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Preventing Biological Threats: What You Can Do

APPENDIX A

Editors

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*A Guide to Biological Security Issues
and How to Address Them*

APPENDIX A

EDUCATIONAL AND TRAINING RESOURCES, POLICY STATEMENTS, REPORTS, AND OTHER DOCUMENTS WITH RELEVANCE TO BIOLOGICAL SECURITY

Section 1: Threats and Responses

Australia et al. 'Addressing Modern Threats in the Biological Weapons Convention: A food for thought paper', BWC/MSP/2013/WP.10, 10 December 2013, available at [http://www.unog.ch/80256EDD006B8954/\(httpAssets\)/61A352396D8A39AFC1257F380051D2AF/\\$file/BWC_MSP_2013_WP.10.pdf](http://www.unog.ch/80256EDD006B8954/(httpAssets)/61A352396D8A39AFC1257F380051D2AF/$file/BWC_MSP_2013_WP.10.pdf) (accessed 7/05/2016).

Australia et al. 'Addressing modern threats in the Biological Weapons Convention: Follow-up and recommendations', BWC/MSP/2015/WP.6/Rev.1, 14 December 2015, available at [http://www.unog.ch/80256EDD006B8954/\(httpAssets\)/D418C82DD8D36607C1257F1F00419472/\\$file/G1528745a.pdf](http://www.unog.ch/80256EDD006B8954/(httpAssets)/D418C82DD8D36607C1257F1F00419472/$file/G1528745a.pdf) (accessed 7/05/2016).

Biochem Security 2030, *Dual-Use for Dummies*, 16 November 2014, available at <http://biochemsec2030.org/2014/11/16/dual-use-for-dummies/#content> (accessed 22/02/2016).

Kenneth Oye, *On Regulating Gene Drives: A New Technology for Engineering Populations in the Wild*, Presentation to the UN BWC Meeting of Experts, 6 August 2014, Geneva, Switzerland. Available at [http://www.unog.ch/_80256ee600585943.nsf/\(httpPages\)/f837b6e7a401a21cc1257a150050cb2a?OpenDocument&ExpandSection=7#_Section7](http://www.unog.ch/_80256ee600585943.nsf/(httpPages)/f837b6e7a401a21cc1257a150050cb2a?OpenDocument&ExpandSection=7#_Section7) (accessed 22/02/2016).

Kenneth Oye et al., 'Regulating Gene Drives: Regulatory Gaps Must Be Filled before Gene Drives Could Be Used in the Wild', *Science*, vol.345:6197 (2014), pp.626-628. Available at <http://science.sciencemag.org/content/sci/345/6197/626.full.pdf> (accessed 22/02/2016).

Kevin Esvelt et al. 'Concerning RNA-Guided Gene Drives for the Alternation of Wild Populations', *eLife*, 17 July 2014, available at <http://elifesciences.org/content/3/e03401v3> (accessed 22/02/2016).

NRC, *Potential Risks and Benefits of Gain-of-Function Research: Summary of a Workshop*, Washington DC: National Academies Press, 2015. Available at <http://www.nap.edu/catalog/21666/potential-risks-and-benefits-of-gain-of-function-research-summary> (accessed 22/02/2016).

NSABB, *Framework for Conducting Risk and Benefit Assessment of Gain-of-Function Research*, May 2015, available at <http://osp.od.nih.gov/office-biotechnology-activities/biosecurity/nsabb/reports-and-recommendations> (accessed 22/02/2016).

Steve Connor, “‘Gene Drives’: Government Science Advisers Expected to Investigate Potentially Dangerous GM Organisms”, *The Independent*, 3 August 2015, available at <http://www.independent.co.uk/news/science/gene-drives-government-science-advisers-expected-to-investigate-potentially-dangerous-gm-organisms-10436053.html> (accessed 22/02/2016).

Think Zone for the Eighth BTWC Review Conference, available at [http://www.unog.ch/unog/website/disarmament.nsf/\(httpPages\)/3803c81a2e03e4c9c1257f6b00357a68?OpenDocument&ExpandSection=8%2C9%2C14%2C10#_Section5](http://www.unog.ch/unog/website/disarmament.nsf/(httpPages)/3803c81a2e03e4c9c1257f6b00357a68?OpenDocument&ExpandSection=8%2C9%2C14%2C10#_Section5) (accessed 7/05/2016).

