Séptima Conferencia de Examen de los Estados Partes en la Convención sobre la prohibición del desarrollo, la producción y el almacenamiento de armas bacteriológicas (biológicas) y toxínicas y sobre su destrucción

1º de noviembre de 2011
Español
Original: inglés

Ginebra, 5 a 22 de diciembre de 2011
Tema 10 del programa provisional
Examen de la aplicación de la Convención según lo dispuesto en su artículo XII

Posibles criterios para la educación y la concienciación de los especialistas en las ciencias de la vida[1]

Presentado por Australia, el Canadá, el Japón, Nueva Zelandia, la República de Corea y Suiza (en nombre del Grupo "JACKSNNZ")[2], los Estados Unidos de América, Kenya, el Pakistán, el Reino Unido de Gran Bretaña e Irlanda del Norte, Suecia y Ucrania

I. Introducción

1. El artículo IV de la Convención sobre las armas biológicas y toxínicas establece que los Estados partes adoptarán "las medidas necesarias para prohibir y prevenir el desarrollo, la producción, el almacenamiento, la adquisición o la retención de los agentes, toxinas, armas, equipos y vectores especificados en el artículo I de la Convención en el territorio de dicho Estado, bajo su jurisdicción o bajo su control en cualquier lugar". Ese artículo puede considerarse el eje que vincula las obligaciones generales de los artículos I y III de manera específica con las disposiciones nacionales de los Estados partes y sienta así las bases de las medidas nacionales de aplicación (véanse asimismo otros documentos de trabajo como BWC/CONF.VI/WP.3). Además, el artículo IV está formulado en términos generales e implica que, además de las medidas legales necesarias, también se requieren otras medidas para una aplicación nacional efectiva.

2. Las reuniones de expertos celebradas durante el primer proceso entre períodos de sesiones (2003-2005) fueron una plataforma ideal para analizar la supervisión, el desarrollo de una cultura adecuada de seguridad en el trabajo (códigos de conducta incluidos) y la educación y la concienciación de los especialistas en las ciencias de la vida, como medidas

[1] En este documento, por "especialistas de las ciencias de la vida" se entiende a las personas que participan en el estudio científico de organismos vivos y de sus productos, incluidas las personas con formación en disciplinas no relacionadas con las ciencias de la vida (como la ingeniería, la informática y la física) que realizan actividades relacionadas con las ciencias de la vida, así como las personas que realizan actividades relacionadas con las ciencias de la vida fuera de las estructuras institucionales formales (por ejemplo, biólogos aficionados).

[2] "JACKSNNZ" es un grupo oficioso compuesto por el Japón, Australia, el Canadá, la República de Corea, Suiza, Noruega y Nueva Zelandia.

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importantes de aplicación a nivel nacional. Los intercambios pusieron de relieve la noción común de que los especialistas en las ciencias de la vida desempeñan una función esencial en la prevención eficaz del uso indebido de la biotecnología y los agentes biológicos. Esta noción queda reflejada en el documento final de la Sexta Conferencia de Examen (BWC/CONF.VI/6), en el que la Conferencia exhorta a los Estados partes a que garanticen la seguridad y protección de los agentes microbianos u otros agentes biológicos o toxinas (Parte II, párr. 11 iii)), al tiempo que los insta a "promover el desarrollo de programas de formación y educación para las personas que tienen acceso a los agentes biológicos y toxinas […] a fin de crear conciencia en ellas de los riesgos y de las obligaciones de los Estados Partes en virtud de la Convención" (Parte II, párr. 14). Esa formación y educación son fundamentales para crear condiciones que permitan a los Estados partes desarrollar y aplicar "los descubrimientos científicos en la esfera de la bacteriología (biología) para la prevención de las enfermedades u otros fines pacíficos", según lo previsto en el artículo X de la Convención.

3. Además, en la Sexta Conferencia de Examen se alentó a los Estados partes a "adoptar las medidas necesarias para crear conciencia entre los profesionales competentes de la necesidad de denunciar las actividades realizadas en su territorio o bajo su jurisdicción o control que puedan contravenir la Convención o la correspondiente legislación penal nacional" (Parte II, párr. 15). En este contexto, el documento final de la Sexta Conferencia de Examen destaca también la importancia de esas medidas nacionales de aplicación a efectos de la resolución 1540 (2004) del Consejo de Seguridad de las Naciones Unidas y la eliminación o prevención de la proliferación, en este caso, de las armas biológicas.

4. Durante el segundo proceso entre períodos de sesiones (2007-2010), partiendo de nuevas consideraciones de bioseguridad y biocustodia[3], así como de vigilancia, educación y concienciación, se dialogó sobre posibles métodos para la inclusión y la participación de los especialistas en las ciencias de la vida. Los debates pusieron de relieve que la participación de los especialistas en las ciencias de la vida en los debates sobre bioseguridad y biocustodia aumentaría su conocimiento de los posibles riesgos y de las obligaciones derivadas de la Convención. Además, los debates destacaron su posible contribución, en su calidad de profesionales de las ciencias de la vida en instituciones académicas, industriales y gubernamentales, a la promoción de la bioseguridad y la biocustodia. En este sentido, en el documento de trabajo presentado por el Japón en nombre del Grupo JACKSNNZ (BWC/MSP/2008/MX/WP.21) se destacan tres medios efectivos para prevenir el uso indebido de la biotecnología: la supervisión/gestión y el control, la educación y la concienciación y los códigos de conducta para los científicos. En el documento también se resalta la importancia de recabar la participación de los interesados nacionales en todas las fases del diseño y la aplicación de los marcos de supervisión, y la necesidad de garantizar que las medidas adoptadas no supongan cargas innecesarias ni restrinjan indebidamente las actividades biológicas permitidas. En consecuencia, en la Reunión de los Estados Partes de 2008, estos reconocieron la importancia de la concienciación de quienes trabajaban en las ciencias biológicas, observaron que la existencia de condiciones formales para las modalidades de educación podía fomentar el conocimiento de la Convención y favorecer su aplicación, y convinieron en la importancia de los programas de educación y concienciación (BWC/MSP/2008/5, párrs. 25, 26 y 27).

[3] En este documento, los términos bioseguridad y biocustodia se emplean siguiendo la definición que figura en las Directrices sobre la biocustodia en el laboratorio de la OMS (2006): "La bioseguridad en el laboratorio es el término utilizado para referirse a los principios, técnicas y prácticas de contención aplicadas con el fin de evitar la exposición no intencional a patógenos y toxinas, o su liberación accidental" y "La biocustodia en el laboratorio consiste en la protección y el control de material biológico valioso dentro de los laboratorios a fin de impedir el acceso no autorizado a este o la pérdida, el robo, la utilización indebida, la desviación o la liberación intencional de este material".

5. Basándose en las consideraciones y en la noción común indicados anteriormente, varios Estados partes iniciaron actividades individuales a nivel nacional. En el caso de Australia, el Japón, Suecia y Suiza, el objetivo general de las actividades, realizadas asimismo por expertos de la Universidad de Bradford (Reino Unido) y la Universidad de Exeter (Reino Unido), era incitar a los investigadores a reflexionar y debatir acerca de las ciencias de la vida, la seguridad y la posibilidad de que sus actividades fueran utilizadas con fines destructivos. Australia, el Japón y Suiza (en nombre del Grupo JACKSNNZ) y Suecia presentaron al Comité Preparatorio de la Séptima Conferencia de Examen un documento informativo (BWC/CONF.VII/PC/INF.4) en el que se destacaban las experiencias y las principales conclusiones de estos Estados partes. En el caso del Canadá, los Estados Unidos de América, Kenya, el Pakistán, el Reino Unido de Gran Bretaña e Irlanda del Norte, la República de Corea y Ucrania, las actividades realizadas a escala nacional, en varios casos en cooperación con la sociedad civil, también han permitido acumular un importante número de experiencias y conclusiones fundamentales. Varias organizaciones científicas están promoviendo nacional e internacionalmente las actividades de educación y concienciación. Los datos oficiosos de que se dispone sugieren que el número de actividades está aumentando gracias a los esfuerzos y a la dedicación de particulares y organizaciones[4].

