



EMERGING SCIENCE FOR ENVIRONMENTAL HEALTH DECISIONS

WORKSHOP

The Exposome: A Powerful Approach for Evaluating Environmental Exposures and Their Influences on Human Disease

FEBRUARY 25-26, 2010 • WASHINGTON, DC

THURSDAY, 8:30–5:00, FRIDAY, 8:30–NOON • NAS BUILDING, 2100 C STREET, NW, AUDITORIUM

Although we can now measure genetic factors in large human populations, the tools for quantitative assessment of human exposures, based on measurements of chemicals in air, water, food, and the human body, have changed little since the 1970s. The lack of high-throughput methods of exposure assessment has motivated epidemiologists to rely upon self-reported data to categorize chemical exposures from environmental, endogenous, and dietary sources. With the possible exceptions of smoking and alcohol consumption, such self-reports have been unreliable predictors of long-term exposure levels, and they are poorly suited for detecting effects of environmental exposures and gene-environment interactions on human diseases.

RECOGNIZING THE DISPARITY in current knowledge between genes and environmental exposures,

Dr. Christopher P. Wild defined the “exposome,” representing all environmental exposures from conception onwards (including exposures from diet, lifestyle, and endogenous sources) as a quantity of critical interest to disease etiology (Wild, 2005). He argued that if we expect to succeed in identifying the combined effects of genetic and environmental factors on chronic diseases, we must develop 21st-century tools to characterize exposure levels in human populations.

THIS WORKSHOP WILL EXAMINE the concept of the exposome and its importance to the etiology of human diseases. In doing so, we will consider the roles that epidemiologists and laboratory scientists can play in identifying resources and technologies for elaborating the exposome in human populations.

THURSDAY, FEBRUARY 25, 2010

8:30 Welcome—*David Balshaw, NIEHS*

8:40 Introduction to the Standing Committee—**William Farland, Colorado State University*

SESSION 1. DEFINING THE EXPOSOME AND ITS IMPLICATIONS

8:50 Frontiers in Exposure Science—**Stephen Rappaport, University of California Berkeley, School of Public Health*

9:00 Complementing the Genome with its Exposome—*Christopher P. Wild, Director, International Agency for Research on Cancer*

10:00 Morning Break

SESSION 2. THE ROLE OF THE ENVIRONMENT IN POPULATION HEALTH BURDEN: THE CASE FOR IMPROVED BIOMARKERS OF ENVIRONMENTAL EXPOSURES

10:10 Environmental Exposures and the Etiology of Cancer—*Paolo Vineis, Imperial College, Division of Epidemiology*

10:35 Exposures from the Social Environment and the Biology of Aging—*Elissa Epel, University of California, San Francisco, Department of Psychology*

11:10 Panel Discussion

- What types of epidemiology studies and exposure information are best suited for determining gene, environment, gene-gene, and gene-environment contributions to health?
- How should environmental monitoring, biological monitoring, and traditional interviews be integrated to optimize characterization of real-world, life-time exposures and the influence of lifestyle factors (diet, activity, stress)?
- Which biological samples and monitoring frequency are most suitable for characterizing the exposome?

*Moderator: *Stephen Rappaport, UC Berkeley*

Panelists: Enrique Schisterman, NIH National Institute of Child Health and Human Development; Nathaniel Rothman, National Cancer Institute; Christopher P. Wild, IARC; Session 2 speakers

12:00 Lunch

REGISTER AT [HTTP://DELS.NAS.EDU/BLS/ENVIROHEALTH/EXPOSOME.SHTML](http://DELS.NAS.EDU/BLS/ENVIROHEALTH/EXPOSOME.SHTML)

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THURSDAY, CONTINUED

SESSION 3. STUDIES, REPOSITORIES, AND MORE: LEVERAGING AVAILABLE RESOURCES

1:00 DoD Millenium Cohort Study—*Tyler C. Smith, DoD Naval Health Research Center, Deployment Health Research*

1:30 NCI Cohort and Consortial Studies—*Patricia Hartge, National Cancer Institute*

2:00 Panel Discussion

- What kinds of information can be derived from these existing cohorts, including analyses of archived samples, for characterizing human exposures?
- What systems or processes should be developed to improve collection of exposure data in these epidemiologic studies?
- Does there need to be common approach and/or standards for sample collection and archiving, so that studies can be linked?
- What types of hypotheses will require the development of novel, epidemiologic studies?

