NIEHS

2012-2017
STRATEGIC PLAN

Advancing Science, Improving Health:
A Plan for Environmental Health Research

NIH...Turning Discovery Into Health

Advancing Science, Improving Health:
A Plan for Environmental Health Research

National Institute of Environmental Health Sciences
STRATEGIC PLAN
2012-2017

U.S. Department of Health and Human Services

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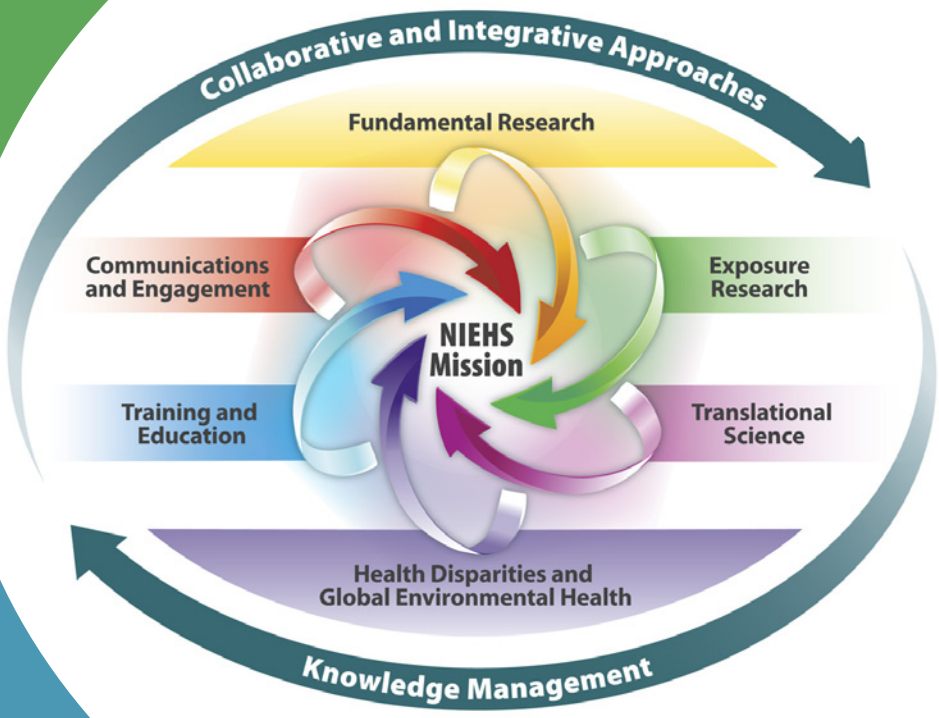
National Institute of Environmental Health Sciences
STRATEGIC PLAN

Mission

The mission of the National Institute of Environmental Health Sciences is to discover how the environment affects people in order to promote healthier lives.

Strategic Themes for Environmental Health Sciences



Vision

The vision of the National Institute of Environmental Health Sciences is to provide global leadership for innovative research that improves public health by preventing disease and disability.

Director's Message

I am pleased to introduce the new 2012-2017 Strategic Plan for the National Institute of Environmental Health Sciences (NIEHS). NIEHS research provides the critical scientific foundation for essential public health and disease prevention activities. The more we know about environmental exposures and how they affect health outcomes, the greater our ability to create healthy environments and improve our health by reducing or preventing hazardous exposures. NIEHS research informs policy decisions related to disease prevention at all levels: individual, community, national, and global. At all these levels, NIEHS supplies leadership to those interested and working in environmental health sciences.

The Institute undertook a transparent and inclusive process to develop this strategic plan. We at NIEHS were very energized and excited as the process unfolded. So many visionary ideas, such productive dialogue — so many passionate and engaged people from throughout the global environmental health sciences community worked with us to get to this point! We are deeply grateful for everyone's hard work and for the passion they brought to the overall task of considering the best way forward for the field of environmental health sciences.

These ideas are reflected in our new **mission** and **vision**. A good mission statement should say clearly what our purpose is. The new formulation of our mission remains true to our statutory purpose and puts our science right up front in the word discover. Additionally, and most importantly, it ties our research — understanding environmental effects on people's health — to an ultimate goal of promoting healthier lives. Our updated vision statement, which defines where are going over the next 5-10 years, emphasizes the pivotal role that NIEHS can play in providing leadership to catalyze worldwide efforts focused on environmental health sciences.

In this document, we present a set of descriptive **strategic themes**, as well as a collection of more specific **strategic goals**. NIEHS, with the help of our stakeholders, has identified these themes and goals as priority areas for the field. The themes are a more general description of the areas, within the field of environmental health sciences, that NIEHS recognizes as important domains for targeted efforts that support the NIEHS mission and vision. As illustrated in the diagram on the previous page, all six of the core themes together with the two crosscutting themes are highly integrated and overlapping, reflecting the interdisciplinary nature of environmental health sciences. The themes give context to the goals, which are the more tightly focused areas identified as priorities by NIEHS, on which we expect to see progress over the next 5 years. As implementation of the strategic plan goes forward, the themes will define the playing field and the goals will be the actual areas of focus and resource allocation. Some of these priority goals represent current strengths of NIEHS — for others, the Institute has identified new directions for the field that will answer novel questions and require state-of-the-art capabilities.

As we move toward implementation, it is important to emphasize that all the areas identified under the themes and goals were not intended to be addressed by NIEHS alone. Our expectation is that they will be considered a framework for the field of environmental health sciences, whose needs and goals are greater than the resources that can be provided solely by the Institute. NIEHS will pursue partnerships and coordinated strategies to achieve these goals. The Institute will prioritize its own resources towards achieving these goals, and will actively work to provide the global leadership defined by our new vision statement to establish the alliances and coordination that will be required to make progress towards these goals. We want their pursuit and achievement to be a partnership enterprise throughout the world.

NIEHS and the environmental health sciences community have made great strides in identifying and understanding the role of environment in health and disease. NIEHS investments have had a significant, measurable public health impact. This Strategic Plan is an attempt to build on these efforts, provide fresh perspective, and bring new understanding to problems in environmental health through application of innovative knowledge and problem-solving. We hope that the themes and goals will provide the framework for setting expectations for what can be accomplished and how we will get there. We are all eagerly anticipating progress on these goals and we hope you share our enthusiasm for the exciting opportunities that await us.

Linda Birnbaum

Theme 1: Fundamental Research

Understanding the biology that defines basic mechanisms of response to environmental stressors and the implications for human health

Fundamental research investigates the basic biological processes of how our bodies function, and of the pathways and systems that are susceptible to the effects of environmental stressors. This research addresses all levels of biological organization — molecular, biochemical pathway, cellular, tissue, organ, model organism, human, and population — and builds on the knowledge from new tools and techniques that allow us to ask more in-depth questions about the effects of our environment on biological systems.

