N E W S

L E T T E R

CRESP UPDATE: SAVANNAH RIVER

Vol. 2 No. 3
May 1997

INSIDE

CRESP UPDATE: SAVANNAH RIVER

CRESP Headquarters:
EOHSI
UMDNJ/RU
Charles Powers, PhD
Executive Director
681 Frelinghuysen Road
Piscataway, NJ 08855-1179
Phone: 908-445-0520
Fax: 908-445-0959

CRESP West:
University of Washington
Department of Environmental Health
PO Box 354695
Seattle, WA 98195
Phone: 206-543-9394
Fax: 206-616-4875

RISK IN THE YEAR 2000

by Lynn Waishwell, Ph.D.

What will the level of exposure to radiation and chemicals be for a family who lives near SRS in the year 2000? Will it be the same for the mother, father and children?

The answer to these questions will be provided by a new computer-based system from the Exposure Assessment Task Group in CRESP-East. The Exposure/Dose Modeling and Analysis System, EDMAS, is a computer-based framework which uses mathematical models to predict the level of exposure and dose of certain contaminants. Using data and information from many sources, this Task Group predicts potential exposures for workers and people who live near the site. The contaminants currently under investigation are cesium, strontium, tritium, several heavy metals and certain volatile organics. These specific contaminants were selected because stakeholders find them of particular interest. Other contaminants and other potential exposure pathways will be included in the development of the model based upon concerns and new information provided by the local stakeholders. This interaction with local stakeholders is extremely meaningful to the Task Group as integrating local concerns and information make the EDMAS more exact in predicting contaminant exposure levels.

The purpose of EDMAS is to help understand the pattern of exposure of a contaminant by tracking it from its source to the actual dose an individual may receive. Many factors must be considered. The pathways by which the contaminant moves from one point to another, such as air or water, the nature of the contaminant, and many other factors influence the amount of exposure. The Exposure Assessment Task Group has focused on the movement of contaminants through groundwater, but all possible methods of movement are incorporated into the framework. EDMAS describes not only the level of exposure, but also estimates the dose people receive. Specific traits of individuals like age, race and gender affect the amount of contaminant that actually is absorbed into the system. By incorporating hundreds of factors in describing exposures for contaminants of concern, EDMAS provides a means of supporting accurate estimates of risks to workers and community members.

EDMAS will be used to predict levels of exposure for many different situations. For example, the amount of exposure to contaminants for workers and local inhabitants will be anticipated for remediation techniques. The major benefit of EDMAS is understanding the level of exposures to contaminants. This is a great help in decision-making about the future actions at DOE facilities. EDMAS also can predict the pattern of future contaminant dispersal of contaminants through ground water, surface water, and air. Predicting these levels for the year 2000 is one of the many possible uses of EDMAS.

Data Characterization, Analysis & Statistics Task Group

Responding to stakeholder concerns, particularly those of the SRS CAB, CRESP's Data Characterization Analysis & Statistics Task Group has been investigating the possible link between workers exposures to tritium and leukemia mortality. This link, if found, might be viewed as a sentinel for community risk.

One component of this effort was the review of available data on this issue. While we could find no published epidemiologic studies of tritium health effects, we sought unpublished data on the SRS workers that were collected several years ago. The 407 workers at SRS thought to be at risk for tritium exposure were routinely monitored for it. Of the 20 leukemia deaths studied, three were monitored for tritium, but none showed measurable exposure. That is, none of the tritium exposed workers died of leukemia. These data do not support an association between low level tritium exposure and leukemia mortality. However, given the small number of workers monitored, and limited number of leukemia deaths, drawing conclusions is tenuous at best.

The other component of our effort is to collect additional data on the workers already studied and to enlarge the study population to include women and minorities. Analyses will investigate overall patterns of mortality and the mortality profile of tritium workers.