- The page features a compilation of academic and policy publications and resources on topics with relevance to the BTWC, including developments in science and technology, national implementation measures, education and awareness-raising, universalisation, and assistance and cooperation. The page further gives an overview of the Intersessional Process in 2012-2015.

The Royal Society, *Assessing the Implications of Advances in Science and Technology for the Biological and Toxin Weapons Convention (BTWC)*, 16 December 2015, available at <https://royalsociety.org/topics-policy/projects/biological-toxin-weapons-convention/> (accessed 22/02/2016).

40th Anniversary of the Biological and Toxin Weapons Convention, commemorative events 2015 at the UN Office in Geneva, available at <http://www.unog.ch/bwc/bwc40> (accessed 22/02/2016).

Section 2: Scientists, Organisations, and Biosecurity

Biosecurity Codes, resource available at <http://www.virtualbiosecuritycenter.org/codes-of-ethics> (accessed 22/02/2016).

- The page provides an overview of different types of codes and examples of existing initiatives. It also features an ‘Educational Center’ and ‘Library’ with relevant resources on biosecurity.

Catriona McLeash and Paul Nightingale, *The Impact of Dual Use Controls on UK Science: Results from a Pilot Study*, SPRU Paper No.132, April 2005, available at <http://www.sussex.ac.uk/Units/spru/hsp/documents/sewp132.pdf> (accessed 22/02/2016).

China, ‘Proposal for the development of the template of biological scientist code of conduct under the Biological Weapons Convention’, BWC/MSP/2015/WP.9, available in Chinese (unofficial translation in English annexed) at [http://www.unog.ch/80256EDD006B8954/\(httpAssets\)/77BBB042D87DD84AC1257F1D00457423/\\$file/Chinese+\(Unofficial+English+translation+annexed\).pdf](http://www.unog.ch/80256EDD006B8954/(httpAssets)/77BBB042D87DD84AC1257F1D00457423/$file/Chinese+(Unofficial+English+translation+annexed).pdf) (accessed 7/05/2016).

Codes of Conduct Database and Chronology, developed by the University of Exeter, 2001-2010, available at <http://brianrappert.net/biological-weapons/codes-of-conduct-2001-2010> (accessed 22/02/2016).

European Biosecurity Awareness-Raising Network, online library available at <http://www.eubarnet.eu/> (accessed 22/02/2016).

- The EUBARnet library contains a collection of resources related to the multidisciplinary concept of biosecurity including materials produced by the Network, thematic materials looking at specific areas or manifestations of biosecurity, and further opportunities in the topic. It is intended as a resource for students, educators and professionals with an interest in the area.

FIRES, A Documentary Project by the Organisation for the Prohibition of Chemical Weapons, available at <https://www.thefiresproject.com/about.html> (accessed 22/02/2016).

- The page provides information on several open-source films, that have been developed by the OPCW, in order to raise awareness of the Chemical Weapons Convention, the role of scientists in upholding the norms enshrined in the Convention, and the OPCW mission and values.
- Information about other OPCW-related educational resources is available at <https://www.opcw.org/special-sections/education/> (accessed 22/02/2016).

German Ethics Council, *Biosecurity – Freedom and Responsibility of Research*, 7 May 2014, available at <http://www.ethikrat.org/publications/opinions/biosecurity> (accessed 22/02/2016).

IAC-IAP, *Responsible Conduct in the Global Research Enterprise*, 30 September 2012, available at <http://www.interacademies.net/10878/19787.aspx> (accessed 22/02/2016).

IAP-InterAcademy Partnership, *Doing Global Science: A Guide to Responsible Conduct in the Global Research Enterprise*, 11 February 2016, available at <http://www.interacademycouncil.net/24026/29429.aspx> (accessed 22/02/2016).

International Union of Microbiological Societies, *Code of Ethics*, 2008, available at <http://www.iums.org/index.php/code-of-ethics> (accessed 22/02/2016).

Managing Risks of Research Misuse, A joint Biotechnology and Biological Sciences Research Council (BBSRC), Medical Research Council (MRC) and Wellcome Trust policy statement, July 2015, available at <http://www.wellcome.ac.uk/About-us/Policy/Policy-and-position-statements/wtx026594.htm> (accessed 22/02/2016).

