



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

WASHINGTON, D.C. 20460

FEB 17 2009

OFFICE OF
RESEARCH AND DEVELOPMENT

Dr. Gary S. Saylor
Chair, Board of Scientific Counselors
The University of Tennessee
676 Dabney Hall
Knoxville, Tennessee 37996

Dear Dr. Saylor:

The Office of Research and Development (ORD) would like to take this opportunity to thank you and the members of the Board of Scientific Counselors (BOSC) for the December 2007 progress review of the National Exposure Research Laboratory (NERL). We greatly appreciate the efforts of the BOSC NERL Standing Subcommittee that conducted the review. The members include Drs. Kenneth Demerjian, Steve Bartell, Joseph DePinto, Douglas Dockery, and Michelle Frey.

The subcommittee was requested to provide advice and guidance on NERL's Conceptual Exposure Framework document. Enclosed is our response to the subcommittee comments and recommendations that were provided in your letter of June 26, 2008.

We are pleased that the BOSC was very supportive of NERL and the development of the Conceptual Framework. The advice and guidance of the BOSC was very helpful to NERL in the revision of the document, which is enclosed for your information.

Again, thank you for your efforts on behalf of ORD. Please feel free to contact me if further information is needed.

Sincerely,

A handwritten signature in black ink, appearing to read "Kevin Teichman".

Kevin Teichman, Ph.D.
Deputy Assistant Administrator for Science

Enclosures

cc: Dr. Kenneth Demerjian
Dr. Steve Bartell
Dr. Joseph DePinto
Dr. Douglas Dockery
Dr. Michelle Frey



**Office of Research and Development's Response to the
Board of Scientific Counselors Report on
ORD's National Exposure Research Laboratory
(final report received June 2008)**

February 2009

BOSC National Exposure Research Laboratory Subcommittee

Dr. Kenneth Demerjian
Dr. Steve Bartell
Dr. Joseph DePinto
Dr. Douglas Dockery
Dr. Michelle Frey

Submitted by:
Dr. Linda Sheldon
Acting Director, National Exposure Research Laboratory
Office of Research and Development

ORD Response to BOSC NERL Letter Report
February 2009

The following is a narrative response to the comments and recommendations of the BOSC review of ORD's National Exposure Research Laboratory (NERL), held on December 11-12, 2007 in Research Triangle Park, NC. The review was conducted by a Standing Subcommittee of the BOSC and was its first formal meeting. The purpose of the review was to provide commentary on NERL's Conceptual Exposure Framework Document. Specifically, the Subcommittee responded to a series of charge questions submitted prior to the face-to-face meeting. The charge is provided in Appendix A.

Overall there was unanimous agreement among the subcommittee members that the effort and time commitment of NERL management and staff to prepare the Exposure Framework was time well spent. The Subcommittee recognized that the Exposure Framework will evolve over time and does provide a unifying theme and cohesiveness that will bring the six divisions into closer working relationships.

The following are principal recommendations made by the Subcommittee. The BOSC's comments are given in bold text followed by NERL's response to the comments. Attached to this report is a summary of detailed comments provided by Subcommittee members and ORD's responses (Table 1).

1. The communication of the vision of the Exposure Framework to other ORD laboratories and centers to develop a sense of ownership ORD-wide is important and dictates that the document be vetted by the other laboratories and centers before it is finalized.

We strongly agree that the Exposure Framework must be communicated ORD-wide as well as with external partners. The central concepts and role of exposure science in addressing environmental health problems have become core components of our laboratory's presentations. This information has been included in our "NERL 101 presentation" as well as in numerous presentations across ORD, to our Program Offices, and to external partners. Figure 3-1 from the framework has been adopted by ORD to describe the breadth of our science in meeting Agency needs and to emphasize the importance of collaboration partnerships across the organizations.

2. Consider separating the Framework into two core documents – one document addressing the NERL/EPA Guidelines to Exposure Science and Research, and the second document describing internal management practices at NERL in implementing the Framework.

The Exposure Framework was designed with dual purposes in mind. The first purpose was to characterize exposure research across the Agency and highlight NERL's role in that research. This provides a context for the science that the laboratory conducts. The second purpose, which is the primary focus of the document, is to clarify and codify the principles that NERL uses to develop and implement research.

We believe that the descriptions in the document of both of these purposes are vital to the structure and integrity of the Framework. We do intend to publish articles in scientific

ORD Response to BOSC NERL Letter Report
February 2009

journals that describe the first purpose of the Framework, and highlight exposure science within NERL and the Agency. The implications for managing the laboratory's research will flow from the remainder of the Framework document.

