THE NATIONAL ACADEMIES
REPORT IN BRIEF

A Survey of Attitudes and Actions on Dual Use Research in the Life Sciences

A Collaborative Effort of the National Research Council and the American Association for the Advancement of Science

Dual use research represents a dilemma in the life sciences in which the same technologies that fuel scientific advances could also be misused for biowarfare or bioterrorism. Reducing the risks posed by dual use research without slowing scientific progress is a critical goal, in which the scientific community plays an essential role. A survey conducted by the National Research Council and AAAS (the American Association for the Advancement of Science) provides baseline data to better understand current attitudes and levels of awareness among life scientists about dual use concerns and policies to address these risks. Overall, the survey findings suggest that there may be considerable support for mechanisms for research oversight that are developed and implemented by the scientific community itself.

Over the past 50 years, rapidly expanding knowledge in the biological sciences has brought great benefits to society. But the same technologies that fuel scientific advances also pose potential risks—that the knowledge, tools, and techniques gained through legitimate biological research could be misused for biowarfare or bioterrorism. This is the "dual use dilemma" of the life sciences. Even research with the greatest potential for misuse may offer significant benefits for human health and other areas of societal concern; determining how to constrain the risks posed by dual use research while furthering essential scientific research is critical for national security, economic competitiveness, and human well-being.

The Need for Data on Awareness and Attitudes about Dual Use Concerns

Several National Research Council (NRC) reports on biosecurity issues share a common message: the scientific community should take preventative actions to protect the integrity of science and to minimize the risk of misuse of dual use research. The first step toward prevention is awareness; as such, many of these reports recommend enhanced education and outreach programs to raise awareness of dual use risks.

A number of efforts to further such educational goals are already underway. The National Science Advisory Board for Biosecurity, which advises the federal government on biosecurity, has been given a mandate to make recommendations on "the development of programs for outreach education and training in dual use research issues for all scientists and laboratory workers at federally-funded institutions." This body's proposed oversight framework for dual use research, issued in 2007 and which includes a recommendation for ongoing, mandatory education, is now under consideration within the U.S. government. The 2008 report of the Commission on Prevention of Weapons of Mass Destruction Proliferation and Terrorism also endorsed mandatory training under a framework combin-

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ing laboratory biosafety and biosecurity. In addition, some universities, nongovernmental organizations, and professional societies have initiated or proposed educational programs even before there is any government mandate to do so.

Despite the widely-recognized need for better education on this issue, however, the current state of awareness of dual use concerns among life science researchers is largely unknown. Scientists' attitudes about policy measures to reduce dual use risks are also not well documented. This paucity of data was underscored during discussions at a 2005 meeting, "Education and Raising Awareness: Challenges for Responsible Stewardship of Dual Use Research in the Life Sciences," which was hosted by the NRC and AAAS (the American Association for the Advancement of Science) to explore ways to most effectively engage and educate the research community on biosecurity issues. Out of the discussions at that meeting grew the idea to undertake a survey that could provide baseline data on current levels of awareness and attitudes about dual use issues and policies among life scientists.

A Collaborative Effort to Survey Life Scientists

With support from The Carnegie Corporation of New York, the Presidents Circle Communications Initiative of the National Academies, and the Alfred P. Sloan Foundation, the NRC and AAAS conducted a survey of life science professionals in 2007. The survey, which was developed based on consultations with experts and practicing scientists as well as four focus groups, aimed to elucidate: (1) scientists' levels of awareness of dual use concerns, and (2) their attitudes about policies to address dual use risks. Most of the survey's respondents were scientists in the biological, health, and agricultural sciences and were U.S. citizens. A majority of the scientists were academics and most were mid-career.

Box 1: Limitations of the Survey Results

The survey was disseminated via emails sent by the AAAS to a random sample of 10,000 of its members. This dissemination generated 1,570 fully completed surveys and 1,954 partially completed surveys, for a total response rate of about 16 percent for completed surveys and 20 percent including partial responses. Unfortunately, the survey results cannot be generalized to the overall population of U.S. life scientists because of the low response rate, the lack of information by which non-respondents could be compared to the respondents, and sampling limitations. Despite these potential problems, however, the data obtained in this study offer valuable insights and new information about how the U.S. life sciences community may view dual use research that merit further investigation. In addition, the survey process and its results provide valuable lessons for future surveys on this and other topics of interest to the scientific community.

Survey Results and Conclusions

A committee convened by the NRC analyzed the survey responses and found that overall, the survey findings suggest that there may be considerable support for approaches to oversight that rely on self governance—mechanisms that are suggested or required by the scientific community itself (see Table 1 for a summary of survey responses on various policy measures). The responses also suggest that there is a need to clarify the scope of research activities of concern and to provide guidance about what actions scientists can take to reduce the risk that their research will be misused by those with malicious intent. The results of the survey must be viewed with caution, however, because of the low response rate and possible response bias (see Box 1 for further discussion).

Perceptions of Risk

The results suggest that survey respondents perceive a potential but not overwhelming risk of a bioterror attack in the next five years, a risk they believe is greater outside the United States. Most respondents do not believe it is likely that dual use knowledge, tools, or techniques will facilitate a bioterror attack in that time period.

