The Increasingly Compelling Moral Responsibilities of Life Scientists

BY DAVID A. RELMAN

Many of my colleagues and fellow investigators in the life sciences were surprised in late 2011 to hear about the deliberate laboratory manipulation of highly pathogenic avian influenza viruses for the purpose of creating derivative strains with enhanced capacity for respiratory transmission among mammals—strains with pandemic potential and serious global consequence. More importantly, few were prepared to undertake a reasoned and dispassionate assessment of the risks and benefits of such research and of its publication. This is unfortunate, not only because the resulting paucity of scientific leadership on this topic led to emotional and often unproductive discourse, but because new instances of concerning research will be increasingly frequent and ever more consequential as the ongoing revolution in the life sciences unfolds.[1]

In this issue of the *Report*, David Resnik describes the tension that arises when tradeoffs between the benefits and risks of open and unrestricted scientific research must be weighed, discusses several approaches for assessing these tradeoffs, and illustrates the use of these approaches in evaluating the recent avian influenza research. He focuses on questions surrounding how and whether this work should have been published, and suggests—appropriately, in my opinion—that while one can apply rational strategies for sorting through these difficult questions, there were no attractive options available under these circumstances.

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As a member of the National Science Advisory Board for Biosecurity, I was involved in early deliberations about the appropriateness of publishing this avian influenza research when manuscripts were referred to us from two scientific journals during their review process, via the U.S. government. As described by Resnik, we grappled with benefits and risks, and in our initial, unanimous decision recommended limited publication, alerting the world to the possibility of evolved transmissibility in these viruses but with redaction of the exact genetic mutations that would enable anyone skilled in the art to synthesize these potentially dangerous viruses. However, after additional discussion, both internal and external to the board, we were asked to reconsider the situation, and this time a majority voted in favor of full publication. I was one of the minority that opposed full publication because I assessed the immediate benefits to be only modest (for example, enhanced surveillance would not likely be realized for a number of years, and the knowledge needed for vaccine design and development was already available), the risks potentially grave (whether due to accidental or deliberate release), and the means for mitigating these risks in the near-to-intermediate term clearly inadequate.[2] Resnik points to the difficulties of performing a formal risk-benefit assessment without the means of quantifying these two terms and suggests application of reasoning based on the precautionary principle instead. This makes sense. But there are three other issues that should be highlighted.

The discussion of this research has focused on questions surrounding publication. While they are important, we need to place greater attention on decision-making at the earliest stages of the research process—that is, at the

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time of the conceptualization of the experiment. Rather than ask whether the work is "worthy of support," we should ask whether it should be undertaken. There can also be multiple alternative scientific approaches and methods for addressing a given question, each with different degrees of risk and benefit, as illustrated by the differing approaches of Masaki Imai et al. and Sander Herfst et al.,[3] and as discussed by Resnik.

Second, Resnik raises the importance of the principles of freedom of inquiry and respect for autonomy. These principles feature prominently in the history of the philosophy of science, but their applicability today is increasingly problematic. The capability of doing harm to large populations is spreading and expanding. In addition, growing economic interests, societal expectations and an implied social contract, and conflicts of interest blur the distinction between the intrinsic and instrumental value of scientific knowledge and raise questions about the meaningfulness of autonomy in today's scientific enterprise. Today's practice of science is based on codependencies between scientists and the rest of society.

Finally, the moral responsibilities of scientists have not been adequately discussed. Frida Kuhlau and colleagues describe a set of moral obligations for life scientists that are particularly relevant to "dual-use" research of concern.[4] One of these, the moral duty to prevent harm, includes not just intentional harmful acts but also acts that impose risks of harm. Because they have such unusual capabilities for causing harm, scientists have a special roles and responsibilities. Kuhlau and colleagues suggest that the obligation to prevent unintended harm imposes a requirement on scientists for awareness of risks, and for reasonable efforts to minimize risks of unintended misuse. Of course, one cannot be expected to foresee all possible potential misuse of one's work. To this point, NSABB has emphasized immediacy of misuse and the scope of the harmful effect as important criteria for identifying research of particular concern.[5] Furthermore, assessments of threat, such as the likelihood of deliberate misuse, should not and cannot be the responsibility of scientists. Above all, we need more extensive engagement and dialogue across all sectors of civil society.

1. D.A. Relman, "The Biological Century: Coming to Terms with Risks in the Life Sciences," *Nature Immunology* 11 (2010): 275-78.

2. See the fifth criterion in A.P. Patterson et al., "Framework for Decisions about Research with HPAI H5N1 Viruses," *Science*, published online February 21, 2013, DOI: 10.1126/science.1236194.

3. M. Imai et al., "Experimental Adaptation of an Influenza H5 HA Confers Respiratory Droplet Transmission to a Reassortant H5 HA/H1N1 Virus in Ferrets," *Nature* 486 (2012): 420-30; S. Herfst et al., "Airborne Transmission of Influenza A/H5N1 Virus between Ferrets," *Science* 336 (2012): 1534-41.

4. F. Kuhlau et al., "Taking Due Care: Moral Obligations in Dual Use Research," *Bioethics* 22 (2008): 477-87.

5. 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," June 2007, http://oba.od.nih.gov/biosecurity/pdf/Framework for transmittal 0807_Sept07.pdf.