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REPRESENTATION FROM THE TRENCHES: ONGOING MONITORING FOR IMPLEMENTING THE BWC

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States parties to the 1972 Biological and Toxin Weapons Convention (BWC) will hold their next Meeting of Experts in Geneva from 20-24 August 2007. This follows the decision made by the Sixth Review Conference to continue the 'intersessional process' of 2003-2005. As described by Richard Guthrie in the last issue of *Disarmament Diplomacy*,[1] the Review Conference agreed a work programme for 2007-2010 comprising an annual one-week Meeting of States Parties preceded each year by a one-week Meeting of Experts. States parties also agreed topics to be discussed at each year's meetings, and that the meetings would additionally cover 'recurring topics'.

The two set topics for the 2007 meetings relate to national implementation.[2] This was also the subject of the 2003 intersessional meetings, where debate focussed heavily on implementing legislation without meaningfully considering wider issues relating to effective national implementation of the Convention. It is anticipated that in the 2007 meetings, states parties will once again restrict their discussions, focussing on criminalization, cross-boundary transfer controls and law enforcement.[3]

Whilst acknowledging the importance of such matters, this paper suggests that a more comprehensive discussion of national implementation is needed. It argues that enacting legislation and putting institutional mechanisms in place to implement that legislation are not going to be enough. National implementation of the BWC is an ongoing process; to monitor relevant life science activities effectively, states parties need to establish oversight mechanisms at multiple stages in the research and development (R&D) process, with successive systems overlapping to ensure maximum confidence in the information collected.

After presenting some background to this argument, the paper provides detailed examples of different oversight mechanisms that states parties might find helpful in identifying gaps in their existing national oversight frameworks. It concludes with a discussion on the roles of statutory and voluntary/self-governance mechanisms for life science oversight, arguing that while statutory mechanisms are requisite to effective oversight, informal monitoring systems also play a critical role.

National implementation is an ongoing process

National implementation comprises three components:

- Legislation to transpose treaty obligations into national law.
- Methods for monitoring relevant work with biological agents and toxins within the national territory.
- Means of enforcing the legislation once breaches are identified.

The discussion on national implementation at the 2007 intersessional meetings needs to consider all three components. For states parties that have not yet implemented their BWC commitments, dialogue needs to continue on how to transpose treaty obligations into national law – through legislation specifically designed for this purpose, through legislation that encompasses more than the objectives of the BWC, or through an array of already existing legislation.

Also important is a continuation of the discussion on appropriate means of enforcement once breaches are identified. This discussion must not limit itself to 'big stick' enforcement actions like levying fines, arrests, prosecuting and imprisonment. It also needs to consider 'softer' approaches to regulation like suggesting changes verbally or through written letters, serving improvements notices or prohibition notices, and withdrawing consent for the violating activity.

However, enacting legislation and enforcing that legislation only form *part* of national implementation. The third component, the ongoing day-to-day monitoring of the life sciences, seems to have been left off the agenda for the 2007 meetings. This is a significant omission, as *effective* oversight frameworks or risk regulation regimes must possess all three components with clear linkages between them.[4]

Ongoing monitoring is particularly important in the context of the BWC because biological weapons

and their associated technologies have a large dual use overlap; they use identical components to a vast array of legitimate activities, including biomedical, bioscience and biodefence R&D. Because of this, and the comprehensive nature of the BWC's prohibitions, implementation of the Convention needs to include the continuous oversight of peaceful, prophylactic and protective life science activities to prevent their misuse or misapplication.

States parties – particularly those that already have legislation transposing BWC obligations into national law – need to focus their efforts on the adequacy of the oversight frameworks they have in place. They need to consider how their present oversight frameworks operate in practice and how best to address any gaps that may exist.

There is a range of methods for monitoring relevant work with biological agents and toxins that covers various stages in the R&D process. This fact, combined with the different kinds of relevant life science activities and the varying national contexts, means that appropriate oversight mechanisms or monitoring systems will vary between states parties. There is no one-size-fits-all approach to address the potential misuse of biological agents and toxins, and, more broadly, the misapplication of the techniques and knowledge developing in the life sciences.

Successive stages of monitoring

Focussed exclusively on the research end of the R&D process, this article will now outline several ways of monitoring life science research ranging from initial risk assessments, through monitoring of work in progress, to publication of results. Some of these mechanisms are already in place in some BWC states parties, but few countries have made a concerted effort to draw up a comprehensive overview of their national frameworks. While not an exhaustive list, the following overview highlights several key elements as a starting point for further elaboration and discussion.

