Strengthening the Biological and Toxin Weapons Convention after COVID-19: Reaching Agreement on a Code of Conduct and Biological Security Education at the 2021 9th Review Conference

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Abstract

The COVID-19 virus pandemic has again demonstrated the devastating impact that a microbial pathogen can have on our health, society and economic systems. It necessitates a fundamental rethink of how the security of our societies can be better sustained. This rethinking will require many aspects of our security systems to be re-examined, but we concentrate here on the consequences of the rapid advances being made in the life and associated sciences. In this chapter, we will describe and analyse one of the most likely means by which the BTWC could be strengthened at the 9th Review Conference, namely: agreement of an International Aspirational Code of Conduct supported by mandatory biological security education for life and associated scientists. We conclude that a vigorous effort by civil society will be needed to assist the achievement of an agreement on this issue at the 9th Review Conference.

Key words: Biological Security, Web of Prevention, BTWC, CWC, Code of Conduct, Education

1. Introduction

Following the failure of the 2016 8th Five-Year Review Conference of the Biological and Toxin Weapons Convention (BTWC) to agree anything other than to meet again at the end of 2017, the 4th Intersessional Process leading up to the 2021 9th Review Conference was rescued by a joint proposal by the three Depositary States – the Russian Federation, the UK and the USA.[1] This allowed the 2017 meeting to agree that Meetings of Experts and Meetings of States Parties (States who sign to the Convention) would take place in 2018, 2019 and 2020 in order to develop proposals that could be brought to the 9th Review Conference in 2021. Then, however, because of the COVID-19 pandemic[2], the final stages of this process became compressed with the 2020 Meeting of Experts scheduled for the end of the year rather than in the summer, the 2020 Meeting of States Parties moved to April 2021 and combined with the first session of the meeting of the Preparatory Committee for the Review Conference, and the Preparatory Committee scheduled to meet again in the summer of 2021 before the Review Conference at the end of the year.

Nevertheless, it might be expected that after the pandemic, heath security, including biological security,[3] would be a political priority across the world,[4,5] but the long history of difficulties in agreeing measures to develop the BTWC suggests that such progress may well not be possible without a concerted effort by States Parties and civil society. With that caution in mind, this chapter describes and analyses one of the most likely means by which the BTWC could be strengthened at the 9th Review Conference, namely: agreement of an International Aspirational Code of Conduct supported by mandatory biological security education for life and associated scientists.[6]

2. The Gap in the Web of Prevention

Amazing advances are taking place in the life and associated sciences and are underpinning a revolution in our biotechnology capabilities. The improved capabilities will yield much that is good for our societies, but they could also be misused for hostile purposes in novel and dangerous chemical and biological weapons. That raises the difficult problem of dual use – the fact that[7] "knowledge and technologies used for beneficial purposes can also be misused for harmful purposes." Yet, unfortunately there is substantial evidence showing that few practicing life scientists (and other scientists involved in the biotechnology revolution) are even aware of the dangers of dual use, or of the history[8] of the way that scientific advances in the last century fed into the largescale offensive chemical and biological weapons programmes of major States.[9]

At a major meeting in Zagreb in 2018, a wide range of experts from around the world reviewed the arrangements in place for dealing with the problem of dual use. Instead of a systematic set of integrated measures, the meeting noted the existence of a disparate jigsaw of measures in place to different extents in different countries and regions.[10] A conceptual framework for an integrated approach to biological security had been developed some years earlier involving international regulations, policies, and guidelines for promoting a comprehensive and integrated system to the management of biological risks in the twenty-first century. However, there was little evidence that this framing of biological security had resulted in the adoption of concrete measures. The framework is centred on the concept of a 'web of prevention' which originated in the early 1990s as the idea of a 'web of deterrence'. The web of prevention[11] refers to the different strands/lines of action that are required for effective biological risk management, regardless of whether biological risks occur naturally, accidentally or deliberately.

Understanding the role that science professionals could make to this framing has been a preoccupation of advocates of the notion of a 'web of prevention' in research conducted over

the last decades and these investigations have suggested that on a worldwide basis those working in the life and associated sciences were largely unaware of the problem of dual use. How science professionals might add their expertise to preventing the hostile misuse of their work had, however, remained unclear under the notion of the 'web of prevention'. Indeed, a similar problem had existed in the chemical sciences, but as shown in the next section, that issue was starting to be addressed by the development and implementation of an international aspirational code of conduct and through the idea of fostering the implementation of related educational provision for raising awareness amongst practicing scientists of the importance of chemical security, about the provisions of the Chemical Weapons Convention (CWC), and about the role of chemical science professionals in contributing to strengthening both former and latter.

