Published in final edited form as:

Stud Ethics Law Technol. 2010 February ; 4(1): . doi:10.2202/1941-6008.1124.

Can Scientists Regulate the Publication of Dual Use Research?

David B. Resnik, JD, PhD[Bioethicist]

National Institute of Environmental Health Sciences, National Institutes of Health Box 12233, Mail Drop CU 03, Research Triangle Park, NC, 27709, U.S.A. resnikd@niehs.nih.gov Phone: 919 541 5658 Fax: 919 541 9854

Dual use research has been defined as research that can be readily used to cause significant harm to public health, the environment, the economy, or national security (National Science Advisory Board for Biosecurity 2007). The growing threat of the misuse of science and technology for terrorist or criminal purposes has led scientists, institutions, professional organizations, funding agencies, journals, and governments to consider how best to control research dual use research (Atlas 2002, Atlas and Dando 2006, National Research Council 2006, Resnik and Shamoo 2005). The three principal mechanisms for controlling dual use research are self-regulation by the scientific community, external regulation by the government, or some combination of the two (Miller and Selgelid 2007, Selgelid 2009). Most of the public debate thus far has focused on three types of dual use policies: funding of dual use research, access to dangerous research materials used in research, such as radiological, chemical, or biological agents, and control over the publication of data and results (Miller and Selgelid 2007). This commentary will focus on ethical and policy dilemmas related to the publication of dual use research.

Though most scientists accept government regulation of dangerous materials used in research, they have strongly resisted government control of the publication of unclassified scientific research. A majority of bioscientists in a recent survey favored self-regulation as opposed to government censorship of publication (Committee on Assessing Fundamental Attitudes of Life Scientists as Basis for Biosecurity Education 2009). Scientists are concerned that government control of publication could threaten scientific progress and intellectual freedom, impede the dissemination of important findings that could benefit society, and place undue administrative burdens on research (Journal Editors and Authors Group 2003). The National Research Council (2004) has recommended self-regulation of dual use research in the biosciences. The National Science Advisory Board for Biosecurity (NSABB), an organization established in 2005 to provide advice to the U.S. government on biosecurity issues, has also endorsed the self-regulation model for publication, in cooperation with government agencies (National Science Advisory Board for Biosecurity 2007). Mechanisms for self-regulation of publication include dual use review by institutions, funding agencies, and journals.

Is self-regulation the best way to make decisions about the publication of dual use research? Some commentators don't think so. Selgelid (2007) argues that voluntary, self-regulation of dual use research will not work because scientists lack the knowledge and expertise needed to assess national security risks, and because scientists will not place harm prevention ahead of their own interests in career advancement. van Aiken (2006) believes that external regulation is necessary because self-regulation is not effective or comprehensive enough to address important security issues. Dangerous research will be published without any dual use review or with only marginal review

Selgelid and van Aiken use some recent examples of dual use research to support their arguments against self-regulation. Selgelid (2007, 2009) discusses an article published by

Jackson and colleagues in the *Journal of Virology* in 2001 (Jackson et al 2001). The goal of their research was to develop a strain of mousepox virus that could render mice infertile, which would be useful for population control. In the paper, the authors described how they inserted a gene into the mousepox virus that would increase its virulence and cause infertility. They succeeded in producing a highly potent strain of the virus that kills mice that are immune to the mousepox virus (Jackson et al 2001). Although the mousepox virus is not dangerous to humans, the techniques developed by Jackson and colleagues could be applied to the human smallpox virus (*Variola major*) to increase its ability to overcome the human immune system. Selgelid (2007) argues that Jackson and colleagues, as well as the editors of the *Journal of Virology*, did not have sufficient information to assess the risks of publishing this research, since specific details about the availability of the human smallpox virus are classified.

While it may be true that the scientists who were responsible for deciding whether to publish the mousepox study did not have access to the information they would need to understand its potential threat to society, that predicament is beginning to change. The U.S. has taken some steps to provide scientists with the information necessary for understanding threats by creating the NSABB. Members of the NSABB are required to have a security clearance of “secret” or higher so they can gain access to classified information needed to understand national security threats. NSABB members can use classified information to make recommendations concerning the publication of dual use research (National Science Advisory Board for Biosecurity 2007). Although the U.S. is the only nation that currently has an agency to provide scientists with advice on biosecurity issues, the oversight of dual use research will be improved if other nations create government agencies similar to the NSABB, which bring together scientists and security experts to provide recommendations and policy guidance (Atlas and Dando 2006).

Selgelid (2007) and van Aiken (2006) both discuss *Science's* decision to publish a paper by Tumpey and colleagues describing a reconstructed 1918 Spanish influenza virus. In the paper, the authors used reverse genetics to reconstruct the virus from its genetic sequence, which was simultaneously published in *Nature* (Tumpey et al 2005, Taubenberger et al 2005). The editors of *Science* followed an established procedure for reviewing dual use research, and consulted with experts who had some knowledge of security issues as well as with representatives from the Centers for Disease Control and Prevention (CDC) and National Institutes of Health (NIH) (Kennedy 2005). One day before the paper was scheduled to be published, the Department of Homeland Security asked *Science* to allow the NSABB to review the paper. Though there was not enough time for the NSABB to meet, all ten members of the board who were polled voted in favor of publication on the grounds that the public health benefits of publication outweighed any risks. In an editorial discussing the decision to publish the paper, *Science's* editor-in-chief, said that he would have disregarded the NSABB's recommendations had it voted against publication (Kennedy 2005). The conclusion that Selgelid (2007) and van Aiken (2006) draw from this incident is that the NSABB is ineffective because the role of the NSABB is advisory only, and scientists are free to ignore its recommendations. What is needed is an oversight agency with the legal authority to stop publication.

