ATSDR’S EXPOSURE-DOSE RECONSTRUCTION PROGRAM
PROGRAM SUMMARY

History
The Agency for Toxic Substances and Disease Registry (ATSDR), a U.S. Public Health Service agency, established the Exposure-Dose Reconstruction Program (EDRP) in March 1993. Because direct measures of exposure and dose, especially historical exposures, are often unavailable to health assessors and health scientists, the agency embarked on a coordinated, comprehensive effort to develop sensitive, integrated, science-based methods for exposure-dose characterization. The agency's EDRP coordinates relevant intramural and extramural projects covering environmental, geochemical, epidemiological, and biomedical disciplines.

Goal and Objectives
For its purposes, ATSDR defines exposure-dose reconstruction as an approach that uses computational models and other approximation techniques to estimate cumulative amounts of hazardous substances internalized by persons at presumed or actual risk from contact with substances associated with hazardous waste sites. Although the emphasis of the program is on estimating past exposures, ATSDR also uses direct personal space and biologic sampling to determine current exposure levels. These direct exposure methods complement the EDRP.

The goal of the EDRP is to enhance the agency's capacity to assess exposure and dose (with special emphasis on characterizing past exposures) to better support health assessments and consultations, health studies, and exposure registries. To achieve this goal, two objectives are developed by the EDRP: (1) to significantly enhance the agency's ability to understand and use existing science-based methods and tools to assess past and current exposure and dose, and (2) to encourage developing new and improved technologies and methods that can be used by agency and non-agency scientists.
**Partners**

Since its inception, the EDRP has applied the philosophy of agency capacity building and enhancement through partnerships with federal, state, and local government agencies, academic institutions, and private concerns. Examples of partners that the EDRP has cooperated with and, in some instances, funded are listed below:

- ATSDR, Division of Health Assessment and Consultation
- ATSDR, Division of Health Studies
- CDC, National Center for Environmental Health
- CDC, Office of the Director, Office of Health and Safety
- Environmental Protection Agency, Water Resources Division
- U.S. Geological Survey
- U.S. Department of Defense
- U.S. Marine Corps
- Massachusetts Department of Public Health
- New Jersey Department of Health and Senior Services
- Oregon Health Division
- State of Connecticut, Attorney General’s Office
- Citizens Action Committee on Childhood Cancer Clusters
- Multimedia Environmental Simulations Laboratory, Georgia Institute of Technology

**Capability and Expertise**

Through intramural and extramural funding, the EDRP assists ATSDR by enhancing the agency’s capability in the areas of environmental health and exposure assessment. The EDRP draws on wide-ranging expertise for these analyses. Capabilities include:

- Environmental fate and transport analyses
  - Groundwater
  - Surface water
  - Soil and air
- Water-distribution system analyses
  - Field-data collection and system monitoring
  - Model calibration and historical reconstruction of system operations
- Numerical analyses
  - Uncertainty analysis (Monte Carlo simulation, fuzzy math)
  - Genetic algorithm (GA) optimization
- Computational software and graphical user interface development
- GIS and spatial analysis technologies
Staff Qualifications

The EDRP relies on agency staff uniquely qualified to conduct public health analyses and exposure assessment studies. The EDRP has conducted studies that range from technical assistance consultations to developing state-of-the-art computational analyses. Using extramural funding as a means of enhancing the EDRP capabilities, professional relationships have been developed with nationally and internationally recognized experts through the implementation and use of cooperative and interagency agreements. Through the use of intramural funding, the EDRP has supported a number of graduate-level students through the Oak Ridge Institute for Science and Education (ORISE), as well as other agency staff in the pursuit of advanced academic degrees. Below is a listing of staff associated with the EDRP. Some staff have directly contributed to the success of the EDRP, while other staff have used the products and services of the agency’s EDRP. Academic credentials and areas of expertise are also noted:

