



EMERGING SCIENCE FOR ENVIRONMENTAL HEALTH DECISIONS

AGENDA

Interplay of the Microbiome, Environmental Stressors, and Human Health

**APRIL 27–28, 2011 ■ WEDNESDAY, 8:00–4:00, THURSDAY, 8:30–NOON*
20 F STREET CONFERENCE CENTER, NW, WASHINGTON, DC**

Our bodies are covered, inside and out, with a great number and diversity of microorganisms—organisms too small to be seen by the naked eye. The sum of all these organisms, which vastly outnumber the cells in the human body, is collectively called the “microbiome.” The microbiome has an enormous influence on the body’s response to the environment and the pathogenesis of disease, but it is the least appreciated component of human biology. Although many of the individual microorganisms, such as *E. coli*, are the infamous causes of infections, the collective microbiome acts as a symbiotic “organ” that performs essential functions necessary for life. Research shows that under healthy, normal conditions, the microbes living in or on our stomachs, skin, and even noses play critical roles in a variety of processes including digestion, nutrition, and immunity.

WHY SHOULD THE ENVIRONMENTAL HEALTH COMMUNITY CARE ABOUT THE MICROBIOME? Interactions between the microbiome and its host influence health. As technological advances improve our ability to characterize and monitor changes in the microbiome, it is increasingly evident that the composition and function of the microbiome is strongly influenced by environmental conditions. In addition, the microbiome itself influences our responses to exposures from environmental or occupational chemicals, pharmaceuticals, and foods, among other things. Many environmentally relevant diseases and disorders such as asthma, autism, and obesity are increasingly being associated with imbalances

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.

in the microbiome. The emerging interplay between the microbiome, environmental stressors, host genetics, genetics of the microorganisms, diet, lifestyle, climate, geography, cultural differences, and human health has a strong implication for how we study and regulate environmental toxicants, pharmaceuticals, food additives, and other products we use in everyday life.

THIS WORKSHOP WILL EXPLORE current and emerging knowledge on the microbiome, its association with human environmental health, and implications new research findings may have for public policy. The workshop will begin with an overview of the microbiome and its relationship to human susceptibility to disease. How environmental factors alter the microbiome and how these changes in turn alter environmental health will be the focus of several talks and discussion sessions. In addition, workshop participants will evaluate ethical and regulatory implications that arise as a result of microbiome discoveries. Since local geography, climate, diet, behavior, and co-morbid infections can have significant effects on the microbiome, understanding how the altered microbiome affects chemical toxicity and drug testing is a critical issue. Does the inability of high throughput toxicity tests using lower organisms and cell lines to take the microbiome into account jeopardize the tests’ ability to predict in vivo toxicity? How reliable are overseas human clinical trials and safety testing for pharmaceuticals if the microbiome of foreign populations is different from the microbiome in domestic populations? How is the widespread use of antibiotics that alter the microbiome in consumer products and foods affecting environmental health? Finally, the workshop will delve into implications that new findings may have on defining risks and developing regulatory policies that best protect human health.

* On Thursday, April 28, the committee and liaisons will meet following the workshop.

WEDNESDAY APRIL 27, 2011 (8:00AM–4:00PM)

- 8:00 Opening Remarks—Linda Birnbaum, *director, National Institute of Environmental Health Sciences (NIEHS)*
- 8:05 Introduction to the Standing Committee—William Farland, *Chair, Standing Committee on Use of Emerging Science for Environmental Health Decisions, Colorado State University*

SESSION 1 YOUR MICROBIOME

- 8:10 Objectives of Workshop—Helmut Zarbl[†], *University of Medicine and Dentistry of New Jersey, Robert Wood Johnson Medical School*
- 8:20 What is the Human Microbiome?—Lita Proctor, *National Institutes of Health, Human Microbiome Project*
- 8:50 Origin and Evolution of the Microbiome—Margaret McFall-Ngai, *University of Wisconsin*
- 9:20 Why is the Microbiome Important in Environmental Health?—Vincent Young, *University of Michigan*
- 9:50 Morning Break