6. Este documento de trabajo se basa en una recopilación de experiencias nacionales en que se destacan los principales resultados y las conclusiones preliminares sobre las posibles maneras de abordar la educación y la concienciación entre los especialistas de las ciencias de la vida (secc. II). Los Estados partes que presentan este documento de trabajo esperan que este alimente las posibles consideraciones y conclusiones de los Estados partes en la Séptima Conferencia de Examen (secc. III). La recopilación de experiencias nacionales figura en el anexo del presente documento de trabajo.

II. Ejemplos de las experiencias de los Estados partes: principales resultados y conclusiones preliminares

7. El análisis de las diversas experiencias de los Estados partes (véase el Anexo) parece revelar varios resultados fundamentales:

a) Los programas de estudios y/o formación existentes en las universidades o en los centros de investigación suelen contener referencias a aspectos relacionados con la (bio)seguridad, pero rara vez contienen aspectos relacionados con la (bio)custodia.

b) Aunque en repetidas ocasiones se ha confirmado que los estudiantes y los profesionales de las ciencias de la vida han adquirido un desarrollado sentido de la (bio)seguridad, su conocimiento de los riesgos que implica el uso malintencionado de las ciencias biológicas es, por lo general, limitado.

c) Los especialistas en las ciencias de la vida no suelen ser conscientes de la posibilidad de que su trabajo específico pueda resultar útil para un programa sobre armas biológicas o ser utilizado para infligir daños a personas, animales o plantas, o para inutilizar recursos esenciales. Sin embargo, se observó que, una vez informados de que su labor de investigación podría tener implicaciones para la seguridad, la mayoría de esos científicos

[4] Véase, por ejemplo, la información presentada en National Research Council, 2011, *Challenges and Opportunities for Education about Dual Use Issues in the Life Sciences*, Washington, DC: National Academies Press, disponible en http://www.nap.edu/catalog.php?record_id=12958, y Judi Sture y *Masamichi Minehata, 2010, JSPS-ESRC Seminar Series, Dual-Use Education for Life Scientists: Mapping the Current Global Landscape and Developments: Seminar Report*, Bradford, Reino Unido: Bradford Disarmament Research Centre, disponible en http://www.brad.ac.uk/bioethics/monographs/.

valoraron la importancia de las actividades de concienciación y convinieron en que los investigadores compartían la responsabilidad.

d) El conocimiento que tienen los especialistas en las ciencias de la vida de instrumentos internacionales como la Convención y demás legislación internacional pertinente es, por lo general, escaso.

e) Las diversas experiencias internacionales también indican que hay similitudes en la manera en que las autoridades abordan estos retos, ya que los ejemplos se refieren, entre otras cosas, a:

i) Criterios para coordinar las actividades de divulgación a escala nacional entre las comunidades científicas, en colaboración con las instituciones educativas;

ii) El establecimiento de redes pertinentes con los centros de coordinación; o

iii) La introducción paralela de directrices, módulos educativos e instrumentos similares para investigadores.

Sin embargo, lo más probable es que estas medidas no tengan grandes repercusiones si no se pueden mantener a largo plazo.

8. La investigación académica continuada sobre bioética y el conocimiento de los riesgos relativos a la biocustodia parecen confirmar que el nivel de sensibilización entre los especialistas de las ciencias de la vida en numerosas instituciones de muchos países es, por lo general, limitado[5]. Entre los motivos de esa falta de conciencia figuran la inexistencia de estudios universitarios que abarquen los aspectos relativos a la Convención y las cuestiones de (bio)seguridad conexas, bien porque al elaborar el programa de estudios no se consideró que fuera un tema importante, o por la dificultad de integrar el contenido sobre biocustodia en un programa que ya se considera sobrecargado, o por falta de conocimientos especializados y de acceso al material docente adecuado.

9. La experiencia de determinados Estados partes, así como las conclusiones complementarias de estudios académicos sobre la concienciación acerca de la bioética, confirman que los Estados partes en la Convención deben adoptar nuevas iniciativas para potenciar el cumplimiento de la Convención mediante la educación y la concienciación de los especialistas en las ciencias de la vida como una medida nacional de aplicación preventiva. Así pues, los Estados partes que presentan este documento de trabajo alientan particularmente a que se consideren los siguientes aspectos en la preparación y la celebración de la próxima Conferencia de Examen.

III. Posibles consideraciones de los Estados partes en la Séptima Conferencia de Examen

10. Los Estados partes, con miras a potenciar la aplicación de la Convención mediante la educación y la concienciación de los especialistas en las ciencias de la vida como medida preventiva en el espíritu del artículo IV de la Convención, podrían tomar en consideración:

[5] Véase, por ejemplo: Dando, Malcolm, 2010, Teaching Biosecurity, Bulletin of the Atomic Scientists, disponible en: http://www.thebulletin.org/web-edition/columnists/malcolm-dando/teaching-biosecurity [consultado el 6 de enero de 2011]; Rappert, Brian (editor), 2010, *Education and Ethics in the Life Sciences*, Canberra: Australian National University E Press, disponible en: http://epress.anu.edu.au/education_ethics.html; y Whitby, Simon y Malcolm Dando, 2010, *Effective implementation of the BWC: The key role of awareness raising and education, Review Conference Paper N° 26*, Universidad de Bradford, disponible en: http://www.brad.ac.uk/acad/sBWC/briefing/RCP_26.pdf [consultado el 6 de enero de 2011].

a) Que el frecuente desconocimiento de los aspectos de la biocustodia y las obligaciones derivadas de la Convención por los especialistas en las ciencias de la vida debe ser paliado de manera más urgente, estratégica y global.

b) Que esos esfuerzos deberían servir, entre otras cosas, de base para las actividades de educación y concienciación que desarrollen los Estados partes individualmente a nivel nacional o en colaboración a nivel internacional.

c) Que esas actividades, entre otras cosas, podrían llevar a la inclusión permanente de módulos y actividades de enseñanza específicos sobre la Convención, por ejemplo en el programa de concienciación en curso.

d) Que los *interesados* en esas actividades de concienciación y en los programas entre períodos de sesiones sobre la educación acerca del doble uso[6], la bioseguridad y la biocustodia deberían englobar, entre otros, a los Ministerios, empresas, instituciones de investigación y académicas, órganos de financiación, editores de revistas científicas y asociaciones científicas pertinentes en todas las etapas del diseño y la ejecución de los marcos de supervisión. Los Estados partes deberían definir y aplicar claramente *la modalidad y la naturaleza* de las actividades en sus normas y reglamentos nacionales, y como complemento de las actividades de divulgación que realicen (es decir, no hay un modelo único).

e) Que se podrían diseñar y aplicar actividades de concienciación efectivas, no prescriptivas (si se considera adecuado), a un precio módico, con varias medidas concretas, como:

i) Explicar los riesgos relacionados con la posible utilización indebida de las ciencias biológicas y la biotecnología;

ii) Abarcar las obligaciones morales y éticas que impone la Convención a las personas que trabajan en las ciencias biológicas;

iii) Proporcionar orientación sobre los tipos de actividades que podrían contravenir los objetivos de la Convención, las leyes y reglamentos nacionales pertinentes y el derecho internacional;

iv) Acompañarlas de material docente accesible, programas de formación de los instructores, seminarios, talleres, publicaciones y material audiovisual;

v) Estar dirigidas a los principales científicos y a las personas responsables de supervisar la investigación o de evaluar los proyectos o publicaciones al más alto nivel, así como a las futuras generaciones de científicos, con el fin de fomentar una cultura de responsabilidad;

vi) Integrar esas actividades en las iniciativas existentes a nivel internacional, regional y nacional.

f) Que las actividades de educación sobre el doble uso, la bioseguridad y la biocustodia y la reglamentación pertinente no deberían representar cargas innecesarias ni restringir indebidamente las actividades biológicas permitidas. Los científicos y los demás interesados podrían prevenir posibles malos usos de la ciencia biológica creando una

[6] En el contexto de este documento, el término "doble uso" indica la posibilidad de que los materiales, conocimientos, instalaciones y tecnologías biológicos destinados a fines pacíficos sean mal utilizados con fines bélicos. Si bien la característica del doble uso no implica necesariamente un mal uso, las referencias a la "educación acerca del doble uso" se centran en particular en los módulos de enseñanza que destacan el potencial uso malévolo de los resultados de la investigación bienintencionada, al ser susceptibles de doble uso.

