

APPENDIX B:

**Proceedings of the
Communicating Research Results: Best Practices Workshop
BOSC Ad Hoc Subcommittee on Communications**

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Communicating Research Results: Best Practices Workshop
BOSC Communications *Ad Hoc* Subcommittee

Washington, DC
May 15, 2003

Communications—An Agency Priority

At the first U.S. Environmental Protection Agency (EPA) Science Forum held in May 2002, EPA Administrator Christie Todd Whitman stressed the importance of basing Agency decisions on quality science. She stated that “it is absolutely essential that EPA managers have the best possible scientific and economic information to consider when making decisions. Only a strong commitment to science can define the environmental challenges of the future and determine the best methods to address these challenges.” The Administrator went on to say that “to make decisions based on sound science, policymakers need information that reflects the latest findings in high-quality research and analyses, usually spanning a variety of scientific disciplines. This information must be presented in a form that non-scientists, or even the EPA Administrator, can understand and use correctly. Communicating the results of our work in a clear manner will lead to a better understanding of environmental risks and how best to manage those risks. As citizens become better acquainted with the scientific basis for EPA’s actions, they can make more informed decisions concerning the environment, their health, and the health of their families.”

One of the most difficult challenges faced by EPA, as well as many other organizations, is how to ensure that its research results are communicated effectively to those who need them at the time they need them. In 2001, EPA’s Board of Scientific Counselors¹ was asked by the Assistant Administrator for Research and Development to examine how the Office of Research and Development

(ORD) research results are communicated, both within and outside the Agency, and how they might be more effectively communicated. To conduct this review, the BOSC formed the Communications *Ad Hoc* Subcommittee, which was chaired by Dr. Ann Bostrom, Associate Professor at the Georgia Institute of Technology. This five-member Subcommittee (see Attachment 1), which included representatives from both academia and industry, met informally on December 2, 2001, to discuss how to approach its task of assisting ORD in improving its communication of research results.

Based on the results of this meeting and subsequent conference calls and e-mail communications, the Subcommittee decided to employ an approach used successfully by previous BOSC subcommittees—to distribute a list of self-study questions to the ORD Laboratories and Centers. The Laboratories and Centers were asked to submit written responses to two general communications questions as well as 10 questions regarding one or two communications innovations. The Subcommittee also elected to review the Laboratory and Center responses to a communications question that was posed as part of the BOSC’s second review of ORD’s Laboratories and Centers. This question focused on how the Laboratory/Center communicates its results within its organization, within ORD, within EPA, to outside agencies, and to the outside world. In addition, the Subcommittee members decided to hold a workshop in conjunction with the May BOSC meeting to discuss best communications practices within the ORD Laboratories and Centers as well as best practices in other organizations.

¹ The BOSC was established by EPA to provide advice, information, and recommendations about the ORD research program. For more information about the Board see the BOSC Web site at <http://www.epa.gov/edrlupvx/bosc/>.

Findings from the Laboratory/Center Review

The Communications *Ad Hoc* Subcommittee members reviewed the responses submitted by the Laboratories and Centers regarding the communications question included in the 2002 Laboratory/Center review conducted by the BOSC. Although this review did not focus on communications, it included one question to solicit input for the communications review. After analyzing the responses to these questions, the Communications *Ad Hoc* Subcommittee developed the following findings and recommendations regarding ORD's communication of research results:

- ❖ Communicating research results is an (often self-identified) area of importance and desired improvement for the Laboratories and Centers.
- ❖ The Laboratories and Centers have not formally identified, characterized, or prioritized the audiences for their research results.
- ❖ Ongoing documentation and assessment of the quantity and quality of research results communications, covering a range of communications as well as processes and products, are lacking.
- ❖ Passive information provision (e.g., Web pages and journal publications) is central to the current efforts to communicate research results.
- ❖ Several of the Laboratories and Centers have insufficient communications expertise on their staffs to improve their communication of research results.
- ❖ There are specific cases of good communications practices that could be useful for the Laboratories and Centers to share.

The Subcommittee used the responses to the communications question to guide the selection of innovations for further review. Representatives from each of the five Laboratories and Centers were invited to the workshop to present their responses to this question and describe these communications innovations. Dr. Bostrom thanked

Mike Moore (EPA/ORD) and Michael Brown (EPA/ORD) for their assistance in planning and organizing this workshop. She noted that a major goal of the workshop is to share best communication practices within ORD and outside the Agency and to identify opportunities for ORD to improve the effectiveness of its efforts to communicate research results.

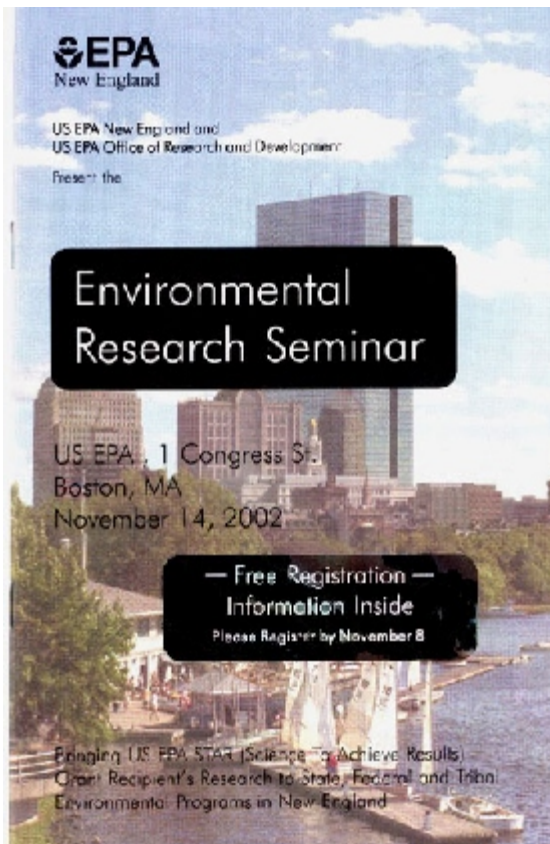
Communicating Research Results: Best Practices Workshop

Representatives from EPA's five ORD Laboratories/Centers, Office of Science Policy, Particulate Matter Research Program, and Office of Air and Radiation attended the workshop to describe communications innovations that exemplified the best communications practices within their respective organizations. In addition, representatives from the Centers for Disease Control and Prevention, Health Effects Institute, CIIT Centers for Health Research, National Institute of Environmental Health Sciences, and American Lung Association were invited to the workshop to present examples of their exemplary communications practices. This 1-day workshop was held on May 15, 2003, in Washington, DC, and a summary of the presentations follows.

ORD's National Center for Environmental Research

Jack Puzak, Acting Director of the National Center for Environmental Research (NCER), identified the Center's primary communication tools and elaborated on two of the more innovative communications—the Center's Science to Achieve Results (STAR) Regional Environmental Research Seminars and the NCER Web site. Other tools that were mentioned include the annual progress review workshops, press releases, several lecture series, internal e-mails to EPA staff, the NCER Warehouse, conference displays, and various publications.

“Science in Our Region”—The STAR Environmental Science Seminar Series. A pilot STAR Regional Environmental Science Seminar was held in Region 1 in November 2002. For this seminar, NCER staff worked closely with the Regional staff to ensure that the seminar covered the research topic(s) of interest to the Region.



State and tribal representatives also were invited to attend the pilot seminar. Six more STAR Regional Environmental Research Seminars are planned during the remainder of FY2003 (Dallas, May 28; Chicago, June 17; Kansas City, August 13; Atlanta, September 10; San Francisco, October 8; Philadelphia, September/October). The audiences for these seminars include Regional staff and managers, state and tribal environmental representatives, local media, industry, and university professors and students.

The communication goals of the STAR Regional Environmental Research Seminars are to:

- (1) make staff and managers aware of the STAR research being conducted at local universities,
 - (2) let Regional staff know that they can contact grantees for information,
 - (3) inform the Regional staff about the NCER Web site and other grants that they could use in their work,
 - (4) provide research information to state/tribal agencies,
 - (5) determine whether other Regions would like to plan seminars, and
 - (6) inform the public through the media.
- Other communication tools used to achieve these goals include a Regional Web site, a brochure that is mailed to state agencies and provided to Regional staff and managers,

e-mails that are sent to staff from the Region's management, and notification sent to the local media.

The success of the Region 1 seminar (and the ones that followed in 2003) was measured by a number of factors. More than 200 people attended the opening session, and more than 90 people attended the scientific sessions. In addition, there was high attendance by Regional staff and management as well as attendance from state agencies, nonprofits, industry, universities, and other federal agencies. The written feedback from participants was overwhelmingly positive as was the verbal feedback from the STAR grantees. Another indicator of the success of the seminar is that six other Regions have expressed a desire to hold similar seminars. The Region 1 seminar's success was attributed to the following:

- ✧ The Region asked for the information so the audience was interested in the topics.
- ✧ Upper-level management in NCER and the Region supported the seminar.
- ✧ The Assistant Administrator for Research and Development (AA/ORD) was supportive of the seminar.
- ✧ The topics were directly applicable to Regional needs.
- ✧ STAR grantees were willing to present their findings at the seminar.
- ✧ The seminar was held in the Regional Office for each access.
- ✧ The NCER and Regional staff responsible for the seminar worked hard to make it happen.