Ecological Hazard Identification Task Group

The overall goal of this Task Group is to refine and test ecological risk methods for evaluating the effects of environmental stresses on ecosystems. This includes the animals that reside within them. Three main questions underlie the Task Group's contribution to understanding risk at DOE sites: 1. What bioindicators can be further developed, refined, and tested to evaluate the risk to organisms and ecological systems at DOE sites? 2. How can restoration ecology be used to evaluate degradation and the potential for recovery at DOE sites? 3. What are the uses and perceptions of ecological habitats at Savannah River? How is the site now being used, how should it be used, and by whom?

One key aspect of ecological risk assessment is to obtain indicators of degradation and contamination that can be used at the population, community, and individual levels. The most useful indicators will be those that tell us something about both ecological and human risks.

Our population-level projects involve developing bioindicators using organisms in different levels of the food chain that have wide geographical importance. As potential bioindicators, the Task Group is evaluating mourning doves, wood ducks, raccoons, opossums, and slider turtles. This combination of species allows us to assess potential risk to both animal populations and human consumers. Further, these are all species that people can recognize and care about. These projects are being conducted in collaboration with faculty at the Savannah River Ecology Laboratory, (SREL) including L. Brisbin and W. Gibbons.

The newest project involves raccoons and opossums. They are higher on the food chain as a substantial part of their diet is animal matter. Both species are hunted and eaten, especially by people with more limited economic means. The Task Group is examining populations in contaminated and uncontaminated sites on SRS, including assessment of heavy metal and cesium levels. This work is in collaboration with C. Lord (a graduate student at CRESP-East), and I. L Brisbin and K. Ganes at SREL. We are also saving some tissues from the racoons and opossums for an examination of biomarkers of exposure by our CRESP-West group at the University of Washington. Methodologies developed at SRS will be applicable to other DOE sites.

The CRESP-East Task Group is also beginning a study of contaminants in frogs from contaminated and uncontaminated sites on SRS. Initially, tadpoles will be used because they live in aquatic environments and their movements are restricted. This information will be used in developing an Index of Biotic Integrity, a measure of biological conditions, with amphibians.

Our community-level projects include assessing the use of the Index of Biotic Integrity (IBI) to examine the effect of habitat degradation on fish and amphibian communities at SRS. We have information on fish that has been collected for a long period of time from SRS that we are using to refine the IBI for these communities, and to test its applicability to indicate both the level and types of degradation caused by site activities. The IBI has been expanded to include landscape scale issues which are important at many of the larger DOE sites. This project is in collaboration with SREL, and involves J. Snodgrass and G. Meffe, as well as J. Karr (Univ. of Washington) who developed the IBI. J. Karr is developing IBIs for plant and insect terrestrial communities at Hanford in Washington State.

Remediation includes consideration of future land use and knowledge about the potential for restoration to functioning ecosystems once remediation has occurred. Our objective is to develop methods to assess the potential for restoration, the seeds or plants that would do best on soils degraded by different stressors (either chemical, radiological or physical), and the time line for natural and assisted restoration. These experiments are being conducted in collaboration with R. Sharitz from SREL.

The individual-level projects include using herring gulls to assess behavioral and physiological effects of pollutants, and using mourning doves to help predict potential hazardous effects under different land management scenarios. For example, using the levels of cesium and heavy metals in doves exposed to the draw-down soils of Par Pond, the Task Group can examine the potential effect of drawing down L Lake. Actual site-specific data from SRS can be used to predict real effects on the populations of mourning doves, a species that is locally hunted and eaten. We will experiment with native plant species on soils with different concentrations of radionuclides. The levels of contaminants in their seeds and fruits will be determined because these food sources will be eaten by birds and mammals and have the potential to be carried off site.

Ultimately the importance of ecological risk assessment rests with a general public that values ecological resources, and appreciates the importance of functioning ecosystems both to their own health and to the health of the environment. Our projects in this area are designed to develop methods to understand how people feel about ecological land use at SRS. Information to date indicates that many people living in South Carolina spend over 20 days a year in a variety of recreational activities, including photography, hiking and camping, fishing and hunting, and bird-watching. This type of information is essential to making decisions about future land use and remediation. These projects are being conducted in collaboration with W. Gibbons at the Savannah River Ecology Laboratory.

