. | Publication Title | <i>Outreach Update</i> |
| | Publication Type | E-bulletin |
| | Audience | Researchers |

Other Sources of Support:

- | | | |
|----|---------------|---|
| 1. | Program Title | EHS COEP |
| | Sponsor | NIEHS |
| | Product/Goal | Educational materials (K-12 and community), partnerships |
| 2. | Program Title | EHS as an Intergrating Context |
| | Sponsor | NIEHS |
| | Product/Goal | Middle School educational materials |
| 3. | Program Title | Health & Safety for Working Teens |
| | Sponsor | WA State Labor and Industries |
| | Product/Goal | High School educational materials |
| 4. | Program Title | PEHSU |
| | Sponsor | ATSDR/AOEC |
| | Product/Goal | K-12 & community outreach on children's environmental health issues |

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30. World Trade Center Supplemental Grants

As part of the federal response to the September 11th terrorist attacks, the NIEHS received supplemental funding to support research, education and training activities related to the World Trade Center (WTC). HHS Secretary Tommy G. Thompson made the announcement of these grants in May of 2002. The grants totaled \$10.5 million and were created to address immediate and long-term worker and community health concerns. In concert with the NIEHS Environmental Health Science (EHS) Centers and SBRP, NIEHS made awards to university researchers in support of an integrated research approach that provides a framework to address current and future health and environmental matters arising from the WTC attacks.

In April 2002, the NIEHS awarded \$4.5 million in grants to support research focused on exposure assessment, epidemiology studies, and community outreach and education. Although the awards were made on a competitive basis, the competition was limited to current NIEHS SBRP and EHS Center grantees demonstrating previous or current institutional World Trade Center (WTC) response activities. In addition to the \$4.5 million in research awards, \$6 million in grants were awarded to support NIEHS' Worker Education Training Program grantees.

As a result of the internal competition for research funds, awards were made to four EHS Centers and two SBRP grantees. The funds provided to NIEHS were in response to an important public health need. The grantees receiving WTC funds understand that the research they are conducting is for the benefit of society, rather than to benefit their own research programs. As such, there has been a great spirit of coordination and collaboration among the investigators. Since the awards were made in April 2002, the WTC investigators have had three meetings to develop coordinated research plans.

The benefits of this coordination are being realized in the collaborative activities that have been ongoing since May 2002 as summarized below.

- Development of a Public WTC Exposure Database – Investigators from Johns Hopkins and Columbia have taken the lead in creating a public database that includes pre- and post September 11 ambient air data collected by the USEPA, exposure data collected from other federal sources and the exposure data collected by NIEHS supported WTC investigators. A significant effort in the creation of this database is the inclusion of USEPA pre- and post September 11 ambient air data and has involved a close collaboration with scientists at EPA. This project will be the first user-friendly relational database constructed that is a comprehensive compilation of collected exposure data that will be available to the general public.

- Development of a WTC Brochure - Outreach coordinators from New York University and University of Medicine and Dentistry in New Jersey have partnered to develop a WTC brochure that provides useful information to the general public impacted by the events of September 11. This brochure summarizes the ongoing work at the six NIEHS supported WTC programs and results obtained to date.
- Community Forums - All of the WTC programs have been involved in town meetings in the New York city and surrounding areas. These forums have served as a venue for NIEHS-funded researchers to address the public about the potential environmental risks, as well as to inform them of future plans outlined for WTC research. These forums also provide the researchers a pulse on the community's concerns. Held periodically, these forums let the public know in a timely manner what results have been obtained, what studies are being conducted, in addition to giving the public a voice by encouraging them to ask questions and express their concerns
- Joint Publications – Since the beginning, investigators have been collaborating and publishing their research findings in joint articles. However, there has not been to date, a joint publication that brings together in one article the major advances in exposure assessment and health outcomes from the WTC program as a whole. Investigators from all six programs are currently collaborating to develop a state-of-the science paper related to WTC accomplishments in these areas. The goal is to publish this article in a prestigious journal such as the New England Journal of Medicine.

We have included material of the NIEHS WTC activities for your information. As this is considered to be an NIEHS Program, we did not consider it to be part of your assessment. However, it does demonstrate the ability of our researchers to quickly mobilize in the face of a national crisis to address public health concerns.

