

**Meeting of the States Parties to the Convention
on the Prohibition of the Development,
Production and Stockpiling of Bacteriological
(Biological) and Toxin Weapons and on Their
Destruction**

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Meeting of Experts

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Item 6 of the provisional agenda

**Standing agenda item: review of developments in
the field of science and technology related to the Convention**

**The convergence of chemistry and biology: implications of
developments in neurosciences**

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Ireland**

I. Introduction

1. The Seventh Review Conference in December last year noted ‘the increasing convergence of biology and chemistry and its possible challenges and opportunities for the implementation of the Conventions.’¹ In February 2012, The Royal Society published Module 3 in its Brain Waves series entitled ‘*Neuroscience, conflict and security*’. This report considers potential military and law enforcement applications arising from key advances in neuroscience. It addresses key advances in neuroscience, including neuropharmacology, functional neuroimaging and neural interface systems, which could impact upon these developments and the policy implications for the international community, the UK government and the scientific community.² The Royal Society makes several important observations and recommendations concerning the implications of the convergence of chemistry and biology.³

¹ A point also emphasised in the UK background paper for the Seventh BTWC Review Conference on scientific and technological developments in BWC/CONF.VII/INF.3/Add.1 New scientific and technological developments relevant to the Convention pp 21–38
<http://daccess-dds-ny.un.org/doc/UNDOC/GEN/G11/648/39/PDF/G1164839.pdf?OpenElement>

² <http://royalsociety.org/policy/projects/brain-waves/conflict-security/?f=1>

³ The Royal Society, *Brain Waves Module 3: Neuroscience, conflict and security*, February 2012 RS Policy document 06/11
See: http://royalsociety.org/uploadedFiles/Royal_Society_Content/policy/projects/brain-waves/2012-02-06-BW3.pdf

2. Three recommendations from the report are particularly relevant to the Review Conference's Decision on the adoption of a standing agenda item for the next intersessional process - *Review of developments in the field of science and technology related to the Convention*:

Recommendation 1: There needs to be fresh effort by the appropriate professional bodies to inculcate the awareness of the dual-use challenge (i.e. knowledge and technologies used for beneficial purposes can also be misused for harmful purposes) amongst neuroscientists at an early stage of their training.

Recommendation 7: The implementing bodies of the Biological Weapons Convention (BWC) and CWC should improve coordination to address convergent trends in science and technology with respect to incapacitating chemical agents.

Recommendation 8: Neuroscience should be considered a focal topic in the science and technology review process of the BWC because of the risks of misuse for hostile purposes in the form of incapacitating weapons.

3. Such issues are of course relevant also to the Third CWC Review Conference, which will take place in April 2013. They provide an opportunity to build stronger ties between the two Conventions with a view to considering the short, medium and long term implications for policy and implementation of both Conventions. This Working Paper highlights how some of the Brain Waves Module 3 recommendations might be taken forward in a BTWC context and looks at one particular area where convergence issues could impact on the object and purposes, as well as the implementation, of both Conventions.

II. Awareness-raising: actions needed in the short term

4. Recommendation 1 ties in directly with issues that have been addressed in previous BTWC intersessional processes; these, in the UK view, remain challenges that the States Parties need to address nationally and internationally and through the new intersessional process from 2012 to 2015 and beyond. Action is required to generate: a renewed effort by appropriate professional bodies to inculcate the awareness of the dual-use challenge among neuroscientists at an early stage of their training; and, greater levels of awareness among scientists of the obligations rising from the CWC and BTWC and of the potential malign applications of their research.⁴

5. These issues are directly relevant for two of the key agenda items on science and technology review:

(a) voluntary codes of conduct and other measures to encourage responsible conduct by scientists, academia and industry; and,

(b) education and awareness-raising about risks and benefits of life sciences and biotechnology.

6. The Experts' Meeting and Meeting of States Parties should address practical ways of implementing such measures and taking actions domestically. In the UK, The Royal Society has taken the lead as the premier scientific body to draw these matters to the attention of its peers – we would encourage other States Parties to work with the relevant professional and scientific bodies in their own countries to promote these issues. We would hope too that the national academies could promote these measures, including by

⁴ See The Royal Society, *Brain Waves Module 3*, pp 60–61

coordinated efforts through the Inter Academy Panel. Convergence issues and their implications should be highlighted in these efforts.

7. The Royal Society hosted a roundtable meeting on dual-use education and awareness-raising in neuroscience in March this year to follow-up on its *Brain Waves 3: Neuroscience Conflict and Security* report.⁵ This noted *inter alia* that a fresh effort was overdue and that it must offer incentives and engage the scientific community as part of the solution, not as part of the problem. A number of complementary interventions could be exploited in addition to working through scientific societies including, for example, law enforcement outreach to scientists and insertion of relevant materials in core texts for science courses. The UK shares the view that it is important to look at how the issue of dual-use can be assimilated with broader professional training for scientists in the university curricula in a holistic and sustainable matter both at home and abroad. In early July 2012 the University of Bradford hosted a conference entitled '*Biosecurity for Life Scientists: Progress and Challenges after the Seventh Review Conference of the BWC*'. This three day workshop was designed to allow participants to share experiences and to exchange insights and inspirations for future work on education in biosecurity issues for life scientists.