3. The Hague Ethical Guidelines and the Work of the Advisory Board for Education and Outreach

Implementation of the 1993 CWC has been heralded as a multi-lateral success story. Embodied in CWC is a powerful international norm against the development, use, preparation, and against assistance by and of States in activity relating to chemical weapons that is prohibited under the Convention. This requires States Parties to "…never under any circumstances: (a) To develop, produce, otherwise acquire, stockpile or retain chemical weapons, or transfer, directly or indirectly, chemical weapons to anyone; (b) To use chemical weapons; (c) To engage in any military preparations to use chemical weapons; (d) To assist, encourage or induce, in any way, anyone to engage in any activity prohibited to a State Party under this Convention."

Non-proliferation together with disarmament, assistance and protection, and international cooperation are the four pillars of the CWC. Since its entry into force in 1997, 193 of the world's 197 recognised States have joined the Convention, 98% of the world

population now live under the protection of its provisions, and 98% of the world's chemical stockpiles having been verifiably destroyed. Maintenance of the Convention is being considered in the context of a changing economic, political, scientific, and technological and security environment.

As noted by Husbands and Suarez[12] based on principle that "…achievements in the field of chemistry should be used to benefit humankind and the environment", it is in this light that the Convention had moved to embrace a set of guidelines for science professionals that were intended to serve as: "…elements for ethical codes and discussion points for ethics issues related to the practice of chemistry under the Convention…"

At the 19th Session of the Conference of States Parties of the CWC in 2014, as part of an initiative to seek to prevent the re-emergence of chemical weapons, a proposal was thus endorsed to develop an ethical code for chemistry professionals. Subsequent workshops organised by the Organisation for the Prohibition of Chemical Weapons (OPCW) involving a broad range of stakeholders including chemical science professionals, academia and industry, consulted broadly as to how draft ethical guidelines might be aligned with norms embodied in the CWC and drawing on best practice and upon other relevant experience a consensus text emerged in 2015 resulting in what are known as the *Hague Ethical Guidelines*.

The role of civil society has been particularly important in achieving this objective. There has been a long history of involvement of the International Union of Pure and Applied Chemistry (IUPAC) in the scientific and technical issues involved in strengthening the CWC and this participation of civil society was well illustrated in the development of the Guidelines. As described in a review of this civil society participation it was noted that:[13]

> "The German government provided special funds for two workshops in 2015 to develop the text for ethical guidelines. The project was notable because although funded and organised via the OPCW, the work was done by an international group of 35 scientists from academia and the chemical industry of 24 countries from all regions of the world…"

According to the *Hague Ethical Guidelines*[14], key elements include: "Core element, Sustainability, Education, Awareness and engagement, Ethics, Safety and security, Accountability, Oversight, and Exchange of information."

The congruence between education and outreach in affecting the efficient and effective implementation of the *Hague Ethical Guidelines* is clear, and at the Twentieth Session of the Conference of the States Parties, in December 2015, in accordance with the recommendation of the report of the Temporary Working Group on Education and Outreach of the Scientific Advisory Board, the Director-General was called upon[15]to set up an Advisory Board on Education and Outreach (ABEO). ABEO thereafter took implementation of the Guidelines as one of its tasks.

In relation to contemporary education research on linking theory and practice in teaching and learning, a 2018 ABEO report noted the potential of active learning approaches including- problem based learning as well as the use of case studies. As well as a range of active learning approaches, the report also noted the importance and 'proven effectiveness' of online technologies and their potential to be used in addressing deficits in teaching and learning about the importance of preventing the re-emergence of chemical weapons. The report noted that active learning might also be adopted in training programmes in professional organisations and societies, and in international disciplinary unions and industry. Indeed, the above

approaches were deemed: "potentially relevant to the OPCW's extensive capacity-building programmes" and due to the potential they demonstrated as a portfolio of activities as models that form an integral part of the overall set of actions covered by the OPCW's commitment to the "prevention of the re-emergence of chemical weapons."

