UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

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OFFICE OF
RESEARCH AND DEVELOPMENT

Gary S. Sayler, Ph.D.
Chair, Board of Scientific Counselors
Center for Environmental Biotechnology
The University of Tennessee
676 Dabney Hall
Knoxville, TN 37996

Dear Dr. Sayler:

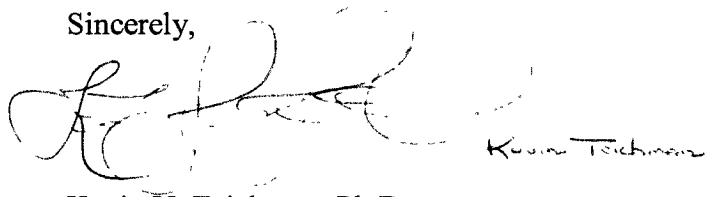
On February 7–9, 2007, the Safe Pesticides/Safe Products Research Program Subcommittee of the Board of Scientific Counselors (BOSC) met in Research Triangle Park, NC to evaluate the Office of Research and Development's (ORD) Safe Pesticides/Safe Products (SP2) Research Program. The Subcommittee presented a report of its findings and recommendations to the Executive Committee of the BOSC on May 24, 2007, and the Executive Committee, in turn, a final BOSC report to the EPA on July 23, 2007. With this letter, I am pleased to enclose the Agency's response to the final BOSC report of its review of the SP2 Research Program.

The SP2 Research Program greatly appreciates the insights, advice, and recommendations offered by the Subcommittee. The attached narrative presents an overview of specific recommendations made by the Subcommittee and provides a brief comment in response that indicates how the SP2 Research Program will take the findings into consideration. A table that summarizes each recommendation, the action to be taken, and a schedule for completion of the action is also attached.

As you are aware, ORD conducts periodic evaluations of its research programs' progress at intervals of 4-5 years. The purpose of these reviews is to determine progress with regard to relevance, quality, performance and scientific leadership. The reviews also focus on identifying how the scientific community and programmatic clients utilize ORD's scientific outputs to protect human health and the environment. In addition to these formal reviews, ORD evaluates program progress midway through the review cycle. These mid-cycle reviews provide critical

feedback to the program concerning its progress since the last review and the extent to which recommendations from that review are being met. The timing for the mid-cycle review of the SP2 Research Program will likely occur in 2009. In this context, we look forward to the possibility of working with you and other members of the Subcommittee again.

Sincerely,



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

Attachment

cc: Dr. P. Barry Ryan - Vice Chair
Dr. Craig Adams
Dr. Jerald S. Ault
Dr. Elly P.H. Best
Dr. Carlos Blanco
Dr. Joel R. Coates
Dr. Richard Di Giulio
Dr. Judy Graham

Office of Research and Development
Response to the Safe Pesticides/Safe Products Subcommittee of the Board of Scientific Counselors' Review
July 23, 2007

BOSC Subcommittee:
Dr. Anna K. Harding - Chair
Dr. P. Barry Ryan - Vice Chair
Dr. Craig Adams
Dr. Jerald S. Ault
Dr. Elly P.H. Best
Dr. Carlos Blanco
Dr. Joel R. Coates
Dr. Richard Di Giulio
Dr. Judy Graham

Submitted:
Dr. Elaine Z. Francis
National Program Director
Pesticides and Toxics Research Program
Office of Research and Development

The U.S. Environmental Protection Agency's (EPA) Office of Research and Development (ORD) relies on its Board of Scientific Counselors (BOSC) to conduct independent expert reviews of its environmental research programs every four to five years. The Safe Pesticides/Safe Products (SP2) Research Program Subcommittee of the BOSC met in Research Triangle Park, NC on February 7–9, 2007. The review focused on the Subcommittee's evaluation of detailed documentation on the program's relevance, quality, performance and scientific leadership. A set of specific questions was used to guide the Subcommittee through the review, producing a number of recommendations and observations with regard to the program.

The purpose of the following narrative is to respond to the recommendations made in the *Review of the Office of Research and Development's Safe Pesticides/Safe Products Research at the US Environmental Protection Agency*, dated July 23, 2007.

The overall impression of the Subcommittee is that the SP2 Research Program is a very successful program. It is well managed throughout all levels, from senior management to data collection and analysis. The relevance of the SP2 Research Program to the Agency's mission is clear and apparent, filling a unique niche within the Agency. EPA needs more advanced scientific approaches to identify chemical risks and assess those risks, while informing risk management on how to reduce risks. This scientifically difficult task requires state-of-the-science solutions, which the SP2 Research Program is supplying. The Subcommittee believes that the program is of great value now and will continue to be so well into the future, but provides, as an outcome of this review, 22 specific recommendations (summarized in Table 1) for consideration by EPA to maintain and enhance the program.

EPA will use these recommendations to guide the SP2 Research Program during the annual planning cycle and future revisions of the Multi-Year Plan (MYP). EPA's responses to each recommendation outline actions being taken by the SP2 Research Program to address the issues identified in the BOSC review.

RELEVANCE

All three Long Term Goals (LTGs) were found to be consistent in scope and content with EPA's Strategic Plan and providing results that are fully relevant to the Agency's needs. The BOSC Subcommittee noted on page 16, however, that for the biotechnology research program under LTG 3, an approach to include mitigation potential on gene transfer, effects on non-target organisms, and targeted species resistance was missing, which may be an impediment to achieving one of the Annual Performance Goals (APGs).

> **Recommendation 1**: An approach to include mitigation potential on gene transfer, effects on non-target organisms, and targeted species resistance should be included with the APGs within LTG 3. Other questions should be addressed including improvement of methods for tracking and quantifying products of genes or new technologies, and expanding the operative definition of "biotechnology."

Response: EPA's biotechnology research program is already addressing a number of the concerns raised by the BOSC Subcommittee. For example, ORD, along with researchers at Oregon State University, has investigated and evaluated the effects of plant incorporated protectant (PIP) crop effects on non-target organisms through the development of field scale protocols. The protocols are linked through a questionnaire based on a dichotomous key leading the study designer to incorporate features that substantially define a study and its objectives. This new approach permits proper design and implementation of field scale studies to ensure collection of necessary information to validate each study's findings. A component of the non-target research included instructions designed to enable the proper review of a finished non-target study. EPA held a workshop (2007) on "Pollen Mediated Gene Flow in the Environment Research" that explored non-target research issues and the future directions associated with it. The workshop was organized by ORD with a participant group consisting of government and industry members. ORD's biotechnology research program has historically been focused on the assessment monitoring and mitigation aspects of genetically modified (GM) Bt corn crops as the result of discussions with EPA's Office of Pesticide Programs (OPP) to address some of their highest priority research needs. Given the current level of resources for this program, it is unlikely that the program could be expanded to address all of the suggestions in this recommendation and in Recommendation 12.