*Moderator: *Susan Fisher, University of California, San Francisco*

Panelists: Craig Postlewaite, DoD Force Health Protection and Readiness; Enrique Schisterman, NIH National Institute of Child Health and Human Development; Session 3 speakers

2:50 Afternoon Break

SESSION 4. CURRENT AND FUTURE TECHNOLOGY

3:00 Use of 'Omics to Characterize Human Exposure—*Martyn Smith, University of California, Berkeley*

3:30 Exposome and Metabolomics: Promises and Pitfalls—*Dean Jones, Emory University*

4:00 Exposome and Adductomics: Promises and Pitfalls—**Stephen Rappaport, UC Berkeley*

4:30 Panel Discussion

- Are 'omic technologies sufficiently well-developed and sensitive to define environmentally-relevant exposures?
- Can these existing or other emerging technologies be adapted for characterizing the exposome?
- Do these technologies lend themselves to high throughput, multiplexed approaches?
- What other technologies could be used to characterize the exposome?

Moderator: Craig Postlewaite, DoD Force Health Protection and Readiness

*Panelists: *Susan Fisher, UC San Francisco; Session 4 speakers*

5:30 Adjourn

* Standing Committee on Use of Emerging Science for Environmental Health Decisions

FRIDAY, FEBRUARY 26, 2010

8:30 Welcome and Introduction Day 2—**Tina Bahadori, American Chemistry Council*

SESSION 5. BUILDING CAPACITY: PUBLIC HEALTH VALUE AND SCIENTIFIC CHALLENGES

8:40 Scientific Challenges to the Exposome Approach—*John Groopman, Johns Hopkins University, Bloomberg School of Public Health*

9:10 Panel Discussion

What would it take to prove the exposome concept?

- Does the exposome require connections to disease etiology in order to have value?
- Is it possible to account for multiple exposures as well as changing exposure over time, even with regular monitoring/testing?
- What is the potential for expanding the exposome beyond epidemiology studies to biomedical research and personalized medicine?

*Moderator: *Tina Bahadori, American Chemistry Council*

Panelists: Elaine Cohen Hubal, US EPA National Center for Computational Toxicology; Howard Frumkin, CDC National Center for Environmental Health; Christopher P. Wild, IARC; Session 5 speakers

10:00 Morning Break

SESSION 6. MOVING THE EXPOSOME FORWARD: NEXT STEPS

10:10 Lessons from the Human Genome Project that may be Applicable to the Exposome Endeavor—*Christopher Austin, NIH Chemical Genomics Center*

10:40 Panel Discussion

- What are the social and political challenges to moving the exposome forward?
- What are the broader and future implications of the exposome for public health? Can information on the exposome be used for preventive strategies or clinical interventions?
- What are the resource needs for moving the exposome concept forward, and is this effort a valuable use of limited resources?
- What are the next steps for mobilizing the exposome as a national initiative?
- What can be accomplished in the near and long term?

Moderator: Linda Wennerberg, National Aeronautics and Space Administration

Panelists: John Howard, National Institute of Occupational Safety and Health; John Groopman, JHU; Martyn Smith, University of California, Berkeley; Session 6 speakers

11:40 Workshop Summary and Close

12:30–2:30 Liaison and Committee Meetings

At the request of the National Institute for Environmental Health Sciences, the National Academies formed the Standing Committee on Use of Emerging Science for Environmental Health Decisions to facilitate communication among government, industry, environmental groups, and the academic community about scientific advances that may be used in the identification, quantification, and control of environmental impacts on human health.

