



The Role of Human Exposure Assessment in the Prevention of Environmental Disease

September 22-24, 1999

**Doubletree Hotel
Rockville, MD**

**organized by the
National Institutes of Health
National Institute of Environmental Health Sciences**

Sponsored by
National Institutes of Health/National Institute of Environmental Health Sciences
National Toxicology Program
National Institutes of Health/Office of Rare Diseases
National Institutes of Health/National Cancer Institute
Centers for Disease Control and Prevention/National Institute for Occupational Safety and Health
Centers for Disease Control and Prevention/National Center for Environmental Health
U.S. Environmental Protection Agency/Office of Research and Development
American Industrial Health Council

Workshop Overview

Knowledge of human exposures to agents of potential public health concern is critical for a successful and scientifically sound approach to the evaluation of human health risks resulting from environmental and occupational exposures. This workshop will focus on the exposure-dose-response-disease paradigm and will describe current opportunities and challenges in exposure assessment research, provide usable information on disease-specific chemical exposures that will enhance integration of exposure assessment with epidemiology and toxicology studies, and highlight approaches for further research and the development of effective prevention and intervention strategies. The two and one-half day workshop is structured so that most of the time will be spent in organized breakout sessions on the state of the science and case studies that will gain focus from the plenary sessions. A Workshop Proceedings Report summarizing the workshop and sessions, and report/recommendations from the breakout groups is planned.

Workshop Goals

- Describe current opportunities and challenges in exposure assessment research
- Enhance integration of exposure assessment with epidemiology and toxicology studies
- Define research needs, strategies and funding mechanisms
- Develop partnerships and mechanisms for increasing stakeholder and community input

Who should attend?

Federal grantees, researchers, risk assessors, and policy-makers from universities, Federal agencies, and industry, labor organizations, public advocacy and community groups.

Scientific Organizing Committee

George Lucier, Co-Chair, NIH/National Institute of Environmental Health Sciences

Scott Masten, Co-Chair, NIH/National Institute of Environmental Health Sciences

Gwen Collman, NIH/ National Institute of Environmental Health Sciences

Allen Dearry, NIH/ National Institute of Environmental Health Sciences

Gayle DeBord, CDC/National Institute for Occupational Safety and Health

Lynn Goldman, Johns Hopkins University and NIH/National Institute of Environmental Health Sciences

Bernard Goldstein, UMDNJ/Environmental and Occupational Health Sciences Institute