Action/Timeline: Most recently, ORD investigated the effects of gene transfer in turf grass. However, given current resources and priorities, EPA is not planning to further develop methods to track and quantify the potential of gene transfer and/or species resistance in agricultural crops. In FY 2009, an EPA report will be completed which documents the testing and evaluation of resistance management models that track the development of resistance to control traits in PIP crops.

STRUCTURE

The BOSC Subcommittee concluded that the SP2 Research Program framework is well thought out, logical, and laid out in a reasonable and integrated manner. In general, the Subcommittee found that the framework presented by the LTGs represents a good way of organizing the large number of activities undertaken by the SP2 researchers

Recommendation 2: The SP2 Program structure needs to remain flexible to emerging science, some of which will be produced by the program itself. Developing a structure for such an interactive, complex research program over multiple years is very difficult and impossible to do with great precision. This makes it even more important that the APGs and APMs be as clear as possible. This enables researchers to better envision goals and managers to better track the progress towards those goals.

Response: ORD concurs that the Multi-Year Plan (MYP) should strive to communicate a clear link between Annual Performance Goals (APGs) and their supporting Annual Performance Measures (APMs) so that during the implementation of the research program, progress made toward completing significant milestones can be clearly understood and communicated. ORD also works toward having each APM and APG be

measureable so that it is clear what constitutes achievement. ORD has developed a process to evaluate how well goals have been met for each of its research programs. As a measure of performance, ORD provides to the Office of Management and Budget (OMB) the extent to which committed APGs and APMs have been met over time. Since establishing performance metrics for OMB has come about since the finalization of the SP2 MYP, a description of these metrics is not in the current MYP. ORD is currently revising its guidance for all MYPs, and a section describing performance metrics for each program will be added. In addition, ORD's Office of Resources Management and Administration has provided new guidance for establishing products, milestones and impacts of annual performance measures. This guidance will be reflected in revised MYPs.

Action/Timeline: Improving APGs and APMs is an ongoing effort. The next update of the MYP will reflect new ORD guidance and new metrics agreed upon with OMB.

The Subcommittee found that there are shortcomings in the presentation of some APGs and APMs and provided several examples on page 20.

Recommendation 3: Clarifications are needed so that the research is more consistent with the text. The relationship between the APMs related to each APG is not always clear. Some of the APMs are not clearly phrased, and the associated APGs are not clearly delineated. Also, even though research should be dynamic and future year changes are expected, each APG should have at least a few APMs each year until the APG is completed.

Response: ORD agrees that it is important for the reader of the MYP and reviewer of the research program to understand the content and context of the APGs and APMs. The following is a brief summary of how ORD has defined the relationship between APGs and APMs: *APGs* for ORD are typically major research outputs that are described in the context of the outcome to which they contribute. They represent significant, timely milestones along a critical path toward the accomplishment of LTGs. *APMs* are research outputs that contribute to the accomplishment of an APG by addressing the most important scientific issues for that particular annual performance goal. The collection of APMs that address an APG should represent the critical research outputs that are both necessary and sufficient for achievement of the APG.

While each APG has multiple supporting APMs that are planned over several years, it is not always practicable to have multiple APMs due each year as recommended. The program needs the flexibility to plan the critical, multi-year research outputs along a path that considers both the requirements of peer-review and completion of supporting work often completed by contract and grant recipients. This process can result in an uneven distribution of APM completion over the timeframe necessary to complete an APG. While the program attempts to have important deliverables annually, this is not always possible over the course of each APG. Furthermore, there has been guidance from the Agency and ORD toward having fewer and more aggregated APMs. Therefore, each APM often reflects an aggregated body of research for which related multiple internal

milestones, some of which may have been more evenly distributed over multiple years, have been combined.

Action/Timeline: ORD will clarify the generic relationship between APGs and APMs in the next update of the MYP and will ensure greater consistency and clarity with the wording of the APGs and APMs.

The Subcommittee noted several times (e.g., pages 21, 24) that although the structure for all LTGs is strong for human-health risk, it lacks sufficient emphasis on exposure assessment. They believe that the required balance between these two components of risk assessment is lacking in the SP2 Research Program.

Recommendation 4: Address structural elements to afford a greater emphasis on exposure.

Response: ORD agrees that the program presented to the BOSC lacked sufficient emphasis on exposure research. As noted at the BOSC review, in response to this issue, there are several explanations for this: 1) exposure research has not been as high a priority need for OPPTS as effects-related research, and 2) there is a lot of exposure-related research ongoing in other research programs that is linked to OPPTS' needs and to the SP2 Research Program. Nonetheless, since the BOSC review, ORD has initiated action to increase the number of full time equivalent employees (FTEs) conducting exposure research under the SP2 Research Program. In addition, the National Exposure Research Laboratory has initiated an implementation planning process for identifying the highest priority areas of exposure research for these additional FTEs to plan and conduct research in support of the SP2 MYP.

Action/Timeline: ORD is shifting FTEs for exposure research into the SP2 program and has initiated an implementation planning process, which is expected to be completed in 2008. The next update of the MYP will provide stronger evidence of linkages to the exposure research of other ORD programs that is relevant to supporting OPPTS.

On page 21, the Subcommittee noted that health scientists from LTG 1 and LTG 2 are apparently using the same study organism and perhaps similar methodologies.

Recommendation 5: Health scientists from LTG 1 and LTG 2 would be well served by having stronger interaction. A mechanism(s) to improve communications between groups doing research on these two LTGs is (are) recommended. For example, [posters] LTG 1A-12 and LTG 2-6 focus on physiological and behavioral studies with exactly the same fish. One project is emphasizing short timescales (days) and the other conducts apparently similar work, but at longer timescales (weeks).

Response: In general, ORD agrees that increased efforts on reinforcing cross-laboratory and ORD research interaction and coordination will enhance and improve the efficiency of our research program. In the particular case presented on posters LTG 1A-12 and LTG 2-6, there are little commonalities other than the species being used. The goal of the

research presented in poster LTG 1A-12 is to develop a high-throughput whole animal (fish embryo) screen for developmental neurotoxicants (DNTs) in conjunction with the research presented in poster LTG 1A-11 on high throughput *in vitro* assays for DNTs. The work represented on poster LTG 2-6 is part of the reproductive toxicity screening related to endocrine disruption and is being conducted in collaboration with research under LTG 3 under the Endocrine Disruptors Research Program.

