BIOSECURITY AND THE REVIEW AND PUBLICATION OF DUAL-USE RESEARCH OF CONCERN

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Dual-use research of concern (DURC) is scientific research with significant potential for generating information that could be used to harm national security, the public health, or the environment. Editors responsible for journal policies and publication decisions play a vital role in ensuring that effective safeguards exist to cope with the risks of publishing scientific research with dual-use implications. We conducted an online survey of 127 chief editors of life science journals in 27 countries to examine their attitudes toward and experience with the review and publication of dual-use research of concern. Very few editors (11) had experience with biosecurity review, and no editor in our study reported having ever refused a submission on biosecurity grounds. Most respondents (74.8%) agreed that editors have a responsibility to consider biosecurity risks during the review process, but little consensus existed among editors on how to handle specific issues in the review and publication of research with potential dual-use implications. More work is needed to establish consensus on standards for the review and publication of dual-use research of concern in life science journals.

FREEDOM AND OPENNESS are traditionally recognized as the central values governing the regulation of life science publication.¹⁻³ Editors responsible for their journal's review processes and publication decisions face a dilemma, however, when free and open publication of legitimate scientific research might provide information that could be misused to harm national security, the public health, or the environment. The US National Institutes of Health (NIH) Office of Biotechnical Activities refers to such research "with significant potential for generating information that could be misused" as "dual use research of concern," or DURC.⁴

The significance of the conflict between freedom and openness in scientific publication on the one hand, and biosecurity on the other, was highlighted by recent concerns over the possible publication of information about 2 research groups' work on the transmissibility of the H5N1 virus (or

avian flu). In 2011, 2 NIH-funded research teams, one led by Yoshihiro Kawaoka at the University of Wisconsin and another led by Ron Fouchier at the Erasmus Medical Center (The Netherlands), developed methods of genetically modifying the H5N1 avian flu virus so that it can be transmitted between mammals. They submitted their papers to *Nature* (Kawaoka) and *Science* (Fouchier). In December 2011, the journals *Science* and *Nature* each received a request from the US National Science Advisory Board for Biosecurity (NSABB) to omit certain information about the methodology and findings from manuscripts the journals were considering for publication.^{5,6} The NSABB is a federal advisory board that is "chartered to provide advice, guidance, and leadership regarding biosecurity oversight of dual use research, defined as biological research with legitimate scientific purpose that may be misused to pose a biologic threat to public health and/or national security."⁷

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The H5N1 avian flu virus is highly lethal (mortality rate of 60%), but people can contract it only by coming into contact with birds. More than 350 people have died from H5N1 since 2003.⁸ Research into mutations that permit the transmission of the virus in mammals may help answer important questions about the possibility of an H5N1 pandemic and contribute to more effective treatments.⁶ However, this research also resulted in the creation of what one of the principal investigators involved has called “probably one of the most dangerous viruses you can make.”⁹ Information obtained from this research, if made freely available, has the potential of being misused by terrorists or others with malevolent intentions. Given this potential for misuse, the NSABB was asked to review the manuscripts and initially recommended that “[n]either...should be published with complete data and experimental details” and that “[c]onclusions of the manuscripts be published but without experimental details and mutation data that would enable replication of the experiments.”¹⁰ The NSABB also recommended the inclusion of language describing the goals of the research and the safety and security measures employed in the research.

The chief editors of both journals expressed concern about the initial implications of the NSABB’s recommendations, and both editors indicated that their journal’s decisions would ultimately depend on what measures were taken to ensure that any information censored from journal publication would be provided to the legitimate scientific community.^{7,8} Bruce Alberts, editor-in-chief of *Science*, wrote that “*Science* has concerns about withholding potentially important public-health information from responsible influenza researchers.... Our response [to the NSABB recommendations] will be heavily dependent upon the further steps taken by the U.S. government to set forth a written, transparent plan to ensure that any information that is omitted from the publication will be provided to all those responsible scientists who request it, as part of their legitimate efforts to improve public health and safety.”¹¹ Philip Campbell, editor-in-chief at *Nature*, is quoted as saying:

We have noted the unprecedented NSABB recommendations that would restrict public access to data and methods and recognise the motivation behind them. It is essential for public health that the full details of any scientific analysis of flu viruses be available to researchers. We are discussing with interested parties how, within the scenario recommended by NSABB, appropriate access to the scientific methods and data could be enabled.¹²