Judith Graham, US Environmental Protection Agency

John Groopman, Johns Hopkins University

Bryan Hardin, CDC/ National Institute for Occupational Safety and Health

La Sonya Harris Hall, NIH/ National Institute of Environmental Health Sciences

Carol Henry, Chemical Manufacturer's Association

Jane Hoppin, NIH/ National Institute of Environmental Health Sciences

Kumiko Iwamoto, NIH/National Cancer Institute

Freja Kamel, NIH/ National Institute of Environmental Health Sciences

Michael Lebowitz, University of Arizona

Paul Lioy, UMDNJ/Environmental and Occupational Health Sciences Institute

Laurie Piacitelli, CDC/ National Institute for Occupational Safety and Health

Leonard Sauers, Procter and Gamble

Ken Sexton, University of Minnesota

Thomas Sinks, CDC/National Center for Environmental Health

John Spengler, Harvard University

Preliminary Workshop Program

Wednesday, September 22

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| 7:30 AM | Continental Breakfast Registration |
| 8:45 AM | Welcome <i>Dr. Kenneth Olden, NIEHS</i> |
| 9:00 AM | Opening Remarks: Human Exposure Assessment and Environmental Disease <i>Dr. Samuel Wilson, NIEHS</i> |
| 9:15 AM | Workshop Charge: Utility and Applications of Exposure Assessment <i>Dr. George Lucier, NIEHS</i> <i>Dr. Scott Masten, NIEHS</i> |
| 9:30 AM-12:15 PM | Plenary Session I: Exposure Assessment in Perspective <i>Chair: Dr. Noorine Noonan, USEPA</i> |
| 9:30 AM | Exposure Assessment: Present and Future <i>Dr. Paul Liroy, UMDNJ, EOHHSI</i> |
| 10:15 AM | Break |
| 10:45 AM | Human Exposure Assessment: Challenges and Opportunities for Improving the Linkage between Exposure and Disease <i>Dr. Howard Hu, Harvard University</i> |
| 11:30 AM | Exposure Assessment: Regulatory and Legislative Issues <i>Dr. Lynn Goldman, Johns Hopkins University and NIEHS</i> |
| 12:15 PM | Lunch |
| 1:30 PM-3:30 PM | Plenary Session II: Emerging Issues in Exposure Assessment <i>Chair: Dr. John Spengler, Harvard University</i> |
| 1:30 PM | Sensitive Populations at Risk <i>Dr. Philip Landrigan, Mt. Sinai School of Medicine</i> |
| 2:10 PM | Gene-Environment Interactions: Bringing Together Molecular Epidemiology and Exposure Assessment <i>Dr. John Groopman, Johns Hopkins University</i> |
| 2:50 PM | Disease Prevention and Intervention: Role of Exposure Assessment <i>Dr. Richard Jackson, NCEH</i> |
| 3:30 PM | Break |
| 4:00 PM-5:30 PM | Plenary Session III: Some Federal Initiatives in Exposure Assessment <i>Chair: Dr. Ken Sexton, University of Minnesota</i> |
| 4:00 PM | National Human Exposure Assessment Survey (NHEXAS): Opportunities and Lessons Learned <i>Dr. Judith Graham, USEPA</i> |
| 4:30 PM | A National Occupational Exposure Survey: Planning and Implementation <i>Dr. DeLon Hull, NIOSH</i> |
| 5:00 PM | National Health and Nutrition Examination Survey (NHANES): A National Biomonitoring Strategy <i>Dr. Larry Needham, NCEH</i> |
| 5:30 PM- 7:30 PM | Poster Session and Reception |

Thursday, September 23

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| 7:30 AM | Continental Breakfast Registration |
| 8:30 AM- 5:30 PM | Breakout Group Sessions (concurrent) Group 1: Aggregate and Cumulative Exposure and Risk Assessment Group 2: Disproportionate Exposures and Disease Impact Group 3: Assessing Environmental Influences on Children's Health Group 4: Integrating Exposure, Dose, Response, and Susceptibility Group 5: Exposure Assessment in Occupational and Environmental Epidemiology |
| 8:30 AM | Introduction and Charge <i>Breakout Group Chairs</i> |
| 8:40 AM | Breakout Group Presentations and Discussion |
| 10:00 AM | Break |
| 10:30 AM | Breakout Group Presentations and Discussion continued |
| 12:00 PM | Lunch |
| 1:30 PM | Breakout Group Presentations and Discussion continued |
| 3:00 PM | Break |
| 3:30 PM | Breakout Group Presentations and Discussion continued |

Friday, September 24

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| 7:30 AM | Continental Breakfast Registration |
| 8:00 AM | Public Comments |
| 9:15 AM-1:15 PM | Plenary Session IV: Conclusions <i>Dr. George Lucier, NIEHS</i> |
| 9:15 AM | Closing Address: A Public Health Perspective <i>Dr. Bernard Goldstein, UMDNJ, EOHSI</i> |
| 10:00 AM | Break |
| 10:30 AM | Conclusions and Recommendations <i>Summary of Plenary Sessions Breakout Group Reports Open Discussion</i> |
| 1:00 PM | Wrap-Up and Closing Remarks <i>Dr. George Lucier, NIEHS</i> |
| 1:15 PM | Workshop Adjourns |

Breakout Group Sessions

The breakout sessions will involve approximately 20 invited participants with participation open to all workshop registrants in attendance. Each session will consist of short introductory presentations highlighting important issues specific for each of the five breakout groups and brief presentations of case examples that illustrate key issues for discussion. The session chairs will develop and lead an organized roundtable discussion focused on discussion topics defined in advance. The breakout groups discussions will be synthesized at the end of the day and prepared for presentation on the following day. The specific format and content of the breakout sessions as well as supporting background materials will be made available to all workshop registrants upon arrival.

1-Aggregate and Cumulative Exposure and Risk Assessment

Co-Chairs: Dr. Clifford Weisel, UMDNJ, EOHHSI; Dr. Edo Pellizzari, Research Triangle Institute; Dr. Joseph Jacobson, Wayne State University; Dr. George Lucier, NIEHS

To achieve scientifically credible and realistic exposure and risk assessments, exposure to harmful agents from all possible sources, through all possible routes, and to agents within a chemical class or of structural similarity which may exert their toxic effects via a similar mode of action must be considered. Chemicals acting by different toxicological mechanisms to produce a similar response or adverse health effect and common co-exposures are also important to consider for risk assessment, but for this scenario, an integrated assessment of exposure and risk is far more complex. This session will focus on some of the key issues involved in both aggregate exposure and risk assessment and cumulative exposure and risk assessment.

