EMERGING SCIENCE FOR ENVIRONMENTAL HEALTH DECISIONS

AGENDA

Systems Biology-Informed Risk Assessment

JUNE 14–15*, 2012 ■ THURSDAY ~8:30–5:30, FRIDAY 8:30–NOON

NATIONAL ACADEMY OF SCIENCES BUILDING, 2101 CONSTITUTION AVENUE, NW, , WASHINGTON, DC

This year marks the 5th anniversary of the seminal National Research Council report on *Toxicity Testing in the 21st Century*. The report began a transformation in toxicity testing and risk assessment. Today, the risk assessment landscape continues changing. These changes are driven largely by phenomenal advances in molecular and systems biology, recent reports from the National Research Council, and volumes of new test data arising from the Tox21 and European REACH programs. These drivers are prompting us to look anew at risk assessment. Presentations in this workshop will report on current efforts to advance risk assessment through the use of molecular and systems biology data to augment, extend or replace traditional data. Concepts, issues, approaches, and several molecular biology-informed risk assessment prototypes (case studies) will be presented. Proof of concept, value of information, and decision rules will be discussed. The prototypes will provide concrete examples to help engender movement from strategy to practical application. Envisioned future application of these new approaches are varied and include ranking chemicals for research and further evaluation, supporting green chemistry/sustainability efforts, aiding emergency and urgent responses, and informing limited and regulatory decision-making.

GOALS/OBJECTIVES

Our goal is to consider how emerging science relating to molecular and systems biology could be used to inform risk assessment and decision making and what key scientific issues must be addressed.

POTENTIAL QUESTIONS TO BE CONSIDERED

1. **Use of Molecular and Systems Biology Data and Approaches to Inform Risk Assessment:** Speaker presentations and subsequent panel discussions will focus on these questions:
   a. Hazard Identification—What kind of molecular and systems biology evidence can indicate that a chemical causes specific health effect(s)?
   b. Exposure/Dose Response—How can exposure/dose response, including responses at ambient concentrations, be quantified?
   c. What kinds of data can help characterize traditionally difficult risk assessment issues such as impacts of mixtures exposures; variability in responses among humans and/or susceptible subpopulations, including life stage; effects of various exposure scenarios (e.g., chronic versus recurrent and intermittent exposures)?
   d. Uncertainty and Variability—How can molecular and systems biology approaches be used to inform assessments of data-poor chemicals?
2. **Proof of Concept, Value of Information, Use of Information:** Participant discussions will focus on these questions:
   a. How can proof of concept be demonstrated for use with molecular and systems biology data to inform risk assessment? What more is needed?

(continued)

* The committee and liaisons will meet on Friday, June 15, until 2:30 and 2:15, respectively.

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b. How can this information inform assessment of other chemicals, particularly with limited data?

c. How might approaches to systems biology-informed risk assessment differ depending on risk context? e.g., "smart" design of chemicals and processes, Superfund decisions, Candidate Contaminant List decisions, National Air Toxics Assessments, and major regulatory assessments such as ozone or benzene.

Throughout the day, please contribute questions/comments to the moderator via index cards, indicating which panel or speaker you are addressing. Questions/comments not addressed during the meeting will be provided to committee, speakers, EPA, and NIEHS.

THURSDAY, JUNE 14 (8:30AM–5:30PM)

Session 1 Workshop Introduction

8:30 Opening Remarks— Ila Cote, *U.S. Environmental Protection Agency,* and John Balbus, *National Institute of Environmental Health Sciences*

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

8:50 The Process of Transformation in Toxicity Testing—Kim Boekelheide, *Brown University*

9:45 *Break*

Session 2 Looking Toward the Horizon of Risk Assessment

Moderator: William Farland

9:55 Historical Perspective of Risk Assessment*— Lauren Zeise†, *Office of Environmental Health Hazard Assessment, California Environmental Protection Agency*

10:35 European Experience with Emerging Science/ Technologies*—Derek Knight, *European Chemicals Agency* (Video Conference)

11:15 Advancing the Next Generation of Risk Assessment *—Ila Cote, *U.S. Environmental Protection Agency*

11:55 *Lunch on your own (cafeteria on lower level or food trucks parked at 21st and Virginia ; Committee and Speakers in NAS Members Room)*

Session 3 Advancing Current Risk Assessment with Systems Biology

Screening/Ranking Chemicals, Hazard ID, Dose-Response Analysis, Exposure Assessment

12:40 Opening Comments—Moderator: Ivan Rusyn†, *University of North Carolina, Chapel Hill*

12:55 QSAR21: Linking Biology to Chemistry Through Chemical Inherency and Mode-of-Action Pathways — Chihae Yang, *Altamira, LLC*

1:30 Towards a Knowledge-Driven Paradigm for Chemical Risk Assessment**—Maurice Whelan, *European Commission, DG Joint Research Centre*

2:25 Systems Toxicology for Cancer Risk Assessment: Considerations in the Context of Vinyl Acetate and Acetaldehyde**— Justin Teeguarden, *Pacific Northwest National Laboratory*

3:20 *Break*

3:30 Using Ozone to Validate a Systems Biology Approach to Toxicity Testing**—Robert Devlin, *U.S. Environmental Protection Agency*

4:25 Enhancing Systems Biology of Environmental Exposures Through Universal Biomonitoring**— Dean Jones, *Emory University*

5:20 Closing Comments—Ivan Rusyn

5:30 Adjourn for the day

FRIDAY, JUNE 15 (8:30AM–12PM)

8:30 Morning Remarks— William Farland

Session 4 Value of Information—Approaches to Decision-Making

8:40 Value of Information: A Decision-Centric Perspective on Emerging Science*—Greg Paoli, *Risk Sciences International*

9:25 *Break*

(continued)

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

* Each speaker presents for 30 minutes, followed by questions from the committee and then broader participants.

** Each speaker presents for 35 minutes, followed by 10 minutes of committee/liaison questions and 10 minutes of audience questions.

FRIDAY, JUNE 15 (8:30AM–12PM)—CONTINUED

Session 5 Systems Approaches in NextGen Risk Assessment

9:40 Panel Discussion

Moderator— Greg Paoli

Panelists—Kim Boekelheide; Ila Cote; Donna Mendrick, *Food and Drug Administration;* John Quackenbush, *Harvard School of Public Health*

10:40 *Break*

Session 6 Perspectives on EPA's Approach to Designing NextGen Risk Assessment

10:50 Panel Discussion

Moderator—George Daston†, *Procter & Gamble*

Panelists—Richard Denison†, *Environmental Defense Fund,* Joyce Tsuji†, *Exponent, Inc.;* Maurice Whelan; Lauren Zeise

11:50 Closing Comments—Daniel Krewski, *University of Ottawa*

12:15 Adjourn—Committee and Liaisons meet 12:45–2:30 and 12:45–2:15, respectively

The Committee on Emerging Science for Environmental Health Decisions is sponsored by the National Institute of Environmental Health Sciences. The Environmental Protection Agency has provided support for this meeting.

For more information and to subscribe for updates, please visit http://dels.nas.edu/envirohealth

Emerging Science workshops are free and open to the public.

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.