- 3. a: The first document should be viewed as an EPA guidance document, founded on best practices and principles for sound exposure research and estimation techniques. This guidance document should be followed up with a peer reviewed journal article describing the scientific basis of the Exposure Framework. This document should include a detailed description of its target audience. Indeed, there are multiple audiences which will require somewhat alternative documents.**

The term "guidance document" has a specific meaning within Federal agencies. The Office of Management and Budget has defined a guidance document as an agency statement of general applicability and future effect, other than a regulatory action (as defined in Executive Order 12866, as further amended, § 3(g)), that sets forth a policy on a statutory, regulatory or technical issue or an interpretation of a statutory or regulatory issue.

Given this specific definition, we prefer not to refer to the Framework as a guidance document. NERL has taken steps, however, to promote the principles of the Framework outside the Agency. The Framework in its entirety will be peer reviewed and published. We have currently published one article in Environmental Magazine on exposure science and its implications for environmental management. NERL is also preparing an article on the Exposure Framework and how it should be used to target the research community.

We agree that the target audience needs to be more fully described, and we have expanded the discussion of audience in section 1 of the Framework. As described above for question 2, the fundamental focus and audience of the Framework is within NERL. The Framework will be translated and communicated to audiences external to NERL, primarily through peer reviewed manuscripts.

- b: The document should identify and work through one human health example and one ecology example to truly assess its utility and clearly identify the processes and prioritization criteria applied in setting the research agenda.**

Using the Exposure Framework as a guide, NERL is developing new approaches for planning and prioritizing science through the design of integrated, multidisciplinary research to address problems of broad national significance. We believe that the utility of the Framework document will be demonstrated through this process. As human health and ecological research applications are developed, descriptions of those applications will be added to the appendix of the Framework. For example, the Framework is being used to evaluate two emerging areas of research in biofuels and nanotechnology, and the role that NERL will play in those areas in elucidating exposure science.

- 4. The second document describes the implementation framework, focusing on NERL practices in terms of: (1) mission and goals; (2) management strategy; (3) research and financial planning process; and (4) administrative procedures. Although it is not in the**

interest of NERL to write a “management book,” it is important to NERL operations and for staff to have an internally focused “rule book” of how the laboratory will pragmatically carry out its mandate.

We agree and have substantially revised Chapter 4 of the Framework to include a more robust discussion of these management concepts. Chapter 4 focuses on management practices as discussed by Robert Kaplan and David Norton using the Balanced Scorecard method. This method is a strategic approach and performance management system that will enable NERL to translate our vision and strategy into implementation. This approach will be centered on financial, organizational, business processes, and research perspectives.

- 5. The Framework document has great value in defining the field of “exposure science” for the broader scientific community. In that context, it is important that the document clearly state its goals and audiences in the introduction and be written in such a way this it is sensitive to the broader role it will be playing. This means being very inclusive in how the document defines and explains exposure science and research in Sections 2 and 3 of the document.**

As stated above, we have strengthened the discussion of audience and have more clearly defined the goals in the Framework introduction. Concepts of exposure science that are more appropriate for external audiences will be further highlighted in published articles.

- 6. The illustration of the source-to-outcome continuum holds for human health and ecological exposures, Figures 2-3 and 2-4, respectively. NERL should consider using a single diagram with text highlighting the complexities of media interactions and the differences in the demands of the research disciplines (as outlined in the text box on page 5 of the Framework document).**

Though we understand the value of integrating the diagrams, we feel that keeping the figures separate provides areas of emphasis on human health and ecological research that would otherwise be compromised. This unique emphasis demonstrates the differences in the Agency’s mission with respect to preserving human health and ecological welfare and highlights the role that exposure processes play.

- 7. The Framework document needs to further clarify how program areas for which the responsibilities are divided among ORD laboratories (e.g., water quality research) will be addressed under the proposed construct.**

The Framework is a tool that will provide strategic direction to NERL. Though we intend to vet the Framework document with others in ORD, the extent and mechanism with which program area responsibilities are divided among ORD is beyond the scope of this document. ORD has created Multi-Year Plans that are led by National Program Directors (NPDs) for each research area. The NPDs determine how program areas are integrated across ORD and work with laboratory management to clarify how NERL supports them in this effort.

8. The Framework should be applied as part of the research planning process, with a follow-up post-audit to assess the effectiveness of the document and help highlight the areas of the Framework that need to be strengthened.

As described above, NERL is using the Framework to coordinate an integrated, multidisciplinary exposure research program. We agree with this recommendation, and plan to use the Framework to inform NERL research planning. We also agree that a follow up audit should be done to identify strengths and opportunities for improvement within the document.