Discussion Topics

Aggregate Exposure and Risk Assessment

- Conceptual Framework for Aggregate Exposure Assessment
- Strategies and Design Issues
- Identify gaps that currently prevent the preparation of technically robust aggregate exposure assessments
- Define the research needed to fill these gaps

Cumulative Exposure and Risk Assessment

- How can we determine whether two agents operate through a common mechanism of action?
- When several agents affect a common endpoint, how can we determine the degree to which each is responsible for the observed effect?
- How can cumulative exposure be quantified given that the units of measurement will be different for each substance?
- How can toxicological and epidemiological studies be designed to improve our capacity to evaluate cumulative exposures?

2-Disproportionate Exposures and Disease Impact

Co-Chairs: Dr. Allen Dearry, NIEHS; Dr. George Friedman-Jimenez, New York University

A number of factors, including access to and quality of health care, nutrition, lifestyle, occupation, education, and socioeconomic status (SES), all may contribute to the present disparities in disease prevalence and health in particular populations. Many of the above have been linked with the gradient in SES that currently exists in this country. This SES gradient may in some instances lead to disproportionate exposures that some populations may experience, e.g., as a result of living conditions, siting of chemical manufacturing/processing facilities, or employment in occupations where disproportionately higher exposures to hazardous substances may occur. An assessment of exposure situations contributing to health disparities as well as intervention strategies is planned for this

breakout session. This will allow for development of scientifically credible approaches for evaluating disproportionate exposures in affected communities and assessing their contribution to observed disparities in health.

Discussion Topics

- What strategies can be used to document and identify causes of disproportionate exposures and/or disproportionate disease risk in community-based studies?
- How can excess risk be reduced?
- Do traditional epidemiologic or clinic-based approaches work when trying to document disproportionate exposures and a linkage to risk/adverse health outcome?
- How can such studies be improved using current exposure assessment methodology?

3- Assessing Environmental Influences on Children's Health

Co-Chairs: Dr. Steven Galson, USEPA; Dr. Elaine Faustman, University of Washington; Dr. Lynn Goldman, Johns Hopkins University and NIEHS

Both biological attributes and physical behaviors of children make them uniquely susceptible to potential adverse health effects from environmental exposures. This session will focus on the susceptibility of children from the perspective of increased responsiveness to a given dose, increased exposure and dose, and study approaches utilized to address these issues. Three focus areas will form the basis for discussion during this session:

- 1) Susceptibility related to differential sensitivity.** Developing systems or disease states can make a child more responsive than an adult, even with similar delivered doses.
- 2) Susceptibility related to differential exposure and/or dose.** Children's exposures differ from adults in many ways because of differences in behaviors impacting known or suspected exposure pathways, microenvironments, and pharmacokinetics.
- 3) Approaches to investigating exposures of children.** The investigation of exposure and health outcomes in children presents special challenges, with the greatest difficulties occurring at the earliest ages.

Discussion Topics

- Critical windows of exposure
- Routes and pathways of exposure
- Biologically relevant exposure measurements
- Important endpoints to consider when performing exposure-effect studies in children

4- Integrating Exposure, Dose, Response, and Susceptibility

Co-Chairs: Dr. Martyn Smith, University of California-Berkeley; Dr. Generosa Grana, Fox Chase Cancer Research Center

The risk of an adverse health outcome after exposure to environmental agents is a function of the type, magnitude, duration and pattern of exposure but also of individual susceptibility to the exposure in question. In addition to factors such as age, nutrition, and socioeconomic status, genetic makeup plays a key role in individual susceptibility. A number of gene products have been found to influence the distribution or metabolism of chemical agents leading to individual variation in internal dose to the target tissue (pharmacokinetics). The spectrum of biological response leading to pathology (pharmacodynamics) is also genetically determined and would be expected to vary between individuals. In a few cases, linkage between expression of variant gene products in the population and individual differences in pharmacokinetics, pharmacodynamics, or the risk of disease have been established. This session will focus on a number of issues relevant to integrating exposure information, biological measures of dose, biological response, and genetic susceptibility from both population-based studies and animal models to improve estimates of risk.

