



Project Summary

Environmental Epidemiology: The Importance of Exposure Assessment

This project summary presents an overview of a 1985 symposium on exposure measurement and evaluation methods for epidemiology cosponsored by the American Chemical Society (ACS) and the United States Environmental Protection Agency (EPA).

Entitled: "Environmental Epidemiology: The Importance of Exposure Assessment," the symposium was organized by the ACS' Division of Environmental Chemistry, and the EPA's Health Effects Research Laboratory. Held in Chicago on September 8-13, 1985, at the 190th ACS national meeting, the symposium presented papers by more than fifty distinguished scientists representing academia, government and industry in the U.S., Europe and Africa.

After a brief assessment of the need for such a symposium and a statement of its intent, this project summary identifies the subject material and the affiliation of the authors. The symposium proceedings have been published and their availability is described in the paragraph immediately below.

This Project Summary was developed by EPA's Health Effects Research Laboratory, Research Triangle Park, NC, to announce key findings of the research project that is fully documented in a separate report of the same title (see Project Report ordering information at back).

Introduction

Epidemiology studies are a valuable tool for assessing the effects of chemical exposure in humans. While they cannot directly prove a cause-and-effect

relationship, they can demonstrate an association between environmental exposure to chemical(s) and observed health effects in the exposed groups. The strength of the association demonstrated depends on how accurately exposure of the groups can be assessed. Unfortunately, most of the exposure measurement and assessment work currently being conducted is of limited value for use in epidemiology studies; rather, current exposure research is directed towards developing methods for detecting toxic chemicals in biological samples (as opposed to living people) or demonstrating that specific source results in exposure (but not quantifying that exposure). The purpose of the symposium is to bring together epidemiologists, chemists, and mathematical modelers so that they can gain insight into each other's needs and capabilities, thus resulting in research projects that will allow the exposure of subjects in epidemiologic studies to be more accurately assessed. This progress in epidemiology is essential to enable scientists to elucidate the risk of chemical exposure incurred by human beings without the uncertainty of interspecies extrapolation.

Epidemiology studies are also important in the regulatory process because the results are necessary to elucidate the risk of human chemical exposure incurred by human beings without the uncertainty of interspecies extrapolation. Because the EPA is required to develop regulations under six separate legislative acts, these studies are usually conducted to provide information for esti-

mation of risk of exposure through a given route or from a specific source.

Case-control and cohort studies can provide a quantitative estimate of health risk association with various environmental exposures, but it is often difficult to assess relevant exposures for individuals, because retrospective epidemiologic studies require estimates of past exposure which must be made in light of current information. While it is important to fully understand the sources, routes, and extent of exposure of individuals to environmental toxicants, obtaining such knowledge about the population included in an epidemiology study may not be practical and may not be achievable in all cases. Prospective studies can be designed in which exposure measurements are included as part of the study, but these studies are generally not feasible because of the high costs of following a cohort for a long period to determine associations between exposure and an observed health effect.

It is important that the exposure data collected for epidemiologic studies be relevant and appropriate for both the study design and regulatory needs. The accurate measure or assessment of exposure is paramount because random misclassification of exposure for study participants can only bias the outcome of the study toward one or no association between exposure and disease. Most epidemiologic studies have assumed that exposure to a contaminant is an adequate surrogate of the dose. A major limitation of past studies has been lack of information on dose, e.g., the amount of the contaminant or metabolite in body tissue or the amount that interacts with the target organ or tissue. Biologic markers of cumulative dose would assist in improving the sensitivity of epidemiologic studies, and should be considered, whenever possible, to supplement the data collected on exposure to environmental contaminants.