Last fall the Task Group conducted a pilot survey of fisherman along the Savannah River, and this spring is interviewing fisherman concerning fishing behavior and fish-eating behavior. Where possible, a small sample of the fish being caught by local fisherman will be obtained for heavy metal analysis (particularly mercury). Currently, we are modifying the questionnaire about recreational activities so that it can be used at the Idaho National Engineering and Environmental Laboratory (INEL), and expect to begin survey work in May.

Exposure Assessment Task Group

Members of the Exposure Assessment Task Group spent March 20 and 21 at the Savannah River Site and held meetings with several Department of Energy and WSRC researchers to identify scientific issues that hold potential for collaborative research. The Exposure Assessment Task Group met with approximately ten groups on site. The meetings covered a wide range of issues such as watershed and groundwater modeling, human and ecological dose assessment, emergency response modeling, and identification of environmental Geographical Information System (GIS) databases for use in exposure assessment.

The discussion on the watershed modeling approach concerned the inter-connectedness of contaminated areas in a watershed. This approach is a change from the traditional way of thinking about how to manage risk due to hazardous waste. The traditional approach is to consider each hazardous site individually. Currently, SRS researchers are developing an approach that evaluates all hazardous sites in a watershed as one unit. This approach is consistent with the model being developed by the Exposure Assessment Task Group, EDMAS.

A key feature of EDMAS is the integration of computer-based modules into the system through the GIS. SRS researchers were interested in the way that GIS was being used as an interface to the modeling system. This GIS interface improves the efficiency of managing information in the watershed modeling effort, and enhances the visualization of results. The predicted movement of contaminants will be able to be seen on a detailed map of SRS.These discussions were also helpful in formulating the focus of the watershed modeling workshop to be held in September, 1997.

Several scientific areas of potential collaboration also exist with ecological researchers at Savannah River Ecology Lab. For example, computer-based modeling could be used to characterize food web models for aquatic and terrestrial wildlife.

Occupational Safety and Health Task Group

The Occupational Safety and Health Task Group will begin a pilot project to develop a registry for workers engaged in various aspects of the environmental management program at SRS. This registry will track worker training and provide a way of notifying workers of health and safety information that arises in the future. It may also be used to facilitate future epidemiologic studies related to Environmental Management (EM) work at SRS.

In addition, the Task Group will focus on improving procedures for protecting subcontractor workers engaged in EM activities or working at locations close to EM projects. Improving these procedures for subcontract workers will support an important trend in occupational safety and health at DOE sites. In this approach, known as Enhanced Work Planning, safety engineers work closely with project managers and with workers to analyze specific hazards at each job and to identify and implement methods for preventing accidents and protecting workers. This work is done with SRS employee health professionals.

Social, Land Use, Demographic and Economic Task Group

The Task Group continues to refine the complex economic model which calculates the economic impacts of potential changes in the Department of Energy on regional economies. Several projects conducted by the Task Group are completed and ready for sharing with stakeholders and the academic community. For example, a paper about land use planning and opportunities near SRS will soon appear in the Journal of Environmental Planning and Management. Other reports are near completion. One will describe the results of our survey of planners and planning near the 16 major weapons sites. The second will report the statistical analysis of jobs, income, and population in 63 counties surrounding the major weapons sites for the period 1970 through 1994.

The Task Group is beginning two new projects. One is a fiscal impact study of the 16 major DOE sites. A second is to understand the dynamics of industrial location and land use at the Rocky Flats and Oak Ridge sites by examining cases that have actually occurred.