These new research questions arise from our expanding knowledge of the genome, epigenome, and regulation of gene expression, and appreciation of direct effects of stressors on cells that do not involve genomic targets. They call for systems and computational approaches, and recognition of the importance of changes in sensitivity to environmental stressors at different life stages, e.g., prenatal, pregnancy, old age. Environmental agents can have direct toxicities and can also influence biological processes that affect susceptibility to other agents. The study of biological systems in response to specific environmental agents represents an area of overlap with Theme 2. The research under this theme and Theme 2 can be thought of as the fundamental knowledge base of prevention science for environmental health, because understanding the mechanisms of disease will help us reduce the incidence of disease and mortality in susceptible populations. Through this research, we hope to create a foundation that will enable us to better understand the links between exposures and disease.

Contributions from epidemiology and population biology studies are a critical component of Theme 1. Observational population-based research provides the real-world reflection of the questions being asked by laboratory science and, in turn, can provide observations that can generate the need for mechanistic understanding. Sometimes, relationships are only evident as a result of looking at exposures and health outcomes together in a population setting. At the same time, interdisciplinary, integrative, and collaborative approaches are necessary. For example, we need to develop better tools for data integration, systems, and computational biology. We must also leverage existing human cohort studies with well-characterized exposure and health information to address the role of environmental exposures in disease etiology.

Environmental health sciences is undergoing a conceptual shift. New understanding of how low level, common exposures contribute to the development of widespread disorders, like diabetes, developmental delays, and other health problems, is changing the traditional paradigm of environmental health research.

Theme 2: Exposure Research

Understanding how the complex nature of exposures, at the individual and population levels, contributes to health outcomes

This theme focuses on the study of environmental exposures themselves — internal and external — not just chemical environmental pollutants, but also exposures arising from a variety of sources, such as the microbiome, infectious agents, nutritional sources, and stress. Key research needs include technology development for exposure measurement, including better biological markers, new sensor and detector tools, remote detection of exposures, more sensitive analytical methods, high-throughput predictive pharmacokinetic models, and informatics tools to improve quantitation of information on exposure from large datasets. This theme also intersects with Theme 1, since new metrics of exposures include biological effects on key pathways involved in disease pathogenesis.

New systems-based approaches to exposure science are now emerging that utilize omics technologies. This approach recognizes that environmentally related health and disease are the result of the totality of a person's environmental exposures, from all sources and routes, across the life span. This totality of exposure is what we are describing in this document as the exposome, a concept that has become increasingly salient in the field of environmental health sciences. Part of our strategic direction will be to engage the scientific community in the effort to clearly define the exposome and to create research opportunities to explore it.

My Air My Health

The My Air, My Health Challenge from NIEHS, the EPA, and HHS will tap into the ingenuity of American problem solvers to develop innovative solutions that connect timely, location-specific air pollution data and human health measurements, to provide a more detailed picture of air quality's impact on our health. For more information on the challenge, visit http://www.niehs.nih.gov/funding/challenges/index.cfm.

Lung-on-a-chip photo courtesy of Don Ingber, Wyss Institute at Harvard University

Theme 3: Translational Science

Transdisciplinary environmental health science to inform individual, clinical, and public health decision-making to improve health

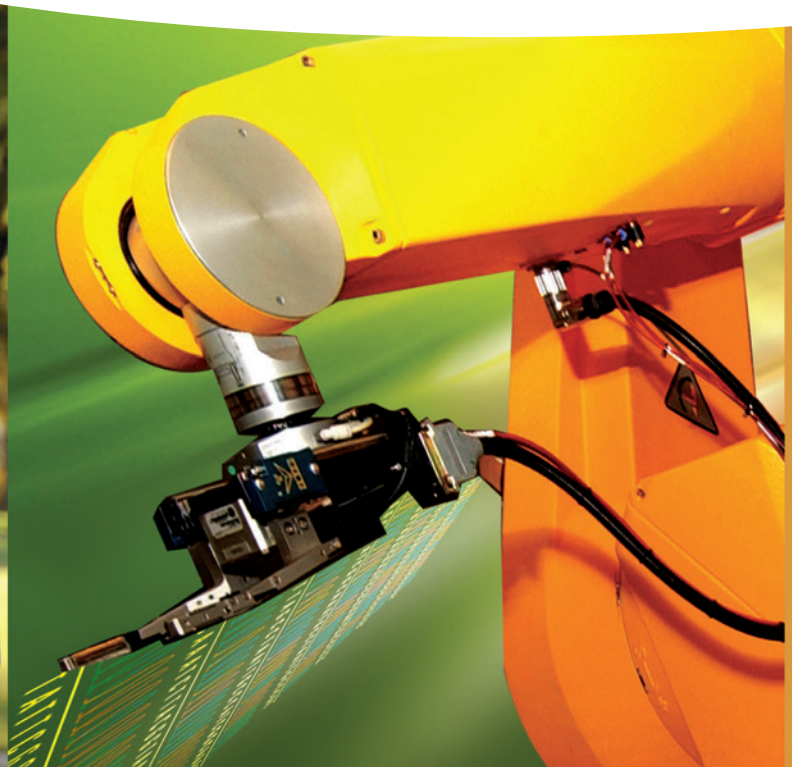
Research that moves a basic science observation into a public health or medical application is sometimes termed translational science. Translational science is Theme 3, in recognition of the fact that our research priorities must include this kind of applied, outcome-oriented research, for us to ensure that the full benefit of all of our research investments can be realized as part of public health, medical, regulatory, and individual practice. This theme embraces broad, interdisciplinary approaches — molecule to cell to model organism to human to society and back again, as informed by public health imperatives.

While translational approaches in medical research are sometimes referred to as bench-to-bedside, NIEHS research results in much broader applications, which have in common an emphasis on preventing adverse health consequences from environmental exposure. NIEHS research moves through multiple translational pathways, not just to the bedside, but to the community, to individual behaviors and choices, and to wider public policy changes and public health practice.

Predictive toxicology is one key component of this theme. The overall goal for the Tox21 program is to take observations obtained from the study of biological pathways and deploy them in a new framework, to provide specific information for making decisions about risk.

Environmental health translational science has been underutilized in the context of state-of-the-art medical practice. In the paradigm known as personalized medicine, biomedical researchers are giving providers the tools to use genomic information to make better individual decisions about diagnosis and treatment that are tailored to the biology of the specific patient. Knowledge of environmental exposure needs to be incorporated into this decision-making framework. Environmental health translational research can introduce, into medical decision-making, a new level of information about gene-environment interactions affecting drugs, biologics, infections, and other environmental factors in health and disease.