Action/Timeline: Cross-laboratory coordination is continuously sought and achieved. In this particular instance, no further action is needed.

On page 24, the Subcommittee commended the chemical-specific exposure program under LTG 1C as being "noteworthy." However, they also noted that while exposure is a substantial component of risk assessment, it is only a minor fraction of the LTG 1 A/B research program. The Subcommittee feels that the SP2 MYP is inadequate to deal with the challenges of exposure assessment, especially of infants and children. They noted that the Food Quality Protection Act (FQPA) emphasizes the importance of aggregate exposure and cumulative risk. They acknowledge that some exposure research is being performed under other programs (e.g., human health risk), but indicate that it is not clear to them that the program will be fully responsive to this FQPA requirement.

Recommendation 6: The SP2 Subcommittee believes that an integrated evaluation of the entire program on health risk, whether it be in SP2, Human Health, EDCs, or other areas, be performed to provide advice on program balance, especially with respect to exposure.

Response: ORD appreciates the "noteworthy" recognition of the LTG 1C research program and recognizes that the LTG 1 A/B research programs could be enhanced with increased contribution from exposure researchers. As noted in response to Recommendation 4, ORD is increasing the exposure FTE resources in the SP2 plan and is using an implementation planning process to identify the highest priority areas for an increased exposure component. The BOSC Subcommittee review and insights will be carefully considered in these discussions.

It should be pointed out that in 2004, ORD's Laboratory/Center/Office Directors recommended that research on aggregate exposure and cumulative risk, which had been ongoing through a separate research program on *Safe Foods* and directly supportive of research needs identified through FQPA, be consolidated into related research in the Human Health Research Program. This consolidated research has been reviewed by the BOSC Subcommittee on Human Health Research (2005) and found to be "promising," "important work," that "provide[s] rapid response to the needs of the Agency's regulatory program," with "new and interesting results." In particular they acknowledged that the research "will generate models for use in determining the cumulative risks of carbamates and pyrethroids and allow EPA to conduct state-of-the art cumulative assessment[s]."

As noted at the BOSC review and in response to Recommendation 4, other ORD research programs also carry out human health exposure research that is relevant to meeting the needs of OPPTS. Therefore, the ORD National Program Directors for the SP2, Human

Health, EDCs, Air, and other research programs confer periodically to ensure that programs are not conducting duplicative efforts, that priority needs do not "fall through the cracks," and that the products of the research are disseminated to those who may find them of benefit. An approach for improved cross-program communication of the entire ORD human health exposure program will be developed for the update of the MYP.

Action/Timeline: Additional FTEs for exposure research are being aligned under the SP2 program. The NERL SP2 implementation planning process should be completed in 2008. An approach to better communicate human health exposure research conducted across MYPs will be developed for the MYP update.

The Subcommittee identified, on pages 24 and 25, an inaccuracy in the title of one of the APGs under LTG 1 regarding the validation/verifications of methods/models developed by ORD. They point out that given their importance to credible guidelines and eventual regulatory decision-making, methods developed by ORD need to be validated/verified by some group, not necessarily by ORD, but they need to be conducted somewhere to allow use by EPA (and others) in test guidelines.

Recommendation 7: The SP2 Program should emphasize the need for explicit and transparent validation/verification of both analytical methods and models used within the program or developed by the program.

Response: ORD agrees that future versions of the MYP need to clarify the distinction that while ORD research may lead to the development of a method or model, that the validation of that method/model is done by an independent group of experts. ORD thanks the BOSC Subcommittee for identifying the inaccuracy that exists in the wording of one of our APGs under LTG 1: "Develop and validate virtual chemical and alternative methods for risk-based prioritization and screening of chemicals." This will be reworded in the next version of the MYP to reflect that ORD will "develop" the methods and subsequently "submit them for validation."

Action/Timeline: The APG will be reworded in the update of the MYP.

The Subcommittee recognizes, on page 25, that there are many additional compounds that merit study under LTG 1C. They acknowledge that new materials for study are selected when the partner office (i.e., OPPTS) discerns the most pressing issues/chemicals, based on input or concern from the public, industry, or scientific papers.

Recommendation 8: Clarify the criteria used to select new compounds for study, and expand the list of compounds under LTG 1C using the methods currently in use. There are many additional compounds in LTG 1C that merit study, and the criteria for selection of compounds that will be studied for effects and exposure are not clear.

Response: As noted in the Subcommittee report, OPPTS actually identifies and prioritizes those elements of our research program that need to be accomplished in the shorter-term, i.e., those that are consistent with LTG 1C. OPPTS' priorities are often

based upon regulatory decisions that they see forthcoming in the near future (e.g., the lead Renovation and Remodeling rule, an announcement on the value of use of sealants on CCA-treated wood), or a critical piece of data that needs to be developed to interpret or complement data that have been submitted by industry (e.g., as with a pesticide's registration package). When there are insufficient resources to conduct both new and previous research that we have committed to completing, we ask OPPTS to identify which element(s) of our research portfolio could be deferred to conduct the newer high priority effort. The next version of the MYP will clarify how these determinations are accomplished.

Action/Timeline: The next version of the MYP will clarify how determinations of short-term research priorities are accomplished.

On pages 25 and 26, the Subcommittee expresses its belief that there is room to further enhance the scientific and mathematical approaches that are underpinning the research activities under LTG 2. They provide a number of recommendations related to ways in which enhancement could take place.

Recommendation 9: There is a need to begin movement towards an ecosystems approach that fully and accurately assesses population and community risks associated with various aspects of SP2.

Response: As part of the ongoing planning process, ORD is considering how additional FTEs can be fully integrated into the existing LTG 2 program and is planning new research that moves towards an integrated, spatially explicit risk assessment program for targeted population and communities of concern that adds a new exposure component to the existing ecological effects modeling efforts. To define the integrated new research program, as noted in response to Recommendation 6, the National Exposure Research Laboratory in collaboration with the other ORD Laboratories/Centers, OPPTS, and the Regional Offices has initiated an implementation planning process for identifying the highest priority areas of exposure research that will allow improved integration of the exposure research with the effects research already represented in the National Health and Environmental Effects Research Laboratory SP2 Implementation Plan.

