



EMERGING SCIENCE FOR ENVIRONMENTAL HEALTH DECISIONS

AGENDA

Use of *In Utero* and Post-Natal Indicators to Predict Health Outcomes Later in Life

OCTOBER 14–15, 2010 ■ THURSDAY, 8:00–5:30, FRIDAY, 8:30–12:00*

LOCATION: THE WASHINGTON CLUB, 15 DUPONT CIRCLE, NW, WASHINGTON, DC

It is increasingly evident that stressors *in utero*, such as malnutrition or chemical exposures, may cause permanent changes in physiology and metabolism that influence the development of, or susceptibility to, disease in adults. Multiple animal models are available to investigate *in utero* perturbations in gene expression, tissue function, and other developmental pathways that may be linked to later life effects. However, many of these models are quite expensive and time-consuming to develop and use, and their relevance to humans remains to be determined. The ability to use human tissues, short-term animal studies, or rapid *in vitro* assays to predict adult health risks could rapidly advance our understanding of this topic. Examples include directly measuring biologically-significant concentrations of environmental toxicants in placenta or cord blood, and linking such exposures to gene expression, tissue function, or other developmental changes associated with an adult disease outcome. Thus, major scientific effort is currently being devoted to developing short-term animal studies and human biomarkers of effect that could be used to investigate associations between *in utero* exposures and diseases later in life.

This forum will provide a brief background on traditional testing strategies and current approaches used to detect later-life effects following *in utero* or early

post-natal stressor exposures. The emerging science in this area will be further explored using two case studies. The first case study is end-point driven and will examine developmental origins of obesity, insulin resistance, and hypertension. The second will explore *in utero* or post-natal exposure to arsenic and potential early indicators that could predict later-life effects. Finally, the meeting will conclude with discussions on the use of this emerging science for risk assessment or decision-making purposes. Some questions that will be used to guide the meeting include the following:

- What is the range of adult disease states that have developmental origins?
- What are the possible mechanisms for persistent, adult-onset effects associated with developmental exposures?
- What early life biomarkers are available to predict later life disease?
- How good are current animal tests in detecting associations between early life exposures and later life effects?
- Are there shorter-term animal tests or mode-of-action-based *in vitro*/human biomarker tests that detect early life events and are predictive of later life effects?
- Is our scientific understanding of these processes sufficient to inform weight-of-evidence-based risk assessments and regulatory practices?

* On Friday, October 15, the committee and liaisons will meet following the forum.

THURSDAY, OCTOBER 14, 2010

- 8:00 **Opening Remarks**—Chris Weis, *National Institute of Environmental Health Sciences*
- 8:10 **Introduction to the Standing Committee**—William Farland†, *Chair, Standing Committee on Use of Emerging Science for Environmental Decision Making; Colorado State University*

SESSION 1: INTRODUCTION

- 8:20 **Meeting Objectives**—Kim Boekelheide†, *Brown University School of Medicine*
- 8:35 **Strategies for Detecting Later Life Effects Following Early Life Stressors in Humans**—Robert Lane, *University of Utah*
- 9:20 **Traditional Testing Strategies for Detecting Later Life Effects Following Early Life Stressors: Animal Models**—John Rogers, *U.S. Environmental Protection Agency*
- 10:05 **Break**
- 10:20 **Novel Effects: From Research to Methods Development and Regulatory Acceptance**—Steven Bradbury, *U.S. Environmental Protection Agency*
- 11:05 **Panel Discussion—Moderator: Helmut Zarbl†, University of Medicine and Dentistry of New Jersey—Robert Wood Johnson Medical School**
- Panel Participants: William Farland†, Colorado State University; Jerry Heindel, National Institute of Environmental Health Sciences; Theodore Slotkin, Duke University Medical Center; Session 1 Speakers**
- 12:00 **Lunch: Speakers, Panelists, Committee Members, and Liaisons—Lunch provided in the Lewis-Eakin Room**
Audience Members—Lunch on your own

SESSION 2: FETAL PROGRAMMING ON LATER LIFE EFFECTS

Emerging Science: *in utero* and post-natal indicators that predict endpoints such as obesity, insulin resistance, and hypertension

- 1:15 **The Placenta: Influence on Fetal Programming and Useful After Birth?**—Leslie Myatt, *University of Texas Health Science Center*
- 1:45 **Obesogens, Stem Cells, and the Maternal Programming of Obesity**—Bruce Blumberg, *University of California, Irvine*
- 2:15 **The Role of Epigenetics in the Developmental Origins of Human Metabolic Disease**—Karen Lillycrop, *University of Southampton*
- 2:45 **Break**

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

**LOCATION: PRESIDENT'S BALLROOM
THE WASHINGTON CLUB, 15 DUPONT CIRCLE, NW, WASHINGTON, DC**

Emerging Science: *In utero* and post-natal indicators that predict diseases caused by arsenic exposure

- 3:00 **Fetal Arsenic Exposure and Adulthood Cancer in Mice**—Michael Waalkes, *National Institute of Environmental Health Sciences*
- 3:30 **Hepatic Gene Expression Changes Associated with In Utero Arsenic Exposure: Accelerated Atherosclerosis in the ApoE-Knockout Mouse**—J. Christopher States, *University of Louisville*
- 4:00 **Consequences of Pre- and Post-natal Arsenic Exposure in Bangladesh**—Joseph Graziano, *Columbia University*
- 4:30 **Panel Discussion—Moderator: Kim Boekelheide†, Brown University School of Medicine**
- Panel Participants: Kristina Thayer, National Institute of Environmental Health Sciences; Session 2 Speakers**
- 5:30 **Adjourn for the Day**

FRIDAY, OCTOBER 15, 2010

SESSION 3: IMPLICATIONS FOR USING EARLY INDICATORS TO PREDICT HEALTH OUTCOMES LATER IN LIFE

- 8:30 **When and in what areas is the emerging science ready for use in risk assessment?**—Robert Chapin, *Pfizer*
- 9:20 **What difficulties do we face in using this new science for risk assessment purposes?**—Ila Cote, *U.S. Environmental Protection Agency*
- 10:10 **Break**
- 10:30 **Panel Discussion—Moderator: Lauren Zeise†, California Environmental Protection Agency**
- Panel Participants: Stan Barone, U.S. Environmental Protection Agency; Bob Benson, U.S. Environmental Protection Agency; Deborah Hansen, U.S. Food and Drug Administration; Sarah Janssen, Natural Resources Defense Council; Reza Rasoulpour, Dow Chemical Company; Session 3 Speakers**
- 12:00 **Adjourn**
- 12:30 **Committee and Liaison Meeting—Lunch provided in the Lewis-Eakin Room**
- 2:00 **Adjourn Committee and Liaison Meeting, Committee to meet alone**
- 3:00 **Adjourn Committee Meeting**