9. The Framework document needs to better articulate NERL's partnering goals and agenda.

Partnerships and collaborations will be essential to the successful conduct of exposure research for NERL. We believe that the greatest value of the Framework will be identifying what research we do so that collaborative opportunities can be sought out and coordinated. Currently we are working to identify problems of national significance and targeted exposure research. Once we have identified these research priorities, we will consider revising the Framework to include a list of partners and related goals.

Appendix A

Charge questions to the NERL BOSC Standing Subcommittee – December 2007

1. Effectiveness of the NERL Exposure Framework
 - (a) Please comment on the effectiveness of the Framework in describing the elements of exposure science.
 - (b) There are both similarities and differences in exposure science as it is applied to humans and ecosystems. Within the document, the authors tried to use concepts and terminology that could be applied to both disciplines with a discussion of differences only where necessary. Does the document provide a meaningful discussion for both disciplines? Are there recommendations for bridging the understanding of exposure research for both groups?
 - (c) Please comment on the effectiveness of the Framework in describing the uses of exposure science in furthering the Agency's mission to protect human health and the environment.
2. What are the core areas of expertise that are required within NERL to effectively conduct human health and ecological exposure research? How are these areas likely to evolve in the future?
3. How can we use the Exposure Framework as a communication tool?
 - (a) To enhance external communications?
 - (b) To develop new partnerships?
4. Please comment on the merits and barriers to conducting the exposure-related collaborative, multidisciplinary research that will be required to successfully address the full suite of risk assessment and risk management activities.

Table 1. Responses to Specific Recommendations Related to Charge Questions

	Recommendation	Response
Effectiveness of the NERL Exposure Framework		
<p>Overall the framework has achieved its goals</p> <ul style="list-style-type: none"> ▪ to draw together and focus the six divisions organized under NERL ▪ to serve as guidance for both internal and external use by EPA <p>Next step is to demonstrate that the divisions can support the principal elements of the Framework while meeting client demands/obligations.</p>		
Effectiveness of Framework in describing elements of exposure science		
	Give statement of primary and secondary audience	Primary – NERL Secondary – ORD, EPA, Scientific Community
	The document provides an opportunity to provide a leadership role in defining the field of exposure science and its uses. This requires careful consideration of sections 2 and 3. Comments on the figures and text are given below. The document strikes a reasonable balance between completeness and detail.	
1	Revise figures 2-3 and 2-4 to emphasize similarities and differences in exposure research for human and other organisms.	<p>We revised figures 2-3 and 2-4 to include the recommended changes which we feel clarify human health and ecosystem similarities and differences.</p> <ul style="list-style-type: none"> ▪ Maintained the two figures and the cascade effect for eco ▪ Changed ambient to environmental concentration ▪ Added food under environmental concentrations ▪ Kept ecosystem exposure in Figure 2-4 ▪ Added text to demonstrate relationships and feedbacks between human and ecological exposure
2	The term “continuum” is not appropriate for the figure 2-3 and 2-4 captions.	We agree and have changed the word “continuum” to “framework”.
3	Examine how well figure 3-1 can be applied to distinguish between exposure assessment work and exposure science research.	This distinction is clearly important and we have clarified this throughout the text. As defined in the text: <i>“Exposure science is applied in the practice of assessing and managing environmental health risk; whereas exposure research is conducted to address critical gaps that will limit the application of exposure science”</i> .
4	Clarify the definition and distinction between multimedia and multipathway exposures.	We have thoroughly reviewed the Framework to ensure that, when these terms are employed, they are used correctly and in the appropriate context. We have also added a text box that