Project concept and design

Risk assessments carried out at the initial project concept and design stage are one way to monitor relevant work with biological agents and toxins. However, few guidelines have to date been developed on how to carry out these assessments with potential misuse or misapplication specifically in mind. A prominent exception is the draft guidance provided by the US National Science Advisory Board for Biosecurity (NSABB). Established by the US government in 2004 to provide advice, guidance and leadership on dual use research oversight, the Board has developed a criterion for identifying "dual use research of concern": *"Research 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"*.[5]

NSABB has outlined seven categories[6] of information, products or technologies that might be especially likely to meet the threshold within the criterion for dual use research of concern. These are knowledge, products or technologies that could:

- Enhance the harmful consequences of a biological agent or toxin.
- Disrupt immunity or the effectiveness of an immunization without clinical and/or agricultural justification.
- Confer to a biological agent or toxin, resistance to clinically and/or agriculturally useful prophylactic or therapeutic interventions against that agent or toxin, or facilitate their ability to evade detection methodologies.
- Increase the stability, transmissibility, or the ability to disseminate a biological agent or toxin.
- Alter the host range or tropism of a biological agent or toxin.
- Enhance the susceptibility of a host population.
- Generate a novel pathogenic agent or toxin, or reconstitute an eradicated or extinct biological agent.[7]

NSABB recommends that if the knowledge, products or technologies related to a proposed project are judged to apply to one of these categories, the project should undergo a more thorough review to determine whether it does indeed constitute dual use research of concern, and if so, how the potential for misuse should be managed.

This review should address:

- The potential for, and the ways in which, information from the research could be misused to pose a threat to public health and safety, agriculture, plants, animals, the environment or materiel.
- The likelihood that the information might be misused.
- The potential impacts of misuse.
- Strategies for mitigating the risks that information from the research could be misused.[8]

Funding applications

An additional way of monitoring relevant work with biological agents and toxins is to conduct similar risk assessments at the funding application stage. One example where this has been implemented is provided by the Wellcome Trust – a major funder of biomedical research based in the UK – who noted its commitment to this in 2003 in its *Position Statement on Bioterrorism and Biomedical Research.* Together with the UK's Medical

Research Council and the Biotechnology and Biological Sciences Research Council, the Trust has made changes to its funding application forms, developed guidance for funding committees, and modified organizational guidelines on good practice in research.[9]

Initiation of research

Once funding has been sought and granted for a research project, yet another layer of monitoring may be applied at the project initiation stage. In some states parties, such as those that are members of the European Union, there are already requirements that regulatory authorities[10] be notified of certain types of work – like the genetic modification of micro-organisms or work with particularly hazardous or dangerous pathogens – before the work starts. Some states parties may also require that consent for certain types of work be explicitly granted by regulatory authorities before such work is undertaken. In either case, notifications and applications for consent provide the regulatory authorities with an overview of, or some control over, the kinds of research carried out under their jurisdiction.

Individual risk assessments focussed on the safety and/or security of proposed work often form a central part of both notifications and applications for consent. These tend to address the agent's hazardous properties, such as its pathogenicity, epidemiology, infectious dose, routes of transmission, medical data, and environmental stability. They will also often address the nature of the work to be carried out, including where the work will be conducted and who will carry it out, the amount of agent used and procedures to be undertaken, the equipment to be used and how it will be decontaminated, whether the work is routine, one-off or undertaken out of hours or by lone workers, whether it could create aerosols or splashes, etc. These sorts of risk assessments are then used to inform what adequate and/or appropriate safety and security measures would be.

In some countries, risk assessments of proposed projects with biological agents and toxins may be reviewed internally through local review committees rather than through scrutiny by external regulators. Depending on the size and kind of institution (academic, private, commercial, military), these reviews may range from the quite informal to the very formal and bureaucratic.

Sometimes the meetings of local review committees are open to the public, or minutes of the meetings and submitted documents are available to the public on request. For other states parties, public registers of information on projects with biological agents and toxins may be kept by regulators or funders. This is the case in the UK, for example, where information[11] on all contained-use work with genetically modified micro-organisms is held in a central register and made available to the public in hard copy at the Health and Safety Executive or electronically online.

Ongoing research

There are several ways to monitor research with biological agents and toxins while it is being carried out, the most prominent of which is inspection by regulatory authorities of laboratory premises and the working practices of the researchers there. A health and safety inspection of a biological laboratory in the UK, for example, would typically comprise both scrutiny of laboratory documentation – particularly going through the various risk assessments the laboratory had carried out for its projects – and a visit to the actual laboratory, during the course of which the inspectors would speak to the researchers working there to check that the written policies and procedures were being adhered to.[12]

There may also be inspections of laboratory premises and routines through accreditation regimes (for example the ISO standards of the International Organization for Standardization or the Good Laboratory Practice and Good Manufacturing Practice standards) or through inspection programmes internal to institutions. These are often carried out by individuals in departments specifically dedicated to health and safety and environmental concerns.