cultura de responsabilidad y seguridad mediante la enseñanza de la biocustodia y la bioética.

g) Que los Estados partes deben informar de sus actividades de concienciación y educación sobre el doble uso, la bioseguridad y la biocustodia de manera más explícita que en el pasado. (Se admite que ya es posible incluir la información de los Estados partes sobre esas actividades en el epígrafe "otras medidas" correspondiente a la medida de fomento de la confianza "E": "declaración de legislación, reglamentos y otras medidas", como medidas adoptadas para garantizar la aplicación nacional efectiva de la Convención.) Al hacerse pública esa información, entre otras cosas, en los informes sobre las medidas de fomento de la confianza, los Estados partes que más hayan avanzado en la aplicación de las actividades de concienciación y educación sobre el doble uso, la bioseguridad y la biocustodia podrán identificar a los Estados cuyas actividades no estén tan adelantadas y ofrecerles la ayuda que necesiten.

h) Que el tiempo entre los períodos de sesiones de la Séptima y la Octava Conferencias de Examen se aproveche para continuar los intercambios y los avances en esta esfera, tanto entre los Estados partes como en colaboración con las organizaciones internacionales y no gubernamentales. A este respecto, los Estados partes podrían elaborar y compartir los objetivos y los resultados de las actividades de concienciación, y se los podría alentar a que designen un punto de contacto nacional para las actividades de educación y concienciación pertinentes.

11. Los Estados partes que presentan este documento de trabajo alientan a todos los Estados partes en la Convención a que acuerden la inclusión de las propuestas mencionadas anteriormente en la sección "Decisiones y recomendaciones" de la declaración final de la Séptima Conferencia de Examen.

Anexo

[ENGLISH ONLY]

Examples of experiences by States Parties

Australia

1. Australia commenced its outreach and awareness-raising on BWC-related issues in 1990, with a set of Guidelines developed by the Department of Foreign Affairs and Trade, to raise the awareness of industry and researchers about the risk of inadvertent involvement in the biological weapons programs of other countries. These Guidelines have been circulated to biological industry, universities, relevant professional associations and government agencies.

2. At the BWC Meeting of Experts in 2005, Australia reported that amongst its scientific community, there was a low level of awareness of the risk of misuse of the biological sciences to assist in the development of biological weapons[7]. One problem identified is that many scientists working in the 'dual-use' areas simply do not consider the possibility that their work could inadvertently assist in a biological weapons program.

3. To address this challenge, the Guidelines have been complemented in recent years by more prioritised outreach and awareness-raising activities by Australian government agencies to target those parts of the scientific community which are most directly affected by the BWC and biosecurity-related legislation, as discussed below.

4. An education and awareness-raising program has been developed by Australia's Department of Health and Ageing to promote recognition and understanding of the security sensitive biological agents (SSBAs) regulatory scheme established in November 2008, and to ensure that the regulated community is able to comply with their obligations. Briefings on the BWC and associated legislation, including the Crimes (Biological Weapons) Act 1976, are included in the SSBA outreach activities.

5. Australia's Defence Export Control Office (DECO), as the agency responsible for the Customs Act 1901 and Weapons of Mass Destruction (Prevention of Proliferation) Act 1995 and their associated regulations, undertakes regular outreach seminars to provide information on the obligations related to exports of dual-use biological materials, equipment and technology. DECO also provides a range of publications which provide information on specific areas of export controls.

6. In 2006, Australia's National Framework for the Development of Ethical Principles in Gene Technology ('National Framework') was published to provide a national reference point for ethical considerations relevant to environmental and health issues in gene technology, GMOs and genetically modified products. Many of these considerations are relevant to the prohibitions outlined by the BWC, or strongly complement the objectives of the Convention and/or the promotion of sound biosecurity/biosafety practices. The National Framework can play a role in helping gene technology practitioners determine in a straightforward and non-prescriptive manner how to best carry out their activities without the risk of contravening the provisions of the BWC.

[7] Raising Awareness: Approaches and Opportunities for Outreach, working paper submitted by Australia, BWC/MSP/2005/MX/WP.29.

7. In 2009, members of Australia's National Centre for Biosecurity (a collaboration of the University of Sydney and the Australian National University) conducted a pilot series of four interactive seminars for Australian scientists and students on the potential security risks of laboratory research on pathogens micro-organisms, including the relevance of the BWC. This series of seminars, funded by the US-based Alfred P. Sloan Foundation, was based on the program developed in the United Kingdom by University of Bradford and University of Exeter.

8. In recognition of the high levels of cooperation necessary between Government officials and the relevant scientific communities to achieve progress in awareness-raising activities, there has been engagement by Government officials with a number of Australian universities, as well as the Australian Academy of Science, the National Centre for Biosecurity and relevant scientific societies, to develop a program to enable more effective outreach activities.

Canada

9. As Canada raised in its opening statement at the 2008 Meeting of States Parties, oversight, education, and awareness-raising among life scientists is essential for full implementation of the BTWC. As part of our ongoing commitments, Canada will be undertaking the following activity to educate and promote BTWC awareness and compliance in 2012.

10. The Public Health Agency of Canada (PHAC) and the University of Bradford, United Kingdom (UoB) are collaborating in the development and delivery of a curriculum for a university-level accredited pilot course on Applied Dual-use Biosecurity; Biosafety and Bioethics to be in Ottawa in 2012. With the aim of promoting BTWC awareness and compliance in Canada, the objectives of this course are to develop a foundation of the concepts of biosafety and biosecurity in the trainee such that increased awareness in regards to the ethical, legal and social relevance of dual-use biosecurity, as well as the responsible conduct of research can provide a foundation for the development of policies and procedures to enhance responsibility and prevent the malicious or misuse of pathogens and toxins.

11. This course will also assist in compliance promotion, and therefore, compliance with those undertaking activities with human pathogens and toxins, within the sphere of oversight of the Human Pathogens and Toxins Act (HPTA), one of Canada's primary tools in BTWC compliance. This course is intended for those with low-level knowledge of biosafety, but a high level of responsibility with respect to compliance with the HPTA.

12. Dependent on a successful delivery of the first course, future plans include expansion into a 60 UK credit Post-graduate Certificate for delivery across Canada, and potentially the transition to a full MA programme (180 UK credits) accessible by the global community.

Japan

13. Japan expressed in its working paper submitted to the Meeting of Experts in 2008 (BWC/MSP/2008/MX/WP.21) that education and awareness-raising among scientists are basic means for preventing the misuse of biotechnology, while recognizing the importance to respect the autonomous responsibility of scientists without obstructing scientific development. In the same working paper, though, Japan also acknowledged that 'the development of educational programmes at the governmental level has not seen great progress'.

14. In order to mitigate such deficiencies, the National Defense Medical College (NDMC) in Japan and the University of Bradford in the UK conducted collaborative research to analyse the current state of biosecurity education in Japan[8]. The research found that there was a lack of educational topics on biosecurity despite a certain level of presence on dual-use references, mainly due to an absence of space in the existing curricula, an absence of time and resources to develop new curricula, an absence of expertise as well as doubt about the need for biosecurity education. Parallel to this survey, the NDMC and the University of Bradford also jointly developed an online learning module in applied dual-use biosecurity education.

15. In addition to the efforts by the NDMC, other universities and institutions in Japan are also taking various approaches to tackle bio-threats. These approaches include a course on bio-ethics and the social responsibility of scientists conducted by Waseda University, a project on anti-bioterrorism conducted by Keio University, and a table-top exercise on response measures in the event of bioterrorism by Jikei Medical University. The University of Tokyo has also launched a Global Health Leadership Program aimed at cultivating human resources capable of addressing global health challenges from cross-sectional perspectives including life ethics. In August 2011, the Science Council of Japan hosted a symposium on "Emerging risks posed by the development of life sciences and the role of scientists" where presentation were made by the leading life scientists in Japan followed by discussions including on the necessity of a code of conduct.

