



EMERGING SCIENCE FOR ENVIRONMENTAL HEALTH DECISIONS

AGENDA

Biological Factors that Underlie Individual Susceptibility to Environmental Stressors, and Their Implications for Decision-Making

APRIL 18–19*, 2012 ■ WEDNESDAY 8:30–5:00, THURSDAY 8:30–NOON
KECK BUILDING, 500 FIFTH STREET NW, WASHINGTON, DC

IT IS WELL KNOWN THAT THERE IS A RANGE OF HUMAN SUSCEPTIBILITY to effects of given environmental exposures. This range is due in part to endogenous factors such as genetics and epigenetics, physiology, lifestyle, and other biological differences. Variability in individual exposures also contributes significantly to variability in human susceptibility, but this meeting focuses on the endogenous/biological factors.

The 2010 National Research Council report *Science and Decisions: Advancing Risk Assessment* notes that it is difficult to estimate an average population risk without understanding how the risk varies among individuals in the population. However, the default approach in risk assessment to account for individual variability is to assume that a ten-fold decrease in allowable exposure will protect the most sensitive subpopulations, even though seldom it is known whether such approach may be overprotective or insufficient.

EMERGING MOLECULAR TECHNIQUES, such as next generation sequencing, are advancing scientists' ability to characterize how individuals differ inherently (genetically and otherwise). Such information can also be used to predict how such individual differences may affect one's susceptibility to a given exposure. While it may not be feasible to determine susceptibility of each individual to each potential exposure, clearly we can characterize the range and a distribution of biological variability in humans at a more granular level than assuming a ten-fold uncertainty factor.

THIS MEETING WILL EXPLORE NEW AND INNOVATIVE APPROACHES to characterizing individual variability arising from endogenous/biological factors and its impact on susceptibility to risks from

environmental exposures. Discussions will also delve into how to bring new data collection and analytic approaches to bear and layer them with conventional data on variability. Topics will span a range of approaches, from molecular analyses to the use of human cells and animal models as experimental systems, and how these approaches can be used to better characterize individual variability linked to endogenous factors in toxicity, epidemiology, and genome-wide-association studies.

THIS FORUM WILL ALSO CONSIDER THE IMPLICATIONS OF EMERGING APPROACHES TO POLICIES designed to address susceptibility in public health and risk assessment. Participants will address approaches for and challenges to describing the relationships among individual variability, disease susceptibility, and public health.

Some questions that will be used to guide the discussions include the following:

- What are the current and emerging technologies that can better inform us about the distribution of individual variability within a population that are due to endogenous/biological factors?
- How does such individual variability help us understand general population variability, sensitive subpopulations and related risks?
- What does the public need to understand about the implications of such individual variability, and how could/should the public health and risk assessment community start addressing this need?

* The committee and liaisons will meet the afternoon of April 19 and April 20 until 3pm.

WEDNESDAY, APRIL 18, 2012 (8:30AM–5PM)

SESSION 1 INTRODUCTION

- 8:30 Opening Remarks—To be determined, *National Institute of Environmental Health Sciences*
- 8:35 Introduction to the Standing Committee—William Farland[†], Chair, *Colorado State University*
- 8:40 Framing this Forum—Farland
- 9:00 Characterization of the Problem: What Do We Know About Individual Variability and Its Contribution to Disease?—Nathaniel Rothman, *National Cancer Institute*
- 9:30 Human Variability in Chemical Susceptibility (Intolerance/Sensitivity), Research Findings to Date and Their Implications for Future Study Design—Claudia S. Miller, *University of Texas Health Science Center at San Antonio*
- 10:00 Technologies to Capture Biological Differences Among Individuals—Eric Schadt, *Pacific Biosciences and Mount Sinai School of Medicine*
- 10:30 Break

SESSION 2 STUDY DESIGNS TO UNDERSTAND THE IMPACT OF BIOLOGICAL VARIABILITY AMONG INDIVIDUALS IN RESPONSE TO ENVIRONMENTAL AGENTS