Concerns that the NSABB’s initial recommendations would hamper important scientific and public health efforts and that there were no practical mechanisms for redacting the papers while effectively sharing the information with responsible researchers were echoed in a February 2012 assessment conducted by the World Health Organization.¹³ The WHO group recommended the publication of

the papers in question, but recognized that there “may be benefit to creating... a mechanism to deal with other dual-use research information in the future.”¹³

In a subsequent review of revised versions of the papers, the NSABB reversed its initial position, recommending that the papers be published. According to the NSABB report, the basis for this reversal was that, first, “data described in the revised manuscripts do not appear to provide information that would immediately enable misuse of the research in ways that would endanger public health or national security,” and, second, that there was “new evidence” considered in the second review that “underscores the fact that understanding specific mutations may improve international surveillance and public health and safety.”¹⁴ While the NSABB unanimously agreed that Kawoaka’s paper should be published in full, only 12 of the 18 NSABB members recommended that Fouchier’s paper be published, but not as written.¹⁴

The potential public health and biosecurity implications of DURC, such as the studies of the transmissibility of H5N1 in mammals, underscore important ethical and policy questions about the responsible publication of DURC, the appropriateness of government intervention in life science publication, and the tenability of continued allegiance to self-governance and the traditional values of freedom and openness in science and scientific publication. Some have argued that direct government involvement in regulating or censoring the publication of nonclassified scientific research is necessary because the scientific community lacks the security-related expertise and information important for assessing risks and ensuring effective safeguards.^{15,16} Critics of government censorship have replied that such worries can be addressed through scientists’ cooperation with the government, the intelligence community, and other advisory groups such as the NSABB that possess the expertise and security clearance necessary for conducting informed and effective biosecurity review of scientific research.¹⁷ Moreover, it may also be argued that preferring a policy of government censorship to the self-regulation of the scientific community could potentially result in important negative effects on national security. This line of reasoning, for instance, was employed in the justification for the National Security Decision Directive (NSDD-189) enacted in 1985 in response to the security threats posed by the foreign acquisition of US-funded advanced technologies, which recognizes that, in the domain of non-classified fundamental research, the “free exchange of ideas is a vital component” of the research environment necessary for the nation’s “economic and physical security.”¹⁸

It remains unclear, however, how willing the scientific publishing community is to embrace a culture in which freedom and openness in science are meaningfully balanced against biosecurity concerns and in which shared decision making about dual-use publication issues can be effective. In one early and much-discussed test of NSABB review, the editor of *Science* affirmed that the decision to publish a

paper describing the reconstruction of the 1918 Spanish influenza virus would not have been reversed had the NSABB, in its last-minute review of the manuscript, voted against publication.¹⁹ Critics have argued that this example illustrates the unwillingness of editors in the life sciences to engage in meaningful or effective self-regulation²⁰ and supports the need for some direct government role in the enforceable censorship of scientific publications.^{15,16} Others have argued that, given the particulars surrounding the Spanish flu paper, the position of the editors in this case may not be predictive of how journal editors will generally regard recommendations from groups such as the NSABB, and thus such isolated and anecdotal evidence cannot, on its own, support an argument for the necessity of unilateral government involvement in the review and publication practices of life science journals.¹⁷ The outcome of the current H5N1 cases may or may not prove helpful in clarifying how journal editors will receive biosecurity recommendations from groups like the NSABB in the future, but the immediate lesson seems to be that editors will be reluctant to withhold publication of dual-use research without at least having practical mechanisms for identifying responsible researchers and organizations with legitimate needs for the information and for distributing the information to them.

Some supporters of government censorship have also speculated that life scientists simply may not be sufficiently motivated by biosecurity concerns to make reasonable and balanced judgments if those concerns conflict with the advancement of science or the scientist's own career.²⁰ Yet, there is some indication that life science editors do, in fact, take seriously a responsibility to consider the biosecurity implications of research under their review. For instance, in 2003 a group of editors published a statement that recognized the need for increased attention to the potential risks of dual-use research publication, affirmed the position that a paper should be modified or not published if the editor concludes that the risks of publication outweigh the potential societal benefits, and called on life science journals to develop policies for dealing with the review and publication of research that may raise biosecurity concerns.³ And in 2011, the NSABB's Working Group on Journal Review Policies convened an editor roundtable, attended by editors from 14 prominent journals and 3 leading editorial associations, to discuss dual-use publication issues and strategies to improve biosecurity review.²¹ But some have viewed the publication of the 2003 statement merely as a move to preempt government intervention in life science publishing, a claim bolstered by the fact that almost a decade after the statement's publication, several of the journals under the editorship of the statement's signers still had yet to draft or implement such policies.²² While editor involvement in efforts like the NSABB's editor roundtable do speak to the seriousness of journal editors' intent to engage in discussions about biosecurity in scientific publication, the working group reported consensus among the editors in the