Actions Taken by Life Scientists in Response to Dual Use Concerns

Although responses indicate that bioterrorism probably is not perceived to be a serious immediate threat to U.S. or global security, they also indicate that there is already concern about dual use issues among some scientists. Some respondents—more than the committee had expected—indicated that they have been so concerned about dual use research that they have already taken actions even without government regulation, such as ending collaborations, not conducting some research projects, or not communicating research results.

Oversight Mechanisms

Given that an oversight framework for dual use research is now under consideration within the U.S. government, the survey was a good opportunity to assess scientists' attitudes toward specific policy options. The survey results

Measures of Personal or Institutional Responsibility	% Saying Strongly Agree or Agree (or Yes*)
Principal investigators should be responsible for the initial evaluation of the dual use potential of their life sciences research.	87
Principal investigators should be responsible for training lab staff, students and visiting scientists about dual use research.	86
Should professional science societies have codes for the responsible conduct of dual use life sciences research?	82*
University and college students should receive educational lectures and materials on dual use life sciences research.	68
Scientists should provide formal assurance to their institution that they are assessing their work for dual use potential.	67
Funding agencies should require grantees to attest on grant applications that they have considered dual use implications of their proposed research.	60
Should scientific journals have policies regarding publication of dual-use research?	57*
Institutions should provide mandatory training for scientists regarding dual use life sciences research.	55
Greater restrictions should be placed on access to specific biological agents or toxins.	47
Researchers conducting dual use research should be certified.	42
All grant proposals for life sciences research with dual use potential should be reviewed by a researcher's institution prior to submission for funding.	41
Scientists conducting or managing research should take an oath.	38
Research findings should be classified based on their dual use potential.	28
Dual use research needs greater federal oversight.	26
Certain experimental methods or findings should be altered or removed prior to publication or presentation.	22
Certain biological equipment that is commonly used in life science research should be licensed.	21
There should be restrictions on disclosure of details about the research or its findings through personal communication.	21
There should be restrictions on publication of findings based on their dual use potential.	21

Table 1. Summary of results regarding support for measures of personal and institutional responsibility. NOTE: The results reported cannot be generalized beyond the scientists who responded to this survey. Not all respondents answered every question; the number of responses for each question ranges between 1,633 and 1,755.

indicated little support for, and even opposition to, additional mandatory measures that might be imposed by regulation. Some individual comments indicated a belief that increased government oversight of dual use research would be counterproductive by inhibiting the research needed to combat emerging infectious diseases and bioterrorism as well as being potentially harmful to the scientific enterprise more generally.

The survey results revealed a greater preference for self-governance measures—mechanisms that are developed and implemented by the scientific community itself—to provide oversight of dual use research. Measures that survey respondents supported included: (1) greater oversight that is not federally mandated,

(2) adoption by professional and scientific societies of codes of conduct that address dual use research, and (3) policies for authors and reviewers of research manuscripts that are submitted to journals to consider the dual use potential of that research.

Education and Outreach

A major reason for conducting the survey was to collect empirical data to inform efforts for education about dual use research. In general, survey respondents indicated support for mandatory education and training about dual use issues; in the United States, such training could be part of ethics and responsible-conduct-of-research training for students and practicing life scientists.

Recommendations

Based on survey results and the committee's analysis, the report offers the following recommendations to improve oversight, education, and outreach and to inform further research efforts.

Oversight, Education, and Outreach

- The life sciences community should expand its dialogue about dual use research. There is a need for greater guidance about the scope of knowledge that is most at risk for misuse, as well as about appropriate actions that can be taken to protect against the misuse of dual use research.
- Journals and professional societies that have biosecurity policies (or plan to adopt them in the future) should be encouraged to communicate those policies more effectively.

Further Research

- Existing educational programs should be examined and ways to improve them should be explored. Education and awareness should also be expanded to the broad international scientific community.
- Additional surveys, interviews, or focus groups should be conducted that better represent the full community, have higher response rates than this study was able to achieve, and have the ability to assess potential bias. Additional surveys of life scientists outside the United States should also be conducted to enable comparisons of attitudes toward dual use research and to inform educational and outreach programs so that they can be effective on a global scale.

Committee on Assessing Fundamental Attitudes of Life Scientists as a Basis for Biosecurity Education: Ronald M. Atlas *(Chair)*, University of Louisville; **Robert Cook-Deegan**, Duke University; **David Franz**, Midwest Research Institute; **James Lepkowski**, University of Michigan; **Francis Macrina**, Virginia Commonwealth University; **Kathleen Vogel**, Cornell University; **Jo Husbands** *(Study Director)*, **Fran Sharples** *(Director, Board on Life Sciences)*, and **John Sislin** *(Program Officer)*, National Research Council, and **Kavita Marfatia Berger**, Center for Science, Technology, and Security Policy, AAAS *(Consultant)*.

The National Academies appointed the above committee of experts to address the specific task requested by The Carnegie Corporation of New York, the Presidents Circle Communications Initiative of the National Academies, and the Alfred P. Sloan Foundation. The members volunteered their time for this activity; their report is peer-reviewed and the final product signed off by both the committee members and the National Academies. This report brief was prepared by the National Research Council based on the committee's report.

This report is a joint product of Policy and Global Affairs and the Division on Earth and Life Studies in collaboration with the American Association for the Advancement of Science. Copies of the report are available from the National Academies Press; call (800)624-6242 or (202)334-3313, or visit the NAP website at www.nap.edu. For more information on the project, contact staff at (202) 334-2816 or visit the Policy and Global Affairs website at www.nationalacademies.org/pga.