- Barbara A. Anderson, MSEnvE, P.E., ATSDR, Environmental Health Scientist, Environmental Science and fate and transport modeling
- Mustafa M. Aral, Ph.D., P.E., Georgia Institute of Technology — Fate and transport analysis, numerical methods
- Robert E. Faye, MSCE, P.E., Eastern Research Group, Inc., — hydrogeology and numerical modeling
- Walter M. Grayman, Ph.D., P.E., W.M. Grayman Consulting Engineer — Water-distribution systems
- Morris L. Maslia, MSCE, P.E., ATSDR — Project Officer, Environmental fate and transport
- Jason B. Sautner, MSCE, ATSDR, Environmental Health Scientist — Water resources management and numerical modeling
- Rene Suárez-Soto, MSCE, ATSDR, Environmental Health Scientist — Environmental science and numerical modeling

Examples of Research and Applications

The EDRP conducts theoretical and applied research in areas of exposure assessment, environmental health, environmental fate and transport modeling, and numerical analysis. Additionally, EDRP staff develop workshops and present graduate-level courses at universities on the aforementioned areas of research. EDRP analyses have also been used and applied to numerous sites at which ATSDR is involved. Selected examples of EDRP research and applications include:
• Study of childhood birth defects and cancer at U.S. Marine Corps Base Camp Lejeune, NC
• Dover Township (Toms River), New Jersey, water-distribution modeling, support of epidemiologic investigation of childhood cancer
• Probabilistic analysis of pesticide transport at Oatland Island, Georgia
• Osborn Connecticut Correctional Institution, Somers, Connecticut—groundwater modeling, PCE contamination
• Solvents Recovery Services of New England, Southington, Connecticut—water-distribution system modeling, VOC contamination
• Newtown, Gainesville, Georgia—air dispersion modeling, arsenic contamination
• Brush Wellman, Elmore, Ohio—air dispersion modeling, beryllium contamination
• Exposure Investigations short course, ATSDR, March 1999
• Analytical contaminant transport analysis system software (ACTS) workshop, ATSDR, June 1999
• Quantitative exposure assessment, Autonomous University of San Luis Potosi, Mexico, May 2003
• Environmental and occupational hazards II (EOH 541), Emory University, January–May 2000, 2001, 2002

Publications
The research conducted by the EDRP has been published in peer-reviewed internal and external publications. Some examples are listed below:


**Awards**

The research conducted by the EDRP and its staff has been recognized for its excellence and contributions to the fields of environmental health and exposure assessment by being cited for scientific and literary awards. Listed below are several awards given to EDRP staff and its scientific publications:

U.S. Public Health Service Engineering Literary Award (Publications Category) for the publication: *Analytical Contaminant Transport Analysis System (ACTS)—Multimedia Environmental Fate and Transport*, June 2005


Assistant Administrator's Award for Special Service to ATSDR, June 2002

Cummig Award, American Society of Military Engineers, 2000 to the Dover Township Water-Distribution System Modeling Team.


Agency for Toxic Substances and Disease Registry, Science Award, 1998
U.S. Public Health Service Engineering Literary Award (Publications Category) for the publication: “Exposure Assessment Using Analytical and Numerical Models: Case Study,” May 1998

U.S. Public Health Service Engineering Literary Award (Publications Category) for the publication: “Estimating Exposure to VOCs from Municipal Water System Pipelines: Use and Application of a Computational Model,” May 1996

**Contact Information**

For additional information on the EDRP or to obtain copies of its publications, contacts are listed below. Information and some publications are also available over the Internet.

Morris L. Maslia, MSCE, P.E., DEE
Project Officer
Agency for Toxic Substances and Disease Registry
1600 Clifton Road, Mail Stop E-32
Atlanta, Georgia 30333
Phone: (404) 498-0415
Fax: (404) 498-0069
Email: mmaslia@cdc.gov
Web: [http://www.atsdr.cdc.gov](http://www.atsdr.cdc.gov)

Mustafa M. Aral, Ph.D., P.E.
Director
Multimedia Environmental Simulations Laboratory
School of Civil and Environmental Engineering
Georgia Institute of Technology
Atlanta, Georgia 30332
Phone: (404) 894-2243
Fax: (404) 894-5111
Email: maral@ce.gatech.edu
Web: [http://ce.gatech.edu/research/MESL](http://ce.gatech.edu/research/MESL)

Last updated: 26 October 2007