sbrp

SUPERFUND BASIC RESEARCH PROGRAM

Stakeholder Input

Responses from SBRP Multi-Project Grantees

http://www.niehs.nih.gov/sbrp

SBRP Directors' Input to the SBRP External Advisory Panel

Introduction

NIEHS considered it important to have input from its grantee community and accordingly developed a series of questions for the Program Directors of its multi-project grants. This group was selected as it is the major component of the Program, has first-hand knowledge and appreciation of the strengths and weaknesses of the Program, and has a clear stake in the future of the Program. This group developed the following consensus document in response to these questions.

Program Directors' Introduction

The objective of the P42 Superfund Basic Research Program (SBRP) was to apply the best available science to the difficult public health and environmental problems caused by many decades of improperly managed disposal of hazardous chemicals. It was recognized at the outset that success required an interdisciplinary approach and that solving the problem was as important as understanding its scope, dimensions and severity. From its origins, the SBRP research portfolio included engineering and other non-biomedical sciences that were needed to make progress in systems that were tightly connected and interacted in complicated ways. Toxicology and epidemiology identified health effects and how they were produced, but also helped experts in remediating the problem know what needed to be done and to what level. The close collaborations that have resulted between biomedical and non-biomedical researchers through the life of this program were unusual for NIH, but have proved highly successful in producing new science on both sides of the divide between the engineers and the health scientists. Each program is required to have a special core facility for translating the basic and applied science to the real world. The science is not only of the highest quality, but it is made accessible and usable to those who need it in the public and private sectors.

Its unique set of requirements has put the SBRP at the front line of innovative efforts to understand the environmental triggers of disease (and suggest what we can do about them). The emphasis on cross-discipline collaboration has increased the return on research investment –the whole proving to be greater than the sum of its parts. In sum, the SBRP's success derives from:

State-of-the-art science. Throughout its 21 year history, high quality research has been the hallmark of the SBRP. A variety of measures — including workshops, publications, patents, and trainees — attest to the productivity and value of the SBRP research enterprise.

Interdisciplinarity. An interdisciplinary approach that is required for research success in this complicated area and that has become a distinctive feature of the SBRP. Combining the assessment of human health risks with ecological and engineering approaches to site remediation has created an integrated research environment where novel solutions to old problems are discovered and new problems revealed.

Capacity to tackle big problems. The SBRP has a record of responding swiftly to big problems, including the assessment of health risks posed by exposure to dust from the twin towers after 9/11 and the mapping of point sources and contaminant plumes following hurricane Katrina. The ability to respond speaks to the close connection between the basic and applied faces of SBRP science.

Scientific and organizational nimbleness. As responsive centers of scientific excellence, the SBRP uses its resources to engage new research challenges and opportunities. This includes moving quickly to investigate and embrace novel scientific paradigms and technologies, such as epigenetics and nanotechnology. This ability to adapt has been reinforced by the challenge of highly competitive annual reviews, opening up this funding opportunity to a broad applicant pool.

Strong commitment to research translation, to community outreach, to USEPA, and to local agencies of environmental management and health. Throughout its history, the SBRP has worked hard to develop close ties with communities, consulting professionals, and regulatory agencies involved with contaminated sites. These real world connections have helped drive the research agenda and have spurred translation of basic science findings into practical applications.

Training the next generation of interdisciplinary scientists. The SBRP has created a unique setting for interdisciplinary training in the environmental health sciences, merging laboratory-based work with field work, and engaging the social sciences and management perspectives that are so critical to understanding this complex area.

With this background, we would like to respond to the specific questions raised by the External Advisory Panel.

Responses to questions

1. **What are the key, fundamental scientific issues that should frame the SBRP enterprise?**

In our view, the SBRP funding opportunity announcement (FOA) currently on the NIEHS web site properly balances structure and flexibility. The FOA instructs applicants to develop an over-arching conceptual theme that “encompasses a holistic approach to protecting human health by incorporating the principles of

environmental health sciences and the engineering, geochemical and ecological sciences within the framework of a basic research program."

Striking a balance is critical. Principal investigators work on specific projects in their own labs or groups, but also collaborate with others in their SBRPs or other institutions. There is a balance between "following the science" which tends to restrict work within a discipline and collaborating with others outside the discipline. Finding how to do this well and efficiently has been one of the major accomplishments of the SBRP Program, making it one of the few integrated funding streams designed, experienced and successful in approaching complex problems in this fashion.

The SBRP mandate is unusually broad, but it is also rooted in an understanding that "decisions needed to protect human health must be based on mechanistic knowledge gained from the integration of available data from all relevant research disciplines such as toxicology, molecular biology, epidemiology, geology, ecology and engineering." So there is also a balance between "basic" and "applied" research. It is a truism that it is difficult to predict when a basic science discovery will turn out to have broad or even revolutionary implications. In the SBRP the eye is always on the applications and implications for practical problems of the basic research, and basic researchers are learning new techniques from their applied colleagues.

This perspective suggests these guiding principles for the SBRP enterprise:

Continue offering "structured flexibility." The SBRP mandates certain core requirements–but in a flexible way that allows individual programs to build upon their unique strengths. The scientific direction of each program evolves based upon geographical and regional issues and is driven by the research strengths of each institution. Figuring out how to enable each program to flourish on its own terms requires attention to organizational culture, knowledge networking and information management.

Enable science-to-science knowledge integration. The SBRP's quest for integration across diverse scientific disciplines is certainly meritorious. But the barriers to integration are formidable. The dramatic expansion in knowledge taking place in the sciences is creating new disciplines and divisions. The process creates new language and epistemic cultures that make weaving the parts into an integrated whole increasingly difficult. In the case of the SBRP, the ability to integrate science perspectives and extrapolate basic research findings into applications stems from the program's unique structure (i.e., the interconnection of cores and projects, and mechanisms for translating research findings to the public). This fundamental framework works well and should be supported.