Mr. Puzak identified a few suggestions for improving NCER's Regional seminars. These included: extending personal invitations to state agencies, rather than just sending out mailings; adding teleconference and simulcast options for those with travel restrictions; increasing the attendance of nonprofits, tribes, and academics in the Region; and sending out followup questions to participants to determine if and how the seminar information was used.

NCER's Web Site. The NCER Web site conveys information on applying for research grants, fellowships, and contracts as well as research projects and their results. It was redeveloped in FY2002 and now includes an Oracle database with several new or improved features, including:

- ❖ Easy access to NCER research abstracts and progress and final reports.
- ❖ Dynamically generated pages that are automatically updated.
- ❖ Improved and flexible search results reports and tailored search functions
- ❖ Links to results and investigator publications.
- ❖ The ability to pass NCER data to other databases such as the Environmental Information Management System (EIMS), Science Inventory, and Web Inventory.

In May 2003, the Oracle database contained 2,600 research project abstracts; 1,500 progress reports; 1,000 final reports; 16,300 investigator publication bibliographic citations; 4,800 journal article bibliographic citations; and 500 full-text pdf journal articles.

More recent Web site advancements include the projects by Region function, top-awarded institutions function, highly cited researchers page, EIMS drinking water portal, science pages, New User Quick Guide, and home page research news and events. The projects by Region function allows Regions to compile grants and fellowships by state, and permits advanced sorting to generate reports by Region with state and institution sub-sorts as well as project funding amounts and state and Regional funding tallies. The top-awarded institutions function facilitates the generation of reports for the institutions with the highest awards based on either funding or number of grants. The highly cited researchers page was compiled using ISI's highly cited researchers list and it identifies the most highly cited investigators funded by NCER. The EIMS drinking water portal groups ORD projects related to drinking water. The Office of Water (OW) will use the data shared through this portal for its upcoming DRINK database. The science topics pages on the NCER



Web site show NCER goals, requests for applications, grant recipients, and results for multiple years on a particular science topic. These pages convey the breadth, direction, and success of NCER research for a specific science topic.

Several indicators of success are used by NCER to determine the effectiveness of its Web site. The Web statistics indicate high usage of the site (i.e., about 40,000 users and more than 500,000 hits per month). The number of list serve subscribers has increased by 34 percent since 1999, and currently, there are about 11,000 list serve subscribers. NCER also receives positive feedback on the Web site from Project Officers, the ORD Web group, Regional scientists, and ORD management.

The success of the NCER Web site was attributed to its design, which meets the specific needs of several user groups. Early and frequent communication was critical for identifying the initial requirements and it has been essential in defining evolving needs. NCER's quick response to Regional feedback concerning the Web site, resulted in the development of tools to meet Regional needs. Frequent communication with OEI has helped improve database efficiency and search times. Mr. Puzak noted, however, that the NCER Web site could be improved by developing better tools to assess user satisfaction and the use of research results. NCER has prepared an online user survey, which can be accessed at <http://www.epa.gov/ncer/draftsurvey>, and plans to develop a

database to analyze survey feedback over time, as well as a tool to analyze the e-mail inquiries received via the Web site. NCER also could improve the dissemination of results used to support EPA rulemaking by developing a new list serve for the Program Offices.

National Risk Management Research Laboratory

Dr. Hugh McKinnon, Director of the National Risk Management Research Laboratory (NRMRL), pointed out that communication is an important part of the Laboratory's function. NRMRL has three types of communications: direct, written, and electronic. The direct communications serve many nontechnical customers. Each year, NRMRL responds to approximately 3,000 telephone requests, operates a free public video library of environmental subjects, distributes hundreds of EPA general audience publications, maintains a Public Affairs liaison with local Congressional offices, and manages local media relations. NRMRL also sponsors a variety of scientific meetings. In 2002, the Laboratory reached more than 100,000 people through its exhibits.



With regard to written communications, NRMRL offers 134 technology transfer documents for distribution within and outside EPA. NRMRL's research results are published in peer reviewed journals (e.g., *Environmental Science & Technology*, *Journal of Environmental Engineering, Atmospheric Environment*, *Ground Water Monitoring and Remediation*, and *Remediation*). From 1998 to 2002, NRMRL researchers published 611 articles in 271 refereed journals. Dr. McKinnon mentioned the risk communication tool series and several publications for a general audience.

As part of its electronic communications, NRMRL creates in-house interactive multimedia CDs for training, research, and workshops/conferences. This multimedia technology presents and enhances information in a radically new and engaging way. It incorporates digital video, audio, 3-D animation, high-end graphics, and peer reviewed content. NRMRL uses interactive CD and DVD formats that can be linked or converted to Web sites. Video excerpts from conferences and training sessions were presented.



Preparation of multimedia products involves a five-step cycle: (1) create video, audio, 3-D animation, graphics, and image media; (2) create the technical content; (3) design the interactivity structure; (4) integrate media into interactive software; (5) subject the product to peer review; and (6) obtain the necessary clearance and publish the product. NRMRL's virtual tour is an example of this technology.

NRMRL measures its communications success through a Customer Satisfaction Program. It is a tool for measuring success and obtaining input for strengthening future products relative to reaching the target audience, selecting topics of interest, and effective delivery to the intended audience.

Using the Pollution Prevention Workshop as an example to illustrate how NRMRL seeks cus-

tomer feedback, Dr. McKinnon indicated that the customer feedback regarding the workshop rated the quality of the workshop as a 4.4 on a 1 to 5 scale. The participants also provided feedback regarding the delivery methods (i.e., direct communication, Internet postings, and guidance documents). NRMRL also uses DIALOG Science Citation Statistics to measure success. The Laboratory searches approximately 4,500 scientific and technical journals for citations and uses those statistics to track improvements over time. NRMRL has identified some ways to improve its communications efforts. There are plans for a NRMRL Multimedia Laboratory, which is in-

tended to increase the use of digital technologies to enhance communications. The Multimedia Laboratory would be in a centralized location and would provide cost-effective sharing of software and hardware. NRMRL also has established the Science Results Integration Program to improve its communications. This program is intended to: (1) integrate science results across ORD and deliver information without organizational boundaries, and (2) expand the use of ORD's research and measure outcomes. Dr. McKinnon concluded his presentation with NRMRL's communication goal: "We get the right information in the right format to the people who need it."



National Center for Environmental Assessment

Dr. Peter Preuss, Director of the National Center for Environmental Assessment (NCEA), stated that NCEA's focus is national-level assessments, risk assessment guidance, risk assessment methodology, and consultation and training. NCEA's mission is to serve "as a national resource center for the overall process of human health and ecological risk assessments and the integration of hazard, dose-response, and exposure data and models to characterize risk." The Center's vision is to be "a high performing assessment center providing timely and high-quality risk information to environmental decisionmakers." NCEA has three divisions located in Washington, DC; Research Triangle Park, NC; and Cincinnati, OH.

The purpose of NCEA's Human Health Assessment Program is to develop contaminant-specific risk assessments on chemicals/stressors that are of

high public concern, which then are used by EPA, the states, and the international community. Some of the contaminants addressed by NCEA include diesel, dioxin, mercury, fuel and fuel additives, particulate matter and ozone, and polychlorinated biphenyls (PCBs). The purpose of NCEA's Ecological Risk Assessment Program is to: (1) improve the science of ecological risk assessment, (2) develop ecological risk assessment approaches, and (3) integrate human dimensions into ecological risk assessments. NCEA also manages nationally recognized programs such as the Integrated Risk Information System (IRIS), Global Change Assessment, and Risk Assessment Forum.

Some specific steps and products are necessary for the "roll-out" of a major NCEA product: coordination across EPA, with other federal agencies, and the Executive Office of the President; audience identification; accurate information; clear

information; timely information; plain language information; different types of information; outreach to stakeholders; and media outreach. The first step in rolling out the Draft Final Guidelines for Carcinogen Risk Assessment and the Supplemental Guidance for Assessing Cancer Susceptibility From Early-Life Exposure to Carcinogens (available online at <http://www.epa.gov/ncea/raf/cancer2003.htm>), for example, is to develop a comprehensive communication plan.

Develop a Comprehensive Communication Plan

1. Description of Action
2. Background
3. Key Messages
4. Audience
5. Expected Reactions from Stakeholders
6. Detailed Communication Strategy
7. Announcement Notification Plan
8. Contacts

**COMMUNICATIONS PLAN
OFFICE OF RESEARCH AND DEVELOPMENT**

TITLE: EPA Draft Final Document on Draft Guidelines for Carcinogen Risk Assessment and Supplemental Guidance for Assessing Cancer Susceptibility From Early-Life Exposure to Carcinogens.

DATE: 10/13/03

PREPARED BY: [Name]

1. ACTION:

EPA is requesting that Federal Register (FR) issue, public comment on EPA's Draft Final Document on Carcinogen Risk Assessment (Draft Guidelines) and Supplemental Guidance for Assessing Cancer Susceptibility From Early-Life Exposure to Carcinogens. The draft Supplemental Guidance provides the proposed approach for assessing cancer risk from early-life exposure. Draft documents will be available on the Internet at <http://www.epa.gov/raf/cancer2003.htm>.

When completed, the Draft Guidelines along with Supplemental Guidance will be published in the Federal Register and will be available on the Internet at <http://www.epa.gov/raf/cancer2003.htm>. The draft Supplemental Guidance provides the proposed approach for assessing cancer risk from early-life exposure. Draft documents will be available on the Internet at <http://www.epa.gov/raf/cancer2003.htm>.