One important component of this theme is to enhance NIEHS use of metrics of comparative effectiveness in environmental health to inform health economics. A key need in this area is to develop tools and methods to evaluate the impact of environmental health research, including contributions to prevention of disease, that is systematic and transparent. For more information on the Tox21 program, visit http://ntp.niehs.nih.gov/go/tox21 and search for Tox 21.



The overall goal for the current Tox21 program is to take observations obtained from the study of biological pathways and deploy them in a new framework, to provide specific information for making decisions about risk.

Theme 4: Health Disparities and Global Environmental Health

Research to understand environmental contributors to global health and health disparities

NIEHS has been a leader in studying health risks associated with environmental toxicants and other stressors borne by vulnerable populations where they live, work, and play. NIEHS has invested heavily in building capacity of affected communities to partner with environmental health scientists in order to study environmental concerns. It has long been recognized that individuals and communities that are socioeconomically disadvantaged also tend to suffer inequalities in both health and environmental burdens. It is also known that characteristics such as age, gender, and occupation can be factors in vulnerability.

Theme 4 incorporates aspects of all the other themes: fundamental research, exposure research, translational science, training and education, and communications and engagement.

Under this theme, NIEHS endeavors to support environmental justice research, by defining the environmental factors and their complex interactions that contribute to environmental health disparities, and by studying chemical and nonchemical stressors at the community level. This research includes developing new approaches to community-based research, fostering collaborations between community groups and research groups, establishing training programs for environmental health disparities research, and capacity building within institutions well placed to undertake health disparities research. For environmental health disparities research, it is necessary to incorporate social and behavioral aspects, as well as implications of environmental exposures into the research.

Environmental exposures of widespread public health significance occur throughout the world — many disproportionately affect not only the disadvantaged in our country but also the developing world. Populations around the world will continue to be a focus of NIEHS research. Taking a global environmental health focus includes opportunities to perform research to learn about risks from widespread exposures. For example, increasing changes in global climate are expected to result in changes to weather, ecosystems, water supplies, and other aspects of our physical environment. These changes, and the mitigation and adaptation efforts that accompany them, will have implications for emerging environmental exposures, especially affecting vulnerable populations. Environmental exposures are also major contributors to the worldwide increase in chronic, noncommunicable diseases and their effect on health and economic costs.

An additional component of this theme that intersects with Theme 3 is the development of new tools and approaches that will help us understand the economic impacts of environmental health risks, decisions, and policies. The field of health disparities research can benefit greatly from the contributions of cost-benefit analyses and comparative effectiveness research. Developing quantitative approaches that can be linked to economic impact is an important capability that can be used to inform decision-making in ways that will disproportionally benefit exposed communities.

As with all the themes, implementation of the goals under this theme will depend on wide-ranging and effective partnerships and collaborations. This requirement points to the need for good relationships between community groups, their leaders and representatives, and the invested researchers. Internationally, the collaborations extend also to foreign scientists and governments.

Theme 5: Training and Education

Developing and retaining a sustainable pipeline of environmental health professionals across a range of related disciplines including fundamental science, exposure science, translation, policy, and outreach, through efforts in education, training, and career development, and raising the level of environmental health literacy of the general population and all other NIEHS stakeholders

NIEHS will facilitate development of a cadre of top-notch, innovative and dedicated environmental health scientists and professionals. Within the scientific enterprise, researchers who are open to transdisciplinary approaches need to be developed, recruited, and trained from across a wide range of disciplines, in order to meet the NIEHS mission of solving the increasingly complex problems in environmental health. Examples include not only traditional basic biological, medical, and population sciences, such as toxicology and epidemiology, but also translational sciences, data and information sciences, veterinary medicine, chemistry, engineering, biostatistics, health economics, bioethics, risk communication, behavioral sciences, and others.

In tandem with the development of the scientific cadre, NIEHS must also seek to develop a base of professionals who can translate the scientific knowledge into policy, education, communications, and outreach, to meet the needs of NIEHS stakeholders. Efforts in both of these areas should include specific focus on increasing the involvement of underrepresented groups in environmental health research, on the use of integrative and collaborative approaches, and on effectively relating environmental health science to actual public health problems that need solutions. NIEHS needs to emphasize the real-world relevance of its scientific efforts, to make environmental health sciences an exciting and enticing field of study and career.

Getting children excited about environmental health science at an early age helps sustain pipeline of future researchers. Efforts in this area not only introduce new researchers into the field, but also provide a framework for education that improves overall environmental health literacy, with the capacity to affect understanding, behavior, and health outcomes across the age spectrum. Thus, environmental health literacy embedded in early education is a necessary condition both for the environmental health scientist pipeline and for wider health promotion and disease prevention efforts.

Getting children excited about environmental health science at an early age, helps sustain pipeline of future researchers.

Communications and Engagement

Advancing translation and dissemination of scientific knowledge on the role of the environment and human health and pursuing appropriate and effective means of engagement of the broad range of Institute stakeholders in environmental health research and public health promotion

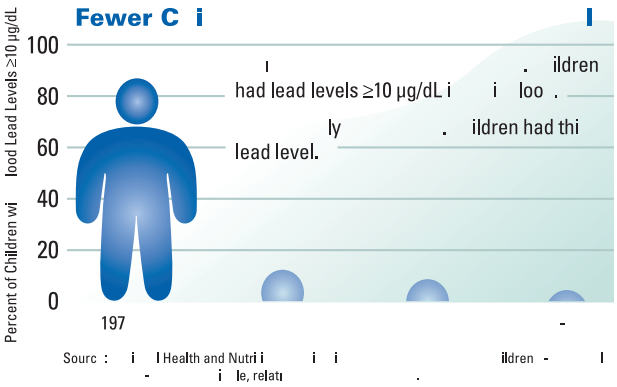
A part of the congressionally mandated purpose of NIEHS is the dissemination of research findings, knowledge, and information on environmental health science. Because the prevention of illness and the improvement of public health are central to the mission and vision of NIEHS, this mandate is interpreted broadly and covers a wide range of communication activities.

In order to be successful in these activities, NIEHS must continue to develop, refine, and implement an innovative and comprehensive communication and engagement strategy that draws on the latest in best practices, standards, and technologies established by professional communications practitioners and researchers.

Communication and engagement activities provide information that can be easily understood and applied by the range of NIEHS stakeholders, including decision-makers at all levels, from individuals to global organizations. A good communication strategy for NIEHS features two-way engagement with our stakeholders and is deployed both internally and with external partners to develop a broad constituency for environmental health sciences.