Together, adoption by the *Hague Ethical Guidelines*, as well as the emphasis placed by the Organisation on the importance of education and outreach activities and the creation of a sense of ownership among chemical science professionals in the Convention, represent a possible model for the ways in which implementation of the BTWC might be improved through adoption of a Code of Conduct for life sciences where a clear emphasis is placed upon awareness-raising and education as well as on the importance of engagement of life science professionals with the BWC.

4. Codes of Conduct, Awareness-Raising and Education for Life Scientists

4.1 Introduction: The Biological and Toxin Weapons Convention

March 2020 marked the 45th anniversary of the entry into force of the Biological Weapons Convention (BWC). It is a multilateral treaty of indefinite duration and currently has 183 States Parties and four signatories. Ten states have neither signed nor ratified the BWC.[16] Since the 5th BTWC Review Conference in 2005-06, States Parties have held annual meetings in a series of Intersessional Processes (ISPs) during the years between its five-yearly review conferences. The ISPs generally have Meetings of Experts (MXs) in the middle of each year and Meetings of States Parties at the end of each year, but the BTWC does not have a large international organisation like the OPCW for implementation of the convention.

Article I of the BTWC bans the development, stockpiling, acquisition, retention, and production of:

- Biological agents and toxins "of types and in quantities that have no justification for prophylactic, protective or other peaceful purposes";
- Weapons, equipment, and delivery vehicles "designed to use such agents or toxins for hostile purposes or in armed conflict."

The Convention has been violated in the past. The Soviet Union, one of the Convention's Depositary States, maintained an offensive biological weapons program after ratifying the BTWC. Russia says that this program has been terminated. Iraq violated its commitments as a Signatory State with its biological weapons program, which was uncovered by the UN Special Commission on Iraq. Iraq became a State Party after the Gulf War. In a 2020 report on compliance with the BTWC, the United States indicated that it still had outstanding compliance concerns in relation to four States.[17]

4.2 The BTWC and the World Health Organisation (WHO)

An important input into the negotiations for the BTWC was a WHO study entitled *Health Aspects of Chemical and Biological Weapons* published in 1970. In 2004, the WHO produced an updated version of this study titled *Public health response to biological and chemical weapons: WHO guidance*.[18] From these studies it is obviously clear that there is an overlap in activities between the WHO and the BWC, and concerns have been raised about any roles that might be perceived as bringing the WHO into the security realm with potential negative consequences for other health work. For centuries, allegations have been made about the misuse of disease. While difficult, an effective response to this has been to examine any available information in factual terms particularly in the context of the capabilities of the life sciences at the time.[19]

Clearly, an attack with biological weapons that produced casualties would have a significant public health impact. If a biological attack were to be carried out using a disease that has limited spread from one human to another, such as anthrax, the casualties while potentially large would be limited to those exposed to the pathogens from the delivery system. A biological attack using a disease with significant human-to-human transmission, such as smallpox, could mean that disease would spread widely across the population; the measures for detecting and controlling this spread would be the same as for naturally occurring disease. Similar concerns relate to very dangerous animal and plant diseases.[20]

The Eighth Review Conference[21] (2016) recognized the "fundamental importance" of enhancing international cooperation and agreed on the value of "working together to promote capacity building in the fields of vaccine and drug production, disease surveillance, detection, diagnosis, and containment of infectious diseases as well as biological risk management". The Conference affirmed that "building such capacity would directly support the achievement of the objectives of the Convention." It also acknowledged "the need to address the lack of ready operational capacity" as a lesson from the Ebola Virus Disease (EVD) outbreak in West Africa.

An assumption in much contemporary discussion is that the impact of COVID-19 could inspire an increased interest in development or use of biological weapons particularly in the messy hybrid warfare that characterises contemporary conflict.[22] As the capabilities of the life and associated sciences continues to increase rapidly the COVID-19 pandemic has highlighted possible vulnerabilities that potential perpetrators might look to in the future.[23] In short, the COVID-19 pandemic has important implications for the BTWC, particularly the need to significantly strengthen its implementation.