This plan describes the action (e.g., public comment on the draft guidelines), background, key messages, audience, expected reactions from stakeholders, detailed communication strategy, announcement notification plan, and contacts. The next step is the preparation of a *Federal Register* announcement to seek public comment on the draft guidelines. For this example, NCEA also developed fact sheets on the draft guidelines and made them available on the Internet.

EPA
United States
Environmental Protection Agency

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Other communications about the roll-out of the Draft Cancer Guidelines included briefings (press, stakeholders, and Congressional members and staff), online public questions and answers (available on the Internet), press releases/media advisories, and announcements in major U.S. daily newspapers (*The Washington Post*, *Los Angeles Times*, and *The New York Times*).

Development of Media Advisory

EPA
United States
Environmental Protection Agency

Headquarters Press Release
Washington, DC
FOR RELEASE: April 1, 2003

EPA SEES DRAFT GUIDELINES FOR CARCINOGEN RISK ASSESSMENT

Agency Releases Draft Guidelines on Draft Public Health Protection and Scientific Soundness, Draft Supplemental Guidance on Risk From Early-Life Exposure Also Issued

CONTACT: David Deegan, 303-561-7819

In an effort to update key scientific information for stakeholders, EPA has released the public review and comment draft final guidelines for carcinogen assessment as well as supplemental guidance for assessing early-life exposure to carcinogens. The release of these draft documents, announced by Dr. Paul Cheney, the Science Advisor to the EPA Administrator and the Assistant Administrator for the Agency's Office of Research and Development, is an important part of EPA's revision of one of its most important guidelines first published in 1986. These guidelines provide a thorough framework for EPA to assess cancer risk from early-life exposure to environmental pollutants.

EPA has been working to revise the 1986 guidelines in light of significant advances in scientific understanding of how cancer may be caused. EPA's guidelines provide the framework for the new guidelines in that Agency's cancer risk management for both public health protection and scientific soundness. The draft guidelines have also previously been the subject of public review and stakeholder comment. The review of EPA's draft documents from many of the comments and suggestions provided to EPA by various reviewers.

NCEA also has developed program/issue-oriented Web pages that are user-friendly, provide one-stop shopping, focus on high-profile activities/products, and involve cross-Agency coordination. The Center has designed program/issue-oriented Web pages for the Risk Assessment Forum, IRIS, Global Change Research Program, and Dioxin and Draft Reassessment; NCEA also was instrumental in the development of the MTBE (methyl tertiary butyl ether) Home Page and assisted OW in developing the Drinking Water Research Tracking Portal (for Intranet use).

EPA
United States
Environmental Protection Agency

IRIS
Integrated Risk Information System

Welcome to the IRIS home page, brought to you by the U.S. Environmental Protection Agency (EPA) and its Office of Research and Development, National Center for Environmental Assessment. IRIS is a database of human health effects that may result from exposure to various substances found in the environment. IRIS was initially developed for EPA staff in response to a growing demand for consistent information on chemical substances for use in risk assessments, decision-making and regulatory activities. The information in IRIS is intended for those without extensive training in toxicology, but with some knowledge of health sciences. For more information about IRIS, read this [Introduction](#).

For definitions of terms in the IRIS Web site, refer to the [IRIS Glossary](#).

[List of IRIS Substances](#)

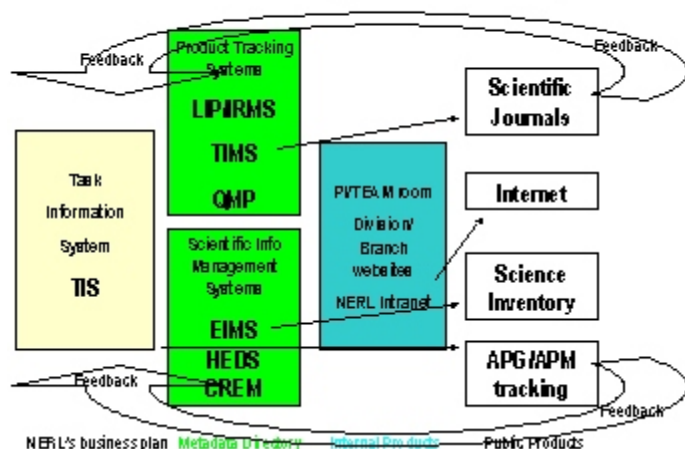
In concluding his presentation, Dr. Preuss listed a number of NCEA's communication/outreach innovations, which included: investing in communications and outreach, building the staff, listening to stakeholders (internal and external), identifying Agency needs, working with ORD Laboratories/Centers and EPA Offices, and addressing BOSC recommendations.

National Exposure Research Laboratory

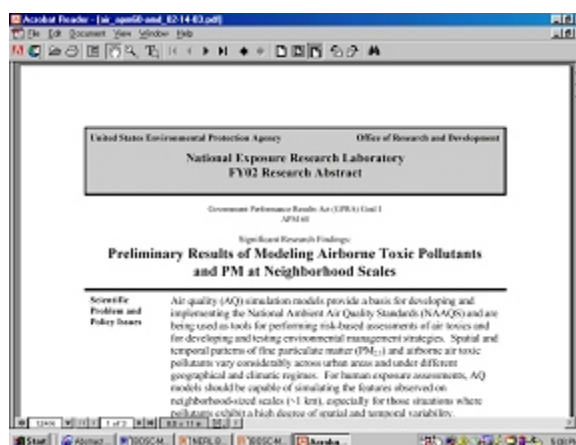
Dr. Gary Foley, Director of the National Exposure Research Laboratory, described NERL's communication goals, the Laboratory's delivery and feedback system, and two of NERL's specific communication innovations—research abstracts and scientist to scientist meetings.

NERL's communication goals are: (1) raising awareness of NERL's relevant high-priority research; (2) engaging all NERL staff in the communication effort; (3) ensuring that all NERL staff can articulate the work being done at the Laboratory to a variety of audiences; (4) sharing and showcasing NERL's research through the right channels and at the right times; and (5) keeping NERL staff aware of the communication products being produced. Dr. Foley described NERL's Delivery and Feedback System, which is updated every year and includes a Task Information System (TIS) that provides a production tracking system with feedback loops to communicate the research through publication in scientific journals, posting on the Internet, and inclusion in the Agency's Science Inventory.

NERL delivery & feedback system



One of NERL's communication innovations is its research abstracts (RAs). For the past 4 years, NERL has posted its RAs on the Web. These abstracts are intended to highlight outstanding research that would draw attention both within and outside the Agency. They communicate in "plain English" and link NERL science to regulatory, public health, and policy outcomes. These RAs also are intended to encourage discussion of other types of communication that may be helpful to clients, reduce inquiries about how NERL's research should be interpreted and communicated to others, and simplify the annual process of reporting major accomplishments.



Each RA must go through a clearance process, which includes: (1) entering data for the RA into the TIS with built-in approvals similar to other tasks; (2) preparing the RA for every significant research output/outcome (including Annual Performance Measures); and (3) transmitting the approved abstract to the client, along with a peer-reviewed major product. NERL produces approximately 20 to 40 RAs each year and they are disseminated by the Laboratory Director, Deputy Laboratory Director, Associate Directors for Health and Ecology, Assistant Laboratory Directors (ALDs), and scientists. The RAs are posted in the TIS and on the NERL Web site. Dr. Foley noted that additional notification of potential audiences and further marketing are necessary for the RAs.

The second NERL communications innovation described by Dr. Foley is the scientist to scientist workshops. NERL has taken a leadership role for 30 of these workshops, including one on models,

one on the lessons learned at the World Trade Center, and one on the use of genomics for measuring endocrine disrupting compounds.

Scientist to Scientist Workshops



For the Biological Assessment and Criteria (BAC) Workshop, which was co-sponsored by EPA and the National Council of State Governments, NERL worked closely with OW to identify experts and coordinate the workshop. It was attended by 246 biologists from 47 states, 26 tribes, and 1 territory. The workshop consisted of 5 days of training (including 4 tracks with 18 courses), informal meetings, and problem-solving sessions. Dr. Foley identified a number of benefits to the workshop participants, which included direct technology transfer from EPA scientists, seeing other states demonstrate the use of EPA tools, and greater use and higher esteem of EPA science. He also listed a number of benefits for NERL: facilitation of the use of research methods, tools, and models; direct communication and interaction with end users of science; and fortification of relationships with customers inside and outside the Agency. NERL management recognizes that continued improvement is important and should include broader outreach to stakeholder clients and more emphasis on integrating products across ORD.

Dr. Foley stated that NERL's research is successful only if it is completed on time, it is of high quality, it is completed within cost, it is delivered to the client, and the client is using it either directly or indirectly. However, he did not believe that this is enough to define success. Success occurs only when the client uses the research

results to make better environmental decisions that have a positive impact on the environment. Dr. Foley stressed the need to integrate products across ORD and to do a better job of working with clients earlier in the process and ensuring that clients understand how to use the tools developed by NERL.