16. Encouraged by such individual activities, a wide range of measures are required for preventing the misuse of biotechnology. It is, therefore, important to share best practices among scientists and institutions at national and international levels and to examine how to apply and implement such practices appropriately.

Kenya

17. In Kenyan universities or research facilities there are already references to aspects related to biosafety. However, these aspects rarely address issues related to biosecurity or dual-use issues. The level of awareness of the risk of misuse of bioscience research is very limited and in instances where the term Biosecurity is used, it is usually in reference to other issues, e.g. Food security or sustainability. Consequently, in the recently drafted Biosecurity policy, emphasis was put on the need to create awareness among the life science community on Biosecurity and also develop education programmes on the same.

18. University of Nairobi and the University of Bradford in the UK are in the early stages of planning a collaborative research to analyse the current state of biosecurity education in Kenya and the East African Region. The research results will be used to guide development of subsequent Dual-use biosecurity education programmes and curricula

19. University of Nairobi, in collaboration with the University of Bradford plans to conduct an online Biosecurity Education course for the life science community in East Africa. In the planned programme, experts will be invited to Nairobi where an intensive one week dual-use biosecurity education course will be delivered online by the University of Bradford.

20. The University of Nairobi, Centre of Biotechnology and Bioinformatics (CEBIB), is reviewing its curricular to introduce Dual-Use Biosecurity Education in its Masters Biotechnology course.

[8] Masamichi Minehata and Nariyoshi Shinomiya, ‘Chapter 5: Japan: Obstacles, Lessons and Future’ in Brian Rappert ed., Education and Ethics in the Life Sciences: Strengthening the Prohibition of Biological Weapons, The ANU E Press, 2010.

Pakistan

A. Introduction

21. Regarding legislations that may be relevant for biosecurity (as well as to comply with requests of international commitments such as the BTWC or the UNSCR 1540), Pakistan enforces a system of both specific regulations and adapted existing laws, like the 2000 CWC Implementation Ordinance; the 2004 Export Control on Goods, Technologies, Material and Equipment Related to Nuclear and Biological Weapons and their Delivery; the 2005 Pakistan Biosafety Rules; the 1976 Drugs Act; the 1997 Environmental Protection Act ; and the 1997 Anti-terrorism Act.[9]

22. Activities done by Pakistan for implementation of Biosafety, Biosecurity and Dual use education:

(a) Pakistan has developed biosafety guidelines in May 2005 and implements it in October 2005.[10]

(b) Pakistan has developed National Biosafety Centre under the umbrella of ministry of environment that is fully functional.

(c) The National Commission on Biotechnology was established in November 2001 in Pakistan. It sets and implements the Biotechnology Pakistan National Policy and Action Plan 2003.[11]

(d) Recognizing the importance of Life Sciences the Higher Education Commission established the Core Group in Life Sciences (NCGLS) with six different disciplines. These include Botany, Genetics, Microbiology, Biochemistry/Molecular Biology, Zoology, Bioinformatics. Their main objectives are promotion of teaching and research in Life Sciences in Pakistan. Identification of areas in Life Sciences which have a direct and major impact on the economy and well-being of the country. Preparation of major projects in these areas. Human resource development in Life Sciences in Pakistan. By this programme more than 3500 teachers have been trained in various advanced biological techniques through 55 national and International workshops and conferences. The National Core Group in Life Sciences (NCGLS) has organized a first two day National conference of life scientists at Bhauddin Zakariya University, Multan on 13-14 November, 2006 in which almost 150 senior and young scientists from different universities of Pakistan have participated.[12] Four resource Centers have been established at various universities. This programme has also developed Life Sciences directory having complete contact information of all life scientists in Pakistan has been published and distributed among the scientists.[13] An important step is Joining of NCGLS with International Council for the Life Science (ICLS) as Associate Member.[14]

(e) The Pakistan Biological Safety Association (PBSA) has been launched under the auspices of the National Core Group in Life Sciences (NCGLS) of the Higher Education Commission in collaboration with OIC Committee on Scientific and Technological Cooperation (COMSTECH).[15]

[9] Nasim N, (2011), Biosafety Education in Pakistan, Presentation to Side Meeting to the Preparatory Committee of the BTWC, Geneva April 13-15, 2011
[10] http://www.environment.gov.pk/act-rules/Biosftyrules.pdf
[11] http://www.blog.paksc.org/2010/11/promoting-bio-technology-in-pakistan/
[12] http://ncgls.hec.gov.pk/index/Workshop_Reports/National_conf_BZU.htm
[13] http://ncgls.hec.gov.pk/
[14] http://app.hec.gov.pk/Press_Releases/2006/Octuber/Octuber%2004th.htm
[15] http://app.hec.gov.pk/Press_Releases/2008/August/Aug_05.htm

(f) A Code of conduct for life scientist has been developed by the National Institute of Biotechnology & Genetic Engineering in 2009. International Biosafety working group recognized Pakistan Biological Safety Association.

(g) First International Seminar on Laboratory Biosafety Issues 21st March 2009.

(h) National Training Seminar on Bio-safety and Bio-security Initiatives June 18 to 19, 2007, Islamabad.

(i) The Ministry of Foreign Affairs established an inter-agency working group to develop a code of ethics and biosafety law Dr. Anwar Nasim elected convener of the Task Force 9th June,2009.

(j) Visit of 3-Member Delegation of US Bio-security Engagement Programme (BEP) 22nd June 2009 at Aga Khan University

(k) Two Seminars on Laboratory Biosafety March 21, 2009 & December 05, 2009 at Agha Khan University,

(l) Biosafety and Biosecurity International Conference Healthier and more secure communities in MENA region 2009 Casablanca, MOROCCO April 2-3, 2009

(m) Pak-USA BEP Workshop-1 Cairo 3-6 May,2010 12 Project proposals submitted 27 participants from Pakistan

(n) Pak-USA BEP Workshop-2 Istanbul, Turkey 20-23 September, 2010. Three Projects approved for funding.Dual-use project Quaid-e-Azam University Islamabad

B. Biosecurity and biosafety education at universities

23. All most all the universities that have biological science department started the course for various degree programs. Quaid-e-Azam University offers courses with Course code: Mic-441 Principles of Biosafety Course code: Mic-575 Biological Safety and Risk Management Course code: Mic-442 Risk Management. Agha Khan, Shifa international, Punjab Universities and Riphah International universities teach the subject of Bioethics in their bio departments.

(a) Course Contents offered at NIBGE Introduction to Biosafety;

(b) Introduction of laboratory safety, bio-safety procedures, use and disposal of bio-hazardous materials, regulator issues and established guidelines for safe practices.

A specialized course as a core subject is being offered at Quaid-e-Azam University on Biosafety, Biosecurity and Dual Use Education for M. Phil and Ph.D. students. Young researchers from various disciplines like Biochemistry, Biotechnology, Microbiology, Botany, Zoology are attending the course as a pre-requisite of their degree.

24. In order to regulate the ethical issues of research national level committees has been established.

(a) Pakistan Medical Research Council's National Bioethics Committee (NBC), which is an advisory body which deals with all aspects of bioethics in the health sector.

(i) Research Ethics Committee

(ii) Medical Ethics Committee

(b) From June 2010, ICLS chapter regarding Pakistan has been established and Dr. Anwar Nasim advisor COMSTECH is its head. At Islamabad, Pakistan ICLS and COMSTECH jointly establish a group 'Responsible Conduct of Science'. It has organized

the two conferences. ICLS sponsored a first conference on "Responsible Conduct of Science", which was hosted by the Organization of Islamic Conference's Standing Committee on Scientific and Technological Cooperation (COMSTECH) in partnership with the Pakistan Academy of Science on June 9-10, 2010. Prof. Zabta K. Shinwari, Terence Taylor and Professor Khalid Temsamani were among speakers and second conference of this held at F C University Lahore on Jan 31 to Feb 01 2011 for students' professors and media people.[16]

C. Education and networking projects on dual use and biosecurity

25. A research group for the awareness of Biosafety Biosecurity and dual use of research among university graduate has been established and it start working for implementation of Dual use education in the country. Giulio Mancini, (Italy), James Revill (University of Bradford), Anwar Nasim, and Zabta Khan Shinwari (Pakistan) are group members. This group has organized the first international workshop on Synthetic Biology & its Dual use at COMSTECH Islamabad from February 3 to 5 2011.This workshop was very successful. Total 30 participants from OIC region was selected for the workshop.[17]

26. A survey was conducted by QAU & LNCV on general perception about Biosafety, Biosecurity, Bioethics and Dual Use of research among university graduate. The result showed that Pakistani scholars had sound knowledge about biosafety as compared to other developing nations.