4.3 The BTWC and Dual Use

At the meeting of BTWC States Parties in December 2017[24] it was agreed that the Meeting of Experts during the ISP would consider the following subjects back to back, as illustrated below:

> "MX1 – Cooperation and Assistance, with a Particular Focus on Strengthening Cooperation and Assistance under Article X;
> MX2 - Review of Developments in the Field of Science and Technology Related to the Convention;
> MX3 – Strengthening National Implementation;
> MX4 – Assistance, Response and Preparedness;
> MX5 – Institutional Strengthening of the Convention."

The same topics would then be dealt with at the Meetings of States Parties later in the years.

The meetings were obviously dealing with a vast and diverse agenda, and within MX2 on science and technology there was also a packed agenda to:

- "Review of science and technology developments relevant to the Convention, including for the enhanced implementation of all articles of the Convention as well as the identification of potential benefits and risks of new science and technology developments relevant to the Convention, with a particular attention to positive implications…"

Clearly, there was little time to consider codes of conduct in details within such a short period of time. However, this matter had already been given considerable attention by States Parties over the preceding two decades.

4.4 Codes of Conduct and Education

At the 2005 Meeting of Experts there was an initial attempt to deal seriously with the issue of codes of conduct with large numbers of papers being produced for the meetings[25,26]. But even in 2005 just introducing a code of conduct was not seen to be sufficient to deal with the problem of the potential misuse of research by some of the States Parties. The need for raising awareness and education of life scientists was reiterated by several States[27,28,29,30.] Given the level of interest it was unsurprising that the 6th Review Conference in 2006 decided that in 2008 during the Second Intersessional Process States Parties would focus on:[31]

> "…Oversight, education, awareness raising, and adoption and/or development of codes of conduct with the aim of preventing misuse in the context of advances in bio-science and bio-technology research with the potential of use for purposes prohibited by the Convention."

What it is important to understand is that in 2008 it was still often believed that just developing a code could be the means to raise awareness of the problem of dual use amongst scientists[32,33,34]. However, progress was being made in the development of educational material linked to the BTWC for life scientists.

Lack of education about dual use was again noted in a contribution by Japan to a joint Working Paper at the Seventh Review Conference in 2011[35]. 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. They also jointly developed an online learning module in applied dual-use biosecurity education. The Third Intersessional Process following the Review Conference was agreed to consider as part of the Standing Agenda Item on the review of developments in science and technology:[36]

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

(e) education and awareness-raising about risks and benefits of life sciences and biotechnology…"

Then, the Meeting of States Parties in 2015 concluded that:[37]

"To further address education and awareness-raising about risks and benefits of life sciences and biotechnology, States Parties recognized that the continuous and accelerating rate of progress in scientific knowledge requires the necessity of deepening a culture of responsible use of this knowledge, which takes into account the object and purpose of the Convention without undermining peaceful uses."

In order to further efforts on education and awareness-raising about risks and benefits of life sciences and biotechnology, States Parties discussed the need to share information and knowledge on these developments, including dual-use research of concern.

The Gain of Function Debate[38] (2011-2015) is a typical example of showing the gap between life scientist and politicians. CRISPR-Cas[39] is another example of great need for the Code of Conduct. Bioethics issues of CRISPR-Cas9 need to be carefully scrutinised. Although CRISPR-Cas9 has a lot of benefits for our life, it also has a bioethical issue[40,41,42,43]. We know that in research benefits we need must be greater than risks. Greater attention must be placed on risks, since they may damage our living or the environment. The application of CRISPR-

Cas9 technique involves risks since it may produce mutation which can be deleterious. Bioethical concerns also arise when this technology is used to alter genomes in the human germline.

In 2016 at the Preparatory Committee for the Seventh Review Conference China and Pakistan put forward an important proposal for the development of a template for a code of conduct. Their Working Paper stated that:[44]

> "With the aim to prevent abuse and misuse of bioscience and technology, fulfil the aims and objectives of the Convention and strengthen global biosecurity governance, China has proposed the development of a template of biological scientist code of conduct within the framework of the Convention in December 2015…"

The paper pointed out that many States had indicated support for an agreed code of conduct and provided suggestions. At the Review Conference itself Ukraine and the UK, reflecting on their own joint studies and research, pressed the case for serious attention to be given to the education of scientists given the current lack of awareness of the Convention and its implications.[45]

The Ukraine, Japan and the UK again pressed the case for serious attention to be given to education at the 2017 Meeting of States Parties in a Working Paper on recent developments in awareness-raising, education and outreach.[46] Finally, China and Pakistan made a clear-cut proposal for bringing this long period of development to a conclusion at the Ninth Review Conference in 2021[47]. They presented a Working Paper at the 2018 Meeting of Experts that included a draft Model Code of Conduct for Biological Scientists.