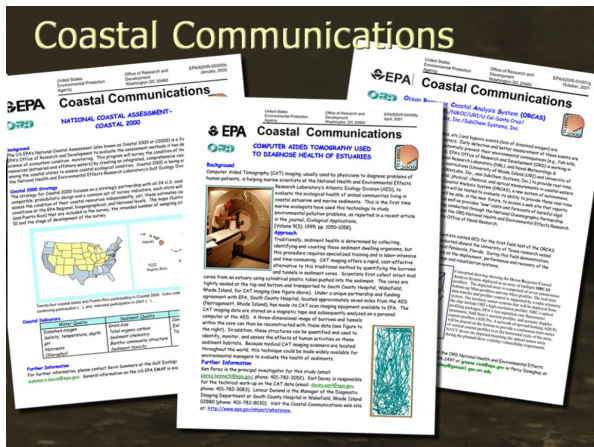
National Health and Environmental Effects Research Laboratory

Steven Hedtke, Deputy Associate Director for Ecology at the National Health and Environmental Effects Research Laboratory (NHEERL), stated that NHEERL has nine Divisions and two field stations in eight different geographic locations, which makes communications a challenge even within the organization. Mr. Hedtke emphasized that communications should occur at all levels, and that there is more to communicating research than just developing and disseminating products. NHEERL's communication goals are to: (1) be accurate and innovative in communicating research results to a wide variety of audiences, (2) provide the tools to NHEERL scientists to assist them in communicating their research, and (3) inform decisionmakers.

NHEERL's communications program practices involve clearly defining the audience; using a high-quality, audience-appropriate writing style; and using modern, graphics-rich formats. In addition, NHEERL believes that obtaining feedback from ORD scientists, management, and staff; Program Offices and Regions (through scientists and NHEERL ALDs); and the scientific community and public regarding publications and requests for information is very important to improve future communications efforts.

NHEERL produces a variety of communication products, including Coastal Communications, journal articles, high profile reports, science reports, and annual reports. Each of these products has different objectives, target audiences, and measures of success.

The objectives of NHEERL's Coastal Communications are to: (1) provide an alert to upcoming/ongoing research in a region of interest, and (2) improve recognition of ORD's role in coastal



research. The target audience for the Coastal Communications includes scientists and managers within coastal communities. Two of the measures of success for this product are the receipt of requests to be added to the distribution list and the positive feedback from users.

Results of NHEERL research often are reported in journal articles. The objectives of publishing in peer reviewed journals are to: (1) report on scientific advances discovered by NHEERL researchers, and (2) build the scientific credibility of Laboratory staff. The target audience for these articles is the scientific community. The measures of success used by NHEERL are the approximately 260 articles published in journals each year and the receipt of awards such as EPA Honor Awards, Science and Technological Achievement Awards, and awards from professional societies.



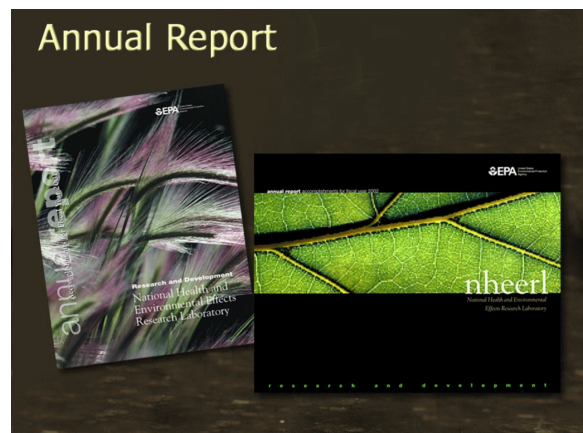
NHEERL research results are sometimes communicated in high profile reports. These reports are intended to rapidly release scientific findings on

particularly “hot” topics, and they target decision-makers, the scientific community, and the public. Measures of success for these reports include feedback from Program Offices and Regions, the number of copies requested from the EPA Warehouse, and the number and type of requests received by ORD and the NHEERL communications team.



Science reports are produced by NHEERL to report on scientific advances and they target Agency staff and the scientific community. Measures of success for the science reports include feedback from NHEERL and other EPA scientists, as well as the Program Offices and Regions.

NHEERL prepares an annual report each year that makes research highlights available to a wide audience, including government agencies, Congress, the scientific community, and the interested public. Measures of success for the most recent annual report include: requests received by the EPA Warehouse for 1,900 publications; numerous requests from NHEERL ALDs, Program and Regional Offices, and the public; the NHEERL



annual report served as a model for the ORD Accomplishments Report (Spring 2002); and receipt of an award of merit for design excellence from the Society for Technical Communications. Mr. Hedtke acknowledged that one of NHEERL's biggest challenges is measuring the success of its communications efforts.

Office of Science Policy

Dr. Kevin Teichman, Director of ORD's Office of Science Policy (OSP), explained that OSP performs three major roles within ORD: science integration, science coordination, and science communication. To integrate science, OSP develops unified ORD positions on the use of science, manages the ORD research planning process, and coordinates the implementation of Agency science policies. To coordinate science, OSP ensures that ORD's research addresses EPA's priorities, brings together ORD and the 10 EPA Regions, and manages ORD's program support function. To communicate science, OSP represents ORD to tribes, states, and local communities, and sponsors colloquia, workshops, and scientific meetings. OSP's primary target audience is EPA's Program and Regional Offices; its secondary target audiences include state and local governments, tribes, the environmental justice community, other federal agencies, professional societies and associations, and the general public.

OSP reaches its audiences for science integration through progress reviews; meetings with Program and Regional senior management; and the Program Support Priorities List. OSP reaches its audience for science coordination through the Research Coordination Teams (RCTs); scientist to scientist meetings; Tribal Science Council; National Environmental Justice Advisory Council; and workshops, symposia, and colloquia. OSP reaches its audiences for science communication through the ORD Accomplishments Report, OSP Quarterly Report, and Web sites/portals.

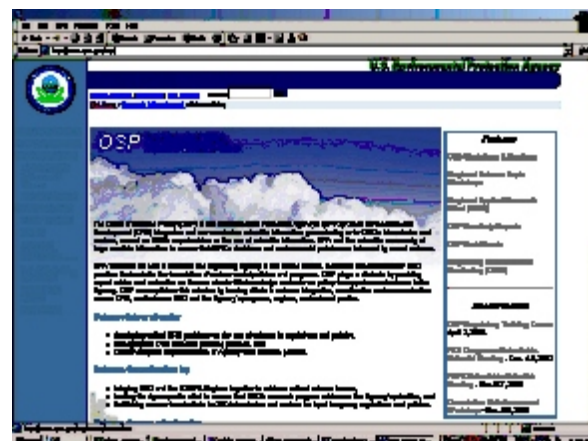
The Regional Science Source Book is an example of a successful OSP communications tool. The Regional Science Resource Book was initiated by OSP to provide the Deputy Regional Administrators (DRAs) with information on research in their respective Regions. This book was prepared for a



Region-ORD Summit, held in Atlanta on September 25, 2002, that was attended by senior leadership from ORD and each EPA Region. The Regional Science Resource Book was considered a success by OSP because:

- ✧ OSP received positive feedback from the DRAs.
- ✧ The AA for the Office of International Affairs (OIA) requested a similar book for international research activities.
- ✧ The book was used as a “scorecard” to track progress on action items.
- ✧ The book was used as a reference by both ORD and Regions in subsequent meetings.

The success of the Regional Science Resource Book was attributed to the support of the AA/ORD, the commitment of ORD to expend the



necessary resources to produce the book, the contributions by ORD Laboratories/ Centers and each EPA Region, and the usefulness of the information to DRAs. Dr. Teichman identified a number of challenges to developing additional resource books, including the cost of producing them, preparing books that are useful to a specific audience, collecting the information to include in the book, and keeping the book current.

A second example of a successful OSP communications product is the Region-ORD Critical Ecosystems Workshop. The topics of the workshop were initiated by the Regions, and the workshop was intended to improve the participants' understanding of the science completed, underway, and needed for ecological assessments. The outputs of the workshop included presentations, papers, and a proceedings report. The workshop resulted in a better understanding of science issues and needs, and development of a network of Regional and ORD scientists who will collaborate beyond the workshop.

Dr. Teichman stated that OSP's communication matches its roles of science integration, coordination, and communication, and OSP's audiences are its clients and stakeholders. He noted that the communication tools developed by OSP can be resource intensive; however, they can pay large dividends in furthering ORD's role of providing science to support EPA's mission. Dr. Teichman commented that journal articles are usually not the best source of scientific information for decisionmakers; better environmental decisions will be made only if managers and policymakers have a better understanding of the science, and that will require communicating by more innovative, targeted means.

Particulate Matter Research Program

Dr. Dan Costa, Chief of the Pulmonary Toxicology Branch at NHEERL and Acting ORD Particulate Matter (PM) Program Manager from January 2002 to October 2002, provided some background information about ORD's PM Research Program. In 1998, Congress added \$22.4 million per year to ORD's \$27.8 million budget to address PM research. ORD based its PM research strategy on the 11 issues identified in the National Research Council's (NRC) first report on PM research

needs. Since that report, NRC has published two additional reports on PM research and recommended a multi-year portfolio of the highest priority research topics.



The add-on Congressional funding in 1998 was a substantial investment in the PM issue and as the 5 years drew to a close, the idea emerged within ORD that a “highlights” report with an assessment of program productivity and advances in knowledge would be appropriate and timely. It also could lay out a conceptual plan to address remaining important knowledge gaps. This report became known as the PM Synthesis Report.