27. On May 24, 2011, a Workshop on Bioethics, Biosafety, Biosecurity and Dual Use Education was organized at the Quaid-i-Azam University (QAU) of Islamabad by the Department of Biotechnology and Bioinformatics of the same university and by the Landau Network-Centro Volta (LNCV). The Workshop had two main objectives: firstly, to inform and raise the awareness on bioethics, biosafety, biosecurity and dual use issues in the life sciences and technologies (more generally grouped as various aspects of "biorisk" reduction and management); secondly, to engage the scientific academic community in Pakistan over the promotion and implementation of education on these topics in national universities. The Workshop is indeed inserted in the framework of a joint project that QAU and LNCV have been carrying since October 2010, aimed at strategizing and promoting education and awareness raising on biorisk management in Pakistan (with special attention to the "holistic biosecurity" aspects). Furthermore, the organization of the Workshop was collaborated by a number of experts and institutions: the Biosecurity Engagement Program of the US Department of State (also supported of the project); the Sandia National Laboratories (specialized in laboratory biorisk management) and the QAU Department of Strategic Studies which hosted the event in its premises. The Workshop was attended by over 80 participants who included invited experts and officials, students, and professors from various Pakistani universities. Distinguished guests (and keynote speakers) included HE Vincenzo Prati, Ambassador of Italy in Islamabad; Prof. Dr Masoom Yasinzai, Vice Chancellor of Quaid-i-Azam University; Dr Irfan Shami, Director General Disarmament of the Ministry of Foreign Affairs of Pakistan; Dr Anwar Nasim, Adviser Science of the Standing Committee on Science and Technology of the Organization of Islamic Countries (COMSTECH) and Prof. Zabta K. Shinwari, Chief Organizer of the event.[18]

[16] http://app.hec.gov.pk/Press_Releases/2006/Octuber/Octuber%2004th.htm

[17] COMSTECH (2011), Workshop on Synthetic Biology and Dual Use, OIC Committee on S&T Cooperation (COMSTECH), Islamabad (http://comstech.org/Synthetic_Biology/tabid/1377/language/en-US/Default.aspx)

[18] http://www.molecular-systematics.org/index.php?option=com_content&view=article&id=30:international-consultative-workshop&catid=4:events&Itemid=25

28. National TB control programme has started an extensive programme for the training of staff from all over the Pakistani peripheral laboratories of NTP regarding Biosafety and Biosecurity. In future their platform in collaboration with QAU can play a key role in capacity building of country scientists for responsible conduct of sciences.

29. Pakistani young scientists attended online course offered by Bradford University on "Dual Use Education".

Republic of Korea

30. The Ministry of Health & Welfare has exerted efforts to strengthen national biosafety and biosecurity supervision through comprehensive legislative acts such as the 2005 amendment of 'Act on the Prevention of Infectious Disease' and the 2008 enactment of 'Act on the Transnational Transportation of Genetically Modified Organisms.' The two legislations serve as a basis for various permission and control measures of highly dangerous pathogens such as Bacillus anthracis and living modified microorganisms containing genes of highly dangerous pathogens that have a high potential of being used in bio-terrorist attacks. The Ministry is also working to establish and strengthen biosafety and biosecurity culture in the domestic biomedicine field.

31. The recent outbreaks of infectious diseases such as AI (Avian Influenza) and PI (Pandemic Influenza) caused by new and mutated pathogens, as well as the growing possibility of bioterrorism have magnified the importance of biosafety and biosecurity. Add to this the increased probability of biomedical laboratory workers being infected by highly dangerous pathogens and living modified microorganisms containing the genes of such pathogens. Against this backdrop, the Republic of Korea has reorganized its legislative systems and amended biosafety guidelines to reinforce biosafety management in biomedical research. Such efforts have been led by the Ministry of Health & Welfare and the Korea Center for Disease Control and Prevention (KCDC). The two organizations are also working to develop and provide education and awareness-raising programs for scientists and workers in the bio-field.

32. To strengthen institutional capacities for biosafety and biosecurity at biomedical research laboratories, the KCDC has worked with Korea Human Resource Development Institute for Health & Welfare (KOHI) to develop an education program for public officers and researchers working in the field of biomedical science. The program has offered 'Laboratory Biological Safety Course' since 2006, and provides information on laboratory bio-risk management, risk assessment, and biosecurity control management.

33. Heightened international concern regarding the use of modern biotechnology and the increased use of highly dangerous pathogens in biomedical laboratories have led to calls for the establishment of a national and international regulatory framework for biosafety, as well as national oversight and management measures for highly dangerous pathogens. The 'Infectious Disease Control and Prevention Act' was enacted following the comprehensive amendment of 'Act on the Prevention of Infectious Disease' and provides that all institutions working with highly dangerous pathogens should have biosafety-level laboratories. The Act also calls for related facilities to implement legal and administrative national security mandates that encompass the concept of biosecurity.

Sweden

34. In Sweden, no formal survey on awareness of obligations under the BWC or of potential risks related to misuse of biological sciences/biotechnology among life scientists has been carried out to date. Although biosafety aspects are considered in national life

science fora, it has become apparent from networking, discussions and informal information gathering that dual-use and biosecurity issues are less well cared for.

35. As a result of contacts generated over time at BWC- and related meetings a series of awareness-raising seminars were arranged and conducted by experts of the University of Bradford (UK) and the University of Exeter (UK) in 2009, at three academic institutions in Sweden. In conjunction with these seminars, an informal network was established with the aim of developing a national education approach, covering biosecurity and dual-use aspects within life science, adapted to local education and curriculum at each academic institution. The Swedish Ministry for Foreign Affairs and the Swedish Ministry of Education took positions in the margins of this initiative.

36. The informal network has agreed to endorse the establishment of biosafety/biosecurity committees at all academic institutions that undertake education and research in relevant fields, as one area of specific importance and with great significance for future work also in dual-use education. These committees were suggested to have comprehensive responsibility for biosafety and biosecurity and, also, an advisory role in matters involving genetic modifications and education related to biosafety and biosecurity. Furthermore, the Centre for Research Ethics and Bioethics at Uppsala University was identified as a crucial element in any initiative to develop national bioethics, dual-use and biosecurity education. Existing educational programmes, which to some extent have started to include these topics in for instance biotechnology/engineering programs and biomedicine master programs, were identified as useful starting points for the formation of national networks with great potential for future implementation of dual-use education in Sweden.

37. Regarding awareness raising and dual-use education it has become evident that, from a European perspective, there is a convergence of BWC- and EU CBRN Action Plan[19]- related national commitments. The initiated bottom-up approach in this area is promising, but will require dedicated durable top-down support including provision of financial resources in order to establish a sustainable framework for facilitating the establishment of national biosecurity education in conjunction with related international efforts.

Switzerland

38. In Switzerland, initial surveys on awareness of potential security risks among life scientists revealed, in the vast majority of cases, a well-developed sense for aspects related to biosafety, but a considerably limited knowledge of aspects related to biosecurity. Moreover, most life scientists seem to be unaware of the BWC's obligations as well as the obligations' relevance to their work. In the same context, existing national legislation relevant for the domain of natural scientific research in general or biological research in particular seemed to be unknown to many.

39. Based on these findings, the Swiss government started to sensitize researchers with a brochure in 2008 ("Biology for Peace") and accompanied a series of awareness-raising seminars conducted by experts of the University of Bradford (UK) as well as the University of Exeter (UK) at various academic institutions in Switzerland in 2009. Further awareness-raising sessions organized and conducted by the Swiss government itself took place in 2010. The analysis of reactions by the attending audience revealed:

[19] EU CBRN Action Plan: http://europa.eu/legislation_summaries/justice_freedom_security/fight_against_terrorism/jl0030_en.htm [viewed 5 April 2011].