SESSION 2 INFLUENCE OF THE MICROBIOME ON ENVIRONMENTALLY RELATED DISEASES

- 10:00 Microbiome and Obesity—Matam Vijay-Kumar, *Emory University*
- 10:30 Microbiome and Cancer—Johanna Lampe, *Fred Hutchinson Cancer Research Center*
- 11:00 Microbiome and Respiratory Disease—Gary Huffnagle, *University of Michigan*
- 11:30–12:30 Panel Discussion—Jo Handelsman (moderator), *Yale University*; James Goedert, *National Cancer Institute*; Margaret McFall Ngai, *University of Wisconsin*; Session 2 speakers
- 12:30 Lunch

SESSION 3 INTERPLAY OF ENVIRONMENTAL EXPOSURES AND THE MICROBIOME

- 1:30 Resilience and Response to Antimicrobials—Les Dethlefsen, *Stanford University*
- 2:00 Identifying and Characterizing Small Molecules from the Human Microbiota—Michael Fischbach, *University of California, San Francisco*
- 2:30 Environmental Contaminants—Tom Van de Wiele, *University of Gent, Belgium*
- 3:00–4:00 Panel Discussion—John Balbus (moderator), *NIEHS*; Bruce Fowler, *Centers for Disease Control*; Jo Handelsman, *Yale University*; Ivan Rusyn[†], *University of North Carolina, Chapel Hill*; Vincent Young, *University of Michigan*; Session 3 speakers

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

THURSDAY APRIL 28, 2011 (8:30AM–NOON)

SESSION 4 SOCIETAL, RESEARCH, AND PUBLIC POLICY IMPLICATIONS

This session will explore the broad societal implications of microbiome research, as well as science and public policy questions that may arise as a result of research findings. Some discussion questions include:

- Since society's understanding of scientific advances increasingly plays a role in science and public policy decisions, how is public perception of risks being considered in the design and communication of microbiome research?
- How does the absence of the microbiome affect toxicity pathway-based testing in human cell lines? How relevant is the microbiome to the interpretation of in vitro toxicity testing results?
- How does the microbiome fit into defining risk from environmental exposures? Is it simply a potential "modulator" of risk to be considered in the decision making process?

- 8:30 Conceptualizing Risk: Societal and Scientific Considerations—Mildred Cho, *Stanford University*
- 9:00 Panel Discussion—Implications in Environmental Health Decisions Part A: Research
Tina Bahadori[†] (moderator), *American Chemistry Council*; Vincent Cogliano, *U.S. Environmental Protection Agency*; Lisa Chadwick, *NIEHS*; Mildred Cho, *Stanford University*; Akbar Khan, *Department of Defense*; Lita Proctor, *NIH*; Daniel Sharp, *National Institute for Occupational Safety and Health*; Jeanette Thurston, *U.S. Department of Agriculture*
- 10:10 Break
- 10:20 Panel Discussion—Implications in Environmental Health Decisions Part B: Policy
Ellen Silbergeld (moderator), *Johns Hopkins University*; Kerry Dearfield, *U.S. Department of Agriculture*; William Farland[†], *University of Colorado*; Lita Proctor, *NIH*; Rita Schoeny, *U.S. Environmental Protection Agency*; Treye Thomas, *Consumer Products and Safety Commission*
- 11:20 The Microbiome Within a New Framework for Environmental Health—Ellen Silbergeld, *Johns Hopkins University*
- 11:55 Workshop Close—Helmut Zarbl, *UMDJ*

SAVE THESE DATES IN 2011—

- July 27–28 *Mixtures and Cumulative Risk Assessment: New Approaches Using the Latest Science and Thinking About Pathways*
- Sept. 20–21 *To be determined*
- Dec. 8–9 *The Individual Exposome*