- 10:45 Quantitative High-Throughput Screening for Chemical Toxicity in Population-Based In Vitro Models—Fred A. Wright, *University of North Carolina, Chapel Hill*
- 11:15 Using Population-Based Animal Models to Explore Individual Variability and Toxicity—John E. (Jef) French, *National Toxicology Program, National Institute of Environmental Health Sciences*
- 11:45 Human Studies that Explore Individual Biological Variability and their Effect on the Susceptibility to Disease—Joel Schwartz, *Harvard University*
- 12:15 Lunch
- 1:15 Modeling Populations from Data on Individuals—Harvey Clewell, *The Hamner Institutes for Health Sciences*
- 1:45 Individual Variability in Sensitivity to Environmental Exposures and Its Implications for Risk Assessment—Duncan Thomas, *University of Southern California*
- 2:15 Panel Discussion—Moderator: Farland
- 2:40 Break

SESSION 3 USING INFORMATION ON BIOLOGICAL VARIABILITY AMONG INDIVIDUALS FOR PUBLIC HEALTH DECISIONS

- 2:50 How Findings from Population-Based Studies May Inform Public Health Decisions on the Individual Level—James Kaput, *Nestlé Institute of Health Sciences*
- 3:20 A Perspective on Pharmacogenetics and Dealing with Emergent Data to Develop Stratified Medicines—Peter Shaw, *Merck*

SESSION 4 USING NEW INFORMATION ON INDIVIDUAL BIOLOGICAL VARIABILITY FOR ENVIRONMENTAL REGULATORY DECISIONS

- 3:50 How Individual Variability Is Currently Factored into Risk Assessment/Regulation/Decision Making—Michael Dourson, *Toxicology Excellence for Risk Assessment (TERA)*
- 4:20 Biological Variability and Improving Environmental Decision-Making—Weihsueh Chiu, *Environmental Protection Agency*
- 4:50 Panel Discussion—Moderator: Joyce Tsuji, *Exponent, Inc.*
- 5:15 Adjourn until tomorrow

THURSDAY, APRIL 19, 2012 (8:30AM–NOON)

SESSION 5 COMMUNITY PERSPECTIVES ON BRIDGING THE NEW SCIENCE WITH DECISION MAKING, INCLUDING INDIVIDUAL DECISION MAKING

- 8:30 Panel Discussion—Moderator and Panelist: Richard Denison[†], *Environmental Defense Fund*
Panel Members: Nicholas Ashford, *Massachusetts Institute of Technology*; Nsedu Witherspoon, *Children's Environmental Health Network*; Barbara Biesecker, *Johns Hopkins University/National Human Genome Research Institute*
- 10:00 Break

(continued)

About the Committee

At the request of the National Institute of Environmental Health Sciences (NIEHS), the National Research Council 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.

[†] indicates a member of the Standing Committee on Use of Emerging Science for Environmental Health Decisions.

**THURSDAY, APRIL 19, 2012 (8:30AM–NOON)
CONTINUED**

**SESSION 6 OPPORTUNITIES FOR NEW APPROACHES:
IMPLICATIONS OF NEW DATA TO INFORM RISK
ASSESSMENT AND REGULATORY DECISION**

- 9:30 **Moving from Risk-Driven Chemicals Policies to Technology-Based Solutions**—Nicholas Ashford, *Massachusetts Institute of Technology*
- 10:15 **Panel Discussion**—Moderator: Ivan Rusyn[†], *University of North Carolina, Chapel Hill*
Panel Members: Kaput; Dan Axelrad, *Environmental Protection Agency*; Chiu; Dan Sharp, *Centers for Disease Control/National Institute for Occupational Safety and Health*; Zachary Pekar, *Office of Air Quality Planning and Standards, Environmental Protection Agency*

**SESSION 7 WHAT RESEARCH IS NEEDED TO MOVE
FORWARD IN THIS AREA?**

- 11:15 **Panel Discussion**—Moderator: Cheryl Lyn Walker[†], *Texas A&M Health Science Center*
Panel Members: Richard Woychik, *National Institute of Environmental Health Sciences*; Thomas; French; Wright; Biesecker; Deborah Winn, *National Cancer Institute*
- 12:00 **Wrap Up**—Farland
- 12:15 **Adjourn**
Committee and Liaisons meet the afternoon of April 19 and April 20 until 3:00pm.

Please note that this meeting will be webcast and recorded. Please visit our website for webcast details.

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