Nuffield Council on Bioethics, *The Findings of a Series of Engagement Activities Exploring the Culture of Scientific Research in the UK*, December 2014, available at <http://nuffieldbioethics.org/project/research-culture/> (accessed 22/02/2016).

Reynolds Salerno and Jennifer Gaudio (ed.), *Laboratory Biorisk Management: Biosafety and Biosecurity*, Boca Raton FL: CRC Press, 2015.

Royal Netherlands Academy of Arts and Sciences, *A Code of Conduct for Biosecurity*, August 2008, available at <https://www.knaw.nl/en/news/publications/a-code-of-conduct-for-biosecurity> (accessed 22/02/2016).

Singapore Statement on Research Integrity, 2010, available at <http://www.singaporestatement.org/> (accessed 22/02/2016).

The Hague Ethical Guidelines related to the Chemical Weapons Convention, 2015, available at <https://www.opcw.org/special-sections/science-technology/the-hague-ethical-guidelines/> (accessed 22/02/2016).

UK Medical Research Council, *Good Research Practice*, available at <http://www.mrc.ac.uk/research/research-policy-ethics/good-research-practice/> (accessed 22/02/2016).

- The page gives an overview of the principles of good research practice that all MRC-funded scientists, including clinical researchers, are required to follow as a condition of their funding. These general principles complement MRC guidance on good practice and regulatory requirements for specific types of research, which appears on other pages within this section.

UK Royal Society, *Brain Waves 3: Neuroscience, Conflict, and Security*, 7 February 2012, available at <https://royalsociety.org/topics-policy/projects/brain-waves/conflict-security/> (accessed 22/02/2016).

US NAS, *On Being a Scientist: A Guide to Responsible Conduct of Research*, Washington DC: NAP, 2009, available at <http://www.nap.edu/catalog/12192/on-being-a-scientist-a-guide-to-responsible-conduct-in> (accessed 22/02/2016).

Zabta Shinwari, *Dual-Use Education Concerns in Biotechnology: Pakistani Perspective*, Pakistan Academy of Sciences, 2015, available at <http://paspk.org/wp-content/uploads/2015/12/Dual-Use-of-Education.pdf> (accessed 22/02/2016).

Section 3: Biosecurity and Law Enforcement

FBI, *Criminal and Epidemiological Investigations Handbook*, Domestic Edition 2015, available at <https://www.fbi.gov/about-us/investigate/terrorism/wmd/criminal-and-epidemiological-investigation-handbook/view> (accessed 22/02/2016). International Edition 2015, available at [http://www.unog.ch/80256EDD006B8954/\(httpAssets\)/F32A77BBAA83C092C1257EEC00](http://www.unog.ch/80256EDD006B8954/(httpAssets)/F32A77BBAA83C092C1257EEC00)

[2EDCA5/\\$file/criminal-and-epidemiological-investigations-handbook-2015-international-edition-2.pdf](#) (accessed 22/02/2016).

Michele Garfinkel et al. *Synthetic Genomics: Options for Governance*, October 2007, available at <http://www.synbiosafe.eu/uploads/pdf/Synthetic%20Genomics%20Options%20for%20Governance.pdf> (accessed 22/02/2016).

NSABB, *Enhancing Personnel Reliability among Individuals with Access to Select Agents*, May 2009, available at <http://osp.od.nih.gov/office-biotechnology-activities/biosecurity/nsabb/reports-and-recommendations> (accessed 22/02/2016).

NSABB, *Strategies to Educate Amateur Biologists and Scientists in Non-Life Science Disciplines about Dual-Use Research in the Life Sciences*, June 2011, available at <http://osp.od.nih.gov/office-biotechnology-activities/biosecurity/nsabb/reports-and-recommendations> (accessed 22/02/2016).

NSABB, *Guidance for Enhancing Personnel Reliability and Strengthening the Culture of Responsibility*, September 2011, available at http://osp.od.nih.gov/sites/default/files/resources/CRWG_Report_final.pdf (accessed 22/02/2016).