Stakeholder Communication Task Group

Stakeholder Communication Task Groups from CRESP East and West met April 21 and 22. Joint strategies to enhance the effectiveness of involving stakeholders in CRESP research were explored. Other discussion focused on understanding stakeholder needs at both the Hanford and Savannah River sites.

CRESP-West

CRESP-West Task Groups participated in many interesting events and activities during the past two months.

Stakeholder Communication

CRESP-West held a regional meeting on April 16 in Richland, Washington to further discuss issues raised at a meeting held in January. Representatives from the Nez Perce Tribe, the Yakama Indian Nation, the Confederated Tribes of the Umatilla Indian Reservation and participants from the January meeting focused on CRESP's current activities on the national level. Participants commented on CRESP's publication, "Improving DOE/EM Risk Information: Content and Format," and provided input into CRESP's upcoming review of the way risk is used in the Department of Energy's Ten Year Plan.

In April, two CRESP researchers, Elaine Faustman and Deirdre Grace, were invited to present information on CRESP's overall mission and activities to the Public Involvement Committee of the Hanford Advisory Board.

This Task Group is developing fact sheets about CRESP. The series of fact sheets describes the mission and focus of CRESP-West's many task groups, and will be continually updated as information changes. Draft versions have been distributed to stakeholders and have been well received. Fact sheets on Remediation Technology, Exposure Assessment and Biomarkers are forthcoming.

Ecological Hazard Identification Task Group

Researchers Mary Ann Hawke and Diana Kimberling of the CRESP-West Ecological Task Group have begun to gather information for the Index of Biotic Integrity project. The researchers will spend the next several months sampling plant and insect life from selected pristine and contaminated areas on the Hanford Reservation. Once the sampling is completed, it will provide information on the composition of healthy arid ecosystems in the Columbia Plateau.

Health Hazard Identification Task Group

This Task Group has collaborated with other CRESP-West Task Groups to understand and develop the use of biomarkers in determining susceptibility of workers at DOE sites. Biomarkers are genetic clues that identify individuals who are at increased risk of specific diseases. Once susceptibility is determined, then workers can be better protected.

Other Notes

On April 11, 1997, Dr. Bernard Goldstein, the Principal Investigator of CRESP, visited the Los Alamos National Laboratory. A meeting on risk assessment with the combined CABs of both Los Alamos and Sandia was called off due to a snowstorm. However, two intrepid members of the Los Alamos CAB did make their way to Albuquerque to discuss risk issues and their current situation.

CRESP

The Consortium for Risk Evaluation with Stakeholder Participation (CRESP) is a university-based national organization created specifically to develop a credible strategy for providing information needed for risk-based cleanup of complex contaminated environments, especially those for which the Department of Energy is responsible. The Consortium specifically responds to the request by the Department of Energy and the National Research Council for the creation of an independent institutional mechanism capable of integrating risk evaluation work. As a result of a national competition, a five-year cooperative agreement was awarded to CRESP in March of 1995. With the agreement of Citizens Advisory Board members, "CRESP UPDATE" is one approach that we are using to share research plans and programs with SRS stakeholders.

CRESP Task Group Leaders at EOHSI

Data Characterization, Analysis & Statistics
Dan Wartenberg, PhD

Ecological Hazard Identification
Joanna Burger, PhD

Exposure Assessment
Paul Lioy, PhD

Health Hazard Identification
Michael Iba, PhD

Occupational Safety and Health
Michael Gochfeld, MD, PhD

Remediation Technology
David Kosson, PhD

Social, Land Use, Demographic, Geographic and Economic
Michael Greenberg, PhD

Stakeholder Communication
Audrey R. Gotsch, DrPH

CRESP INFORMATION

If you would like information about CRESP or any of the activities described, contact Lynn Waishwell, Director of Outreach and Communications at 908-445-0220.

CRESP UPDATE

If you would like to be added to the mailing list for this publication, please send you name, address and telephone number to:

CRESP UPDATE
EOHSI-Room 236
681 Frelinghuysen Road
Piscataway, NJ 08855-1179