Less formalized, although as important, are inspections by peers, who take on the role of biosafety officers alongside their principal jobs as researchers. Even less formalized but still a highly significant oversight mechanism is day-to-day peer observation in the laboratory. As NSABB, among others,[13] has noted: "*Researchers are the most critical element in the oversight of dual use life sciences research. They know the work best and are in the best position to anticipate the types of knowledge, products, or technologies that might be generated, the potential for misuse and the degree of immediacy of that threat*".[14]

The same point was made by a laboratory head at a large San Francisco Bay Area biotechnology company in a particularly candid interview carried out as part of a study looking at the implementation and impact of biosafety and biosecurity regulations in laboratories.[15] He noted that early on, for a small company, "the biosafety people tend to be very technical as they are usually still working as researchers and only doing the biosafety job on a part time basis. At around 150 employees companies can no longer rely on part-time biosafety officers. Ironically, it is when professional biosafety people are employed that you loose an understanding of what's going on. They are administrators in inclination and ability. They only know the regulations you have to comply with. Mid-size companies move away from using scientists towards

administrators that don't know what's going on at the bench top level".

He went on to say that "EH&S [Environment, Health & Safety] don't deal with the real safety issues, they only handle the bureaucracy. They are administrators. They may chair the safety committee, but even so they pretty much just turn the wheels. Most EH&S safety people are technically incompetent, and completely antithetical to people in research. There is a natural schism between EH&S and scientists, and the earlier you are in the R&D process the bigger the gulf". He showed me a copy of the Atlanta-based Centers for Disease Control (CDC) publication *Biosafety in Microbiological and Biomedical Laboratories*, and commented, "See, it only applies to standard viruses. There is no guidance for genetically modified viruses or for very large volumes of viruses. In the synthetic virus era you have to make your own rules – it has to be self-policing; you cannot have a set standard".

His laboratory works on genetically engineering viruses: "We can derive strains that are more infectious than HIV. Yet, the biosafety officers are busy pushing airborne pathogens regulations. The real safety issues are inherently self-policed. The pursuit of following safety regulations is a distraction. You can't develop regulations fast enough to follow evolving research. With basic research you have to depend on representation from the trenches to know what is going on".

One way to harness or strengthen the effect of peer observation in the laboratory, as well as to raise awareness among individual researchers themselves, is to find constructive ways of incorporating concern about potential misuse into the professional norms of biological scientists, their training and research practices, and their manuals and standard operating procedures. These may, for instance, be institutional policies outlining specific biological hazards (like how to safely handle infectious materials) and procedures for controlling them, or policies describing requirements for onsite containment facilities and appropriate practices for that type of containment (such as when to display biohazard warning signs, when to use biosafety cabinets, how to disinfect work areas, how to control access, etc). Documentation on how these policies and procedures are followed can provide a useful oversight mechanism. Laboratory notebooks – where the concept, intent and design of experiments are recorded along with observations made during the experiment and any resulting data where it is practical to do so – and their review by peers would be another example of documentary oversight.

Publication of manuscripts

Relevant work with biological agents and toxins can also be monitored at the publication stage of the research process. For instance, in 2003, the Journal Editors and Authors Group – comprising 32 leading life science journals – stated that "scientists and their journals should consider the appropriate level and design of processes to accomplish effective review of papers that raise security issues", and that this may, on occasion, lead an editor to conclude that "the potential harm of publication outweighs the potential societal benefits [and that in such circumstances] the paper should be modified, or not be published".[16]

The American Society for Microbiology journals provide one example of journals that have specific policies and procedures in place. Following the terrorist attacks in 2001 and the ensuing anthrax letters, the Society "adopted specific policies and procedures for its journals to provide a degree of careful scrutiny in the peer review process of submitted manuscripts dealing with dangerous pathogens".[17] Its Publications Board review process now "seeks to determine if an article contains details of methods or materials that might be misused or might pose a threat to public health or safety".[18] Other high-profile journals, such as *Science*, the *Proceedings of the National Academy of Sciences* and *Nature*, have developed or put in place similar review procedures.