roundtable that the materials and methods sections of papers with dual-use implications should remain sufficient to allow for reproduction of experiments, despite the risks of publishing such information, suggesting the existence of at least one line on the advancement of science that editors might be unwilling to cross for the sake of biosecurity concerns.²¹

A further set of problems concerns the practicality and effectiveness of strategies for dealing with dual-use publication issues that rely on the development of policy at the level of the individual journal and that lack some form of legal enforcement. As Singleton points out, a decision not to publish made on biosecurity grounds "is, or should be, different in kind from the normal decision to reject," since, unlike biosecurity-based decisions, a normal decision to reject a submission "says nothing about the suitability of the item for publication in another journal."²³ Thus, while an individual journal's biosecurity practices may prevent it from publishing research that may be misused, without some measure of legally enforceable government censorship, such journal-specific actions arguably do little to further the actual goal of biosecurity, since authors may simply resubmit their papers elsewhere or pursue other publication venues for making their work public, as they may with any other ordinary rejection from a journal. Similarly, if biosecurity measures are not legally enforceable and globally consistent, this may have the effects of stifling research in some geographical areas or promoting "research tourism" to countries with minimal regulation.¹⁶

On the other hand, Resnik has argued that such security gaps could be eliminated without government involvement through the scientific community's own development of an "international and all-encompassing" system of self-regulation.¹⁷ Resnik points out that these efforts could be led by international groups such as the Committee on Publication Ethics (COPE), an organization of more than 6,000 members that "provides advice to editors and publishers on all aspects of publication ethics and, in particular, how to handle cases of research and publication misconduct."²⁴ Led by such international groups, the development of consistent dual-use policies across all journals would help minimize opportunities for scientists to avoid stringent dual-use review and thereby reduce the need to rely on government powers for effective safeguards. The development of uniform policies could also promote the legitimacy of and compliance with dual-use publication policies by establishing well-vetted policies and procedures and clarifying the standards, expectations, and requirements placed on editors, reviewers, and authors dealing with dual-use research.

Skepticism about such a strategy, however, may be raised in light of the fact that COPE itself has already deliberately excluded dual-use research from the set of issues addressed by the group. Jeremy Theobald, a former COPE officer, reported at a 2007 meeting on dual-use research that, earlier that year, COPE's Council had considered the

question whether all journals should have policies regarding dual-use research and that the Council ultimately agreed that “the issue is not in COPE’s remit and COPE’s position on the editorial independence of the editor still stands.”²⁵ According to Theobald, COPE’s decision was based on the view that requiring journals to have dual-use policies would amount to dictating what journal editors should or should not publish and would restrict publication freedom.

Other scientific and editorial groups have taken different approaches. The World Association of Medical Editors’ policy statement entitled “Geopolitical Intrusion on Editorial Decisions,” while not mentioning dual-use specifically, states that, in decisions to edit and publish manuscripts submitted to biomedical journals, editors should “take into account whether studies are ethical and whether their publication might cause harm to readers or to the public interest,” and that “[d]ecisions to edit and publish should not be determined by the policies of governments or other agencies outside the journal itself.”²⁶ The Council of Science Editors’ “White Paper on Promoting Integrity in Scientific Journal Publications” recognizes that under the role of the scientific editor to “see that the outcomes of the scientific enterprise benefit the public,” editors are charged with “identifying dual-use research” and “should develop guidelines and procedures to allow the scientific evaluation as well as the evaluation of the possible risk of communicating information with dual-use potential.”²⁷ The American Society for Microbiology, the National Research Council Canada Research Press, and the Nature Publishing Group all have policy statements on dual-use research that affirm, with differing levels of specificity, the science editor’s responsibility to address questions of dual-use in review and publication of research.²⁸ In spite of this, COPE’s reported decision not to take action on issues of dual-use policy development throws into sharp relief the scientific publishing community’s general and principled objections to the legitimacy of security-based constraints on editorial independence and suggests that an “international and all-encompassing” system of self-regulation for dual-use research review and publication issues may face serious difficulties garnering widespread support in the scientific publishing community.