Peter Clevestig, *Handbook of Applied Biosecurity for Life Science Laboratories*, Stockholm: SIPRI, 2009. Available at <http://books.sipri.org/files/misc/SIPRI09HAB.pdf> (accessed 22/02/2016).

US Department of Health and Human Services, *Screening Framework Guidance for Providers of Synthetic Double-Stranded DNA*, available at <http://www.phe.gov/Preparedness/legal/guidance/syndna/Pages/default.aspx> (accessed 22/02/2016).

Section 4: States and Biosecurity

Centre for Biosecurity and Biopreparedness, *An Efficient and Practical Approach to Biosecurity*, 2015, available at <https://www.biosikring.dk/biosecuritybook/> (accessed 22/02/2016).

OIE, Documents Database on the concept of ‘One Health’, available at http://www.oie.int/doc/en_index.php (accessed 22/02/2016).

OIE, ‘Chapter 5.8 International Transfer and Laboratory Containment’, *Terrestrial Animal Health Code*, 2014, available at http://www.oie.int/index.php?id=169&l=0&htmfile=chapitre_international_transfer_ani_path_o.htm (accessed 22/02/2016).

OIE, 'Chapter 1.1.3 Biosafety and Biosecurity: Standard for Managing Biological Risk in the Veterinary Diagnostic Laboratories and Animal Facilities', *Manual of Diagnostic Tests and Vaccines for Terrestrial Animals*, 2015, http://www.oie.int/fileadmin/Home/eng/Health_standards/tahm/1.01.3_BIOSAFETY_BIOSECURITY.pdf (accessed 22/02/2016).

Robert Koch Institute, Germany, *Dual Use Potential of Life Sciences Research: Code of Conduct for Risk Assessment and Risk Mitigation*, 2013, available at http://www.rki.de/EN/Content/Institute/Dual_Use/code_of_conduct.html;jsessionid=AFFA0DF891CE725964DD5B5D6339778D.2_cid381?nn=4005636 (accessed 22/02/2016).

The Netherlands Biosecurity Office, available at <http://www.bureaubiosecurity.nl/en> (accessed 22/02/2016).

- The Biosecurity Office is the national information centre for the Dutch Government and for organisations that work with high-risk biological material. The Biosecurity Office aims to disseminate the government's new policy on biosecurity; for example, by giving workshops and providing information.
- Biosecurity Movie, 2014, available at http://www.bureaubiosecurity.nl/en/Information/Biosecurity_movie (accessed 22/02/2016).
- Biosecurity Toolkit, available at <http://www.bureaubiosecurity.nl/en/Toolkit> (accessed 22/02/2016).

UK Department for Environment, Food and Rural Affairs and Forestry Commission, *Protecting Plant Health: A Plant Biosecurity Strategy for Great Britain*, April 2014, available at <https://www.gov.uk/government/publications/plant-biosecurity-strategy-for-great-britain> (accessed 29/02/2016).

UK Government Office for Science, *Rigour, Respect, Responsibility: A Universal Ethical Code for Scientists*, September 2007, available at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/283157/universal-ethical-code-scientists.pdf (accessed 22/02/2016).

UK HM Government, *National Security Strategy and Strategic Defence and Security Review 2015: A Secure and Prosperous United Kingdom*, November 2015, available at <https://www.gov.uk/government/publications/national-security-strategy-and-strategic-defence-and-security-review-2015> (accessed 29/02/2016).

UN Security Council Resolution 1540 Committee, *National Reports Database*, available at <http://www.un.org/en/sc/1540/national-implementation/national-reports.shtml> (accessed 29/02/2016).

- The page provides information on the national implementation reports submitted by States with regard to their obligations under UNSC Resolution 1540. A *List of*

Legislative Documents is available at <http://www.un.org/en/sc/1540/national-implementation/legislative-database/list-of-legislative-documents.shtml> (accessed 29/02/2016).

US NIH, *Biosecurity: Dual Use Research of Concern*, available at <http://osp.od.nih.gov/office-biotechnology-activities/biosecurity/dual-use-research-concern> (accessed 22/02/2016).

US NIH, *Tools for the Identification, Assessment, Management, and Responsible Communication of Dual Use Research of Concern: A Companion Guide*, 2014; available at <http://www.phe.gov/s3/dualuse/Documents/durc-companion-guide.pdf> (accessed 22/02/2016).