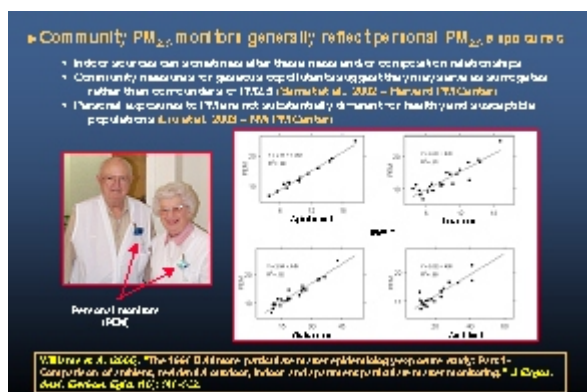
The “idea” and the “need” for the PM Synthesis Report emerged in January 2002, and the conceptual plan and schedule for the report were developed from April to June. The sections of the report were drafted from August to October, and a full draft with appendices was produced in October. Revisions were made to the report through February 2003, and a near final draft was prepared by March 15, closely followed by a briefing for the AA/ORD on March 27. Final editing of the report is ongoing and it is expected to be completed in June 2003.

The report is intended to communicate the PM Program to diverse clients (e.g., Assistant Administrators, Congress, NRC, management, investigators) in a succinct and positive manner. It captures the essence and highlights of the program over its 5-year funding augmentation, in light of the NRC priorities. It provides a comprehensive and balanced report and includes a global narrative, project descriptions, budget information, and a bibliography. The PM Synthesis Report was designed to be very user friendly, and as part of

the report preparation efforts, a PowerPoint briefing was developed that could serve as a resource for AA Office presentations.

The ALDs coordinated the writing efforts to address the 11 Research Topic Areas of the NRC priority needs. Each section was laid out in a format to address the uncertainties, relevance, accomplishments, program implications, and future directions of each Topic Area. The PM Program Manager then took responsibility for the major revisions and rewriting of the report, and once the draft was completed, a number of NCER staff were asked to review it. Dr. Costa noted that considerable effort was expended on the Executive Summary and the 3-page overview.

The report was prepared almost exclusively by EPA staff from across ORD Laboratories and Centers. Several face-to-face meetings, e-mails, and teleconferences were the primary conduits of communications among the staff working on the report, and they were very responsive in performing their tasks. Senior managers were briefed and given an opportunity to review the report before it was submitted to the AA/ORD. Professional editors now are working to finalize the report.



Dr. Costa identified several lessons learned from preparing the report. It forced program leadership to critically examine the program’s accomplishments, overall plan, and future directions. He stated that a vested (and not contracted) and sometimes blinded effort drove the project to completion. The PM Program Manager clearly needs more administrative support to complete such tasks, and there is a definite need for a PM Program Web site to serve as a resource for intramural and extramural scientists and regulators.

The success of the PM Synthesis Report is measured by the positive feedback received from many managers throughout ORD and by the support from the AA’s Office. One of the greatest challenges to the development of the report was gaining trust among the various contributors within the Agency, especially during the time that funding shifts were being made across the Laboratories/Centers to meet the Agency’s needs. However, this challenge was overcome and the document development team successfully focused on completing the report.

EPA Office of Air and Radiation

Prudence Goforth, Communications Director for the Office of Air and Radiation (OAR), indicated that her primary role in OAR is to connect to the public and end users so that they understand the science behind EPA decisions, policies, and regulations. She is in contact with the press on a daily basis and the range and complexity of the subjects that she covers is extensive. Ms. Goforth stressed the importance of communicating the research underpinning Agency decisions. To illustrate some of her responsibilities, Ms. Goforth mentioned that she was involved in the recent release of the Ozone Implementation Plan, and has been working on the 5-year review of the National Ambient Air Quality Standards (NAAQS) that are due to be released very soon.

One of her roles is to capture the interest of the reporters who are seeking 30-second sound bites. She posed the question: What do you do when you are asked to communicate something before the research and analysis has been completed? She warned against assuming that the data speak for themselves. It is essential that the communicator take the time to put the data in context. Ms. Goforth said she learned this lesson the hard way with regard to EPA’s involvement with the World Trade Center. Her office received thousands of inquiries about air quality during the weeks and months following September 11. The staff were overwhelmed and, as a result, made the critical mistake of posting a massive amount of air monitoring data on the Web without giving it context. Everyone with an agenda started mining the data for their own purposes. They often would focus on a 1-hour spike or a 1-day spike to exaggerate the risk. Ms. Goforth said that it has taken EPA

months to undo the damage caused by the misinformation reported those data. She noted that similar lessons were learned when working on the anthrax incidents.

The most effective way to get the research results used by decisionmakers is to make a connection between the researcher (technical) staff, the communications staff, and a Web specialist. This will ensure that the researcher is focusing on how the results will be announced or released and made available on the Web. This group should be asked to identify the level of interest of various audience groups and to anticipate their reactions. What concerns will be raised? Who is likely to be interested in the results? What will be of interest to the public? Ms. Goforth emphasized the importance of anticipating the worst information to be conveyed and thinking of the best approach to communicate that information. She said that her approach is to have someone on her staff write the best story that could be communicated as well as the worst story. These are not for distribution outside the Agency, but they are very helpful in preparing EPA staff for the release of the results.

Another issue to consider is who should be involved in releasing the information. Who will give the announcement credibility (e.g., EPA Administrator, American Lung Association)? Should the information being communicated be put in a larger context? What has been done in the past and where is it headed in the future? What relationship does this research have to issues the government is facing? How will the research findings help or hurt a regulated organization? Knowing the answers to these questions helps to formulate an effective communication strategy.

More and more universities and other organizations are using press conferences to announce their research results. For example, the President's Clear Skies Initiative was announced at a press conference. Reporters should be invited to attend such press conferences and given the opportunity to discuss the results with the researchers. Research results also are commonly communicated through fact sheets, questions and answers, and the Web. Although the Web may be the best way to communicate with some audiences, there is a need to do a better job of inform-

ing users of what to expect from the links. Ms. Goforth encouraged those in attendance to use their communications staff and emphasized the importance of putting the science into context.

Centers for Disease Control and Prevention

Dr. Marsha L. Vanderford, Deputy Director of Communication at the National Center for Environmental Health (NCEH), Centers for Disease Control and Prevention (CDC), emphasized the importance of being consistent in communicating information to the public. Her presentation focused on communication research associated with the National Report on Human Exposure to Environmental Chemicals. The first National Report included information on the measurement of 27 toxicants in humans at levels that were previously unknown. Most of the data compiled were baseline measurements, and there were trend data for only 3 of the 27 chemicals. In addition, most of the health effects of the toxicants were unknown.

The first report received positive feedback from scientists, and this led to the development of a second report in January 2003, which focused on 116 chemicals measured between 1999 and 2000 (most of which were first time measures). The Office of Communications received hundreds of requests for interviews about the report, and early media coverage suggested that the public was



interested in the report as well. In addition, previous qualitative studies suggested public desire for more information/attitudes about environmental health hazards. As a result, formative research was conducted on the communication of the reports.

The primary audiences for the first report were intended to be public health agencies, the scientific community, and policymakers. The audiences for the second report included the public, environmental advocacy organizations, and professional audiences (scientists, state and local public health agency staff, health care providers, and federal partners).

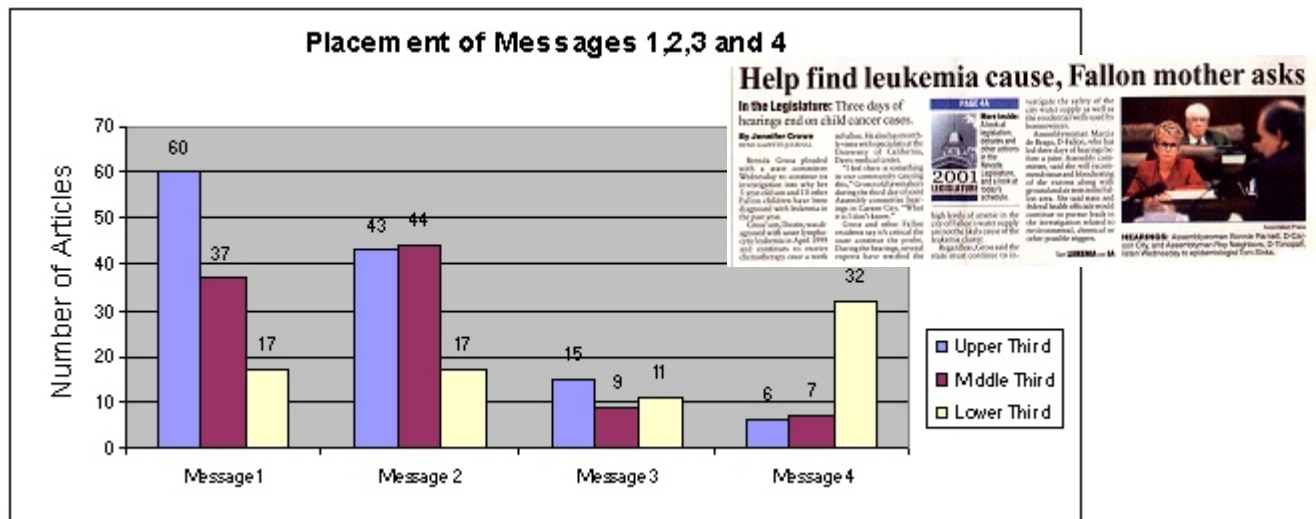
Qualitative audience research provides insights on the target audience and increases understanding of the motivations and reactions of the audience. This type of research answers the question “why” rather than “how” prevalent. It also provides access to responses the researcher might not have considered and offers insights into the core values and underlying beliefs, behaviors, and perceptions of the audience.