Action/Timeline: The NERL SP2 implementation planning process should be completed in 2008. The NHEERL SP2 Implementation Plan was completed in 2005.

According to the Subcommittee, to link empirical extrapolations across species and elements of the ecosystem, to address probabilistic risks at the population level, and to make those risk assessments spatially explicit by incorporating features of the "habitats" and environmental variability will require some vision refocus and perhaps new thinking (page 25).

Recommendation 10: There is a need to develop further the mathematical foundations that underpin the current modeling efforts, with greater rigor associated with statistical applications in risk assessment. Research in LTG 2 largely focused on empirical and

analytical methods to reduce the uncertainties associated with strict reliance on population measures.

Response: ORD agrees that the quality of the models developed within LTG 2 is only as good as the mathematical and ecological foundations on which they are based. ORD will take the comments of the BOSC and implement them to encourage greater integration of our ecological modeling efforts to include exposure and the effect of changes in habitat to expand the utility of the currently available models.

Action/Timeline: The process for development of the NERL SP2 Implementation Plan, which will be completed in 2008, will lead to addressing this recommendation.

The Subcommittee indicated that the current focus on PC-based models, while helpful in a didactic sense, are approaches that are rapidly becoming obsolete in the research and applications sciences. The panel feels that the prospective vision of the empirical-modeling linkages needs to be both greatly enhanced and expanded to accommodate the expected pace of scientific progress and commensurate with the scope and timing of partner needs and requests. They think much of this innovation will come through improved and expanded efforts toward building connections and opportunities that facilitate greater representation of potential academic collaborators where intellectual and applications research synergies could help the SP2 Program ascend to new heights.

Recommendation 11: Pursue collaborative relationships to advance methods and techniques in the area of high-performance computing (grid and cluster computing and scientific data visualization) to facilitate development and applications of state-of-the-art coupled biophysical spatial models that integrate biology, predator-prey systems, habitats, physics, and humans for probabilistic risk assessment.

Response: ORD agrees that information technology is advancing rapidly and that cluster computing along with other high performance computing capability would increase the speed and breadth of applications we could develop. One important aspect that is a critical component of ORD's research program is technology transfer to the end user community in EPA, the States, and Tribes. In consideration of the end-user community, it is necessary that predictive modeling programs be available on standard platforms that do not require high-level computing skill or hardware. With that consideration in mind, a significant portion of the work under LTG 2 is development of web-based applications that are and will be available publicly. In addition, ORD's National Center for Computational Toxicology (NCCT) is pursuing several research programs that use EPA's supercomputer or grid system, including a project to evaluate ligand-receptor interactions for a large number of chemicals and proteins and for visualization of virtual tissue models. As with the above, the products of such research would be made web-accessible to the general public.

Action/Timeline: The development of web-based applications of products of ORD's research for use by our clients and the identification and pursuit of research partners to help provide tools that our clients can use are ongoing.

The Subcommittee recognizes that the science being used to achieve LTG 3 is appropriate to achieve the particular goals of understanding the potential adverse effects of release of genetically modified crops into the environment. On page 26, they acknowledge that this type of research is not available off the shelf, and therefore it has to be performed to meet the "decision-making" needs of ORD and OPPTS. Because this type of research is unique, they indicate that it serves as a template for research elsewhere in the world.

> **Recommendation 12**: It is recommended that knowledge on early products of agricultural biotechnology be broadened to meet future releases of PIP crops (e.g., to PIP crops with multiple engineered traits and other agricultural systems and environments). The research area is currently very narrow to address the most urgent needs and evaluate the products currently on the market. In addition, the following research topics, which are not included in the current program, should be addressed: (1) the need for monitoring protein fate/transfer/effect in the environment; (2) development of improved analytical methods for environmental matrices; and (3) looking ahead at biopharming (e.g., production of pharmaceutical products by transgenic crops) and future commercialization of PIP crops.
>
> **Response**: As the BOSC Subcommittee has noted, the current research area is addressing the highest priority needs identified by OPPTS. When the biotechnology initiative began in FY 2003, it was funded at a level of $4.9 M. Since then, there have been sequential reductions to the program so that in the FY 2008 President's Budget, proposed funding is at $3.6 M (a 26% decrease from that of the initiative). This level of funding is sufficient to support the intramural researchers and approximately $1 M/year for the STAR program on potential allergenicity. It is for these reasons that, although the additional areas that have been recommended by the BOSC sound interesting, given other priorities ORD does not plan to expand the program. As with other elements of our research program, we will continue to seek partners with whom we can leverage our expertise and resources. For example, since the BOSC review, we have issued a joint solicitation for research proposals with the National Institute on Allergy and Infectious Diseases (NIAID) on Exploratory Investigations in Food Allergy, where we have specified that EPA's interest is in the development and application of methods, identification of biomarkers, and evaluation of protein characteristics (including those of novel proteins) associated with food allergy.
>
> **Action/Timeline:** ORD will continue to seek research partners in this area. A joint request for proposals was issued with NIAID on August 23, 2007. No other action is proposed for biotechnology research, given current resources and other priorities.

On page 28, the Subcommittee recognizes the significant scientific interrelationships that exist across the SP2 Research Program.

> **Recommendation 13**: It is important to maintain the existing cross-disciplinary and cross-organizational collaborations that exist and build upon them, where appropriate. Significant scientific interrelationships exist across the SP2 Program, with some flowing

into others. Such scientific and resource leverage benefits the program. For example, a method developed under one program may be applied to another program.

Response: ORD appreciates the positive feedback regarding our cross-disciplinary and cross-organizational collaborations. The program will continue to work toward seeking other partners, inside and outside the Agency, whose interests/efforts are complementary and with whom we can leverage resources.

Action/Timeline: ORD will continue leveraging the research program with others both within and outside the organization. Efforts are ongoing.

The Subcommittee, on page 28, indicates that evaluation of the relationship of APMs and project descriptions to APGs 1 and 2 raises serious questions about whether the APMs are likely to result in the APGs *as stated.* They also suggest that the resources needed to attain this APG as worded are in great excess of what is available.

Recommendation 14: Revise the language to better express the program. For example, an APG should be accomplishable over the life of that APG with the resources available. This is primarily an issue of clarification, because the projects themselves flow well. The sequencing of projects for LTG 1 A/B, as described in the text above, is not possible to follow accurately because the phrasing of the APMs and the APGs is not consistent with resources or projects being performed.