(a) that life scientists consider awareness-raising on aspects related to security as important (some even spoke of an "eye-opener"),

(b) that, due to the general academic autonomy and freedom of research and teaching in Switzerland, a governmental imposition of content within the curriculum would be met with scepticism,

(c) that particularly legally binding top-down approaches would therefore be inappropriate,

(d) that it is important to consider existing patterns of cooperation among researchers, institutions, and authorities, and that these existing patterns provide ideal platforms for an outreach, and

(e) that awareness-raising activities in the regular study and work environment of life scientists similarly provide an ideal base.

40. These lessons learned provide the base for possible ways forward, such as the inclusion of educational modules on biosecurity for biosafety officers in research facilities, or the encouragement to introduce educational modules on biosecurity in academic courses for future life scientists.

Ukraine

41. In 2004 Commission on Biosafety and Biosecurity (CBB) at the National Security and Defence Council of Ukraine (NSDCU) was established by the Decree of the President of Ukraine. CBB serves as advisory body to NSDCU headed by the President of Ukraine and it deals, inter alia, with all issues of national obligations relevant to the BWC.

42. In the frame of the "Biological Weapons Proliferation Prevention Program" the Ukrainian Ministry of Health and US Department of Defence have signed in 2005 an Implementation Agreement on cooperation in Biological Threat Reduction. Successful implementation of this Agreement? Including provisions on biological research, biological threat detection and response, will provide fundamentals for Biosecurity (physical safeguard of pathogens' collections) and for prevention and eradication of infectious diseases in Ukraine.

43. Since BWC States Parties Meeting in 2005 Ukrainian delegation permanently stresses on the necessity to raise awareness and education amongst life scientists and professionals in the field of Biotechnology and Pharmaceutical industry on dual use issues and on Biosafety and Biosecurity. Ukraine also reported that amongst its scientific community, there was a low level of awareness of the risk of misuse of the biological sciences' results.

44. National Academy of Sciences of Ukraine (NASU) and CBB in cooperation with Bradford and Exeter Universities (UK) have organised an interactive Seminar in 2007 on Biosafety education including the relevance of the BWC for Ukrainian scientists and students. NASU and CBB, under the patronage of Science and Technology Centre of Ukraine, have also conducted an International Conference on Biosafety and on national implementation of BWC in 2009. Another International Conference on Biosafety and on national implementation of BWC under the patronage of BWC Implementation Support Unit in Geneva is planned to be organised in Ukraine in spring 2012. The detailed list of activity of different interested authorities of Ukraine in this field, inter alia, is traditionally reported through providing annual declarations on Confidence Building Measures in the frame of BWC.

45. In February 2009 NSDCU held a special meeting on Biosafety and Biosecurity when the whole range of Biosafety problems was addressed. State Programme on Biosafety and Biosecurity is under final approval now by the Ukrainian Government now. This State Programme includes issues of Biosafety and Biosecurity education and awareness rising.

46. National Academy of Sciences of Ukraine (NASU), which is the main scientific Institution in Ukraine responsible, inter alia, for strategic planning and expertise of fundamental research in the country, has adopted in 2009 National Code of Ethics for Scientists (including Bioethics for Life Scientists) in. This National Code has been circulated to government agencies, universities, research institutes, biological and pharmaceutical industry, relevant professional associations etc. National Committee on Bioethics was established in Ukraine and this Committee organizes National Congresses (with wide international participation) on Bioethics each two years.

47. Ukrainian Biochemical Society (UBS), which unites scholars in the field of Biochemistry, Molecular and Cell Biology, has organised special sessions and/or lectures on Biosafety and Biosecurity during IX (2006) and X (2010) Ukrainian Biochemical Congresses, VII (2009) and VIII (2011) International Parnas Conferences on Biochemistry and Molecular Biology, as well as during III (2010) Ukrainian-German Symposium on Nanotechnologies. UBS also launched an initiative to create special Committee dedicated to Biosafety education at the Federation of European Biochemical Societies.

48. Ukraine's State Export Control Administration (USECA) undertakes regular outreach seminars to provide information on the obligations related to exports of dual-use biological and chemical materials, equipment and technology. UECA takes part in meetings of states parties to the Australia Group.

49. NASU in cooperation with the Canadian Global Partnership Program and the UK University of Bradford is conducting a collaborative research survey now (2011-2012) on the current state of Biosecurity education, of BWC awareness and of dual use issues in Ukrainian Universities and Medical Schools. A Conference and series of seminars are envisaged discussing the results of the survey, and the brochure to be published as recommendations to the education on Biosafety and Biosecurity in Ukraine.

United Kingdom of Great Britain and Northern Ireland

50. Since 2003 the UK has held five Biological & Toxin Weapons Convention-related seminars for academics, research councils, professional and trade organisations, and the pharmaceutical and biotechnology industries. These seminars assisted the UK's preparations for the intersessional meetings on codes of conduct issues by ensuring that we had, and continue to have, a clear sense of the views of relevant stakeholders as well as their advice. Our most recent event took place in March 2008 and was devoted primarily to oversight, education and awareness-raising. While previous seminars largely focussed on the theory and general principles, the March 2008 seminar concentrated on the practicalities such as:

(a) What are the emerging lessons from work on elaborating codes of conduct and practice?

(b) What are the problems that have been encountered during the promulgation and implementation of codes of conduct? What are the solutions?

(c) How can we develop effective and practical oversight mechanisms for research?

(d) How can we develop educational programmes? (There have been many statements calling for such programmes, but specifics on what that education should cover are often absent).

51. At the 2008 Meeting of Experts we also presented a paper on examples of UK approaches to the oversight of emerging technologies, focussing on nanotechnologies and synthetic biology, which had been included in the UK contribution on scientific and technological developments to the Sixth Review Conference. This suggested that these approaches might be relevant for other States Parties as they grapple with the complex issues that are associated with dual-use technology.

52. We would note that there are still considerable difficulties in convincing some members of the academic community that oversight and awareness in the context of the Biological and Toxin Weapons Convention (BTWC) and Chemical Weapons Convention (CWC) are issues deserving attention and action. We had, for instance, developed plans, in collaboration with two universities, for a series of awareness raising seminars in 2009 at various UK universities. These would have addressed CWC issues such as the problems posed by the governance of dual-use technology and codes of conduct, oversight, awareness raising and education, but it was not possible to proceed because of a lack of interest on the part of universities.

53. A more recent initiative in the chemical context however comes from the UK's National Counter Terrorism Security Office. This is an awareness-raising project aimed at universities known as REVISE (REducing Vulnerability In the Scientific Environment) that seeks to inform academics and laboratory personnel about the potential dual use of everyday lab-based resources and the terrorist aspiration to acquire them without attracting attention. It encourages those responsible for laboratory security to introduce a culture change within the laboratory environment which in turn develops baseline levels of access control, challenge culture and stock control.

54. We have also taken opportunities where they arise to address awareness raising with the academic and industrial communities – for instance presentations at the annual Institute of Safety in Technology and Research's Biosafety Section's autumn symposium in 2008 and at other conferences addressing relevant biological science issues, and at seminars organised by the chemical industry.

55. Within the UK, the University of Bradford has devoted considerable efforts to developing educational material to support awareness-raising and education. The University's Education Module Resource (EMR) offers content that includes history and national implementation of the Biological and Toxin Weapons Convention, dual-use issues in the contemporary life sciences, and responsible conduct in scientific research. The EMR is freely available online and the content can be tailored in order to fit it into different educational contexts. It is currently available in English, Japanese, Russian, French and Romanian/Moldovan, and will shortly be available in Spanish, Urdu, Polish, Portuguese, Arabic and other languages. In order to facilitate development of best practice so that biosecurity education can be assimilated and implemented in different academic contexts in different regions, the University of Bradford has tested the EMR at universities in Italy, Japan, Portugal, Spain, Sweden, the Netherlands and the UK.