Preventing Disease

Lead poisoning in American children has decreased by about 86% since the late 1970s. Much of this success is due to research supported by NIEHS and others, which helped to identify and reduce the health effects of lead poisoning in children and adults. NIEHS and other agencies help to stop preventable diseases, by communicating the most up-to-date information about environmental risks to health care providers and the public.



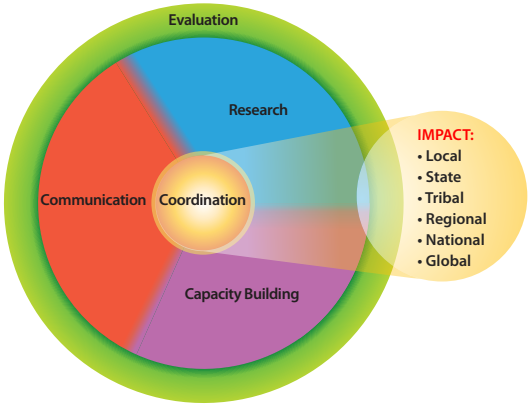
Crosscutting Theme: Knowledge Management

Environmental effects on health and disease are complex, and understanding these effects requires an integrated and comprehensive approach to data management. The pace of data generation in environmental health sciences has surpassed the existing infrastructure for information acquisition, management, analysis, visualization, and dissemination. The various issues around information, data, and knowledge management comprise an overarching issue with implications applicable to all the strategic planning themes.

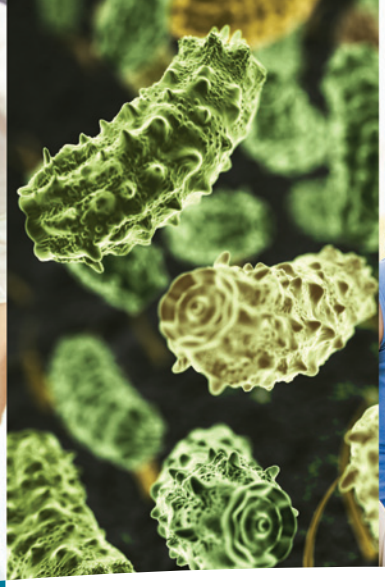
There is a broad consensus in the scientific community that more informatics expertise and resources are required to support environmental health sciences research. Emerging technologies allow for transformative analysis of genome structure and sequence, transcriptome, epigenome, metabolome, proteome, exposome, phenome, etc., but currently the field of environmental health sciences has relied on other disciplines to define the bioinformatic parameters necessary for data integration. While environmental health sciences has made some progress within these constraints, it has become apparent that dedicated strategic investments of resources are necessary to support the information and knowledge needs of the multiple disciplines within the environmental health sciences. Strategies that facilitate integration of such data, in the context of environmental exposures, would permit greater synergy among environmental health science researchers and improve our basic understanding of environmentally associated diseases. Across the environmental health sciences community, there is a need for centralizing, accessing, and analyzing diverse environmental health data through public resources. A path forward could include leveraging multiple sources of existing data, which are now unconnected, and create better ways to connect and access these data, to address pressing environmental health questions into the future.

Crosscutting Theme: Collaborative and Integrative Approaches

An overarching theme identified during the NIEHS strategic planning process is the importance of collaborative and integrative approaches to environmental health sciences. Adverse effects leading to disease occur at multiple points throughout complex systems, often from multiple exposures and across various life stages. The research enterprise for environmental health sciences needs to be positioned to exploit all relevant disciplines in a coordinated, integrated fashion to solve these complex problems. Environmental health scientists need to be enabled to work across a wide array of fields, such as cell and molecular biology, structural biology, biochemistry, genetics, pharmacology, toxicology, epidemiology, biostatistics, behavioral sciences, engineering, and many others. Systems biology, computational biology, and other promising new approaches are dependent on interdisciplinary collaborations. In addition to interdisciplinary approaches to fulfilling its science mission, NIEHS must also work to develop innovative collaborations with sister agencies, communities, and other partners, to effectively translate this knowledge, to inform prevention and interventions, as well as to guide stakeholder decision-making at all levels.



Coordinated activities in research, communication, capacity building, and evaluation.



NIEHS Strategic Goals

Goal 1

Identify and understand fundamental shared mechanisms or common biological pathways, e.g., inflammation, epigenetic changes, oxidative stress, mutagenesis, etc., underlying a broad range of complex diseases, in order to enable the development of applicable prevention and intervention strategies.

a. Investigate the effects of the environment on genome structure and function.

b. Investigate the effects of the environment on the epigenetic regulation of biological and pathological processes.

c. Understand the role of key biological mechanisms and their regulation in determining resistance and susceptibility to environmental stressors.

d. Understand the normal processes of human development, maturation, and aging, and identify environmental factors that contribute to altered function.

e. Develop a pipeline to integrate high-throughput screening, cell systems, and model organisms, to identify fundamental mechanisms underlying responses to existing and emerging environmental toxicants, and to better predict their relationship to disease.

Goal 2

Understand individual susceptibility across the life span to chronic, complex diseases resulting from environmental factors, in basic and population-based studies, to facilitate prevention and decrease public health burden.

a. Using a life-span approach, identify critical windows of susceptibility to the effects of environmental exposures.

b. Deepen our understanding of dose-response relationships to environmental factors across the life span.

c. Study the factors that determine individual susceptibility to environmental stressors across the life span.

Goal 3

Transform exposure science by enabling consideration of the totality of human exposures and links to biological pathways, and create a blueprint for incorporating exposure science into human health studies.

a. Advance characterization of environmental exposures through improved exposure assessment, at both the individual and population levels.

b. Define and disseminate the concept of the exposome.

c. Create tools and technologies and the research capacity needed to characterize the exposome.

Goal 4

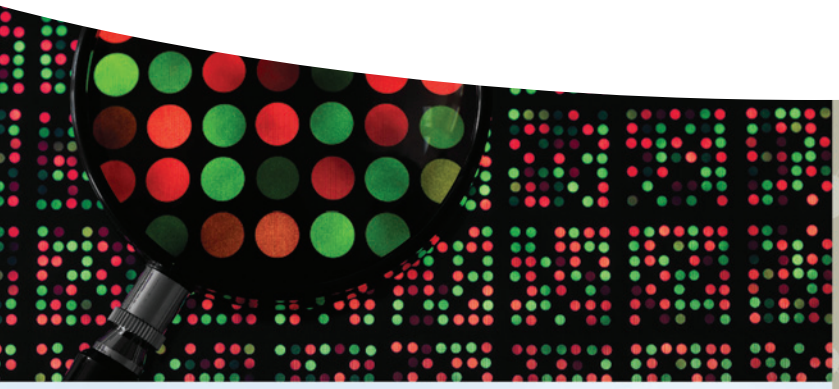
Understand how combined environmental exposures affect disease pathogenesis.