Response: As noted previously in the response to Recommendation 3, ORD agrees that the wording for the APG on development of methods needs to be revised to reflect that we would submit the methods for validation to another party. As ORD revises the MYP, it will also consider modifications to other APGs as well to better reflect the intent of the goal. The BOSC Subcommittee has pointed out that greater resources are needed to attain the APG on "evaluate…current test methods…." It should be noted that in developing the MYP, ORD took into consideration the resources it had as of FY 2007 and assumed an even budget in future years in developing the APGs and APMs. It may very well be that as the period of time for the APG continues that ORD may determine that additional research and time are needed to adequately address the APG. Modifications would be made to the MYP at that time to accommodate these needs.

Action/Timeline: As noted in response to Recommendation 3, ORD will clarify the generic relationship between APGs and APMs in the next update of the MYP and will ensure greater consistency and clarity with the wording of the APGs and APMs. The APGs and APMs will continue to be identified keeping in mind the budget.

On page 29, the Subcommittee notes that there is a significant need and general guidance for a nanotechnology program, but that it is not described in the SP2 MYP. They acknowledge that at the BOSC SP2 review and a later conference call, this issue was raised, and representatives from OPPTS and ORD said that ORD is working on a nanotechnology research strategy. Its assignment to its own or another MYP will be made after the research strategy is completed. They agreed that this is good, but believe that a research strategy is needed "now" especially considering OPPTS needs.

Recommendation 15: ORD should more rapidly develop its own research program in nanotechnology, and encourage other funding organizations internationally to also work in the area. There will always be "high priorities" that exceed resources available. Thus, prioritization within the "high" category is essential. SP2 has done this reasonably well, with one major exception: the health and environmental risk implications of nanotechnology. Virtually all stakeholders and interested parties nationally and internationally are calling for a vastly expanded research program on implications, but it is not happening to a significant degree.

Response: ORD appreciates the Subcommittee's comments regarding the need for EPA to demonstrate leadership and develop a nanotechnology research program quickly. Several years ago, ORD realized that while some studies had been done to determine potential toxicity of certain nanoparticles to humans and other organisms (both *in vivo* and *in vitro*), very little research had been performed on environmental fate and transport, transformation, and exposure potential. Research also is lacking on technologies and methods to detect and quantify nanomaterials in various environmental media. In addition, studies indicate that the toxicity of the nanomaterial will vary with size, surface charge, coating, state of agglomeration, etc. Consequently, the Agency has developed a Nanomaterial Research Strategy (NRS) that is currently undergoing Program and Regional Office review. An external peer review is planned to take place in March 2008. The scope of this research document is strategic in that it discusses broad themes and general approaches. The purpose of this strategy is to guide the ORD program in nanomaterial research. The strategy builds on and is consistent with the foundation of scientific needs identified in the report by the Nanotechnology Environmental and Health Implications (NEHI) Workgroup (NSTC, 2006), and on the EPA White Paper on Nanotechnology (EPA, 2007). Special attention is given to EPA's role among federal agencies in addressing data needs for hazard assessment, risk assessment, and risk management relevant to the EPA mission and regulatory responsibilities. ORD will use the NRS and incorporate these research activities into its multi-year planning process.

Action/Timeline: Beginning in fiscal year 2007, ORD focused on the following high priority areas: environmental fate, transport, transformation and exposure; and monitoring and detection methods. Resulting data will be used to inform and develop effects and exposure assessment methods and identify important points of releases for potential management. Having laid a foundation for understanding possible material alterations under various conditions, ORD will direct a greater share of fiscal year 2009 and 2010 resources to exploring the effects, specifically toxicity of the altered materials as identified in the first two years. To complement its own research program, EPA is working with other federal agencies to develop research portfolios that address environmental and human health needs. In addition, the Agency is collaborating with academia and industry to fill knowledge gaps in these areas. Finally, the Agency is working internationally and is part of the Organization of Economic Cooperation and Development's efforts on the topic of the implications of manufactured nanomaterials.

The Subcommittee notes that the details regarding what additional research would be performed if additional resources became available (Appendix I, pages 46–47 of MYP) is very poorly described.

Recommendation 16: Describe criteria for prioritization of future work and discuss how the additional projects meet the criteria. The priorities for ongoing work are appropriately described. However, the priorities for future work, if new funds became available, are poorly described.

Response: In FY 2006, OMB introduced a pilot program within the Agency, resulting in an additional $4.5M for research provided for the Pesticides and Toxics offices. In response to this budget increase, teams of managers and scientists from across ORD's Laboratories and Centers, the Office of Pesticide Programs, the Office of Pollution Prevention and Toxics, the Office of Science Coordination and Policy, and the lead Region for pesticides and toxics held a series of meetings to determine how these additional resources would be used. Within a short period of time, the multiple parties reached a consensus on identifying the research needed and allocating the resources accordingly. The planners used the previous SP2 MYP as the overall framework to guide their decisions. In a number of instances, the additional resources went to accelerate projects already planned. In other cases, new research that was complementary to ongoing efforts was identified. Many of these efforts are described within the SP2 MYP. This approach and partnership resulted in a portfolio of research that is already having an impact on Agency decisions about a year and a half after implementation. Therefore, a similar approach would likely be used should additional resources become available in the future.

Action/Timeline: The Appendix in the update of the MYP will provide greater detail on the process identified above, which was used successfully to accelerate research in areas that had previously been identified as high priority. In addition, the updated Appendix will provide stronger descriptions of options for potential new research directions based upon discussions with OPPTS senior managers.

The Subcommittee, on page 30, comments that some of the strongest program elements reviewed were those that demonstrated strong intra-Agency, inter-agency, and vibrant academic collaborations.

Recommendation 17: In the areas of statistical analyses, bioinformatics, theoretical and mathematical model building and probabilistic risk assessments, a strong need for and growth of collaborations is recommended. Some of the strongest program elements reviewed were those that demonstrated strong intra-Agency, inter-agency, and vibrant academic collaborations.

Response: The National Center for Environmental Research (NCER), as part of the Science to Achieve Results (STAR) program, has completed its second year of funding for two environmental bioinformatics centers. The STAR-funded centers are The *Carolina Environmental Bioinformatics Research Center at the University of North Carolina at Chapel Hill* and the *New Jersey Research Center for Environmental Bioinformatics and Computational Toxicology*. Both centers will be funded through 2010.

The Centers bring together multiple investigators and disciplines, combining expertise in biostatistics, bioinformatics, cheminformatics, computational biology, and computer science. They are developing novel analytic and computational methods, creating efficient user-friendly tools to disseminate the methods to the wider community, and are applying the computational methods to data from molecular toxicology and other studies.