Create an actionable framework for research that cross-fertilizes grand challenges. To ensure that the SBRP meets the programmatic goals of the national Superfund Program while complementing the needs of associated agencies (e.g., EPA, ATSDR, CDC), the SBRP needs to keep abreast and work to cross-fertilize the research needs of these associated agencies. Doing this is not easy; it amounts to an applied research project in and of itself.

2. **What are the emerging issues that the SBRP should anticipate and incorporate into future initiatives?**

As citizens and scientists we recognize that while science has a timeless quality, the world and its demands change and establish constraints and opportunities within which we work. Within recent months stringent new challenges have reordered many priorities. The SBRP is perhaps better suited than most programs to adjust appropriately. It has been designed to meet complex challenges and been tested by urgent events. Doing so, like everything else, is an exercise in balance. We do not think it wise to suddenly change direction with each crise du jour, but we recognize when events require proper and appropriate response.

To the still existing problem of managing the consequences of hazardous chemicals in our environment is added the context of a major national effort to establish energy independence and to repair, extend and make new civil infrastructure. This takes place against a more general concern for a changing climate, changes that could have profound public health implications, even within the relatively narrow scope of the SBRP's two decade history of fundamental research on the health effects of chemical exposure. For example, atmospheric chemistry to study climate change and the impact on dispersion of volatile chemicals from hazardous waste sites would be a natural extension of SBRP experience and expertise. Similarly, development of alternative energy technologies should have a parallel effort in understanding the public health implications of the entire device life-cycle, from manufacturing through use to decommissioning and disposal. Much time, effort and later expense can be saved by considering the safe design specifications. Said another way, the SBRP's original mission remains highly compatible and relevant to the needs of changing times and we believe the flexible structure will allow interdisciplinary research to follow the science into the new problems.

3. **How can the SBRP best support the acceleration of the basic science into application?**

    a. *How is this supported?*

Since we are working with Federal dollars, this is achieved through technology transfer as carried out by the respective institutions. This process is inherently flawed because the process of technology transfer is not an efficient process at

all institutions. However, it is a vital component of each SBRP and is one of the principal mechanisms for moving basic research findings into application.

b. How can this be best facilitated?

Each application is different, and depends on the institution. However, effective communication through publications, patents and license agreements of various kinds (including public licenses) should be pursued. While conferences and workshops are a good tool to broadcast the findings, it is important that the interested parties attend these meetings. For example, the development of new bioremediation tools or biomarkers for exposure may best be marketed in conjunction with the EPA, since standards for detection would need to be established. While the PI meetings every year try to invite representatives of the EPA, consideration may be given to launching a more robust meeting that includes both the SBRP and the EPA scientists.

In addition, creative means of science communication should also be considered. For example, attention could be given to the potential power that new multimedia and visualization technologies can bring to the task of linking science to society. SciVee is a noteworthy example. SciVee is a new portal for multimedia and science communication. SciVee enables scientists to combine their published scientific article with a corresponding video into an online presentation called a "SciVee pubcast." The idea is to use YouTube-like functionality to liven up and broaden the reach of one's work in the marketplace of ideas. The SBRP might want to consider creating a "community" for the kind of research aims shared among grantees and their partners.

4. What activities and relationships would suit the objectives stated in the rationale?

a. Is the current balance of P42, R01 and SBIR grants appropriate?

The SBRP P42 program is a uniquely equipped program for comprehensive interdisciplinary basic research on environmental toxicants. There is no other program structure within NIH that has achieved the level of success as demonstrated in publications and collaborations. However, the SBRP program is grossly underfunded and channeling of additional funds into separate RO1 programs and SBIR grants erodes the ability to assemble diverse interdisciplinary teams of basic research investigators. The smaller RO1 and SBIR models are stand alone programs that cannot meet the mandate and objectives of the SBRP, and it is recommended that these programs be eliminated.

b. Are new structures needed to support data sharing among the SBRP grantees?

This is a potential weak link in the SBRP. It is important that data be shared and available to all investigators. This becomes particularly important when different SBRPs are working on related issues, such as the impact of arsenic on biological systems. One potential tool for improving communication and data sharing might be through the development of Web Portals and other means of open access. This can also be accomplished by interdisciplinary collaborations, such as the development of the recent Bioassay Network which was introduced at the recent annual PI meeting. The Bioassay network is fostering collaboration among SBRPs, the EPA and other key agencies on a national level in ways that create economies of scale and shared resources/tools that can help each individual SBRP meet their aims. Studies suggest that effective trans-disciplinary collaboration of this sort can stimulate innovation, inspire new directions in basic science, and enhance the positive role of science in society. These types of endeavors should be highly encouraged.

c. *What is the role of the SBRP conferences/workshops to meet programmatic goals?*

A vital part of the SBRP, these conferences enhance communication and serve to promote interdisciplinary collaborations. A unique aspect of the SBRP meetings is the presentations by the graduate students and postdoctoral fellows. These presentations provide the venue that allows for the dissemination of research findings by each of the SBRPs. These meetings also serve to bring together investigators that are also interested in translating the scientific information into science policy.

d. *What role should community outreach play? Is it vital and should it be continued?*

The consensus amongst the Program Directors is that Outreach can serve a vital role if the appropriate population can be identified. Many of the SBRPs have developed Outreach Cores and they feel strongly that outreach should be a cornerstone of the program. Others have elected to utilize their available resources in other ways and feel equally committed that outreach should be optional. Thus, the general consensus on this issue was to leave community outreach optional. Since Research Translation has been perceived as a vital part of the SBRP, several programs have opted to integrate Outreach with Research Translation.

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