The events surrounding the publication of the 1918 reconstructed Spanish flu virus do not constitute sufficient evidence that the NSABB is ineffective. The NSABB has been in existence for only a short while and has not had the opportunity to review many cases of dual use research. Indeed, *Science's* editor stated that one reason why the Department of Homeland Security asked the NSABB to review the 1918 Spanish flu paper was to give the board some experience with a live case (Kennedy 2005). We do not know whether the editors of science journals are likely to ignore the NSABB's recommendations in the future,

or whether they view the NSABB as a useful resource for guidance on dual use issues. More research is needed in this area. However, it is worth noting that other government advisory bodies have commanded considerable respect among scientists. Since 1974, the Recombinant DNA Advisory Committee (RAC) has overseen NIH-funded recombinant DNA research and issued guidelines. Though the RAC's guidelines are mandatory only for institutions receiving NIH funding for recombinant DNA research, they have become a universal standard for research in this area, and they are followed by private companies and institutions that do not receive NIH funding (Office of Biotechnology Activities 2009). It remains to be seen whether biosecurity advisory groups established by government agencies achieve the RAC's stature, but this could happen if scientists recognize the importance of controlling dual use research and understand the need to independent advice.

While the criticisms presented by Selgelid and van Aiken do not demonstrate that self-regulation of dual use publication is fundamentally flawed, they do call attention to some potential problems that need to be addressed for self-regulation to be more effective (i.e. more reliable, comprehensive, fair, and efficient). First, scientists who conduct dual use review must have access to information needed to assess the risks posed by research. Since some of this information may be classified, it is important for scientists to collaborate with members of the security community in these matters. By establishing the NSABB, the U.S. has provided scientists with a valuable source of information and advice about biosecurity issues. If other countries follow the U.S.'s example, collaborations among scientists and members of the security community are bound to improve, which will enhance the competence of dual use review.

Second, dual use decision-making also should strike an appropriate balance between promoting free and open exchange of scientific research and protecting society from harm. As pointed out by Selgelid (2007) and van Aiken (2006), a potential flaw of self-regulation is that it is heavily weighted in favor of publication rather than harm prevention. This is understandable, given the importance of free inquiry and scientists' interests in knowledge dissemination. To counteract this bias, dual use decisions should include input from independent parties, such government officials, security experts, ethicists, attorneys, or other non-scientists. Advisory groups with scientific and non-scientific members, such as the NSABB, can provide scientists with an independent perspective on publication decisions.

Third, the criteria and procedures used to evaluate dual use research should be transparent, so that interested stakeholders—i.e. scientists, government officials, politicians, and members of the public—can be assured that fair procedures and policies will be followed. If stakeholders view dual use publication decisions as unprincipled or biased, they may not comply with or support the system. Scientists may decide to find ways to avoid dual use review, and other stakeholders may try to replace the system of self-regulation with some form of external control. The NSABB has developed some criteria and procedures for dual use research review, but additional policy development in this area may be needed (National Science Advisory Board for Biosecurity 2007).

Fourth, dual use review also needs to be comprehensive. It should not be limited to specific fields of biomedical research that raise security issues, such as microbiology and virology, but should include other areas of research that may have also have dual use implications, such as physics, chemistry, genomics, pharmacology, medicine, engineering, and computer science. Even social sciences, such as anthropology and psychology, may raise dual use concerns. One of the most controversial dual use publications to date was a mathematical model of how to infect the U.S. milk supply with botulinum toxin developed by two economists (Wein and Liu 2005). In psychology, research on psychopharmacology could be used to develop mind control or interrogation techniques (Moreno 2003).

Fifth, the self-regulation system should be international and all-encompassing in scope, so that scientists will be not able to avoid dual use review by publishing in journals that lack dual use policies. To date, only a small number of journals have such policies, but others should develop them (van Aken and Hunger 2009, Nature 2010, American Society for Microbiology 2009). International groups, such as the Committee on Publication Ethics or the International Committee of Medical Journal Editors, can lead policy development efforts.

In addition to developing policies, scientists need to foster a culture of shared responsibility concerning dual use research. Scientists must be committed to the ethical conduct of research and have a keen awareness of the potential beneficial and harmful effects of their work (Resnik and Shamoo 2005). They must view it as an ethical responsibility to take steps to prevent research from being misused, such as not publishing some results or refraining from some types of research, if necessary. To foster a culture of shared responsibility, scientists should incorporate dual use provision into their ethics codes, and they should teach students and trainees about dual use issues (Somerville and Atlas 2005). Though some professional societies have addressed dual issues in their ethics codes, very few have to date, and more work is needed in this area (Rappert 2004).