56. The UK Global Partnership Programme is currently funding Bradford University to develop a National Series for a number of specific countries including in the Former Soviet Union. This series includes the essential values of the current EMR, but the themes, contents and learning outcomes for educational contexts are designed to be country specific. The main objective is to provide user friendly educational resources for use in the immediate introduction of short educational programmes for higher education. By providing detailed teaching guidelines (MS Word) and teaching material (Power Point) for

a facilitator (not necessarily an expert of biosecurity issues), the National Series will help a range of universities and other educational institutes to implement biosecurity education programmes.

57. The University of Bradford is also the only higher education institution globally currently offering university-accredited training in biosecurity, via its Train-the-Trainer programme, which is offered in 6-week and 12-week versions at UK Masters level.[20] This innovative provision uses online teaching technology and allows classes of students to take part in the programme via web connections for twice-weekly classes and seminars. Assessment is via online group presentations and by traditional written assignments. Now in its second year, the programme has attracted praise from students and sponsors and has accredited participants in over 20 countries. Students have included lecturers, science professionals, security personnel, military personnel and government policy-makers. Bradford is also currently planning a full Masters degree in Applied Dual Use Biosecurity to begin in September 2012, which will be provided online using the same technology, teaching and assessment techniques as the Train-the-Trainer programme.

United States of America

A. Overview

58. Managing security risks associated with life-sciences research is a shared responsibility of all those engaged in the life sciences, including the researcher, institution, local community, national government, and international community. Biosafety/Biosecurity education and awareness-raising across the life sciences communities is a critical component of effective risk management and is also a shared responsibility.

59. Over the past 10 years the U.S. government, academic and scientific institutions, industry and non-governmental organizations (NGOs) have worked together to develop, implement and raise awareness about biosecurity and biosecurity education. Diverse groups, including the biosafety community, scientific societies, and pertinent professional and institutional associations have also played critical roles in advancing the dialogue and engaging stakeholders on these issues.

60. These education and awareness-raising efforts have sought to expand the robust culture of responsibility that already exists within the life-sciences community[21] to include biosecurity. They have focused on raising awareness about the threat of/potential for misuse and on developing and making available the tools, information and resources needed to empower the life sciences communities to manage security risks associated with life-sciences research.

61. Recent advances in science and technology have expanded the ‘individual researchers’ beyond the traditional life-sciences communities to include groups such as engineers, informaticists, amateur biologists and researchers conducting work outside traditional institutions. In response the U.S. Government has expanded its educational target audiences to include these communities.

[20] This work is supported by funding from the US Department of State.

[21] For example the National Institutes of Health Policy on the responsible conduct of research requires all trainees, fellows, participants, and scholars receiving support through any NIH training, career development award (individual or institutional), research education grant, and dissertation research grant receive instruction in responsible conduct of research: http://grants1.nih.gov/grants/guide/notice-files/NOT-OD-10-019.html

62. Below is a summary of U.S. government and non-government biosafety/biosecurity outreach, training and awareness-raising activities. While not exhaustive, the list is representative of the diverse efforts the United States conducts and resources available.

B. United States Government

The National Institutes of Health (NIH) Office of Biotechnology Activities (OBA): manages a program to address concerns about dual use research and research done for legitimate purpose that could yield information, products or technologies that could be misused by those who would intend to harm national security or public health. http://oba.od.nih.gov/oba/index.html

The National Science Advisory Board for Biosecurity (NSABB): is a Federal advisory committee (managed by NIH OBA) that provides advice to the United States government (USG) regarding biosecurity oversight of dual use research. A key charge to the NSABB is to provide recommendations on the development of programs for outreach, education, and training on dual use research issues for all scientists and laboratory workers at federally funded institutions. http://oba.od.nih.gov/biosecurity/about_nsabb.html

Federal Bureau of Investigation (FBI) Biological Science Outreach: FBI conducts outreach to the scientific community (academia and industry) to raise awareness the biosecurity roles and responsibilities of law enforcement, research institutions, and community stakeholders and build a culture of responsibility and trust between the scientific and security communities. http://academicbiosecurityworkshop.org

U.S. Department of State Biosecurity Engagement Program (BEP): BEP's mission is to engage biological scientists and combat bioterrorism worldwide by providing assistance to improve biosecurity, biosafety, pathogen surveillance, and infectious disease surveillance and response. http://www.bepstate.net/

U.S. Department of Defense (DOD) Cooperative Biological Engagement Program (CBEP): CBEP aims to cooperatively assist partner nation governments to counter the threat of bioterrorism and prevent proliferation of biological weapons technology, pathogens and expertise. CBEP provides education and training to enhance clinical, laboratory and epidemiological safety and security and works to strengthen the partner nation's disease detection, diagnostic and reporting systems.

C. U.S. Government outreach to emerging life sciences communities

FBI Synthetic Biology Program: FBI outreach to public and private synthetic biology companies to raise awareness about the potential security risks inherent to the industry, and work with the companies to develop common standards and best practices for risk management. The international component of this program fosters dialogue between international companies and their respective government/law enforcement agencies to develop processes to mitigate the risk of misuse of harmful DNA sequences.

FBI Amateur (Do-It-Yourself) Biology Initiative: FBI outreach to amateur biologists and biologists that conduct projects outside the traditional research setting to promote a culture of responsibility by raising the level of awareness regarding potential security vulnerabilities and exploitation, developing lines of communication between members of the community and their respective local FBI WMD Coordinator who serves as a resource to assist community members in the development of a safety and security best practices.

D. Training programs

The National Biosafety and Biocontainment Training Program (NBBTP): http://www.nbbtp.org

Emory University -Biosafety Training Course: Biosafety Level 4: This five-day training offers participants the opportunity to learn and practice new skills for BSL4 laboratories. http://www.sph.emory.edu/CPHPR/biosafetytraining/bsl4.html

University of Texas Medical Branch (UTMB) - National Biocontainment Training Center (NBTC) dedicated to preparing the worldwide community of infectious disease scientists to work safely in high-containment research laboratories: http://www.utmb.edu/nbtc/

Select Agent Program Training Workshops: U.S Department of Health and Human Services (HHS) and the U.S. Department of Agriculture (USDA) conduct a yearly training workshop to inform individuals of their legal responsibilities for implementing the Select Agent Regulations. http://www.selectagents.gov/Training.html

Joint Criminal and Epidemiological Investigation Training Program: developed jointly by the FBI and the Centers for Disease Control and Prevention (CDC) to improve efforts to identify and investigate potential overt or covert biological threats. Initially designed as a domestic program, FBI and CDC have expanded this training to international partner countries.

The Field Epidemiology Training Program (FETP) and the Field Epidemiology and Laboratory Training Program (FELTP): applied epidemiology programs offered by CDC to help foreign countries develop, set up, and implement dynamic public health strategies to improve and strengthen their public health system and infrastructure. The FE(L)TP programs include biosafety and bioethics training in support of epidemiological activities. http://www.cdc.gov/globalhealth/fetp/

E. On-line resources

1. Education/training

The CDC Learning Connection: maintains a compendium of free learning products on a wide variety of health issues, including Emergency Management, Infectious Disease, Legal/Ethical Issues, Policy/Planning, Preparedness and Response, and Public Health. http://www.cdc.gov/Features/CDCLearning/

The CDC Online Training Course: provides education regarding key principles for securing biological agents in research laboratories and biomedical facilities where loss, theft, release or intentional misuse of the agent might have significant public health or economic consequences. http://www.cdc.gov/biosafety/biosecuritytraining/page1024.html

The FDA's Food Defense and Emergency Response-Training: The U.S. Food and Drug Administration (FDA) works with other government agencies and private sector organizations to help reduce the risk of tampering or other malicious, criminal, or terrorist actions on the food and cosmetic supply. Web-based training and additional educational resources: http://www.fda.gov/Food/FoodDefense/default.htm

NIH materials for Research Conduct and Ethics Instruction: including case studies for the 2010 theme (Science and Social Responsibility): http://sourcebook.od.nih.gov/resethicscases/2010-cases.pdf

Federation of American Scientists (FAS) ***Case Studies in Dual-Use Biological Research:*** http://www.fas.org/biosecurity/education/dualuse/

Dual Use Dilemma in Biological Research, Southeast Regional Center of Excellence for Emerging Infections and Biodefense (SERCEB): http://www.serceb.org/dualuse.htm