Telephone interviews were conducted with four focus groups comprised of people from across the United States. The materials reviewed during the research process included news reports, fact sheets and Web information, and links to EPA information. Findings from the formative research showed that there was personalization of the information (i.e., relationship to local events or to family’s or friends’ illnesses), expectations that the report would indicate high levels of expo-

sure and dangerous health effects, and skepticism that the findings would be used to improve public health. The findings also indicated that some individuals would prefer not to know about possible exposures.

The formative research also investigated what participants would be motivated to do (e.g., seek information, limit further exposure, seek personal testing, share information with others, talk to a physician, participate in limited activism). The implications of the formative research findings were that: (1) communication materials should be developed specifically for lay audiences and should include FAQs to respond to questions from the public, fact sheets for public dissemination, and information posted on Web pages; and (2) audiences should be directed to credible sources where more local and personal information is available. The study also indicated that given the unknown risk, two-way communications should be available and boundaries should be placed around the uncertainty (e.g., attention should be focused on lead and cotinine, for which there are known health effects and chronological trends, with the surprise of “good news”).

There were four major messages to be communicated: (1) advances in biomonitoring are a major step forward in tracking exposure; (2) it is too early to judge new baselines, but the good news is that there is a decline in exposure to lead and cotinine; (3) in time, there will be many valuable uses of the data—all of which will be aimed at protecting public health; and (4) everyone (i.e., science, government, industry, and the public)



benefits from knowing more about exposures to these chemicals.

An evaluation of media coverage from March to April 2001, revealed 84 news reports (TV, radio, print, Web, and wire) and 66 print reports. A media analysis of the print coverage was conducted to determine the effectiveness of the communication strategy in emphasizing priority messages. The analysis indicated that 99 percent of the reports included one or more priority messages and these messages filled 41 percent of all print media space. In most cases, at least one of the priority messages was placed in the first third of the report.

CDC decided to assess how effectively it communicated about the first report to the primary audiences (i.e., scientists, public health staff and officials, health care providers, and federal partners), so that it could do a better job communicating the second report. Dr. Vanderford pointed out that these primary audiences are the ones who will use the report to: (1) determine if chemicals are getting into the bodies of Americans, (2) assess the effectiveness of public health efforts to reduce exposure, (3) establish reference ranges for comparison with at-risk populations or individuals, (4) track trends in levels of exposure, (5) determine whether levels are lower in different demographic groups, and (6) set priorities for research on human health effects of chemicals. The audience research was designed to obtain information from the audience regarding the relevance of the report to participants' work and professional interests, channels for accessing the report, impressions of the report, impact of the report on participants' work, evaluation of the report format, and awareness and expectations for the second report.

The audience research process involved semi-structured in-depth interviews with 54 participants (15 scientists, 13 health care providers, 13 public health officials, and 13 federal partners). Dr. Vanderford added that there was a high level of awareness of the report among certain groups of participants. The channels used for the initial notification were professional organizations, list serves, and colleagues and contacts with the CDC. The primary sources of information about chemicals and human exposure came from published

literature; state and federal databases; federal agencies such as the Agency for Toxic Substances and Disease Registry (ATSDR), National Institute for Occupational Safety and Health (NIOSH), EPA, National Institutes of Health (NIH), and CDC; and professional associations.

Most participants expected to use the report in the future; current uses of the report included comparison with other studies, setting/changing research agendas, and serving as a model for sampling and analytic methods. The value of the report was in providing reference ranges, a geometric mean, percentiles, and sufficient information to model the data. The participants were dissatisfied with the report because of the demographic variations and the lack of health effects, safety thresholds, criteria for selection, access to raw data, and accessibility to lay audiences. The level of awareness varied among the audience groups and most health care providers were unaware of the reports. With regard to expectations about future reports, there were some who were anticipating the next report, and they wanted to know when the next report would be released and what it would cover.

Health Effects Institute

Dr. Robert O'Keefe, Vice President of the Health Effects Institute (HEI), provided HEI's view on how to communicate scientific information. He stressed the importance of building trust in the messenger. The perceived credibility of the organization affects the receptiveness to the message. HEI is an independent nonprofit research institute that is jointly funded by industry and government. Its mission is to provide independent research on the health effects of air pollution from sources in the environment. In addition, HEI's core function is to provide research that directly informs regulatory decisions.

HEI is structured to maintain credibility and transparency in controversial national regulatory debates. The Institute not only has joint and equal funding, but also has an independent Board of Directors and a standing Research and Peer Review Committee. HEI is not affiliated with sponsors, has no perceived point of view, and does not take policy positions. HEI's various science products include research reports, reviews of the sci-

entific literature, reanalysis of studies, and HEI Perspectives.



Research reports are highly technical in nature and are HEI's core scientific product. Examples of these reports include epidemiological and toxicological studies of particulates, benzene, etc. HEI usually conducts reviews of the scientific literature on key topics (e.g., MTBE or diesel exhaust), and these reviews are moderate to highly technical. HEI also reanalyzes studies central to the regulatory process, such as the Harvard Six Cities Study. HEI Perspectives is a synthesis/primer on key issues that are central to understanding health effects of pollutants (e.g., PM mechanism, epidemiology).

The HEI audience includes sponsors (EPA, industry); science community (investigators); stakeholders (environmental nongovernmental organizations, industry associations, citizens, etc.); Congress; other federal agencies (Office of Management and Budget, Department of Energy, Federal Highway Administration, etc.); international/other regulatory bodies (World Health Organization [WHO], European Commission, Japan EPA, International Agency for Research on Cancer [IARC], California Air Resources Board [CARB]); international lenders (World Bank, Asian Development Bank); and the press. HEI publications are targeted to a diverse constituency, and reanalysis often is needed to communi-

cate to a broad spectrum of policy and scientific professionals. Congress wants to know if the study held up under scrutiny, if there was an open process, and if adequate data were provided. Regulators may want to know about the reanalyzed relative risks and the implications for other studies. Scientists want to know about the methodological approaches, implications for science, and future research. Industry, NGOs, and others also have unique interests.

HEI publications are organized to communicate to a diverse audience. Therefore, each contains an HEI statement that provides a synopsis in lay terms of the project context, results, implications, and conclusions (2-4 pages). Each also includes a preface, which provides details on the process; an investigators report, which is a detailed technical report by the scientific research team including data, methods, and scientific approaches; and a review committee commentary, which is a technical peer review and integrated distillation of key findings, strengths and weaknesses, conclusions, and implications for regulatory decisions.

Dr. O'Keefe described four phases in a study release. Study Release I begins with a decision to undertake the major research area or project. HEI communicates its motivation to stakeholders to explain why they should trust HEI, the relevance of the project to its sponsors, the regulatory agenda, the scientific rationale for undertaking the



research, the public health implications, and the expected benefits. He noted that an early face-to-face meeting is ideal. In Study Release II, program summaries are prepared providing key scientific background, and workshops are held with stakeholders during study design/implementation.

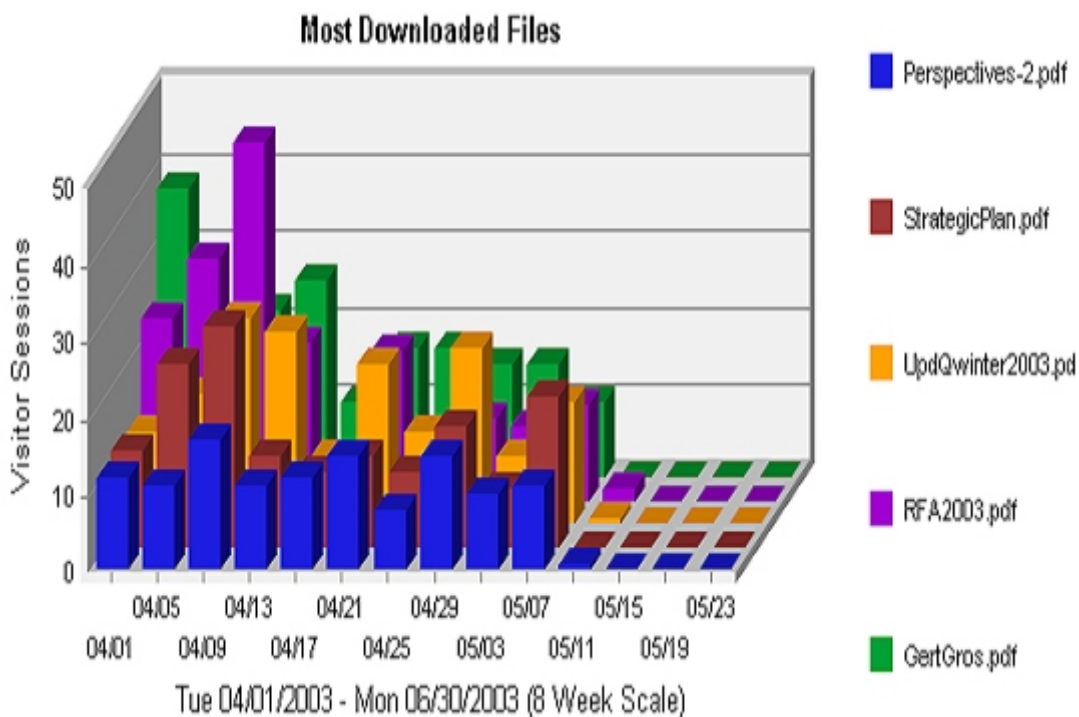
HEI also provides briefings and updates of study progress, and holds an annual conference where posters and abstracts of the latest results are displayed. In Study Release III, HEI conducts a pre-briefing with the sponsors to inform them of key findings 24-48 hours prior to release.