Both Centers are being funded as cooperative agreements, enabling collaboration with scientists from the ORD's National Center for Computational Toxicology and National Center for Environmental Assessment. Interactions between the STAR Environmental Bioinformatic Centers and ORD will further be facilitated by a seminar program that brings scientists to Research Triangle Park, NC on a bimonthly basis starting in 2008. This supplants the teleconference seminars that were conducted throughout 2007 targeted at introducing the goals and objectives of the STAR Centers to the intramural workforce.

Both NHEERL and NCCT have committed to increasing the breadth of the intramural workforce in bioinformatics and systems biology and collectively they have added four senior level staff in these areas and are collaborating with the researchers from the extramural Bioinformatics Centers.

Action/Timeline: Significant efforts of collaboration across ORD and with extramural scientists in the areas of bioinformatics have been ongoing for the last two years and will continue for at least another three. As noted previously, ORD continuously seeks opportunities to leverage our resources and expertise with others, and we will continue to do so in this area as well.

QUALITY

According to the Subcommittee, the scientific quality of the research products presented to them was viewed as high quality (page 33). This assessment was reached, in part, as a result of strong evidence of relatively high publication and citation rates in high-visibility journals of significant scientific reputation, the immediacy with which papers are recognized throughout the scientific community, the ultimate use of the research by OPPTS, and the scientific qualifications and stature of researchers, including invited presentations and offices held within national societies.

Recommendation 18: The SP2 Program is large and far-flung. On occasion, the panel found it difficult to identify the relationship between high quality work and a specific goal. The Subcommittee believes it might be useful to have service awards (as well as peer-reviewed papers) mapped to individual program elements to better designate high quality products.

Response: ORD has and will continue to include service awards in biosketches for all programs. In addition, for the SP2 Research Program Review, additional materials were provided as background that pulled information such as awards, editorial positions, positions in professional societies, etc., into integrated tabular form. ORD managers have recently discussed the merit of deliberately tracking and reporting awards within each

program, aligned as recommended, for all programs. ORD is intending to bring this subject up as part of the discussion on program metrics before the BOSC Executive Committee (EC) in January 2008. This interaction with the BOSC EC on this topic will inform the policy on systematically collecting this type of information for future BOSC reviews.

Action/Timeline: Information will continue to be supplied in biosketches and other formats when possible. Discussions at the January 2008 meeting with the BOSC EC will lead to guidance regarding the value-added of collection and presentation of more detailed information for future BOSC reviews.

The Subcommittee recognizes the extensive peer review processes that are used by ORD to ensure the quality of its major research programs. They concluded that principal investigators appear to have been carefully and appropriately selected for the projects through both non-competitive (e.g., intra-Agency) and competitive (e.g., STAR grant) paradigms.

Recommendation 19: The peer-review process used by the SP2 Program should be continued. The SP2 Program effectively uses appropriate external and internal peer-review mechanisms in the Science to Achieve Results (STAR) Program selection process and in the development of research priorities and products.

Response: ORD appreciates the positive feedback regarding the use of peer review mechanisms. While we feel that our existing peer review policy and procedures provide the necessary framework for our peer review program, we continually look to identify ways to build on our successes to further strengthen peer review within ORD and across EPA. Consistent Agency-wide application of peer review has been an EPA priority for many years. Since issuing our peer review policy in 1993, we have taken several major steps to support and strengthen the policy. But proof of a policy's value lies in its implementation, and here also EPA has been very active to ensure that our peer review policy is not only understood across the Agency, but is *applied* rigorously across EPA's program and regional offices. Use of the 2006 *Peer Review Handbook, 3rd Edition*, which we believe is one of the most advanced treatments of peer review for intramural research and scientific/technical analysis of any federal agency, keeps the Agency aware of the importance of peer review and provides guidance for the application of peer review. Regular training helps reinforce adherence to the policy and procedures.

Action/Timeline: ORD will continue to follow existing guidance and policies to ensure its research programs and products are appropriately peer reviewed. Efforts are ongoing.

SCIENTIFIC LEADERSHIP

The Subcommittee points out the way in which the SP2 Research Program and its researchers have played a leadership role at the national and international levels (pages 37–39).

Recommendation 20: Continue to reward scientific excellence and minimize administrative burdens. Maintaining this leadership position requires constant attention to

supporting an organizational culture that favors research that makes a difference to EPA's mission. Recruitment and retention of the "best and brightest" is fundamental to success and is enhanced by such a culture. This can be difficult, because it requires a wide array of resources (personnel and funds) and focuses on long-term as well as short-term research issues.

Response: ORD appreciates the positive feedback regarding our rewarding scientific excellence and seeking ways to continue to minimize administrative burdens. ORD agrees that recruiting and retaining excellent scientists is key to the continued success of this research program. ORD will continue to use the variety of mechanisms it has to do so. In addition to recruiting and retaining our own personnel (Full Time Equivalents, FTEs), ORD can rely on other innovative mechanisms to supplement and complement the scientists in the SP2 Research Program. One approach has been to use existing vehicles to bring on board postdoctoral fellows, recently graduated students, student interns, and other fellows (i.e., through the American Schools of Public Health, American Association for the Advancement of Science) who do not count against our personnel ceiling. Another mechanism is to use a newly acquired authority to hire a few senior-level internationally renowned scientists to work with us for a defined period of time. Both the junior-level and senior-level scientists tend to bring vibrancy to research programs.

Action/Timeline: ORD will continue to use all mechanisms available to reward and retain its scientists and to recruit new ones. Efforts are ongoing.

COORDINATION & COMMUNICATION

The Subcommittee, on page 41, indicates that coordination and communication strategies for the SP2 Research Program are very good but that improvements are possible in how information is conveyed throughout the EPA and other federal agencies. Several recommendations address this issue.

Recommendation 21: More emphasis should be placed on scientist-to-scientist communication through workshops and other suggested interactions. Further, better communication with other laboratories within the federal government (e.g., Department of Energy laboratories) is recommended. ORD managers and scientists view OPPTS as their primary client. Less emphasis is placed on communications to other organizations.

Response: The SP2 Research Program uses a variety of mechanisms to communicate the results of its research with our clients and other organizations and scientists. Under section "IX. Communication," the MYP describes the efforts ORD undertakes to communicate with others during the planning, conduct, and after completion of the research. ORD will consider expanding this section in the next version of the MYP to provide greater detail on how this is done. For example, ORD may consider adding an Appendix that lists examples of the planning meetings, progress reviews, workshops, seminars, etc. that have taken place to promote communication. Furthermore, under section "III. Relationship of EPA's Research to that of Other Organizations," ORD

describes the various outside collaborations. These relationships were further explained in a table prepared for the Office of Management and Budget for our Program Assessment Rating Tool submission in 2007. ORD will consider including this, or a table similar to it, in the update of the MYP.