The NSABB in the United States has drafted a set of principles for the responsible communication of research with dual use potential.[19] The Board argues that if the communication of dual use research is considered to pose potential security risks, a risk-benefit analysis of communicating the information should be conducted: *"After weighing the risks and benefits of communicating dual use research findings, the decision regarding communication is not necessarily a binary (yes/no) one. Rather, a range of options for communication should be identified and considered. The options available will depend on the research setting, e.g. academia, government, private. They could range from full and immediate communication, to delayed and/or modified communication, to restricted/no communication, and could be recommended singly or in appropriate combinations on a case-by-case basis, depending on the nature of the dual use finding and the potential risks associated with its communication".*[20]

The Board also argues that "it is important to consider not only *what* is communicated, but also the *way* in which it is communicated" and that "thought should be given to the need for the inclusion of contextual and explanatory information that might minimize [public] concerns and mis-understandings".[21]

Complementing statutory measures with informal oversight mechanisms

Some of the oversight mechanisms I have outlined in this paper are prescribed by statutory

measures, others are based on voluntary guidelines from regulators or professional organizations, and some are based on the tacit rules of the life sciences. The extent to which oversight of peaceful, prophylactic and protective life science research is best provided through statutory means or through self-governance by the scientific community is the subject of ongoing debate.

The National Research Council in the United States, which began focussing on dual use oversight fairly early on in this debate, highlighted three recent examples of "contentious" life science research in its 2004 report *Biotechnology Research in an Age of Terrorism*,[22] and argued that "these cases illustrate that, to balance the risks [for potential misuse] against the obvious benefits, one must depend upon expert scientific judgement".[23] It made the further point that: "The qualitative and case-by-case nature of these judgements is the primary reason the committee believes *it is better to rely on self-governance* to manage this aspect of the problem rather than to attempt to define appropriate or inappropriate research via regulation".[24]

The draft report of the NSABB Working Group on Oversight Framework Development, which was presented and discussed at the April 19, 2007 meeting of the NSABB, echoed this observation. Noting that "The foundation of oversight of dual use research is investigator awareness, peer review, and local institutional responsibility", it recommended a mix of self-governance and non-statutory guidelines: "The responsible conduct and communication of dual use research of concern depends largely upon the individual conducting such activities. No criterion or guidance document can anticipate every possible situation. Motivation, awareness of the dual use issue, and good judgement are key to the responsible evaluation of research for dual use potential. It is incumbent upon the institution and the investigator to adhere to the intent of such guidance as well as to the specifics".[25]

In contrast, the UK government has taken a very different view. In a Working Paper submitted to the BWC Meeting of Experts in August 2003, setting out the UK views on core elements needed for effective national measures to ensure the security and oversight of biological agents and toxins, it stated that: "The UK believes that some states parties may have limited numbers and types of facilities handling pathogens and toxins of key concern. In such cases, such facilities may be largely under direct or indirect control by the government, which may therefore not find it necessary to enact legislation in order to ensure that biosecurity measures[26] are in place. In other countries, including the UK, the broad range of owners and operators of such facilities and the wider extent of the legitimate work undertaken (and, therefore, the greater number of targets for unauthorized acquisition) is such that legislation is likely to be necessary to ensure that effective biosecurity measures are fully adopted and implemented nationally. In this situation, *relying on facilities to self-regulate biosecurity is likely to be an inadequate approach, and government-based formal oversight arrangements based on legislation would be necessary*".[27]

The UK working paper goes on to list key regulatory determinants of 1) which pathogens and toxins should be controlled, 2) what premises – and activities underway within the premises – are covered, and 3) what measures must be instituted at them. Noting that in many states parties these would need to be created by domestic legislation, it also lists a number of oversight mechanisms: notifications, inspections, appropriately-trained and resourced officials, etc – to ensure that biosecurity measures are fully and consistently implemented and maintained.

The UK argument is persuasive, and one that I support. However, as this article demonstrates, other forms of oversight are also important. Oversight should not be limited to an exclusively governmental function; there are important roles for individual scientists, laboratory managers, professional bodies, trade associations and others in monitoring work and activities with biological agents and toxins.

Conclusion

"Representation from the trenches" – through peer review of draft projects, funding applications, laboratory documentation and manuscripts for publication as well as through peer observation in the laboratory – is fundamental to providing effective oversight of the rapid pace and nature of change in the life and biomedical sciences and must be actively supported by national governments.

Although the debate over the relative balance of formal and informal monitoring systems is important, it should not detract from the central points of this article: first, that the ongoing monitoring of activities relevant to the BWC is an essential component for effective implementation of the Convention; second, that national oversight frameworks must comprise overlapping methods for monitoring relevant work with biological agents and toxins at multiple stages in the R&D process in order to adequately protect against the potential misuse and misapplication of relevant life science activities; and third, that in addition to putting formal monitoring systems in place, states parties must actively encourage the development of *informal* monitoring systems.