HEI typically prepares a press release for major studies and a press backgrounder for complex studies or exceptional circumstances. On the day of release, HEI calls key stakeholders to inform them of the release. Notification of the release is sent via e-mail and hard copy, and it is posted on the Web. In the weeks following the release, HEI visits key stakeholders to provide face-to-face briefings and to answer detailed questions. Although this process is labor intensive, it has been effective and appreciated. It sets the stage for future releases and prepares the sponsors and stakeholders for unfavorable results. Study Release IV involves followup synthesis, such as publication of HEI Perspectives.

Dr. O’Keefe acknowledged that tracking and evaluating the communication of scientific information is very difficult. HEI tracks the citing of its research studies/reviews in rulemaking (EPA criteria documents, CARB rulemaking, WHO guidelines processes, IARC monographs, etc.). HEI also tracks journal publications from its studies, the demand for HEI Perspectives, and the number of visitors on the Web site and the documents downloaded.

The soft measures include invitations to present HEI’s results at key stakeholder forums or to Congress. HEI also tracks the reactions of sponsors and stakeholders, and whether new groups or the press (trade and popular) are taking an interest in the studies. Dr. O’Keefe stated that the key elements to communicating scientific information are:

- ✧ Pay attention to organizational perceptions, which matter and require early and consistent maintenance.
- ✧ Interact with the audience to minimize any surprises.
- ✧ Tailor the publications, in type and internal structure, to communicate effectively.



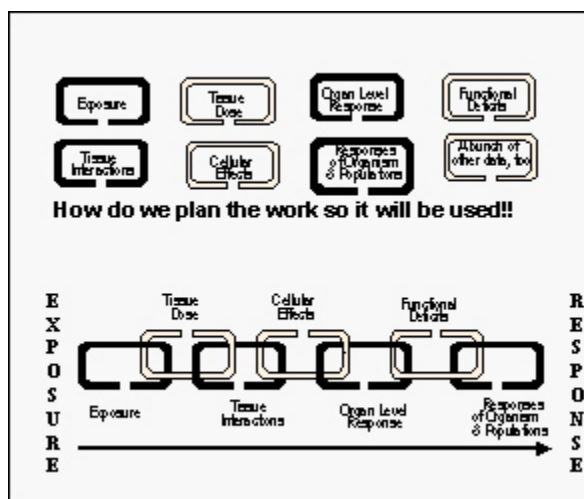
- ✧ Subject the publication to editing (by non-scientists); this can be a challenge but is worth the effort.
- ✧ Understand individual reporter interests and prepare supplemental press materials—especially for technical documents.
- ✧ Track both hard and soft measures.

Dr. O’Keefe concluded his presentation with some additional points for consideration by EPA. He stated that the Agency should track the publication of important studies it sponsors and pursue joint press strategies with the investigators. In addition, EPA-funded results should be summarized and communicated in a synthesis document, on the Web, and in the science press.

CIIT Centers for Health Research

Dr. Fred Miller, Vice President for Research at the CIIT Centers for Health Research, described the process for developing, implementing, and communicating research at CIIT. He said CIIT is a small research institute that publishes its results in the open literature; however, CIIT does not stop with mere publication of results. CIIT communicates its results through a quarterly newsletter, its Web site, an educational outreach program (for K-12), and a number of other communication tools. CIIT’s core program consists of about \$16 million of research, funded by the American Chemistry Council (ACC), that focuses on systems biology—the what and the why.

The fundamental characteristics of environmental health research at CIIT are: (1) risk assessment (RA) orientation, which involves institutional commitment and experience to bring science to bear on the decisionmaking process; (2) integration of basic and applied science; and (3) commitment to address uncertainties that often arise in RAs such as low dose responses, interspecies extrapolation, and susceptible populations. Systems biology is the quantitative study of biological processes as whole systems instead of isolated parts. A systems level view is needed to understand the complex dynamics that underlie the physiology in both the normal and diseased states. CIIT’s approach employs a synergistic integration of theory, computation, and experiment.

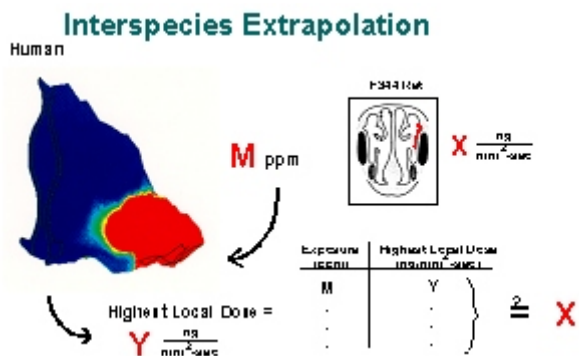


The expected outcomes from using a systems biology paradigm at CIIT are that complex biological data are more effectively integrated into risk assessments; uncertainties such as relevance of animal data to humans are reduced and sometimes eliminated; the mode of action is better understood; and the determinants of interindividual variability and, by extension, potential developmental and gender-specific susceptibilities are defined. The nature and extent to which proposed research will address and reduce uncertainties in assessing human health risks is a major factor for identifying and prioritizing core research on issues and topics. The long-term viability and effectiveness of the core research requires a mixed portfolio comprised of program projects to address major issues that require an extensive, integrated research strategy; individual projects that address important topics; methods development activities; and an investment in and use of cutting-edge technologies.

CIIT uses a program orientation and implementation guidelines document that covers relevance and scientific questions specific to identifying and prioritizing program and individual projects as well as methods development projects. The questions that should be asked when identifying and prioritizing program and individual projects are: What is the issue and what part do we want to work on? What risk assessment uncertainties would be addressed? What would represent an impact and how likely can we achieve it? The scientific approach questions to ask are: What is the hypothesis? What is the scope of the program needed? Is a systems biology approach feasible

and would it add value? The areas of emphasis for core research include the developing organism, risk assessment elements, and susceptibility factors.

Dr. Miller provided an example from the CIIT research program and how it links to the focus areas of respiratory biology/toxicology. In the study on mechanisms of adaptive and adverse responses in the respiratory tract following low-level exposure to inhaled reactive gases, the issues were that human exposures to reactive gases are often low level. Extrapolation of animal exposure data to humans is needed. Another issue was that many reactive gases induce rodent nasal lesions, and the predictability of rodent nasal lesions for humans is uncertain. Additionally, there is a need to understand the dose-response relationships over time; the pathogenesis of lesions; the susceptibility factors, including gender, age, ethnicity, and genetics; and the risk assessment context. The relevance of this study is that it: (1) addresses Long-Range Research Initiative (LRI) research strategy issues, including real-world human exposures, demonstration of adversity, and biological sensitivity; (2) has a high probability of impact (i.e., it builds on existing strengths and knowledge at CIIT, is a current focus of regulatory attention, and will provide a template for broader RA efforts); and (3) addresses uncertainties in risk assessment, including interspecies and intraspecies extrapolation as well as acute to subchronic to chronic extrapolation.



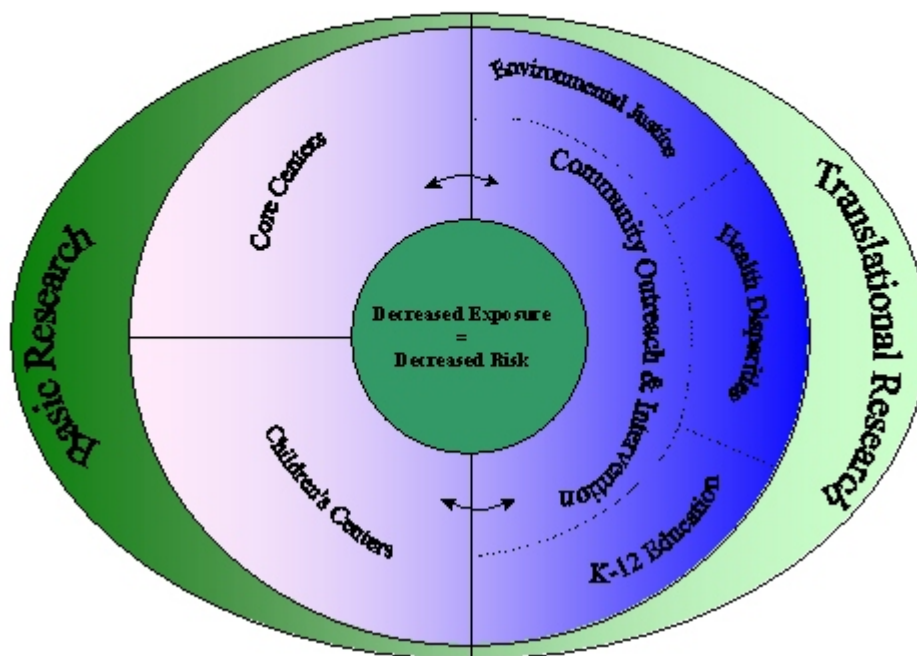
One of the research program goals of this study was to compare and contrast focused, coordinated studies on two reactive gases to elucidate modes of action for insight on adaptive and adverse effects, and then to apply this knowledge to Cl₂ and H₂S risk assessments. Additional goals were to use a systems biology approach and to focus on

the primary responses. This project has examined the differences in complexity of the nose geometry of the rat and the human. CIIT has developed anatomically rich, computational fluid dynamic (CFD) models built from rat, monkey, and human data. These models describe how the complex anatomy of the nasal passages affects airflow patterns in the nose. The goal is to use this model to extrapolate dose data for human exposures. In concluding his presentation, Dr. Miller presented a diagram that illustrated the interactions and synergies of three CIIT projects—Olfactory Toxicity of H₂S, Cl₂ Risk and VOI Analysis, and Cl₂ Dosimetry and Pathobiology. He noted that all three of these projects are building on CIIT's dosimetry modeling core.