Biosecurity: Risks, Responses and Responsibilities, Center for Arms Control and Non-Proliferation.
http://www.armscontrolcenter.org/policy/biochem/biosecurity_educational_materials

The Life Sciences, Biosecurity and Dual Use Research: Dual Use Role Playing Simulation, University of Exeter (UK), University of Bradford (UK), and University of Texas at Dallas (USA).
http://projects.exeter.ac.uk/codesofconduct/BiosecuritySeminar/Education/index.htm

Biology and Security, Student Pugwash USA (USA)
http://www.spusa.org/pubs/peace_security/biosecurity/index.html

BSL-3 Facility Inspection videos. These informational videos are for entities or individuals who currently possess, store, or transfer Select Agents and those who are planning to begin work with Select Agents or toxins. http://www.selectagents.gov/FIV.html

Emergency Preparedness and Biodefense: NIH Videocasting and Podcasting. Seminars and training events broadcasted live to a world-wide audience over the Internet and also recorded and made available for viewers to watch at their convenience as an on-demand video or a downloadable podcast. http://videocast.nih.gov/PastEvents.asp?c=58

Global Biorisk Management Curriculum Development (GBRMC): CBEP is developing and implementing a biorisk management curriculum to address biosafety and biosecurity training. Users of the training materials can participate in a virtual network of trainers via a web-based portal, and provide lessons learned, updates, and feedback for the continual improvement of the materials. The network of trainers currently consists of over 100 biosafety professionals active in the United States, Europe, Asia, and Africa.

2. Awareness-raising

The Executive Office of the President, **Office of Science and Technology Policy website:** established to inform the public, academic and private sector research communities about government policies related to the safe and secure conduct of biological research and the technologies arising out of the application of the life sciences. http://www.whitehouse.gov/administration/eop/ostp/nstc/biosecurity

The S3 (Science, Safety, and Security) website: provides information on biosafety, biosecurity, biocontainment, and biorisk management. http://www.phe.gov/s3/Pages/default.aspx

NSABB Dual Use Research video*:*
http://oba.od.nih.gov/biosecurity/biosecurity.html

NSABB Dual Use Research Brochure:
http://oba.od.nih.gov/biosecurity/pdf/EducationalBrochureDualUseResearch.pdf

NSABB Responsible Communication of Life Sciences Research with Dual Use Potential:
http://oba.od.nih.gov/biosecurity/pdf/Communication_Tools%20_Dual_Use_Potential.pdf

Biological Risk Management and Nonproliferation website: established by HHS, Office of the Assistant Secretary for Preparedness and Response (ASPR) for increased

awareness of BWC and UN Security Council Resolution 1540 (UNSCR 1540). http://www.phe.gov/about/OPP/Pages/bwc.aspx

The FBI's International Biosecurity and Prevention Forum (IBPF) Currently under development this website is intended to provide an international forum for the coordination and sharing of information and best practices related to the prevention and response to the misuse of biological agents as weapons of mass destruction.

F. International efforts

1. U.S. Government-supported

The International Centers for Excellence in Research (ICER) program: An NIH/National Institute of Allergies and Infectious Disease (NIAID) program to develop and sustain research programs in resource-poor countries through partnerships with local scientists. NIAID has developed core programs at the ICER sites and, over time, has facilitated the expansion of research capacity by training young scientists, improving laboratory and clinical infrastructure, and enhancing information technology capabilities. http://www.niaid.nih.gov/about/organization/dir/Pages/internationalCenters.aspx

International workshops and tabletop exercises with BWC-relevant lessons learned: HHS/ASPR co-organized with DOD three international workshops and tabletop exercises in 2010–2011 strengthening the core capacities required by the WHO International Health Regulations (IHRs) and existing national measures consistent with the obligations under the BWC and UNSCR 1540 to deter, prevent, and respond to biological incidents or threats.

"Applied Dual-Use Biosecurity Education Train-the-Trainer Course" run by Bradford University - (Bursaries for participation provided by BEP since 2009. The program is taught on line and over the four semesters of funding, will reach 60 students from over 20 countries

American National Academy of Sciences project (2011): *Develop Global Norms and Educational Standards Against the Misuse of Biotechnology*, aims to develop said standards. (BEP funded)

American National Academy of Sciences in 2011 project (2011): *Implementing an International Faculty Development Project on Dual Use Education.* (BEP funded)

Landau Network Centro Volta's survey-based work on biosafety, biosecurity and bioethics education in Morocco and Pakistan. This work included the workshop referenced in the LNCV text (see para 23), as well as activities to develop educational programs to rectify knowledge gaps elucidated in the survey. (BEP funded since 2009)

CWA 15793-Laboratory Biorisk Management standard Set requirements necessary to control risks associated with the handling or storage and disposal of biological agents and toxins in laboratories and facilities. (CBEP and BEP support implementation of the CWA and supported the development of and participation by international representatives in the development of the accompanying guidance document)

WHO Biorisk Management Advanced Trainer Program (BRM ATP) aims to increase the number of qualified trainers who train and educate others in biorisk management. (Department of State funded development and initial implementation)

2. Non-U.S. Government

AAAS: Responsible Bioscience for a Safe and Security Society These workshops incorporate ethical and risk management (including security risks) in special sessions and throughout the meeting and address underlying issues associated with international scientific cooperation/collaboration. http://cstsp.aaas.org/InternationalMeeting/home.html

G. Studies, reports and articles

Ethics Education: What's Been Learned? What Should be Done? 2009. NAE (National Academy of Engineering). Washington, DC: National Academies Press. http://www.nae.edu/nae/engethicscen.nsf/weblinks/NKAL-7LHM86?OpenDocument.

2nd International Forum on Biosecurity: Report of an International Meeting, Budapest, Hungary, March 30-April 2, 2008. 2009. NRC. Washington, DC: National Academies Press.

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. 2009. NRC. Washington, DC: National Academies Press. http://www.nap.edu/catalog.php?record_id=12460

Responsible Research with Biological Select Agents and Toxins. 2009. NRC. Washington, DC: National Academies Press.

Challenges and Opportunities for Education About Dual Use Issues in the Life Sciences. Washington, DC: National Academies Press. http://www.nap.edu/catalog.php?record_id=12958

Outreach and Education in the Life Sciences A Case Study of the U.S. Department of Energy National Laboratories. Weller RE, RL Burbank, and HA Mahy. 2010. PNNL-19237, Pacific Northwest National Laboratory, Richland, WA.

http://www.pnl.gov/main/publications/external/technical_reports/PNNL-19237.pdf

Competing Responsibilities? Addressing the Security Risks of Biological Research in Academia. 2010. AAAS/AAU/APLU. http://cstsp.aaas.org/content.html?contentid=2331

Professional and Graduate-Level Programs on Dual Use Research and Biosecurity for Scientists Working in the Biological Sciences. 2008. AAAS. http://cstsp.aaas.org/content.html?contentid=1899

Biological Safety Training as a Component of Personnel Reliability. 2009. AAAS. http://cstsp.aaas.org/content.html?contentid=2049

Workforce Development: Preparing the Next Generation for Infectious Disease Threats. 2009. AAAS. http://cstsp.aaas.org/files/Preparing%20the%20Next%20Generaltion%20for%20Infectious%20Disease%20Threats.pdf

Building the Biodefense Policy Workforce. 2009. AAAS http://cstsp.aaas.org/files/AAAS_BiodefensePolicyWorkforce_Report.pdf

Guidance for Enhancing Personnel Reliability and Strengthening the Culture of Responsibility, NSABB, September 2011.

http://oba.od.nih.gov/biosecurity/pdf/CRWG_Report_final.pdf

Strategies to Educate Amateur Biologists and Scientists in Non-life Science Disciplines About Dual Use Research in the Life Sciences, NSABB, June 2011.

http://oba.od.nih.gov/biosecurity/pdf/FinalNSABBReport-AmateurBiologist-NonlifeScientists_June-2011.pdf

Addressing Biosecurity Concerns Related to Synthetic Biology, NSABB, April 2010. http://oba.od.nih.gov/biosecurity/pdf/NSABB%20SynBio%20DRAFT%20Report-FINAL%20(2)_6-7-10.pdf