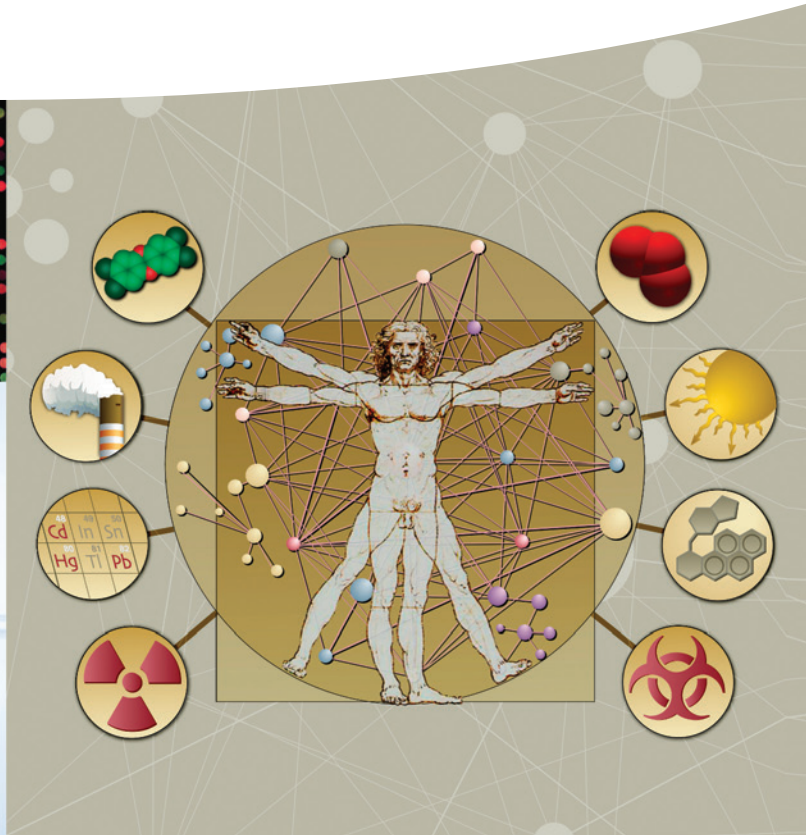
a. Assess the joint action of multiple environmental insults, including chemicals, nonchemical stressors, and nutritional components, on toxicity and disease, and identify interactions resulting from combined exposures.

b. Study the role of the human microbiome and its influence on environmental health, and explore the role of the microbiome in responses to environmental exposures.

c. Study the interactions of infectious agents with environmental exposures.

d. Understand how nonchemical stressors, including socioeconomic, behavioral factors, etc., interact with other environmental exposures to impact human health outcomes, and identify preventive measures that could be taken.





Goal 5

Identify and respond to emerging environmental threats to human health, on both a local and global scale.

a. Enlist the capacity of the environmental health science (EHS) research enterprise to elucidate information necessary for timely and effective public health action.

b. Act proactively with other public health partners to provide appropriate responses to emerging environmental threats, both natural and man-made.

c. Focus on research needs to help inform policy responses in public health situations in which lack of knowledge hampers policymaking, e.g., health effects of exposures related to hydrofracking or climate change, or exposures to engineered nanomaterials.

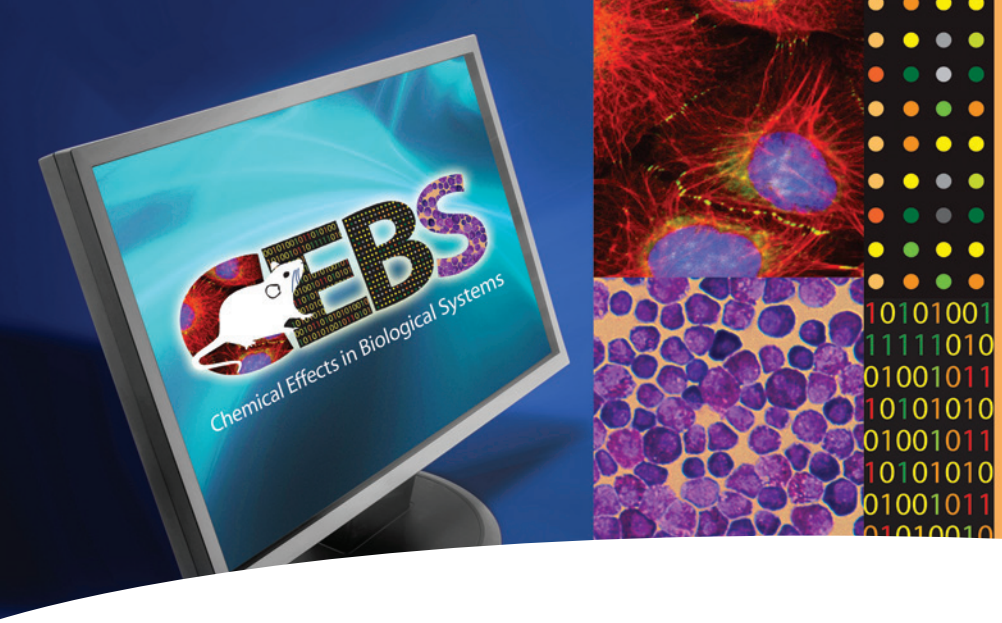
Goal 6

Establish an environmental health disparities research agenda to understand the disproportionate risks of disease, and to define and support public health and prevention solutions in affected populations.

a. Conduct community-based participatory research that incorporates cultural competencies.

b. Include research and education on the ethical, legal, and social implications of EHS research, including human participation issues, research integrity, reporting of results, and other issues.

c. Develop and recommend or implement interventions to reduce or eliminate environmental exposures that cause the greatest burden of disease to affected populations.



Chemical Effects in Biological Systems (CEBS)

The CEBS database houses data of interest to environmental health scientists. CEBS is a public resource and has received depositions of data from academic, industrial, and governmental laboratories. CEBS is designed to display data in the context of biology and study design, and to permit data integration across studies.

Goal 7

Use knowledge management techniques to create a collaborative environment for the EHS community, to encourage an interdisciplinary approach to investigate, analyze, and disseminate findings.

a. Develop bioinformatics, biostatistics, and data integration tools to conduct interdisciplinary research for application to environmental health science.

b. Develop and invest in publicly available resources and computational tools, for integrating and analyzing environmental health data.