The presentation at the Meeting of Experts had been preceded by an international conference in Tianjin, China on *Building a Global Community of Shared Future for Biosecurity: Development of a Code of Conduct for Biological Scientists* at which China's ideas for the code were discussed in detail by a range of 28 experts from 14 different countries, 6 experts from international organisations and a large host delegation from China itself. The conference lead to the addition of educational elements to the proposed code of conduct, but the new version of the code also retained the kind of international cooperation that will be needed for example to deal with threats of the kind illustrated by the present COVID-19 outbreak (Table 1).

Table 1: Elements of the 2018 China Draft Model Code of Conduct for Biological Scientists

1. Research Integrity
2. Respect for the Object of Research
3. Process Management for Science Research
4. Constraint on the Spread of Research Outcome
5. Popularisation of Science and Technology
6. Institution's Role
7. Education and Training
8. Awareness and Engagement
9. International Exchanges

Then in his report of the meeting the Chair of the MX2 Session on science and technology concluded that such a code of conduct would be one of the elements that had most chance of being agreed at the Ninth Review Conference[48]. It is important to stress that what was being proposed is quite analogous to the *Hague Ethical Guidelines* for chemists. It is an Aspirational Code (like the Hippocratic Oath for medical doctors) that can be implemented in more stringent codes to fit the circumstances of different State Parties, but which will require education and

awareness-raising about the BTWC and the problem of dual use. How this plays out will depend on how well meetings of the BTWC succeed in 2020 and 2021 in the lead up to the decision making 9th Review Conference.

There have been various development and implementation projects concerned with teaching life scientists about biological security and the problem of dual use. These were given a thorough review recently which resulted in similar conclusions to those developed for chemists. The reviewer stated that in order to be effective attention has to be given to three main points:[49]

> "…First, materials and resources need to be made widely available and accessible…. Second in order to reach as many stakeholders as possible, it is recommended that materials are available in different languages. Third…training materials and resources are developed in a user-friendly manner, so as to enable lecturers and educators to use them easily without the need for extensive prior preparation or training."

Given the massive task of awareness-raising about the BTWC, dual use and biological security in general, these seem eminently sensible suggestions. It is also quite clear that active learning methods, such as Team-Based Learning[50,51] are by far the best way to present this kind of material to scientists. The review also stressed that education was not a solution to the problem of dual use in itself, but only within the context of an effective code of conduct for the scientists involved.

5. Conclusions

When the COVID-19 pandemic is over there will be many questions to be answered about how our biological security can be improved. Certainly, some of these questions will be focused on

how the BTWC can be strengthened. Given the history of the convention it surely cannot be assumed that this will be an easy task. Therefore, it may well be that the best approach is to concentrate on issues that appear to be the least contentious and costly, but which could make a significant difference. One such issue is the potential agreement of an international Aspirational Code of Conduct with awareness-raising and education as an integral element. This approach has the great advantage of having been implemented recently in support of the CWC and has been well discussed over two decades within the orbit of the BTWC. It would not commit any State Party to immediate major activities but would allow States that are able to do so to pioneer innovative approaches that can be reported back and copied later by others. The whole approach would have the benefit of bringing many more people with expert knowledge into engagement with the convention while helping to minimise the problem of dual use.

However, it has to be understood that the CWC had the advantages of a major international organisation (OPCW) and the strong long term engagement of the International Union of Pure and Applied Chemistry in developing the *Hague Ethical Guidelines*, and the ABEO to carry out its investigation and report on the best ways forward for education. The BTWC lacks many of these advantages and so an important question is whether civil society is able, during the lead up to the 9th Review Conference, to provide some strong backing for States Parties interested in agreeing an effective international code with education and awareness-raising as one of its key elements. Whether the BTWC 9th Review Conference does move along the lines that the CWC has developed over the last decade will be much dependent on the preparatory meetings to be held in late 2020 and early 2021 in the lead up to the review and civil society should pay particular attention to these proceedings if it wants to contribute to strengthening biological security in the future.

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