III. Neuroscience and peptides: medium to long term considerations

8. The Royal Society recommends that advances in neuroscience, particularly in the development and delivery of peptides and other neurotransmitters, should be included in the review of science and technology during the BTWC intersessional process since there are important implications for areas of convergence with the CWC.⁶ Although neuroscience is not specifically mentioned in the list of topical scientific subjects to be addressed by the new intersessional process, advances in production, dispersal and delivery technologies of biological agents and toxins is to be considered in 2015. This would be the time to pay direct attention to this Royal Society recommendation, and the UK calls upon States Parties to come prepared to that meeting. In the meantime the UK favours placing the implications of neuroscience for the BTWC (and the CWC) as part of the regular scientific and technological review discussions in the intersessional process. The UK would therefore be interested in hearing the reactions of other States Parties' Experts on these issues. We have one specific area to comment on and this follows below.

9. The UK believes that developments in neuroscience, such as those highlighted in the Royal Society report as well as in the UK's background paper on scientific and technological developments submitted to the Seventh Review Conference, offer prospective benefits as well as risks. The convergence of chemistry and biology is a core issue in this context. Many of the benefits and risks of advances in the neurosciences lie in the future. However, in the development phase it is timely to consider issues related to governance of this dual-use technology area, balancing the obligation to take measures to prohibit and prevent misuse with the need to ensure that the beneficial development of science is not hampered. States Parties need to be vigilant and be in a position to take decisions and actions in good time when needed; these intersessional meetings provide a platform to promote relevant measures.

⁵ <http://blogs.royalsociety.org/in-verba/2012/03/23/dual-use-education-in-neuroscience/>

⁶ The Royal Society, *Brain Waves Module 3*, p 62

10. In the longer term there could be impacts on the CWC's verification regime from the convergence of chemistry and biology – questions on the continuing relevance of currently scheduled chemicals might increase. Developments arising from convergence might mean that CWC States Parties have to consider inclusion of other materials on the CWC's schedules, such as some biochemicals and additional toxins. We are not there yet, but given advances in peptide production, for instance, greater production levels of highly potent materials might lead to production of several hundred kilograms per year per peptide plant.⁷

11. We noted in the previously mentioned UK background paper that small peptides, including toxins, can be chemically synthesised – a service that is now readily available commercially. As one recent study has noted, peptides are of interest in the incapacitating chemical agent context because peptide based bioregulators are responsible for the control of a number of vital physiological functions in the human body.⁸ In his response to the CWC Scientific Advisory Board's 17th report, the OPCW Director-General noted that practical limitations regarding the technical capability to chemically synthesise many toxins, bio-regulators and biologically active peptides need to be assessed, and he encouraged States Parties to share any information they may have on the subject.⁹

12. If such materials were ever added to the CWC's schedules – and there are already two toxins on Schedule 1 - we could then have some form of direct verification measures applying to areas also covered by the BTWC. It is unclear whether it would also be necessary to consider any modifications to the CWC's Verification Annex declaration and inspection thresholds, given that these materials are produced in kilogram quantities – well below the current CWC thresholds. This highlights the need for close and continuing cooperation between the CWC and BTWC to ensure sharing of expertise and so that relevant developments and their potential or actual implications are not overlooked or downplayed in either Convention. The UK supports the steps already taken by the OPCW Director-General in this respect following the 25 July 2011 Report of the Advisory Panel on Future Priorities of the Organisations for the Prohibition of Chemical Weapons. This includes the decision to recruit a scientific adviser inside the Technical Secretariat.

IV. Conclusion

13. We encourage States Parties to pay particular attention to the implications for the BTWC (and the CWC) from developments in neuroscience and the need to keep in mind the potential long-term implications for the Conventions. We need to be proactive rather than reactive in our national and collective responses to all relevant developments in science and technology, including neuroscience, and to support efforts to increase awareness of the dual-use challenges arising from advances in neuroscience. The new intersessional process provides a platform for such efforts. Building and sustaining the links between the BTWC and CWC are thus key activities for the foreseeable future and we look

⁷ See *Technical Workshop on Incapacitating Chemical Agents, Spiez, Switzerland, 8-9 September 2011*, Federal office for Civil Protection FOCP, Spiez Laboratory, Dr Matt Giraud, Awareness: Peptide Production & Challenges – Lonza view, pp 29-30 and Summary page 27
See: http://www.labor-spiez.ch/de/dok/hi/pdf/web_e_ICA_Konferenzbericht.pdf. For a further discussion of peptides see Ralf Trapp, *Synthesis of Peptide Bioregulators* in Jonathan Tucker edited *Innovation, Dual Use and Security Managing the Risks of Emerging Biological and Chemical Technologies*, The MIT Press, London, 2012, pp 173-185.

⁸ Technical Workshop on Incapacitating Chemical Agents, p 26

⁹ Note by the Director-General, Response to the Report of the Seventeenth Session of the Scientific Advisory Board, EC-67/DG.11, 9 February 2012
http://www.opcw.org/fileadmin/OPCW/S_series/2011/en/ec67dg11_e_.pdf

forward to seeing ever closer cooperation between experts and meetings in Geneva under the new intersessional process with counterparts and relevant events in The Hague as work advances there on the evolution of the OPCW.