Discussion Topics

- Relating exposure to dose and dose to response
- Incorporating susceptibility into exposure-dose and dose-response models
- Linking genetic polymorphisms with gene function and relevant exposures
- Genetic variation in exposure-dose and dose-response as a determinant of risk
- Interaction of increased exposure and increased sensitivity in specific populations

5-Exposure Assessment in Occupational and Environmental Epidemiology

Co-Chairs: Dr. Kyle Steenland, NIOSH; Dr. Jonathan Samet, Johns Hopkins University

Occupational and environmental studies represent two approaches to studying associations between exposure to toxic agents and human health effects. An adequate and accurate assessment of exposure to the agent(s) in question is essential for establishing associations (or lack thereof) between exposure and health endpoints. The two types of studies deal with different populations, exposures that differ in route and magnitude, and different sources and types of information. Thus the approaches used to assess exposure in the two types of studies differ in some ways and are similar in others. This breakout session will compare and contrast the two types of studies for the purpose of developing strategies that can enhance the utilization of both in environmental health research. Three case studies will be used as examples: arsenic, diesel exhaust particulates, and radon.

Discussion Topics

- What are the similarities and differences in assessing exposure in occupational and environmental studies?
- What are the advantages and limitations of each study type for relating exposure to health outcomes?
- What tools have been developed in occupational studies that can be applied to environmental studies, and vice versa?
- What difficulties are encountered in extrapolating from high to low exposure scenarios? And from workers to the general population?

Public Comment Session

This session will provide an opportunity for attendees who wish to contribute to the workshop deliberations time to comment. To allow sufficient time for all that wish to participate, oral comments will be limited to five minutes. Interested individuals must notify us in advance so time can be allotted.

Written comments may also be provided and should be submitted to NIEHS, Attention: Anna Lee Sabella, MD A3-02, P.O. Box 12233, Research Triangle Park, NC 27709. **Written statements/comments must be received by September 10, 1999, in order to be distributed and considered during the workshop.**

Call for Posters

A poster session will facilitate further discussion and examination of topics related to the current scientific understanding of the role of human exposure assessment in the prevention of environmental disease, and allow researchers an opportunity to present the results of their most recent studies. The poster session will be held on Wednesday evening, September 22. Due to limited space, only a certain number of posters will be accepted for presentation. If you are interested in presenting a poster, please check the response on the registration form. Abstract submission and poster instructions will be mailed to you. **The deadline for receipt of abstracts is Tuesday, September 7, 1999.**



Accommodations

Hotel reservations can be made directly with the Doubletree Hotel (301) 468-1100 or 1-800-222-8733. A block of rooms is being held through August 31, 1999. Reservations made by this date will receive a rate of \$159.00 (single occupancy), and \$179.00 (double occupancy). Room rates are subject to applicable state and local taxes (currently 12% per room night) in effect at the time of check-in. Identify all reservations with the National Institute of Environmental Health Sciences group code **E302**. For a list of alternate accommodations in the Rockville area, please call Anna Lee Sabella at 919/541-4982.

Travel Information

The Doubletree Hotel is located at 1750 Rockville Pike, Rockville, Maryland, just north of the Washington, DC Capital Beltway, and one-half block from the Twinbrook Station stop (Red Line) of the Metro, Washington's rapid rail transit system offering connections to Ronald Reagan National Airport and the surrounding area. Baltimore-Washington International Airport and Dulles International Airport also service this area. Private Sedans, Inc. offers transportation to and from the area airports. For fares and reservations call 301/460-7644 or 800/877-7644.

Registration

Please mail your registration with check, no later than September 10, 1999 to:

NIEHS
"Exposure Assessment Workshop"
MD: A3-02
P.O. Box 12233
Research Triangle Park, NC 27709
Fax: (919) 541-0295

Registration Fee: \$75.00 (US)
Check, cashier check or money order
made payable to:
NIEHS Scientific Conferences

Registrations sent by fax will not be confirmed until payment is received. No refunds will be issued after September 10; however, the registration may be transferred to a colleague with written notification to NIEHS.

(Please type or print clearly)

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For questions or additional information contact Anna Lee Sabella by telephone at 919/541-4982 or e-mail to sabella@niehs.nih.gov

Breakout Session Selection

Please rank your first and second choice selections for attendance at the various breakout sessions. Attempts will be made to honor your selections although assignments to these sessions will be subject to space availability.

CONCURRENT SESSIONS (Thursday, September 23, 1999)

- Aggregate and Cumulative Exposure and Risk Assessment
- Disproportionate Exposures and Disease Impact
- Assessing Environmental Influences on Children's Health
- Integrating Exposure, Dose, Response and Susceptibility
- Exposure Assessment in Occupational and Environmental Epidemiology

Public Comment Session

I wish to participate: _____
(Limited to 5 minute oral presentation)

Poster Session

Yes, I am interested in presenting a poster: _____

Tentative Title: _____