Notes

[1] Richard Guthrie, 'Rising Out of the Doldrums: Report on the BWC Review Conference', *Disarmament Diplomacy 84*, (Spring 2007).

[2] Specifically: "(i) Ways and means to enhance national implementation, including enforcement of national legislation, strengthening of national institutions and coordination among national law enforcement institutions. (ii) Regional and sub-regional cooperation on implementation of the Convention" See Final Document of the Sixth Review Conference, Geneva 2006, BWC/CONF.VI/6

[3] Letters dated May 24 and July 10, 2007 to the Permanent Representatives in Geneva of the States Parties to the BWC from Masood Kahn, Chairman of the 2007 Meeting of Experts and Meeting of States Parties.

[4] Filippa Corneliussen, 'Regulating Biorisks: Developing a Coherent Policy Logic Part I', *Biosecurity and Bioterrorism*, Vol.4(2) (2006), pp 160–167, and Filippa Lentzos, 'Regulating Biorisks: Developing a Coherent Policy Logic Part II', *Biosecurity and Bioterrorism*, Vol.5(1) (2007), pp 55–61. For a more general discussion on coherent oversight frameworks or risk regulation regimes see: C Hood, H Rothstein, and R Baldwin, *The Government of Risk: Understanding Risk Regulation Regimes* (Oxford: Oxford University Press, 2001).

[5] NSABB Draft Guidance Documents, July 2006, available at www.biosecurityboard.gov

[6] These categories draw to some extent on the seven "experiments of concern" outlined in the 2004 National Research Council report *Biotechnology Research in an Age of Terrorism*. The NSABB categories, however, have a different purpose and meaning. While "the seven experiments of concern are classes of experiments that … illustrate the types of endeavours or discoveries that will require review and discussion … The NSABB categories … are descriptors of information, products, or technologies that if produced from life science research, might define that research as meeting the criterion for being dual use research of concern". (ibid p 17)

[7] Draft report of the NSABB Working Group on Oversight Framework Development, presented and discussed at the 19 April 2007 meeting of the NSABB and available at www.biosecurityboard.org

[8] ibid

[9] A joint BBSRC, MRC and Wellcome Trust policy statement on "Managing risks of misuse associated with grant funding activities" September 2005, http://www.wellcome.ac.uk/doc_wtx026594.html

[10] Regulatory authorities may be at a local, state or national level.

[11] This includes information on the premises, the nature of the work to be carried out at the premises, the purpose of individual activities, and the characteristics of the genetically modified micro-organisms involved.

[12] For more detail on how the Biological Agents Unit of the British Health and Safety Executive carries out its inspections see: Filippa Corneliussen, 'Regulating Biorisks: Developing a Coherent Policy Logic Part I', *Biosecurity and Bioterrorism*, Vol.4(2) (2006), pp 160–167.

[13] Such as the National Research Council of the National Academies in the United States or the Royal Society in the United Kingdom.

[14] See note 8

[15] Wellcome Trust Postdoctoral Research Fellowship No. 068431/Z/02/Z October 1 2003–September 30 2006 entitled 'Social and Ethical Aspects of Governing Dual-Use Biomedical Research and Development'. The interview referred to was conducted on a non-attributable basis, on the understanding that I would publish the results.

[16] The Journal Editors and Authors Group, 'Statement on the Consideration of Biodefence and Biosecurity', *Nature*, February 2003.

[17] American Society for Microbiology, 'The professional responsibilities of scientists,' presentation to the BWC Meeting of Experts, Geneva, 16 June 2005.

[18] ibid

[19] See note 5

[20] See note 5

[21] See note 5

[22] The mousepox virus, total synthesis of the poliovirus genome and recovery of infectious virus, and comparison of the immune response to a virulence gene from vaccinia and smallpox. National Research Council, *Biotechnology Research in an Age of Terrorism*, 2004, pp 25–29.

[23] ibid, p 109.

[24] ibid, pp 109–10, author's emphasis.

[25] See note 7

[26] The UK understands 'biosecurity measures' to be those designed to prevent the unauthorised acquisition of pathogens, toxins or other bioactive substances of biological origin, specifically to prevent their potential misuse inconsistent with the provisions of the BTWC.

[27] United Kingdom working paper, 'The Design of National Mechanisms to Maintain the Security and oversight of Pathogenic Microorganisms and Toxins', July 15, 2003, BWC/MSP.2003/MX/WP.7/Rev.1, author's emphasis.

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