These debates illustrate the importance of support from journal editors for the success of any strategy for dealing with the responsible regulation of dual-use research review and publication. Journal editors have final responsibility for publication and, in many cases, a great deal of influence over the review process and the development of journal policy. Thus, the attitudes and practices of journal editors are vital to the feasibility and effectiveness of any strategy to regulate the review and publication of DURC and are crucial for informed discussions about how best to balance the values of free and open scientific inquiry against security risks. As the National Research Council report points out, “any process to review publications for their potential national security risks would have to be acceptable to the wide variety of journals in

the life sciences, both in the United States and internationally.”^{2(p8)} Yet, only a few studies have examined dual-use research journal policies.^{22,29} While these studies have provided useful knowledge, they are limited by the fact that they include information only on the existence and content of journal policies. To our knowledge, no study to date has examined the views and experiences of life science journal editors with respect to the review and publication of research with potential biosecurity implications. The aim of this study was to survey a broad, international sample of journal editors in order to describe their attitudes and experiences regarding the review, regulation, and publication of DURC in the life sciences.

METHODS

Our sample was drawn from a list of more than 4,000 journals listed in life science and medical journal categories in the ISI Web of Science database. We excluded from our search journal categories in the areas of patient care, surgery, nursing, dentistry, law, ethics, and policy, as these journals are unlikely to receive submissions that might qualify as involving dual-use research. We then examined the particular journals listed in these categories and excluded any journals that focused on the excluded categories or that did not appear to publish research findings. A random list of 850 journals was computer generated. We emailed these journals’ chief editors with a brief description of the study and invited them to participate. Only 1 invitation was sent per journal. A reminder email was sent to nonrespondents 10 days later. The invitations were sent and all data were collected in March 2011.

The survey consisted of 20 questions and was developed specifically for this study. The principal part of the survey asked about the editors’ experiences with and attitudes regarding the review and publication of DURC. Some of the questions were addressed specifically to the journal selected in our sample (hereafter, the contact journal), and others gathered information about the editors’ experiences and attitudes in general. The questionnaire was reviewed by a panel of 8 editors, research scientists, and biosecurity experts from the US, the UK, France, Russia, Switzerland, and Denmark, and revisions were made based on their comments. The Human Subjects Review Committee at Union College approved this study. The questionnaire was delivered to the editors via a self-administered online survey.

Both the invitation letter and the questionnaire provided editors with the NSABB’s definition of DURC as “[r]esearch that, based on current understanding, can be reasonably anticipated to provide knowledge, products, or technologies that could be directly misapplied by others to pose a threat to public health and safety, agriculture, plants, animals, the environment, or material.”⁴ Editors were asked about their length of tenure as editor, editorial positions on

other journals (ie, chief or associate editor), and the journal's geographical location and impact factor. Editors also were asked about their experiences reviewing DURC; whether they have sought or have been asked to cooperate with government, intelligence, or military advisors on the review of research that may raise biosecurity issues; and whether they have made decisions to modify or withhold the publication of articles with dual-use research implications. We also asked how editors should handle decisions to publish research with potential biosecurity implications, as well as how serious they think are the biosecurity risks of biomedical and life science publication. All questions in these sections asked respondents to select their answer from a closed list of choices (eg, yes/no or a 5-category Likert scale: strongly agree, agree, neither agree nor disagree, disagree, strongly disagree). Each question also offered respondents an opportunity to provide optional written comments explaining or elaborating on their answers.

Participation in the survey was voluntary, and participants were informed of their right not to answer any or all of the questions. The survey was anonymous; no link was created between individual respondents and their responses, and there was no way to determine which editor provided what responses.

Descriptive statistics were performed on factors pertaining to the editors and journals (eg, editor's length of tenure as editor, journal's location, and impact factor) and questions concerning editors' experiences with and their attitudes regarding the review and publication of dual-use research. Chi-square analyses were performed to ascertain possible associations between:

1. Factors pertaining to editors and journals (eg, editor's length of tenure as editor, journal's location, and impact factor, and journal's assessment of risk to free and open access of research published in nonclassified medical and life science journals) with the journal having a policy concerning the publication of dual-use research;
2. Editors' attitudes on their responsibility to consider risk of research with their attitudes on criteria for accepting or rejecting a paper for publication; and
3. Editors' assessment of risk to free and open access of research published in nonclassified medical and life science journals with their attitudes on whether national security requires publication restrictions, as well, whether or not journal policies concerning DURC should apply only to open access research.