- The page provides information on US Government policies, materials, and activities, as well as educational resources on dual-use research of concern.

WHO, *Laboratory Biosafety Manual*, 3rd ed., 2004, available at http://www.who.int/csr/resources/publications/biosafety/WHO_CDS_CSR_LYO_2004_11/en/ (accessed 22/02/2016).

WHO, *Biorisk Management: Laboratory Biosecurity Guidance*, September 2006, available at http://www.who.int/csr/resources/publications/biosafety/WHO_CDS_EPR_2006_6.pdf (accessed 22/02/2016).

WHO, *Responsible Life Sciences Research for Global Health Security*, 2010, available at http://www.who.int/csr/resources/publications/HSE_GAR_BDP_2010_2/en/ (accessed 22/02/2016).

WHO, *Laboratory Biorisk Management: Strategic Framework for Action, 2012-2016*, 2012, available at http://apps.who.int/iris/bitstream/10665/70878/1/WHO_HSE_2012.3_eng.pdf (accessed 22/02/2016).

WHO, *Guidance on Regulations for the Transport of Infectious Substances, 2015-2016*, 2015, available at http://www.who.int/ihr/publications/who_hse_ihr_2015.2/en/ (accessed 22/02/2016).

Wilton Park, *Dual-Use Biology: How to Balance Open Science with Security*, September 2013, Conference Report available at <https://www.wiltonpark.org.uk/wp-content/uploads/WP1260-Report.pdf> (accessed 22/02/2016).

Section 5: Biosecurity and Active Learning

George Mason University, US, *MSc Programme in Biodefence*, information available at <http://masononline.gmu.edu/programs/biodefense-ms/> (accessed 22/02/2016).

Multiple Uses of Chemicals, available at <http://multiple.kcvs.ca/site/index.html> (accessed 22/02/2016).

- The page provides educational resources which explore the beneficial uses, misuses, and abuses of multi-use chemicals, both historically and presently. These interactive resources have been designed for students, educators and policy makers, with specific content directed towards each group.

University of Bradford, *Educational Module Resource*, a set of 21 lectures translated into 10 languages covering dual-use bioethics, biosecurity, and the challenges to the Biological and Toxin Weapons Convention (BTWC) arising from cutting-edge life science research, available at <http://www.brad.ac.uk/bioethics/educationalmoduleresource/> (accessed 22/02/2016).

University of Bradford, *30-credit online distance-learning trainer-the-trainer MA module in Dual-Use Biosecurity*, information available at <http://www.brad.ac.uk/bioethics/trainthetrainer/30creditbiosecuritymodule/> (accessed 22/02/2016).

University of Bradford, *National Series*, country-specific lecture material on dual-use bioethics and biosecurity covering 15 different countries (translated into Georgian and Ukrainian), available at <http://www.brad.ac.uk/bioethics/nationalseries/countrymaterial/> (accessed 22/02/2016).

University of Bradford and University of Manchester, *Neuroethics Educational Module*, five lectures covering issues in dual-use bioethics and biosecurity, available at <http://neuroethicseducation.lab.ls.manchester.ac.uk/default.aspx> (accessed 22/02/2016).

Uppsala University, *Research Ethics Training for Medicine and the Life Sciences*, information available at <http://www.ethicstraining.crb.uu.se/about/> (accessed 22/02/2016).

This online interactive training aims to teach how to:

- Deal with publication ethics, competing interests and other issues that can help you manage research collaborations.
- Improve your own capacity to reflect on preconceptions and values in relation to ethical problems.
- Improve your ability to mobilize a sense of responsibility when you face ethical dilemmas.

US NAS, *Developing Capacities for Teaching Responsible Science in the MENA Region: Refashioning Scientific Dialogue*, Washington DC: NAP, 2013, available at <http://dels.nas.edu/report/developing-capacities-teaching-responsible-science/18356> (accessed 22/02/2016).

US NAS, *Research in the Life Sciences with Dual-Use Potential: An International Faculty Development Project on Education about Responsible Conduct of Science*, Washington DC:

NAP, 2012, available at <http://www.nap.edu/catalog/13270/research-in-the-life-sciences-with-dual-use-potential-an> (*accessed 22/02/2016*).