Goal 8

Enhance the teaching of EHS at all levels of education and training — kindergarten through professional — to increase scientific literacy and generate awareness of the health consequences of environmental exposures.

a. Empower individuals at all levels of education with knowledge to make better health decisions.

b. Use leadership and partnerships to strengthen EHS education and literacy, using research on effective EHS education strategies and creating mechanisms for educators to promote EHS education.

c. Develop critical training programs in EHS research tailored for multiple groups, e.g., students, postdocs, foreign scientists, and science teachers.

d. Incorporate EHS into medical education and practice, e.g., nursing, M.D., etc., to increase awareness of environmental medicine in health care practice.

NIEHS Scholars Connect Program (NSCP): Connecting Minority Scholars with Environmental Health Science

NSCP is designed to provide an opportunity for highly motivated science, technology, engineering, and math-focused undergraduate students from historically black colleges and universities, minority-serving institutions (MSI), and other nearby academic institutions with minority student populations, to connect with NIEHS and engage in many of its educational, informational, training, and career-oriented outlets. For more information, visit http://www.niehs.nih.gov/about/od/deputy/osed/scholars/index.cfm.

Goal 9

Inspire a diverse and well-trained cadre of scientists to move our transformative environmental health science forward, and train the next generation of EHS leaders from a wider range of scientific disciplines and diverse backgrounds.

a. Foster cross-disciplinary training in areas that are necessary, but underrepresented, in EHS, e.g., informatics, engineering, biobehavioral, etc.

b. Recruit trainees from other disciplines to diversify our science base.

c. Ensure effective opportunities across the entire career trajectory, for young investigators' transition to independence, and for retraining midcareer scientists and other EHS professionals.

d. Promote the integration of EHS into medical education to increase the number of physician or nurse researchers who are trained in EHS.

e. Build environmental health research capacity in those countries around the world experiencing the greatest burden of death, disease, and disability due to environmental factors.

f. Increase diversity within training programs for environmental health scientists.

Goal 10

Evaluate the economic impact of policies, practices, and behaviors that reduce exposure to environmental toxicants, through prevention of disease and disabilities, and invest in research programs to test how prevention improves public health and minimizes economic burden.

a. Develop an interdisciplinary research and training program in environmental health economics, to better understand the economic costs and benefits of environmental exposures, related diseases, and interventions to prevent exposures and diseases.

b. Measure economic benefits and comparative effectiveness of NIEHS investments, employing health economics as a part of the NIEHS research agenda, and develop tools and databases to advance this research.

c. Assist policymakers with systematic review and state-of-the-science assessments to help them make clinical and policy recommendations.

Goal 11

Promote bidirectional communication and collaboration between researchers and stakeholders, e.g., policy-makers, clinicians, intervention and prevention practitioners, and the public, in order to advance research translation in the environmental health sciences.

a. Promote NIEHS as a trusted and accessible source of EHS-based information and increase reach and effectiveness in communication and outreach.

b. Identify and expand our relevant stakeholder communities and enhance engagement to understand their priorities, concerns, and needs related to EHS.

c. Build and lead long-term federal and nonfederal partnerships with health education agencies and mission-related stakeholder groups, to create a pipeline for the coordination of disseminating scientific results to the public and to hear back from constituents.

d. Conduct research, as needed, on effective EHS communication strategies, including risk communication and public health.

e. Develop an integrated, searchable knowledge base on the impact of the environment on health.

EHP Goes Paperless

NIEHS proudly publishes Environmental Health Perspectives (EHP), the top peer-reviewed scientific journal for environmental, occupational, and public health research.

As part of its long-standing commitment to sustainable publishing, EHP is going paperless! This move is part of an overall strategy to increase the use of electronic communication technologies, such as tablet and other mobile versions, which will enhance the journal's reach and impact.

Check out the EHP podcast series at http://ehp03.niehs.nih.gov/static/podcasts.action and follow EHP on Twitter at https://twitter.com/ehponline.

Process for Development of NIEHS Strategic Plan

The NIEHS strategic planning process had three phases: stakeholder input, analysis of strategic themes, and development of strategic goals.

The Visionary Ideas website was open from March 1 through April 30, 2011. We received 231 ideas and 491 comments, including some very exciting, out-of-the-box suggestions made by 2,938 respondents. The ideas received more than 10,000 votes, which helped us understand our stakeholders' enthusiasm and interest for each one.

In Phase I, we also convened a Stakeholder Community Workshop in July 2011. The workshop brought together a diverse group of environmental health professionals to discuss and further identify forward-looking ideas for consideration. Almost 170 peer-nominated external stakeholders and NIEHS staff participated in the exercise. The attendees represented all the major stakeholder groups and were selected from a group of almost 600 nominations, which were considered by a committee drawn from all divisions of NIEHS. The workshop used Open Space Technology — a nontraditional format that succeeded in creating an exciting and thought-provoking atmosphere.

The workshop resulted in 97 reports on key ideas that participants identified, discussed, and compiled. These were combined into a single report and posted on the Strategic Plan website.

All of this input, including the visionary ideas and Stakeholder Community Workshop reports and public comments, was then reviewed, synthesized, and organized into eight major thematic areas. Some crosscutting ideas were placed under more than one thematic area.

In Phase II, the collected thematic areas were compiled, along with the reports and visionary ideas that contributed to them. This was the starting point for discussions by a smaller group of external advisors and NIEHS staff that met in October 2011 at the Strategic Planning Workshop. This group reviewed the overall input and drafted new mission and vision statements.

During the workshop, the participants identified and discussed strategic themes that directly supported the mission and vision. It was emphasized that the themes must be integrated, interconnected, and crosscutting, in order for NIEHS to achieve our mission. The mission, vision, and strategic themes were posted on the NIEHS website for comment in January 2012.

Strategic goal development came next in Phase III. The NIEHS leadership team spearheaded the process of creating the goals from the previous inputs, mission, vision, and strategic themes. Each NIEHS division conducted retreats to conceive and propose cross-institutional goals. The NIEHS leadership team reviewed all the suggested goals, prioritized them, and developed a set of 11 strategic goals for NIEHS.

Once the draft strategic goals had been collected and refined, they were posted on the NIEHS website for review and public comment during the month of February 2012, along with updated drafts of the mission, vision, and strategic themes. The themes and goals were also presented at the February National Advisory Environmental Health Sciences Council meeting. NIEHS received a number of comments from interested individuals and organizations at the meeting. The NIEHS leadership carefully considered each of these comments and incorporated appropriate changes into the documents. The final draft strategic plan, including the mission, vision, themes, and goals, was posted online for final public comment and review in April 2012. The new NIEHS 2012—2017 Strategic Plan,: Advancing Science, Improving Health: A Plan for Environmental Health Research, was finalized and adopted in August 2012.