National Institute of Environmental Health Sciences

Dr. Allen Dearry, Associate Director of Research Coordination, Planning, and Translation at the National Institute of Environmental Health Sciences (NIEHS), provided a brief overview of the Institute. The mission of NIEHS is to reduce the burden of human illness and dysfunction from environmental exposures by understanding each element and how they interrelate. The NIEHS achieves its mission through multidisciplinary biomedical research, prevention and intervention efforts, and communication strategies that encompass training, education, technology transfer, and community outreach. Dr. Dearry explained that environmental health, in its broadest sense, comprises those aspects of human health, disease, and injury that are determined or influenced by factors in the environment.

The NIEHS target audiences include the general public, community and advocacy groups, professional organizations, grantees, health professionals, other agencies, and Congress. NIEHS' Office of Communications and Public Liaison (OCPL) is responsible for developing press releases, pamphlets, videos, fact sheets, conference exhibits, public service announcements, responses to public and media inquiries, and developing information for posting on the NIEHS Web site (<http://niehs.nih.gov/home.htm>). In addition, NIEHS publishes the journal *Environmental Health Perspectives*, which has global distribution and includes 17 issues per year. The journal covers the



topics of toxicogenomics, children's health, and environmental medicine. NIEHS has made the journal available to underdeveloped countries and published a Chinese edition.

NIEHS also coordinates the National Toxicology Program (NTP), which is an interagency program that coordinates toxicological testing programs within the Department of Health and Human Services (DHHS), develops and validates improved testing methods, and provides information about potentially toxic chemicals to health regulatory and research agencies, the scientific and medical communities, and the public. The NTP issues an annual report on carcinogens that provides data on substances known to be carcinogenic. The three centers of the NTP facilitate information sharing among various federal agencies on alternative toxicological methods, risks to human reproduction, and phototoxicology. The NTP also maintains a Web site, including a list serv; holds public meetings; and produces technical reports.

The translational research that is conducted at the NIEHS strives to improve our understanding of how physical and social environmental factors affect human health; develop better ways of preventing environmentally related health problems; and promote partnerships among scientists, health

care providers, and community members. One of NIEHS' roles is translational research, which is the conversion of environmental health research into information, resources, or tools that can be used by public health and medical professionals and by the public to improve overall health and well being. Translational research at the NIEHS is intended to improve understanding of how physical and social factors affect human health, develop better means of preventing environmentally related health problems, and promote partnerships among scientists, health care providers, and community members. NIEHS' translational research programs focus on environmental justice, community-based participatory research; health disparities, children's environmental health and disease prevention; and ethical, legal, and social implications. The NIEHS Translational Research Web site can be found at <http://www.niehs.nih.gov/translat/home.htm>.

Dr. Deary emphasized the importance of two-way communication, noting that true communication is always two way. The benefits of two-way communication include more collaborative communication, improved research that is relevant to public health, and more cost-effective approaches that will link research to health outcomes as well as translate and disseminate the information to the

target audiences. The challenges of two-way communication, however, are in identifying key participants, investing the required time, being proactive in the face of controversies and crises, and meeting the expectations and needs of the audience. The two-way communication at the NIEHS includes research (Community Outreach and Education Programs), education (K-12 Program), and priority setting (workshops, roundtable meetings, retreats, brainstorming sessions; the NAS and Institute of Medicine (IOM) Committees; town meetings; Interagency Working Groups; and Public Interest Liaison Group). NIEHS also supports numerous Centers across the United States.

NIEHS' future directions will include translational research that involves creating environmental justice partnerships for communication, establishing seven to eight Centers for Population Health and Health Disparities, working with the National Cancer Institute on breast cancer and the environmental centers, and the built environment (man-made structures, land-use planning). Additional future directions include environmental medicine (nurse training, research, and practice), and the Division of Research Coordination, Planning, and Translation.

Communications Subcommittee Synthesis

Following the workshop presentations, Dr. Bostrom led a discussion to synthesize findings and recommendations to improve ORD's communication of research results. She pointed out that ORD has made a laudable effort to improve its practices and innovations in communicating research results. There is increased focus and efforts taken by the ORD Laboratories and Centers to communicate to various target audiences. In addition, ORD has made organizational changes, hired more staff, and allocated more resources to communications.

At the front end of communications is defining the audiences and goals. Most of the Laboratories and Centers target three or four audience groups. Should the press be considered an audience? She noted that most Laboratories/Centers recognize the importance of obtaining input on communications design earlier in the process, and there is increased outreach to end users in the design of

research programs. She commented that a similar approach could improve ORD communications. In examining outputs versus outcomes, Dr. Bostrom asked if ORD can actually determine if its research is affecting EPA policy. Dr. Henderson pointed out that risk communication had not been discussed during the presentations. Dr. Bostrom replied that the CDC presentation mentioned risk communication, but she added that risk communication was not a specific part of the Subcommittee's charge. The Subcommittee decided to limit its focus to the communication of research results. Dr. William Farland, Acting Deputy Assistant Administrator for Science, agreed that risk communication is an important issue, adding that it should be dealt with independent of this review.

Dr. Farland asked the BOSC if the press should be viewed as an audience or a tool. Dr. Herb Windom (Skidaway Institute of Oceanography), commented that the press is an important audience, because of the tremendous amount of information to be communicated from ORD. He thought it was important that ORD consider the press an audience and develop specific messages for them. He added that ORD can build public trust through the news media. EPA should be proactive in identifying the good that it does, and This should be communicated to the press to build public trust. Dr. Jerry Schnoor (University of Iowa), Chair of the BOSC, agreed that the press is important and media reports of ORD research should be tracked. He added that academia closely tracks its press coverage by both the popular and trade press. Dr. Bostrom thought that the press should be considered an audience, and ORD should make a concerted effort to involve the press in its communication efforts. Dr. Steve Lewis (Exxon Biomedical Sciences Inc.), member of the Communications *Ad Hoc* Subcommittee, noted that the scientific literacy of the press has increased substantially in the past 10 years. Dr. James Bus (Dow Chemical Company) said that he was struck by the fact that each Laboratory/ Center develops its own methods and outputs for communication. He asked if it is in ORD's best interest to maintain all of these different methods and outputs. Should ORD consider centralizing certain aspects of communication, such as Web sites? Is it cost effective for each Laboratory/ Center to maintain its own Web site? More effi-

cient communications could free resources for the research activities. Dr. Fred Miller commented that the inclusion of the media as an audience depends on what is being communicated. In some cases the media becomes a public driver. Ms. Cindy Yu (EPA/NERL) pointed out that centralizing ORD communications might separate the communicators from the scientists, leaving the communicators with just a cursory understanding of the science.

Dr. Jim Clark (Exxon Mobil Research & Engineering Co.) said that ORD needs to prioritize its messages and its audiences. He noted that the public and the scientific community are among ORD's priority audiences. Mr. Mike Moore (EPA/ORD) commented that most EPA staff communicate regularly with the trade press, and there has been an increase in the popular press picking up ideas from the trade press. He stressed the importance of building public confidence—ORD needs to be perceived by the public as an organization that is conducting valuable research in a cost-effective manner to improve public health.

Dr. Bostrom stated that there has been a great deal of positive feedback on the products developed by ORD's Laboratories and Centers. Some of the products also have received awards. The question arises, "How successful is EPA's communication of research results?" Also, "Does EPA's research affect policy? To what extent and how do the communication efforts influence the degree to which science influences policy? What changes in communication strategies can help EPA to obtain greater results?"

Dr. Caron Chess (Rutgers University), a member of the Communications *Ad Hoc* Subcommittee, was struck by the progress EPA has made in communications in the past 10 years. Although the communication goals could be better defined, it is

clear that EPA recognizes the value of communication. Dr. Bostrom mentioned that, although Diane Maple, Director of Media Relations for the American Lung Association was unable to attend the meeting because of illness, her presentation was included in the handouts for the meeting.

Dr. Bostrom thanked the speakers for their outstanding presentations and the participants for their insightful comments. She then provided an outline for the Communications *Ad Hoc* Subcommittee Report. It will include a mission statement, a section on managing communications, and the goals for communication. In addition it will address audience selection, content design and format, and staffing. The report also will present the conclusions and recommendations of the Subcommittee. Dr. Bostrom expects that the report will be about 10 pages.

It is clear that ORD recognizes that it can no longer rely primarily on journal publications to communicate its research results to its various audiences. ORD's investment in communications training is evidence that the managers recognize that effective communicators need a broad array of skills and they must understand the technologies and nuances of multimedia, interactivity, and the Web. They also need to keep abreast of the advancements in the communications field and be familiar with the latest communication research techniques. In addition, communications staff must be actively engaged in the day-to-day activities and decisionmaking of their organizations so that they understand and can effectively communicate the significance of the research results.

Dr. Schnoor thanked Dr. Bostrom and the other Communications *Ad Hoc* Subcommittee members for their efforts in organizing such a valuable session on ORD communications. He indicated that the BOSC Executive Committee is looking forward to reviewing their report.

Presentations for the
Communicating Research Results:
Best Practices Workshop