In sum, scientists can regulate the publication of dual use research, provided that they are committed to developing effective dual use policies and a culture of shared responsibility. If scientists do not take the steps needed to make self-regulation to work, additional government regulation may be necessary.

Acknowledgments

This research was supported by the intramural program of the National Institutes of Health (NIH), National Institute of Environmental Health Sciences (NIEHS). It does not represent the views of the NIH, NIEHS, or U.S. government.

References

- American Society for Microbiology. Instructions for Authors in ASM Journals. 2009 [February 26, 2010]. Available at: http://jcm.asm.org/misc/journal-ita_edl.dtl#01.
- Atlas R. National security and the biological research community. *Science*. 2002; 298:753–4. [PubMed: 12399568]
- Atlas R, Dando M. The dual-use dilemma for the life sciences: perspectives, conundrums, and global solutions. *Biosecurity and Bioterrorism*. 2006; 4:276–86. [PubMed: 16999588]
- Committee on Assessing Fundamental Attitudes of Life Scientists as Basis for Biosecurity Education. 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. National Academy Press; Washington, DC: 2009 [February 26, 2010]. Available at: <http://www.nap.edu/catalog/12460.html>.
- Jackson R, Ramsay A, Christensen C, Beaton S, Hall D. Expression of mouse interleukin-4 by a recombinant ectromelia virus suppresses cytolytic lymphocyte responses and overcomes genetic resistance to mousepox. *Journal of Virology*. 2001; 75:1205–10. [PubMed: 11152493]
- Journal Editors and Authors Group. Uncensored exchange of scientific results. *Proceedings of the National Academy of Sciences*. 2003; 100:1464.
- Kennedy D. Better never than late. *Science*. 2005; 310:195. [PubMed: 16223986]
- Miller S, Selgelid M. Ethical and philosophical consideration of the dual-use dilemma in the biological sciences. *Science and Engineering Ethics*. 2007; 13:523–80. [PubMed: 18060518]
- Moreno J. Neuroethics: an agenda for neuroscience and society. *Nat Reviews Neuroscience*. 2003; 4:149–53.

- National Research Council. *Biotechnology Research in the Age of Terrorism*. National Academy Press; Washington, DC: 2004.
- National Research Council. *Globalization, Biosecurity and the Future of the Life Sciences*. National Academy Press; Washington, DC: 2006.
- National Science Advisory Board for Biosecurity. *Proposed Framework for the Oversight of Dual Use Life Sciences Research: Strategies for Minimizing the Potential Misuse of Research Information*. 2007 [February 26, 2010]. Available at: http://oba.od.nih.gov/biosecurity/pdf/Framework%20for%20transmittal%200807_Sept07.pdf
- Nature. *Biosecurity Policy*. 2010 [February 26, 2010]. Available at: http://www.nature.com/authors/editorial_policies/biosecurity.html.
- Office of Biotechnology Activities. *About the Recombinant DNA Advisory Committee*. 2009 [February 26, 2010]. Available at: http://oba.od.nih.gov/rdna_rac/rac_about.html.
- Rappert B. Responsibility in the life sciences: assessing the role of professional codes. *Biosecurity and Bioterrorism*. 2004; 2:164–74. [PubMed: 15588054]
- Resnik D, Shamoo A. Bioterrorism and the responsible conduct of biomedical research. *Drug Development Research*. 2005; 63:121–33.
- Selgelid M. A tale of two studies; ethics, bioterrorism, and the censorship of science. *Hastings Center Report* 37. 2007; 3:35–43.
- Selgelid M. Governance of dual use research: an ethical dilemma. *Bulletin of the World Health Organization*. 2009; 87:720–23. [PubMed: 19784453]
- Somerville M, Atlas R. Ethics: a weapon to counter bioterrorism. *Science*. 2005; 307:1881–82. [PubMed: 15790831]
- Taubenberger JK, Reid AH, Lourens RM, Wang R, Jin G, Fanning TG. Characterization of the 1918 influenza virus polymerase genes. *Nature*. 2005; 437:889–93. [PubMed: 16208372]
- Tumpey TM, Basler CF, Aguilar PV, Zeng H, Solórzano A, Swayne DE, Cox NJ, Katz JM, Taubenberger JK, Palese P, García-Sastre A. Characterization of the reconstructed 1918 Spanish influenza pandemic virus. *Science*. 2005; 310:77–80. [PubMed: 16210530]
- van Aken J. When risk outweighs benefit: Dual-use research needs a scientifically sound risk–benefit analysis and legally binding biosecurity measures. *EMBO Reports*. 2006; 7(SI):S10–S13. [PubMed: 16819441]
- van Aken J, Hunger I. Biosecurity policies at international life science journals. *Biosecurity and Bioterrorism*. 2009; 7:61–71. [PubMed: 19379105]
- Wein L, Liu Y. Analyzing a bioterror attack on the food supply: the case of botulinum toxin in milk. *Proceedings of the National Academy of Sciences*. 2005; 102:9984–89.