NIEHS Strategic Plan Participants

Karen Adelman, Ph.D.
National Institute of Environmental Health Sciences

Janice Allen, Ph.D.
National Institute of Environmental Health Sciences

Bruce Androphy, J.D.
National Institute of Environmental Health Sciences

Trevor Archer, Ph.D.
National Institute of Environmental Health Sciences

David Armstrong, Ph.D.
National Institute of Environmental Health Sciences

David Arond, M.D., M.P.H.
Tufts University School of Medicine

Joellen M. Austin, M.P.A., M.S.M
National Institute of Environmental Health Sciences

John M. Balbus, M.D., M.P.H.
National Institute of Environmental Health Sciences

David Balshaw, Ph.D.
National Institute of Environmental Health Sciences

Claire Barnett, M.B.A.
Healthy Schools Network

Cynthia Bearer, M.D., Ph.D.
University of Maryland School of Medicine

Thomas Begley, Ph.D.
State University of New York–Albany

Bradley Bernstein, Ph.D.
Harvard Medical School

Gary Bird, Ph.D.
National Institute of Environmental Health Sciences

Linda Birnbaum, Ph.D.
National Institute of Environmental Health Sciences

Abee Boyles, Ph.D.
National Institute of Environmental Health Sciences

Christopher Bradfield, Ph.D.
University of Wisconsin–Madison

Patrick Breysse, Ph.D., M.H.S.
Johns Hopkins Bloomberg School of Public Health

Alma Britton
National Institute of Environmental Health Sciences

Julia Brody, Ph.D.
Silent Spring Institute

Doug Brugge, Ph.D., M.S.
Tufts University School of Medicine

John Bucher, Ph.D.
National Institute of Environmental Health Sciences

Wayne Cascio, M.D.
Environmental Protection Agency

Trisha Castranio
National Institute of Environmental Health Sciences

William Chameides, Ph.D.
Duke University

Marie-Francoise Chesselet, M.D., Ph.D.
University of California – Los Angeles

John Cidlowski, Ph.D.
National Institute of Environmental Health Sciences

Luz Claudio, Ph.D.
Mt. Sinai School of Medicine

Terrence J. Collins, Ph.D.
Carnegie Mellon University

Gwen Collman, Ph.D.
National Institute of Environmental Health Sciences

Lisa Conti, DVM, M.P.H.
Florida Department of Health

William Copeland, Ph.D.
National Institute of Environmental Health Sciences

Jose Cordero, M.D., M.P.H.
University of Puerto Rico

Deborah Cory-Slechta, Ph.D.
Univ. of Rochester School of Medicine & Dentistry

Geraldine Dawson, Ph.D.
Autism Speaks

Allen Dearry, Ph.D.
National Institute of Environmental Health Sciences

Barry Dellinger, Ph.D.
Louisiana State University

Richard Denison, Ph.D.
Environmental Defense

Michael DeVito, Ph.D.
National Institute of Environmental Health Sciences

Dana Dolinoy, Ph.D.
University of Michigan

Sidney Draggan, Ph.D.
National Council for Science and the Environment

Christie Drew, Ph.D.
National Institute of Environmental Health Sciences

Robert Dyer, Ph.D.
Environmental Protection Agency

John Essigmann, Ph.D.
Massachusetts Institute of Technology

Lisa Archer Edwards, Ph.D.
National Institute of Environmental Health Sciences

David Fargo, Ph.D.
National Institute of Environmental Health Sciences

Ken Fasman, Ph.D.
Adelson Medical Research Foundation

Michael Fessler, M.D.
National Institute of Environmental Health Sciences

Richard Finnell, Ph.D.
The University of Texas at Austin

Christine Flowers
National Institute of Environmental Health Sciences

Carol Folt, Ph.D.
Dartmouth College

Paul Foster, Ph.D.
National Institute of Environmental Health Sciences

John Froines, Ph.D.
University of California-Los Angeles

Howard Frumkin, M.D., M.P.H., Dr.P.H.
University of Washington

Michael Gallo, Ph.D.
University of Medicine and Dentistry of New Jersey

Stavros Garantziotis, M.D.
National Institute of Environmental Health Sciences

Thomas Gasiewicz, Ph.D.
University of Rochester

Dori Germolec, Ph.D.
National Institute of Environmental Health Sciences

Frank Gilliland, M.D.
University of Southern California

Julia Gohlke, Ph.D.
University of Alabama at Birmingham

Lynn Goldman, M.D., M.P.H.
George Washington University

Michael Gould, Ph.D.
University of Wisconsin-Madison

Gina Goulding
National Institute of Environmental Health Sciences

Nadine Gracia, M.D., M.S.C.E.
Office of the Assistant Secretary for Health, HHS

Joe Graedon, M.S.
Community Member

Kathleen Gray, M.S.P.H.
University of North Carolina at Chapel Hill

John Groopman, Ph.D.
The Johns Hopkins University

Traci Hall, Ph.D.
National Institute of Environmental Health Sciences

Philip Hanawalt, Ph.D.
Stanford University

Erin Haynes, Dr.P.H.
University of Cincinnati

Bernard Hennig, Ph.D., R.D.
University of Kentucky

Heather F. Henry, Ph.D.
National Institute of Environmental Health Sciences

Shuk-mei Ho, Ph.D.
University of Cincinnati

John Hollingsworth, M.D.
Duke University

Stephanie Holmgren, M.S.L.S., M.B.A.
National Institute of Environmental Health Sciences

Michael Holsapple, Ph.D.
International Life Sciences Institute

Darryl Hood, Ph.D.
Meharry Medical College

Paul Howard, Ph.D.
Food and Drug Administration

Andrea Hricko, M.P.H.
University of Southern California

Elaine Hubal, Ph.D.
Environmental Protection Agency

Claude Hughes, M.D., Ph.D.
Quintiles

Joseph M. (Chip) Hughes
National Institute of Environmental Health Sciences

William Jirles, M.P.H.
National Institute of Environmental Health Sciences

Laurie Johnson
National Institute of Environmental Health Sciences

Paul Jung, M.D.
National Institute of Environmental Health Sciences

Robert Kavlock, Ph.D.
Environmental Protection Agency

Jack Keene, Ph.D.
Duke University

Christopher Kemp, Ph.D.
Fred Hutchinson Cancer Research Center

James Kiley, Ph.D.
National Heart, Lung, and Blood Institute

Steve Kleeberger, Ph.D.
National Institute of Environmental Health Sciences

Amy Kostant, Ph.D.
Science Communication Network

Richard Kwok, Ph.D.
National Institute of Environmental Health Sciences

Virginia T. Ladd
American Autoimmune Related Diseases Association

Michele LaMerrill, Ph.D.
Mt. Sinai School of Medicine

Bruce Lanphear, M.D., M.P.H.
Cincinnati Children's Hospital Medical Center

Cindy Lawler, Ph.D.
National Institute of Environmental Health Sciences

B. Paige Lawrence, Ph.D.
University of Rochester

Mary Lee, M.D.
University of Massachusetts

George Leikauf, Ph.D.
University of Pittsburgh

Grace LeMasters, Ph.D., M.S.N
University of Cincinnati

Edward Levin, Ph.D.
Duke University

Stephanie London, M.D., Dr.P.H.
National Institute of Environmental Health Sciences

