

10565- Lessons Learned from the National Human Exposure Assessment Survey (NHEXAS)

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Three NHEXAS Studies were conducted from 1995-1997 to evaluate total human exposure to multiple chemicals on community and regional scales. EPA established cooperative agreements with three Consortia to conduct three interrelated NHEXAS field studies. The University of Arizona, Battelle Memorial Institute, and the Illinois Institute of Technology studied several hundred Arizona residents. Several hundred participants from EPA Region 5 were studied by Research Triangle Institute and the Environmental and Occupational Health Sciences Institute. In a third study, Harvard University, Johns Hopkins University, Emory University, Southwest Research Institute, and Westat studied 80 Maryland residents. Interagency Agreements were established with the Centers for Disease Control and Prevention, the Food and Drug Administration, and the National Institute for Standards and Technology for biomarker and environmental analyses. Volunteer participants were randomly selected from each of three areas of the country to obtain a population-based probability sample. Scientists measured the levels of a suite of chemicals to which participants were potentially exposed in air, foods, beverages, soil, and dust. Measurements were made of chemicals or their metabolites in biological samples, including blood and urine. Participants completed questionnaires to help identify possible sources of exposure and to characterize themselves, their activity patterns, and the home environment. As a follow-up to the NHEXAS Studies, a Workshop was held in 2001 to: 1) document the experiences and lessons learned for use in designing and implementing future studies; 2) assess the feasibility of approaches for conducting NHEXAS-type studies and measurements on representative samples of the population and subpopulations; and 3) assess the adequacy of methods, approaches, and designs to collect data for multiple pathways/routes of exposures for multiple pollutant classes. Participants included individuals from the Consortia, EPA, and other federal agencies. Extensive interviews were conducted with participants before the Workshop to help serve as a basis for discussion. Highlights of lessons learned, as discussed at the Workshop, include:

Large-scale population-based exposure studies can be planned, designed, coordinated, resourced, and logistically implemented.

Relevant exposure samples and corresponding metadata can be collected to characterize aggregate exposures for key species for selected ages and lifestyles.

The scientific community (federal agencies, universities, states, communities, contractors) can work together efficiently and effectively to plan and conduct studies.

High percentages of samples can be successfully collected and analyzed for most media.

Cooperative agreements can be appropriate funding mechanisms to support research.

The extensive documentation developed and evaluated (e.g., Standard Operating Procedures, methods, databases) will be very useful for designing and conducting field studies.

Results will be useful to develop future hypotheses and answer many current science issues.

Lessons learned and areas for improvement in project leadership, study design, survey operations, field sampling, analytical laboratories, database issues, and quality assurance will be presented, along with recommendations for future studies.

This work has been funded wholly by the U.S. EPA under contracts with University of Arizona (1D-5008NATX, 1D5010-NATX, 0D-5929-NATX), Battelle Memorial Institute (0D-5928-NANX), Research Triangle Institute (1D-5015-NANX), Environmental and Occupational Health Sciences Institute (0D-5925-NATX), Emory University (1D-5013-NAEX), Southwest Research Institute (0D5927-NANX), and Westat (1D-5012-NALX). It has been subjected to Agency review and approved for publication.

11116- Identification of Research Gaps in Microenvironment Modeling and Exposure

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The purpose of this research is twofold: design an overarching framework that is comprehensive, logical, and useful for industrial needs; and within that framework identify research needs based on gap and sensitivity analyses. The overarching framework, called the Comprehensive Chemical Exposure Framework, will be used to house models, algorithms and databases associated with micro-environmental exposure modeling. The research needs are defined for representative high volume compounds that could be involved in exposure scenarios. These exposure scenarios were used to guide the types of models, algorithms, and databases required to evaluate each scenario. Model and Process Flow Diagrams were developed for each exposure scenario and research gaps were identified based on publicly available information. Once the gap analysis was completed for the source, transport, exposure, and health impact components of each scenario, a qualitative sensitivity of the entire system was conducted. The Gap Analysis focused on reviewing the Process Flow Diagrams that had been developed to properly evaluate each of the four example exposure scenarios to identify models, algorithms, and databases that were missing or unknown. This was done for the Source, Transport, Exposure, and Impacts components of the exposure scenarios. In some cases, models existed but they were determined to be too simplistic or conservative and were considered a research gap. In these cases, alternative paths were explored to determine the type of model or algorithm required to fill the research gap. A qualitative Sensitivity Analysis was also performed on the models and algorithms identified for the various compounds and exposure scenarios. This was conducted on the four modeling components using the following guidelines:

1. Models associated with the primary exposure pathway were believed to introduce more sensitivity than those on secondary exposure pathways
2. Missing models and databases were considered a high priority
3. Inaccurate models were ranked as a high priority
4. Models of lesser compatibility in temporal and spatial scales with the other models were considered a high priority

The Gap and Sensitivity Analyses provide guidance on what research should be conducted in the near future to improve the risk estimates from exposure to high volume compounds. Improvements that have been identified include source models to better characterize the release of vapors into the environment and resuspension of contaminated particulates that can impact small children and pregnant mothers. The lack of physiologically based pharmacokinetic models for most compounds and human life stages (i.e., embryo, fetus, neonate, geriatrics, and pregnant mothers) is a major gap that is slowly being filled. The complications of smoking (and other life-style choices) and exposure to mixtures of compounds also need more research to understand their impacts on human health. Accurate toxicity and health impact data continue to be in demand for detailed exposure assessments. This work was done for the American Chemistry Council in support of micro-environmental exposure modeling.