Brief descriptions highlighting the overall research being conducted by our WTC programs are provided in Attachment A.

30. Attachment A WTC Research

Columbia University

- Developing of a relational database for WTC-related air monitoring data compiled from NIEHS-supported research.
- Conducting an epidemiological study to evaluate acute/cumulative air pollutant exposures on pregnancy outcomes and relationships to fetal/child development in 300 women (150 exposed, 150 unexposed) and their children.
- Analyzing air and dust samples collected between October and January.
- Analyzing soils and sediments in NY harbor and urban park lakes to reconstruct chemical and elemental depositional fluxes following 9/11.
- Conducting community outreach with the West Harlem Environmental Action to make the air monitoring database accessible to the public and develop a “short course” to enable people to understand and interpret the data.

Johns Hopkins University

- Developing a registry of WTC site clean up workers. 3000 to 4000 workers will be identified and included in this registry.
- Conducting a respiratory symptoms and psychological health assessment of WTC workers. This study will include questionnaires and pulmonary function testing.
- Conducting a personal exposure assessment of WTC workers to airborne contaminants and its comparison to air monitoring data.
- Conducting outreach to worker populations will include focus groups to identify concerns, newsletters and risk communication panels.

(3) Mount Sinai School of Medicine

Mount Sinai represents an inter-institutional partnership with Columbia University, Lamont-Doherty Earth Observatory.

- Conducting a clinical and epidemiology study of 200 WTC ironworkers to investigate respiratory abnormalities and Post-Traumatic Stress and compare findings.
- Conducting an epidemiological study of 300 pregnant women and children to assess pregnancy outcomes and relationships to fetal/child development.
- Analyzing exposure assessment employing NASA's Airborne Visible Infrared Imaging Spectrometer (AVRIS) for remote sensing imagery for WTC plumes
- Conducting community outreach that is being coordinated with the existing Pediatric Environmental Health Specialty Unit at Mount Sinai.

New York University

NYU represents an inter-institutional partnership with Columbia University, Lamont-Doherty Earth Observatory and the University of Rochester.

- Conducting a WTC-NYC firefighters clinical study of 300 subjects to assess cardio-pulmonary effects. This study is in collaboration with CDC/NIOSH/Bureau of Health Services of FDNY and NYU.
- Conducting a WTC resident respiratory impact study to examine prevalence for respiratory symptoms, especially new onset of asthma-like symptoms. A screening questionnaire will be sent to 6000 residents and it is proposed that spirometry will be performed on 500 residents with more complex physiologic testing performed on 30 residents.
- Analyzing collected indoor and outdoor settled dust samples and air samples for elemental and chemical composition will be performed on a subset of the 1250 samples collected to date.
- Conducting toxicity analysis of dust samples in whole animals and in vitro models.
- Conducting community outreach to include public forums, newsletters, video development and web pages.

University of Medicine and Dentistry of New Jersey (UMDNJ)

- Developing a qualitative risk assessment that will assess the dynamics between perceived community concerns and documentation of actual risks
- Conducting an exposure assessment of indoor air quality. Nineteen indoor samples will be analyzed for organic constituents and fibers and subset of NYU's ambient air samples will be analyzed for organics.
- Developing and testing computational models and databases to assess the impact of contaminant release from the WTC fire and collapse on air quality of affected local microenvironments.
- Conducting a reproductive outcome study that will utilize existing databases of all births recorded in New Jersey and the five boroughs of NYC and six closest counties to NYC to assess gender ratio, premature birth and birth defects following September 11.
- Conducting a longitudinal cohort resident study of approximately 490 residents to assess post-traumatic stress, depression and panic following WTC and integrate this information with exposure data. The NIMH is supporting the psychological symptoms analysis.
- Conducting community outreach focused on increasing awareness of the potential environmental health effects resulting from the WTC tragedy.

University of North Carolina – Chapel Hill

- Conducting an exposure assessment to measure PAH levels in filter samples gathered by EPA at ground zero during the weeks following the WTC collapse
- Conducting a pilot study to validate a newly developed personal passive air particulate monitoring device
- Developing a spatio-temporal mapping model for levels of particulate matter at the WTC and surrounding sites