Christopher Long, M.P.A.
National Institute of Environmental Health Sciences

George Lucier, Ph.D.
Community Member

Daniel Madrigal, M.P.H.
Center for Environmental Research & Children's Health

Cheryl Marks, Ph.D.
National Cancer Institute

J. Patrick Mastin, Ph.D.
National Institute of Environmental Health Sciences

Carolyn Mattingly, Ph.D.
Mount Desert Island Biological Laboratory

Kimberly McAllister, Ph.D.
National Institute of Environmental Health Sciences

Rob S. McConnell, M.D.
University of Southern California

Aubrey Miller, M.D., M.P.H.
National Institute of Environmental Health Sciences

David Miller, Ph.D.
National Institute of Environmental Health Sciences

Frederick W. Miller, M.D., Ph.D.
National Institute of Environmental Health Sciences

Richard Miller, Ph.D.
GlaxoSmithKline

Marie Lyn Miranda, Ph.D.
Duke University

Frank Mirer, Ph.D., CIH
Hunter College

Nuala Moore
American Thoracic Society

John S. Morawetz
International Chemical Workers Union

Richard Mural, Ph.D.
Windber Research Institute

Craig Newschaffer, Ph.D.
Drexel University

Sheila Newton, Ph.D.
National Institute of Environmental Health Sciences

Heather Nicholas, M.S.
National Institute of Environmental Health Sciences

Martha Nolan, J.D.
Society for Women's Health Research

Karen Peabody O'Brien, Ph.D.
Advancing Green Chemistry

Liam O'Fallon, M.A.
National Institute of Environmental Health Sciences

Emily Page
Creative Consultancy

Heather Patisaul, Ph.D.
North Carolina State University

Richard Paules, Ph.D.
National Institute of Environmental Health Sciences

David Peden, M.D., M.S.
University of North Carolina at Chapel Hill

Sally Perreault Darney, Ph.D.
Environmental Protection Agency

Jerry Phelps
National Institute of Environmental Health Sciences

Michael Pino, D.V.M., Ph.D.
Sanofi Aventis

Antonio Planchart, Ph.D.
Mount Desert Island Biological Laboratory

Jonathan Pollock, Ph.D.
National Institute of Drug Abuse

James Putney Jr., Ph.D.
National Institute of Environmental Health Sciences

Kenneth Ramos, Ph.D.
University of Louisville

Ericka Reid, Ph.D.
National Institute of Environmental Health Sciences

Robert W. Rickard, Ph.D., D.A.B.T.
DuPont

Jeanne Rizzo, R.N.
Breast Cancer Fund

Joshua Rosenthal, Ph.D.
Fogarty International Center

Andrew Rowan, Ph.D.
The Humane Society

Karin Russ, R.N.
Collaborative on Health and Environment

Leona Samson, Ph.D.
Massachusetts Institute of Technology

Dale Sandler, Ph.D.
National Institute of Environmental Health Sciences

Jennifer Sass, Ph.D.
Natural Resources Defense Council

William Schrader, Ph.D.
National Institute of Environmental Health Sciences

Jane Schroeder, D.V.M., M.P.H., Ph.D.
National Institute of Environmental Health Sciences

Victoria Seewaldt, M.D.
Duke University

Banalata Sen, Ph.D.
National Institute of Environmental Health Sciences

Cosette Serabjit-Singh, Ph.D.
Community Member

Peggy M. Shepard
WEACT for Environmental Justice

Ellen Silbergeld, Ph.D.
The Johns Hopkins University

Robert Sills, Ph.D.
National Institute of Environmental Health Sciences

Thomas H. Sinks, Ph.D.
Centers for Disease Control and Prevention

William Slikker, Ph.D.
Food and Drug Administration

Martyn Smith, Ph.D.
University of California at Berkeley

William Stokes, D.V.M.
National Institute of Environmental Health Sciences

Tonya Stonham
National Institute of Environmental Health Sciences

Carol Stroebel
Children's Environmental Health Network

William Suk, Ph.D.
National Institute of Environmental Health Sciences

James Swenberg, D.V.M., Ph.D.
University of North Carolina at Chapel Hill

Jack Taylor, M.D., Ph.D.
National Institute of Environmental Health Sciences

Palmer Taylor, M.D.
University of California-San Diego

Kristina Thayer, Ph.D.
National Institute of Environmental Health Sciences

Kimberly Thigpen Tart, J.D.
National Institute of Environmental Health Sciences

Wendy Thomas, M.S.
American Meteorological Society

Claudia Thompson, Ph.D.
National Institute of Environmental Health Sciences

Ray Tice, Ph.D.
National Institute of Environmental Health Sciences

Frederick Tyson, Ph.D.
National Institute of Environmental Health Sciences

David Umbach, Ph.D.
National Institute of Environmental Health Sciences

John Vandenberg, Ph.D.
Environmental Protection Agency

Thomas Vogt, Ph.D.
Merck

Cheryl Walker, Ph.D.
University of Texas

Nigel Walker, Ph.D., D.A.B.T.
National Institute of Environmental Health Sciences

Clarice Weinberg, Ph.D.
National Institute of Environmental Health Sciences

Philip Wexler
National Library of Medicine

Birgitt Williams
Dalar International Consultancy

Scott Williams, Ph.D.
National Institute of Environmental Health Sciences

Ward Williams
Dalar International Consultancy

Sacoby Wilson, Ph.D.
University of South Carolina

Deborah Winn, Ph.D.
National Cancer Institute

Mary Wolfe, Ph.D.
National Institute of Environmental Health Sciences

Tracey Woodruff, Ph.D., M.P.H.
University of California – San Francisco

Leroy Worth, Ph.D.
National Institute of Environmental Health Sciences

Richard Woychik, Ph.D.
National Institute of Environmental Health Sciences

Beverly Wright, Ph.D.
Dillard University

Robert Wright, M.D., M.P.H.
Harvard University

Elizabeth Yeampierre, JD
United Puerto Rican Organization of Sunset Park (Uprose)

Steven Zeisel, M.D.
University of North Carolina at Chapel Hill

Darryl Zeldin, M.D.
National Institute of Environmental Health Sciences

Harold Zenick, Ph.D.
Environmental Protection Agency

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