RESULTS

Of the 850 editors selected, 47 had previously opted out of receiving invitations from the commercial survey service we used and therefore did not receive an invitation. Another 41 emails were returned as undeliverable. Of the 762 re-

maining editors, 127 returned the questionnaire for an effective response rate of 16.7%. Twelve of these (9.4%) were partially completed. One additional questionnaire was returned completely blank and was excluded from analysis. The 127 contact journals were published in 27 different countries and were grouped into 3 geographical categories: the US and Canada (51, 40.1%), Europe (60, 47.2%), and elsewhere (16, 12.6%). Editors provided impact factors for 117 of the contact journals. The mean impact factor was 5.26. The average length of tenure as editor at the contact journal was 9 years (median=6). Slightly less than half of the editors (46%) reported that they currently serve as the chief or associate editor of at least 1 additional journal. In total, respondents served as chief or associate editors for at least 292 life science journals at the time of the survey.

Policies Regarding Dual-Use Research of Concern

Few editors reported that their contact journal had a written policy covering the review or publication of DURC. Of 119 responses to this question, 11 (9.2%) stated that their journal had such a policy. Roughly the same percentage of respondents (10.9%) reported that their contact journal did not have a policy at the time of the survey but that they were either in the process of drafting one (5) or planning to do so in the future (8). A total of 70.6% (84) stated that their journal has no such policy nor were they currently considering creating one. Editor's length of tenure, as well journal's location and impact factor, were not associated with the contact journal's having a policy or planning to develop one.

When asked about their own views regarding national security policies and the publication of DURC, 33.4% of respondents stated that they agreed or strongly agreed that a "reasonable national security policy requires some restrictions on what legitimate, non-classified research may be published in publicly accessible medical and life science journals," while 45.8% disagreed or strongly disagreed ($n=120$). Agreement that a reasonable national security policy may place limits on the publication of legitimate, nonclassified research was associated with the editors' assessments of the seriousness of risks associated with allowing free and open access to research published in nonclassified life science journals ($p<0.001$). Fewer than one-quarter (23.4%) of respondents stated that there were "some serious" or "very serious" risks to allowing free and open access to scientific research in nonclassified journals, while 54.3% stated that there was little to no risk ($n=116$).

Experience with Dual-Use Research of Concern

Editors in this study reported having little experience dealing with the review and publication of DURC. When

asked if they believe their contact journal has published research that qualified as DURC under the NSABB's definition, 15 (12.5%) answered "Yes," 74 (61.7%) answered "No," and 31 (25.8%) stated that they were "Unsure" ($n=120$). One editor explained in a written comment that the journal had never published research that qualified as DURC under this definition, but that the journal had 1 case in which the author withdrew a paper because of security concerns. Of the 31 editors who answered that they were unsure whether their journal had published DURC, 16 provided a further written explanation stating that the definition was too vague to be useful. As 1 editor stated the general concern: "Given my lack of clairvoyance, that [definition] could apply to anything."

Only 11 editors reported having experience with biosecurity review. Six of these editors reported having received a request from government, military, or intelligence agencies or officials to participate in the review of potential DURC. Only 1 editor provided information on the request, stating that it had resulted from CIA interest in the participation of ex-Soviet scientists in an international conference. Five other editors reported having subjected a submission to some other "additional level of scrutiny or review" because of biosecurity concerns. When asked how the concern was identified, 2 answered by "the authors," 1 "by myself," 1 by "reviewers and co-editors," and another provided no information. One of the 11 editors reporting some experience with biosecurity review was also the only editor to report ever having requested input from government agencies or officials during the review process. We excluded an additional editor's positive response to these questions because, in a written clarification, the editor stated explicitly that the review was not in fact based on security concerns but on other risks to the public health from the publication of research on off-label drug use.

Respondents who reported ever having experience as editors with biosecurity review were asked about the outcome of those review processes. Only 1 of these editors reported having ever requested a paper's author(s) to revise or modify the content of a submission because of biosecurity concerns. This editor added only that the making of this request "was not the journal's decision." No editor in our survey reported ever refusing to publish a submission on the basis of biosecurity concerns.