ORD Response to BOSC NERL Letter Report
February 2009

	Recommendation	Response
		defines these terms.
5	Characterize whether or not dosimetry is within the domain of exposure science.	Understanding dose to tissues and organs is important to the field of exposure science. For example, NERL develops pharmacokinetic models to characterize dose to target organs in the human body. Language that describes the importance of dosimetry has been strengthened.
6	Define whether or not cascade effects critical to Homeland Security and Drinking Water research are within NERL's domain for human exposure.	Secondary infection and event consequences are within the human exposure domain. Language has been added to the text to clarify this point.
7	Clarify if the dosimetry process within exposure assessment is part of NERL's domain.	Language has been strengthened. See response number 5 for more explanation.
Does the Document provide a meaningful discussion for both human and ecological exposure research? Are there recommendations for bridging the understanding between groups?		
Recognize this is difficult and seems forced at times but is necessary		
8	Utility will be demonstrated through application. Recommends that specific applications be applied and added to Framework.	We are in the course of developing a new process for research planning. The Framework is explicitly being used as a part of this process. We will include examples in an appendix to the Framework as it is completed.
9	<p>Questions on how NERL views certain Human Health issues</p> <ul style="list-style-type: none"> ▪ Cascade effects in homeland security and secondary infection ▪ How is biotransformation considered ▪ Consider bioaccumulation exposures and cascade impacts. ▪ Are autoimmune system impacts, etc., considered a cascade 	<ul style="list-style-type: none"> ▪ Cascade effects are not as common in human exposure but we view the examples as cascade impacts and have included this in the text. ▪ Biotransformation is considered part of our PBPK models; this is not a cascade but a process. ▪ Bioaccumulation is not viewed as a cascade impact, but rather an exposure pathway. ▪ We agree these are very important they describe human vulnerability and susceptibility and are considered in quantifying exposure and risk but not as a cascading effect.
10	Describe more fully the relationship of human to ecological exposure.	Throughout the Framework, we have added text to more thoroughly demonstrate the linkages between human and ecological exposure.
Please Comment on the Effectiveness of the Framework in describing the uses of exposure science in furthering the Agency's mission.		

ORD Response to BOSC NERL Letter Report
February 2009

	Recommendation	Response
	One of the strengths is the specification of the utility of exposure science	
11	Include information on the role of epidemiology in NERL's approach to exposure research.	A more detailed description of NERL's approach to using epidemiological studies has been added to Section 3.
12	Explicitly define NERL's clients and customers.	We recognize the value of identifying our clients and have added text throughout the Framework relating this value.
13	Integrate a conceptual research prioritization process into the Framework.	The Office of Research and Development, of which NERL is a part, is in the process of defining broad changes to research priorities and multi-year research plans. NERL will play a key role in defining integrated multidisciplinary programs of broad national significance and targeted research projects. Although the Framework lacks a specific articulation of how research will be prioritized, to date it has effectively guided the development of an initial set of research problems that will define our future research program. We feel that, at this time, adding a prioritization methodology would reduce necessary flexibility.
What are the core areas of expertise that will be needed by NERL to effectively conduct human health and ecological research? How are these areas likely to evolve in the future?		
We were asking for BOSC visioning not recommendations in this question. We did not consider that a response was needed about our agreement with the BOSC vision, what NERL's expertise was in these areas and how we planned to fill voids in particular areas. NERL already has some expertise in all of the areas mentioned.		
How can we use the Exposure Framework as a communication tool?		
To enhance internal and external communications		
14	NERL should separate the framework into two documents.	See response under general comments and information provided on Balanced Scorecard.
15	Develop guidelines to align public and scientific understanding of exposure.	Although the Framework was designed primarily as an internal (to the Agency) document, we agree that it has value in clarifying exposure science to the scientific and lay communities. To date, we have published one article on the Framework in Environmental Magazine and are preparing other publications that will demonstrate fundamental principles of exposure science to a variety of audiences.
16	Develop external and internal communication materials that champion	As discussed under the general recommendations, we have already begun to

ORD Response to BOSC NERL Letter Report
February 2009

	Recommendation	Response
	<p>the ideals and use of the Framework.</p> <ul style="list-style-type: none"> ▪ Exposure Science publication ▪ Abstract/summary of guidelines ▪ Standard presentation ▪ Frequently asked questions about NERL and guidelines 	<p>communicate the framework internally and externally. Additionally, we are in the process of creating a number of the materials such as a standard briefing for rolling out the Framework to NERL organizational units. Now that the Framework has been finalized, we are preparing additional communication materials as recommended. Coupled with our external publications on the Framework, this approach to distribute and communicate the document's principles will result in improved understanding of exposure science and increased NERL partnerships.</p>
17	<p>Internal Communication</p> <ul style="list-style-type: none"> ▪ Standard presentation for Deputy Directors to provide staff ▪ Research Planning Fact Sheet ▪ "How to" guide for participating in Research Planning 	<p>These are excellent recommendations and will be implemented now that the Framework is complete.</p>
To Develop new Partners		
18	<p>Leverage the Framework as a tool to develop new partnerships</p> <ul style="list-style-type: none"> ▪ Focus on guidelines ▪ Develop and articulate its partnering goals ▪ Use examples other than air ▪ Use presentations, publications, and scientific conferences 	<p>Clear communication of exposure science, its role in Agency decisions, and the exposure research NERL conducts provides a strong basis of developing new partnerships. As state previously, this is already having an impact across ORD, with EPA program offices, and with the external scientific community. We strongly agree with this recommendation and it is a priority for NERL to use the Framework as a tool to develop new partnerships.</p>