Action/Timeline: The MYP update will provide greater detail on communications with other federal agencies and other research organizations.

Recommendation 22: It is recommended that a more focused communications program be developed to disseminate information from SP2 research out to the regions and other program offices. Some of the research in the SP2 Program has fundamental value to other programs (e.g., endocrine disruptors, human health, ecological assessment, etc.) so managers there should be part of the communication strategy. Because these other programs also have value to the SP2 Program, information from these programs should be communicated more regularly to OPPTS.

Response: ORD concurs that there is a need to continue striving to improve our coordination and communications across our research programs to better serve our partners. The MYP, under section "VII. Relationship to Other Multi-Year Plans," describes how the SP2 Research Program provides either direct or indirect benefit to other ORD research programs, how other programs benefit SP2, and how communication takes place across the programs. The MYP states the following: "The mechanisms for collaboration with outside-ORD organizations are highlighted in Section III. In order to improve coordination across the MYPs within ORD, the NPD for the Pesticides and Toxics Research Program meets periodically with the NPDs for each of the relevant MYPs as well as the leaders for other programmatic areas (e.g., computational toxicology, nanotechnology, homeland security) who oversee research that is ongoing in support of OPPTS. These discussions are important not only to ensure that these programs are not conducting duplicative efforts, but also so that we ensure that the products of the research are disseminated to those who may find them of indirect benefit." ORD recognizes that there is a continued need for improvements. Since the inception of the National Program Directors and similar leadership positions across all of ORD's research programs, there have been a number of discussions on how to improve the cross-program coordination and communication. Through continued discussions, greater understanding of opportunities for partnership and better service to and products for our partners will be accomplished. For example, a meeting between the ORD and OPPTS senior managers will be held in early 2008 to discuss the status of research and identify priorities. While the SP2 Research Program has the lead in organizing the meeting, the research programs that will be discussed also include those on Endocrine Disruptors, Nanotechnology, Computational Toxicology, Human Health, and Ecosystems.

Action/Timeline: Striving to improve coordination and communications is an ongoing process. As an example, a coordinated meeting of those research programs that provide the highest priority needs to OPPTS will be held in 2008 among ORD and OPPTS senior managers.

Table 1. Safe Pesticides/Safe Products Research Program
Summary of Recommendations and Proposed ORD Actions and Timelines

Recommendation	ORD Action	Timeline for Action
Recommendation 1: Include approach to address issues of mitigation potential on gene transfer, effects on non-target organisms, and targeted species resistance within the APGs in LTG 3. Also, improve methods for tracking and quantifying products of genes or new technologies, and expand the operative definition of "biotechnology."	**Response**: Some efforts are already underway that address Subcommittee concerns, including developing/applying field scale protocols for non target species effects, holding a workshop in 2007 on "Pollen Mediated Gene Flow in the Environment Research," and investigating effects of gene transfer in turf grass. Given current priorities and resource levels, further development of methods is not planned.	A workshop was held in FY 2007. In FY 2009, an EPA report will be completed that documents the testing and evaluation of resistance management models that track the development of resistance to control traits in PIP crops.
Recommendation 2: Retain flexibility of structure to emerging science, some of which will be produced by the program itself. APGs and APMs need to be as clear as possible.	**Response**: ORD concurs. ORD has provided OMB with performance metrics for APGs and APMs. ORMA has provided new guidance for establishing products, milestones, and impacts of APMs.	Improving APGs and APMs is ongoing. The next update of the MYP will reflect new metrics reflecting ORD guidance and agreements with OMB.
Recommendation 3: Clarify relationship between APMs and each APG to make the research more consistent with the text. Each APG should have at least a few APMs each year until the APG is completed.	**Response**: ORD will clarify the generic relationship between APGs and APMs and will ensure greater consistency and clarity with the wording of the APGs and APMs.	The next update of the MYP will reflect improvements in clarity and consistency in the APGs and APMs.
Recommendation 4: Greater emphasis is need on exposure-related research.	**Response**: ORD has initiated a shift to increase the number of full time equivalent employees (FTEs) conducting exposure research under the SP2 Research Program. NERL has initiated an implementation planning process to identify high priority areas of exposure research for the additional FTEs in support of the SP2 MYP. Other ORD research programs are providing relevant exposure-related products in support of OPPTS.	ORD is shifting FTEs for exposure research into the SP2 program. In 2008, the NERL SP2 Implementation Plan will be completed. The next update of the MYP will provide stronger evidence of linkages to the exposure research of other ORD programs relevant to OPPTS' needs.
Recommendation 5: A mechanism(s) to improve communications between groups doing research in LTGs 1 and 2 is (are) recommended (specific examples were given).	**Response**: Cross-laboratory coordination is continuously sought and achieved. In this particular instance, no further action is needed, because the research between the two identified areas is unrelated.	Cross- laboratory coordination is ongoing.
Recommendation 6: Perform an integrated evaluation of the entire program on health risk, whether it be in SP2, Human Health, EDCs, or other areas, to provide advice on program	**Response**: ORD is increasing the exposure FTE resources in the SP2 research program, is using an implementation planning process to identify the highest priority areas, and	Additional FTEs for exposure research are being aligned under the SP2 program. In 2008, the NERL SP2 Implementation