Symposium Papers and Contributors

Chapter in Proceedings

Section I: Use of Biological Monitoring to Assess Exposure

1. Detection of Aflatoxin B₁ Guanine Adducts in Human Urine Samples from Kenya, *Lars O. Dragsted, Johnston Wakhisi, and Herman Autrup*

2. Assessment of Human Exposure to Chemicals Through Biological Monitoring, *Alfred M. Bernard and Robert R. Lauwerys*
3. The Monitoring of Exposure to Carcinogens by the GC-MS Determination of Alkylated Amino Acids in Hemoglobin and of Alkylated Nucleic Acid Bases in Urine, *Peter B. Farmer, David E. G. Shuker, Eric Bailey*
4. Determining DNA Adducts by Electrophore Labeling-GC, *Roger W. Giese*
5. Quantification of Tissue Doses of Carcinogenic Aromatic Amines, *Paul L. Skipper, Matthew S. Bryant, and Steven R. Tannenbaum*

Section II: Epidemiologic Considerations for Assessing Exposure

6. The Feasibility of Conducting Epidemiologic Studies of Populations Residing Near Hazardous Waste Disposal Sites, *Gary M. Marsh and Richard J. Caplan*
7. Feasibility Study to Relate Arsenic in Drinking Water to Skin Cancer in the United States, *Julian B. Andelman and Margot Barnett*

Section III: Health and Exposure Data Bases

8. Use and Misuse of Existing Data Bases in Environmental Epidemiology: The Case of Air Pollution, *Peter Gann*
9. Opening and Controlling Access to Medicare Data, *Glenn J. Martin*
10. Drinking Water Quality Data Bases, *Nancy W. Wentworth, James W. Westrick, and Kaiwen K. Wang*
11. The FDA Total Diet Study Program, *Pasquale Lombardo*
12. Overview of EPA Major Air Data Bases, *David W. Armentrout*
13. National Database on Body Burden of Toxic Chemicals, *Philip E. Robinson, Cindy R. Stroup, Anna S. Hammons, M. Virginia Cone, C. Donald Powers, Marialice Ferguson, and Herman Kraybill*
14. Broad Scan Analysis of Human Adipose Tissue from the EPA FY 82 NHATS Repository, *John S. Stanley, Kathy E. Boggess, John E. Going, Gregory A. Mack, Janet C. Remmers, Joseph J. Breen, Frederick W. Kutz, Joseph Carra, and Philip E. Robinson*

Section IV: Assessment of Exposure to Environmental Contaminants For Epidemiologic Studies

Part One: Air Exposures

15. Results from the First Three Seasons of the TEAM Study: Personal Exposures, Indoor-Outdoor Relationships, and Breath Levels of Toxic Air Pollutants Measured for 355 Persons in New Jersey, *Lance A. Wallace, Edo D. Pellizzari, Ty D. Hartwell, Charles M. Sparacino, Linda S. Sheldon, and Harvey Zelon*
16. Inhalation Exposures in Indoor Air to Trichloroethylene from Shower Water, *Julian B. Andelman, Amy Couch, and William W. Thurston*

Part Two: Water and Occupational Exposures

17. Drinking Water Characteristics and Cardiovascular Disease in a Cohort of Wisconsin Farmers, *Elaine Zeighami, Gunther F. Craun, and Charlotte A. Cottrill*
18. Empirical Estimation of Exposure in Retrospective Epidemiologic Studies, *Charles E. Lawrence and Philip R. Taylor*
19. Evaluation of Lead Exposures in the Environment and Their Contribution to Blood Levels in Children, *Daniel Greathouse*
20. The Use of Industrial Hygiene Data in Occupational Epidemiology, *Robert F. Herrick and Larry J. Elliot*

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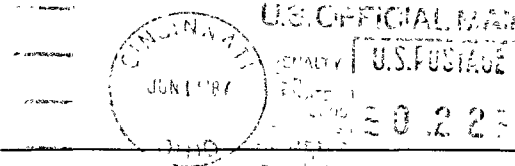
The complete report, entitled "Environmental Epidemiology: The Importance of Exposure Assessment," (Order No. PB 87-132 866/AS; Cost: \$24.95, subject to change) will be available only from:

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