
**Seventh Review Conference 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**

12 January 2012

English only

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Item 10 of the agenda

**Review of the operation of the Convention
as provided for in its Article XII**

**New scientific and technological developments relevant to the
Convention**

**Background information document submitted by the Implementation
Support Unit**

Addendum

Annex

Submissions from States Parties

Australia

1. Australia provides the following information to the Biological Weapons Convention (BWC) Implementation Support Unit (ISU), UNODA, Geneva, on scientific and technological developments relevant to the Convention, in accordance with paragraph 24(c) of BWC/CONF.VII/PC/2.

2. At the outset, Australia expresses its appreciation to the Chinese Academy of Sciences and the other international scientific organisations which co-hosted and convened the international workshop, Trends in Science and Technology Relevant to the BWC, held in Beijing in November 2010.¹ The workshop concluded that life sciences research continues to advance rapidly and is expected to do so for the foreseeable future, but did not identify any discoveries that fundamentally altered the nature of life sciences research since 2006. The diffusion of research capacity and knowledge, and the growing numbers of international collaborations in S&T were highlighted, as was the increasing integration and convergence of multiple scientific disciplines.

¹ National Research Council, *Life Sciences and Related Fields: Trends Relevant to the Biological Weapons Convention*, National Academies Press, 2011. (The 'Beijing Report').

3. In this brief report, we consider the convergence of biology and chemistry, which is one of the scientific and technological developments highlighted in the Beijing Report.² In our view, the implications of the convergence of biology and chemistry on the BWC will warrant particular attention at the Review Conference, and in the following Intersessional Process.

4. A number of different issues are included under the general umbrella term of 'convergence', including: the increasing use of biologically mediated processes (catalysts, naturally occurring organisms and genetically modified organisms) for the production of chemicals (biosynthesis); the more recent development of the chemical synthesis of replicating organisms (which has taken place with small viruses so far); and recombinant DNA technology that allows replacement of the original genome in bacterial cells with synthetically produced genomes, to produce bacteria with new capabilities (synthetic biology).

5. These advances promise many benefits to humankind, including more efficient food production, improvements to medicines and to health care, the generation of renewable energy sources, and the enhancement of pollution management.

6. There are also many potential benefits of the convergence of chemistry and biology (and related aspects of nanotechnology) for the BWC, including developments in detection of pathogens and toxins (biosensors), medical countermeasures, decontamination, and laboratory analysis and identification techniques, including bioforensics. However, it is also recognised that these developments could potentially be misused, including an increased potential for mis-use of toxins and bioregulators for hostile purposes.

7. The convergence of biology and chemistry has potential implications in the areas of overlap between the BWC and the Chemical Weapons Convention (CWC) that result from the fact that certain classes of toxic chemicals, including toxins and bioregulators, are covered by the scope of both treaties. As noted in the Beijing Report, as the life sciences continue to advance rapidly, this 'mid-spectrum' area of overlap between the BWC and CWC may continue to expand in several ways, including the possibility of more molecules being discovered that fall within the mid-spectrum, the possibility of the production of toxins and bioregulators in quantities that may be suitable for large scale use for hostile purposes, and more feasible delivery systems for these types of chemicals.³

8. In recent years, the scientific community associated with the CWC has also become increasingly interested in the implications of the rapid advances in the life sciences, including the convergence of biology and chemistry. For example, these implications were considered at the workshop co-hosted by the Organisation for the Prohibition of Chemical Weapons (OPCW) and the International Union of Pure and Applied Chemistry (IUPAC) in Zagreb in 2007⁴ in advance of the 2nd CWC Review Conference convened in 2008.

9. A number of articles published about the implications of the rapid advances in life sciences for the BWC and CWC have tended to discuss the potential future implications from a theoretical perspective, and there appears to be limited information available as to what is realistically possible to achieve with the current state of development of science and technology. This led to the view by the Director-General of the OPCW that the

² National Research Council, *Life Sciences and Related Fields: Trends Relevant to the Biological Weapons Convention*, National Academies Press, 2011, pp. 81-92.

³ National Research Council, *Life Sciences and Related Fields: Trends Relevant to the Biological Weapons Convention*, National Academies Press, 2011, pp. 88-90.

⁴ M Balali-Mood et al, Impact of Scientific Developments on the Chemical Weapons Convention, (IUPAC Technical Report), *Pure Appl. Chem.*, Vol. 80, No.1, pp.175-200 (2008).

convergence of biology and chemistry warrants further study at the practical level, and that additional advice should be sought, including from stakeholders in industry and academia.⁵

10. To this end, the OPCW recently convened the first meeting of a new Temporary Working Group on the convergence of chemistry and biology, which had been requested to examine what this convergence means in practical terms to the OPCW. Participants at the meeting included experts from the life sciences and the biotechnological industry. The group discussed advances in the life sciences, the extent of biologically-mediated synthesis of chemicals, the application of chemical DNA synthesis for the production of toxins, bioregulators and peptides, and other aspects of convergence relevant to the CWC.⁶

11. The Temporary Working Group concluded that there has been a recent trend towards the commercial production of an increasing number of chemicals using biological processes, and that the capacity for the synthesis /production of toxins, bioregulators and peptides is rapidly evolving and is being driven by advances in systems and synthetic biology. The group recommended the continued monitoring of these developments, including through surveys and technical feasibility analysis. To achieve these objectives, the group recommended the establishment of a structured process to continue monitoring the convergence of chemistry and biology, including, for example, by convening meetings of experts in chemistry and biology, including through the CWC and BWC meeting processes.

12. The Temporary Working Group recommendation of convening meetings of experts in chemistry and biology, including through the CWC and BWC meeting processes, accords with the report of the Advisory Panel convened in 2011 by the OPCW, which notes that the convergence between chemistry and biology calls for closer interaction in the implementation of the CWC and BWC, including through exchanges of experience and joint technical reviews.⁷

13. Australia supports the recommendations made by the OPCW Temporary Working Group for the continued monitoring of these developments, including through surveys and technical feasibility analysis, and for the establishment of a structured process to continue monitoring the convergence of chemistry and biology. We also see considerable merit in the convening meetings of experts in chemistry and biology, including through the CWC and BWC meeting processes, and through exchanges of experience and joint technical reviews by the CWC and BWC communities.

⁵ Note by the Director-General, Report of the Scientific Advisory Board on Developments in Science and Technology, OPCW-RC-2/DG.1 (28 February 2008), Paragraph 2.6.

⁶ Report of the First Meeting of the SAB Temporary Working Group on the Convergence of Biology and Chemistry, The Hague, The Netherlands (15-16 November 2011), Annex 2 to Report of the Seventeenth Session of the Scientific Advisory Board, SAB-17/1, (23 November 2011).

⁷ OPCW, Report of the Advisory Panel on Future Priorities of the Organisation for the Prohibition of Chemical Weapons, Office of the Director-General, S/951/2011, p.20.