balance, especially with respect to exposure.	taking into consideration the BOSC's insights for an increased exposure component. The BOSC Human Health Subcommittee reviewed the aggregate exposure/cumulative risk research (2005) and found it to be relevant and timely.	Plan will be completed. The MYP update will include an approach to better communicate human health exposure research across MYPs.
Recommendation 7: The SP2 Program should emphasize the need for explicit and transparent validation/verification of both analytical methods and models used within the program or developed by the program.	**Response**: ORD agrees to clarify the distinction that it develops a method or model, while the validation of that method/model is done by an independent group of experts.	The next update of the MYP will reword the APG.
Recommendation 8: Clarify the criteria used to select new compounds for study, and expand the list of compounds under LTG 1C using the methods currently in use.	**Response**: OPPTS identifies and prioritizes those elements of our research program that need to be accomplished in the shorter-term, based on impending regulatory decisions or gaps in industry-submitted data.	The next update of the MYP will clarify how determinations of short-term research priorities are accomplished.
Recommendation 9: Begin movement towards an ecosystems approach that fully and accurately assesses population and community risks associated with various aspects of SP2.	**Response**: ORD is considering how additional FTEs can be fully integrated into the existing LTG 2 program and is planning new research that moves toward an integrated, spatially explicit risk assessment program for targeted population and communities of concern that adds a new exposure component to the existing ecological effects modeling efforts.	The NERL SP2 Implementation Planning Process will address this issue. It will be completed in 2008 and will complement the NHEERL SP2 Implementation Plan that was completed in 2005.
Recommendation 10: Mathematical foundations that underpin the current modeling efforts should be further developed, with greater rigor associated with statistical applications in risk assessment.	**Response**: ORD agrees to encourage greater development and integration of our ecological modeling efforts to expand their utility.	The NERL SP2 implementation planning process, which will be completed in 2008, will address this issue.
Recommendation 11: Pursue collaborative relationships and extended development to advance high performance computing methods and techniques to facilitate the use of biophysical spatial models that integrate biology, predator-prey systems, habitats, physics, and humans for probabilistic risk assessment.	**Response**: It is critical that ORD's end users be able to access the predictive models we develop. Therefore, we will continue to develop web-based applications and make them available publicly. NCCT is pursuing several research programs that use EPA's supercomputer or grid system, which will also be made web-accessible to the general public.	Efforts are ongoing to develop web-based applications of ORD research products and to identify and pursue research partners to help provide tools that our clients can readily access.
Recommendation 12: It is recommended that knowledge on early products of agricultural biotechnology be broadened to meet future releases of PIP crops. Additional research topics were also identified.	**Response**: Limitations in resources in the biotechnology research program prevent its expansion to address the additional recommended topics; however, we continue to seek partners with whom we can leverage our expertise and resources.	Efforts are ongoing to seek research partners in biotechnology. In FY 2007, a joint request for proposals on Exploratory Investigations in Food Allergy was issued with the National Institute on Allergy and Infectious Diseases (NIAID).

Recommendation 13: It is important to maintain the existing cross-disciplinary and cross-organizational collaborations that exist and build upon them, where appropriate.	**Response**: ORD will continue leveraging the research program with others both within and outside the organization.	Efforts are ongoing.
Recommendation 14: Revise the language of certain APGs to ensure that there are sufficient resources with which to meet the goals and thus to better express the program.	Response: As noted in response to Recommendation 3, ORD will clarify the generic relationship between APGs and APMs in the next update of the MYP and will ensure greater consistency and clarity with the wording of the APGs and APMs. The APGs and APMs will continue to be identified keeping the budget in mind.	The next update of the MYP will reflect improvements in clarity and consistency in the APGs and APMs.
Recommendation 15: ORD should more rapidly develop its own research program in nanotechnology, and encourage other funding organizations internationally to also work in the area.	**Response**: The Agency has developed a Nanomaterial Research Strategy (NRS) to guide the ORD program in nanomaterial research. To complement its own research program, EPA is working with other federal agencies, collaborating with academia and industry, and working internationally on the implications of manufactured nanomaterials.	Beginning in FY 2007, there was an increase in resources focusing on high priority nanomaterial research areas. An external peer review of the NRS will be held in March 2008. ORD will direct a greater share of FY 2009 and 2010 resources to exploring the toxicity of altered nanomaterials.
Recommendation 16: Describe criteria for prioritization of future work and discuss how the additional projects meet the criteria.	**Response**: The current MYP already describes how teams of managers and scientists from across ORD's Laboratories and Centers, OPPTS, and the lead Region for pesticides and toxics partner to identify research needs and resource allocations with the previous SP2 MYP as a guiding framework. Resources go to accelerate existing projects or to new complementary research. The updated MYP will strengthen these descriptions.	The Appendix of the next update of the MYP will provide greater detail on the prioritization process used to accelerate research previously identified as high priority. In addition, the updated Appendix will provide stronger descriptions of potential new research directions based on discussions with OPPTS senior managers.
Recommendation 17: A strong need for, and growth of, collaborations is recommended in the areas of statistical analyses, bioinformatics, theoretical and mathematical model building, and probabilistic risk assessments.	**Response**: ORD scientists are collaborating with academic scientists from the STAR-*funded Environmental Bioinformatics Research Centers*. ORD has recently hired four senior level staff in the areas of bioinformatics and systems biology. ORD continuously seeks opportunities to leverage our resources and expertise with others and we will continue to do so in this area as well.	Significant efforts of collaboration across ORD and with extramural scientists in the areas of bioinformatics have been ongoing for the last two years and will continue for at least another three. Newly acquired hiring authority has been used to bring on board four senior bioinformaticians and systems biologists.
Recommendation 18: Map service awards (as well as peer-reviewed papers) to individual program elements to better designate high quality products.	**Response**: ORD has and will continue to include service awards in biosketches for all programs. Additionally, the SP2 Research Program Review provides	In January 2008, a meeting with the BOSC EC will lead to guidance regarding the value-added of

	background materials that pull information on awards, editorial positions, positions in professional societies, etc., into integrated tables.	collection and presentation of detailed information for future BOSC reviews.
Recommendation 19: The peer-review process used by the SP2 Program should be continued.	**Response**: ORD will continue to follow existing guidance and policies to ensure its research programs and products are appropriately peer reviewed.	Efforts are ongoing.
Recommendation 20: Continue to reward scientific excellence and minimize administrative burdens.	**Response**: ORD will continue to use all mechanisms available to reward and retain its scientists and to recruit new ones.	Efforts are ongoing.
Recommendation 21: Place more emphasis on scientist-to-scientist communication with other laboratories within the federal government (e.g., Department of Energy laboratories) through workshops and other suggested interactions.	**Response**: The MYP describes ORD efforts to communicate with others during the planning, conduct, and after completion of the research; and describes various outside collaborations. ORD will consider expanding these sections of the MYP.	The MYP update will provide greater detail on communications with other federal agencies and other research organizations.
Recommendation 22: Develop a more focused communications program to disseminate information from SP2 research out to the regions and other program offices.	**Response**: ORD concurs that there is a continued need to improve coordination and communications to better serve our partners. The MYP describes current actions to do so. A meeting between ORD and OPPTS senior managers will be held to discuss the status of research across multiple relevant programs and identify priorities.	Efforts to improve coordination and communications are ongoing. An ORD-OPPTS senior managers' meeting will be held in 2008.