Editor Views on Review and Publication Issues

Despite the general lack of experience with dual-use review reported, respondents generally supported an editorial responsibility to consider biosecurity risks during the review process. When asked whether editors have a responsibility during the review process to consider biosecurity risks from the potential misuse of research, 74.8% agreed or strongly agreed and only 13.4% disagreed or strongly disagreed

($n=119$). We also asked editors to indicate their level of agreement or disagreement with the following statement taken from the COPE Code of Ethics: "Editors' decisions to accept or reject a paper for publication should be based only on the paper's importance, originality, and clarity, and the study's relevance to the remit of the journal." The COPE Code of Ethics was not cited as the source of this quote in the questionnaire. A total of 71.7% of respondents agreed or strongly agreed, and 17.5% disagreed or strongly disagreed ($n=120$) with this statement. Although we did not require editors to explain their responses, 11 of the 21 editors who disagreed with this statement commented on their answers to this question. Of these, national security and public health (3), environmental and safety concerns (1), ethical and legal considerations (4), and the quality and impact of research (3) were cited as also being relevant to publication acceptance decisions. Respondents who supported an editorial responsibility to consider biosecurity risks during the review process were more likely to agree with the COPE statement as well ($p=.048$).

Editors were asked about their views regarding a series of particular issues involving how the review and publication of dual-use research ought to be handled. Roughly half of the respondents (53.4%) felt that life science editors should accept a request from government, military, or intelligence officials or agencies to participate in the review process only if the information on which their recommendations were based, including classified information, would be made available to the journal's editors, while 22.8% disagreed or strongly disagreed, and 23.7% neither agreed nor disagreed ($n=118$).

A majority of editors supported transparency with respect to the outcome of dual-use review processes that result in decisions to modify a paper for publication. Slightly more than two-thirds of the respondents (67.5%) agreed that, if a decision is made during the review process to amend or alter a paper for biosecurity reasons, the published paper should carry a disclosure of this fact; only 11.9% disagreed ($n=117$). However, editors were split over whether any paper that may raise biosecurity concerns should be accompanied by an editorial or additional discussion that puts the publication in perspective, regardless of whether the original paper was altered on biosecurity grounds. A total of 27.9% (32) agreed or strongly agreed with this process, while 33% (39) disagreed or strongly disagreed ($n=118$). In the optional written comments, some editors objected to such disclosures and discussions as excessive and/or unwarranted. Several others worried that policies requiring disclosures or discussions of modifications or security implications of dual-use research undermine genuine security efforts by highlighting potential risks and making potentially harmful research much easier to identify by those who would misuse it. As one editor wrote: "This would also seem to flag a piece of work as being something a potential terrorist should be looking at.... A warning label would seem to me to be counterproductive."

Finally, editors were asked about their own views regarding whether “review articles or other papers relying entirely on open source information” should be exempt from journal policies dealing with dual-use research. Slightly more than half of the respondents (54.2%) agreed or strongly agreed, 20% disagreed or strongly disagreed, and 25.8% responded that they neither agreed nor disagreed ($n=120$). Several of the editors who agreed with this statement commented that, with respect to the risks of publishing dual-use research, there is no difference between review articles and primary research and that, for example, “Reviews may often link information that may not be obvious without a lot of effort.” Comments from editors who disagreed expressed the view that “[i]t would be pointless to apply such restrictions” and that “[s]uch a policy would be futile, since all of the information upon which a review would be based is already in the public domain.”

DISCUSSION

Our international survey examined the attitudes and experiences of editors from a wide range of journals in the life sciences regarding the review and publication of DURC. Consistent with previous research on this topic,^{22,29} we found that few life science journals have policies in place to deal with dual-use research. We also found that, at the time of this survey, nearly 9 in 10 (87%) journals without dual-use policies had no plans to develop them in the future. Of the 127 editors serving at least 292 journals, only 11 editors reported any involvement in dual-use review of a submission, none reported ever having withheld a publication for biosecurity reasons, and only 1 editor had asked for a paper to be amended. While our study drew from a broad range of life science journals, and we acknowledge that higher levels of experience with dual-use review might be found by different studies that focus more narrowly on particular disciplines in the life sciences, these findings are in line with previous research on the frequency of DURC submission and review in the life sciences.³⁰

One important finding of this study was that most respondents agreed that life science journal editors have a responsibility to consider potential biosecurity threats during the review process (74.8%; $n=119$). Furthermore, respondents generally did not seem to regard this responsibility as being in conflict with the claim that decisions to publish should be based only on scientific merit. This is not to say that there is consensus on what those responsibilities are, what the standards should be, or how they might be applied in particular fields or instances. But contrary to COPE’s reported justification for excluding dual-use issues from its code of conduct, these findings seem to suggest that journal editors in the life sciences do not, in general, regard a responsibility to consider biosecurity concerns as incompatible with the traditional responsibilities and standards of scientific editing. Given the lack of consensus we

found among editors regarding particular issues in the review and publication of dual-use research, we believe that the scientific research and publishing communities would benefit from increased attention to dual-use policy development from groups, such as COPE, that specialize in editorial and publication ethics issues.

A significant finding was that editors’ assessments of the seriousness of risks from nonclassified publication of life science research were associated with agreement that reasonable national security policies may require censoring scientific publications ($p < .001$). Moreover, roughly one-third of respondents agreed that censorship may be required by reasonable national security policies, although this study did not explore what kind of censorship editors thought could be justified or under what conditions it might be justified. Still, these findings are interesting, especially in light of the Committee on Assessing Fundamental Attitudes of Life Scientists as a Basis for Biosecurity Education survey, which found much lower levels of support among life science researchers for any government censorship.¹ It is possible that those most responsible for making publication decisions are more open to the possibility of justified censorship of research and more willing to balance risk and scientific openness in matters concerning DURC than life scientists in general, although this is a highly speculative suggestion and one that requires more research.

Another interesting finding was that a slight majority (54.3%) of editors in this survey answered that journal editors should accept requests from government advisors to participate in the review process only if all of the information on which the recommendation (including classified information) was made would be provided to the editors. Since editors have final responsibility for publication decisions, it is understandable that they may be reluctant to make decisions based on information and advice they cannot themselves assess. But this demand for transparency is problematic in the case of biosecurity review, since classified information cannot be legally provided to individuals who lack the appropriate clearance status. If external advisory bodies such as the NSABB are to be effective partners in the review process, it seems that more work is needed to promote trust in the appropriateness of their advice. The recent experience with the H5N1 papers suggests that the development of practical mechanisms for disseminating dual-use information to researchers and institutions is an important component in fostering editors’ cooperation with external biosecurity advisory groups.

A limitation of this study is the low response rate (16.7%). It is worth noting that this response rate is within the norm for response rates for online surveys of biomedical professionals.³¹ Nevertheless, given this response rate, it is possible that our results are not representative of all life science journal editors, especially with regard to experience with reviewing DURC. One factor that may have contributed to the low response rate is that editors might have

decided not to participate because they felt that dual-use research does not raise issues for their own journal, given its particular topic or focus. In fact, several editors who declined participation wrote to us citing this as their reason. To the extent that this was a factor in the response rate, our survey may actually be biased toward editors of journals that are more likely to deal with dual-use research or who have already had experiences with groups such as the NSABB, although we cannot verify this. It is also worth noting that invitations to participate were sent out and all data were collected in March 2011, well before the recent public, polarizing debate over the publication of the H5N1 papers. It is possible that the survey response rate might have been higher or that editor responses might have been different had the survey been conducted after the H5N1 case. While we do not believe that the response rate invalidates the results, even if the attitudes and experiences reported were confined to a sizable minority of life science journal editors, the apparent lack of agreement we observed regarding how to handle particular issues in the review and publication of research with potential biosecurity implications signals a need for further discussion about appropriate standards for dealing with publication issues involving DURC.

CONCLUSION

International support from a wide spectrum of journals is vital if strategies for dealing with the review and publication of life science research with potential dual-use implications are to be effective safeguards against the misuse of legitimate research. While few editors in the life sciences have experience dealing with DURC, most recognize an editorial responsibility to consider the potential biosecurity implications of research submitted for publication in nonclassified journals. Few journals, however, have policies in place for dealing with dual-use research, and there is little consensus among editors regarding how particular issues involving the review and publication of research with potential dual-use implications ought to be handled. More work is needed to establish consensus on standards for the review and publication of DURC in life science journals. Journal editors, and especially the various editorial associations, can help lead the way in this by further sharing information about policies and best practices for dealing with dual-use research and by encouraging the development of communication between the scientific community and the security and intelligence communities.

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