

# 10. Reducing security threats from chemical and biological materials

JOHN HART AND PETER CLEVESTIG

## I. Introduction

In 2008 policymakers continued to broaden prevention and response measures against perceived chemical and biological warfare (CBW) threats. These threats have been addressed by overlapping initiatives and measures, including attempts to define those posed by bioterrorism and chemical terrorism. Efforts to destroy chemical weapons and to universalize and effectively implement international prohibitions against CBW were carried out at the national level and within multilateral frameworks. The security and public health sectors considered possible CBW threats and how to deal with them within a cooperative framework.

Twenty-four United Nations offices, agencies and international organizations, including the International Criminal Police Organization (Interpol), carried on their collaboration in the Counter-Terrorism Implementation Task Force in the framework of the 2006 UN Global Counter-Terrorism Strategy.<sup>1</sup> The parties to the 1972 Biological and Toxin Weapons Convention (BTWC) held the second political and expert meetings under a 2007–10 inter-sessional programme agreed by the Sixth Review Conference in 2006.<sup>2</sup> The Second Review Conference of the 1993 Chemical Weapons Convention (CWC) was also held in 2008.<sup>3</sup> For the first time the Conference of the States Parties (CSP) to the CWC was unable to agree a final document by consensus.

The United States Department of Justice announced that a scientist working for the US defence establishment was solely responsible for the 2001 anthrax letter attacks. He committed suicide shortly before he was to be arrested and some analysts and former colleagues have questioned whether he was responsible or had acted alone.

<sup>1</sup> The UN Global Counter-Terrorism Strategy and its Plan of Action are contained in UN General Assembly Resolution A/RES/60/288, 8 Sep. 2006, <<http://www.un.org/terrorism/>>.

<sup>2</sup> For a summary and other details of the Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on Their Destruction see annex A in this volume.

<sup>3</sup> For a summary and other details of the Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on Their Destruction see annex A in this volume. A conference is held every 5 years to review the operation of the CWC.

Section II of this chapter considers the implementation of the BTWC, while developments under the CWC, including the Second CWC Review Conference and the 13th CSP, are described in section III. Section IV provides an overview of CBW allegations and related activities. Section V describes CBW prevention, response and remediation developments, including the anthrax letter investigation. Section VI presents the conclusions.

## II. Biological weapon control and disarmament

As of 31 December 2008, 163 states were parties to the BTWC.<sup>4</sup> In 2006 the Sixth Review Conference to the BTWC agreed an inter-sessional process for 2007–10 which consists of four meetings to be held in that period to ‘discuss, and promote common understanding and effective action’ on four areas.<sup>5</sup> Two of these inter-sessional meetings were held in 2008: the Meeting of Experts, on 18–22 August, and the Meeting of States Parties, on 1–5 December.<sup>6</sup> They considered: (a) national, regional and international measures to improve bio-safety and bio-security, including laboratory safety and security of pathogens and toxins; and (b) oversight, education, awareness raising, and adoption or development of codes of conduct. The latter group of measures aims to prevent misuse in the context of advances in bioscience and biotechnology research that have the potential to be used for purposes prohibited by the convention.<sup>7</sup> The Meeting of States Parties exchanged information and views and supported the continued development of synergies in efforts to introduce and strengthen bio-safety and bio-security measures.<sup>8</sup>

<sup>4</sup> The Cook Islands, Madagascar, the United Arab Emirates and Zambia became parties to the BTWC in 2008. The states that had signed but not ratified the BTWC were Burundi, Central African Republic, Côte d’Ivoire, Egypt, Guyana, Haiti, Liberia, Malawi, Myanmar, Nepal, Somalia, Syria and Tanzania. The states that had neither signed nor ratified the convention were Angola, Cameroon, Chad, Comoros, Djibouti, Eritrea, Guinea, Kiribati, Marshall Islands, Mauritania, Micronesia, Mozambique, Namibia, Nauru, Niue, Samoa and Tuvalu.

<sup>5</sup> On the Sixth Review Conference see Hart, J. and Kuhlau, F., ‘Chemical and biological weapon developments and arms control’, *SIPRI Yearbook 2007: Armaments, Disarmament and International Security* (Oxford University Press: Oxford, 2007), pp. 578–83.

<sup>6</sup> The BioWeapons Prevention Project (BWPP) in cooperation with the Verification Research, Training and Information Centre (VERTIC) produced daily briefing papers on the work of the meetings. See <<http://www.bwpp.org/>>; and <<http://www.vertic.org>>. See also United Nations Office at Geneva, <<http://www.unog.ch/bwc>>; and the ‘Biological and Toxin Weapons Convention’ website <<http://www.opbw.org>>.

<sup>7</sup> Sixth BTWC Review Conference, ‘Final document’, document BWC/CONF.VI/6, Dec. 2006, p. 21.

<sup>8</sup> E.g. Statement by H. E. Mr. Ali Reza Moaiyeri, Ambassador and Permanent Representative of the Islamic Republic of Iran before the Meeting of the States Parties to the Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons (BTWC), Geneva, 1 Dec. 2008, p. 3.

The Implementation Support Unit (ISU), a temporary three-person body located at the UN Office at Geneva, created compendiums of national approaches to bio-safety and bio-security and of national approaches to oversight of science, education and awareness raising.<sup>9</sup> The ISU also continued work on a BTWC National Implementation Database and prepared background papers on bio-safety and bio-security, developments in codes of conduct since 2005, education outreach and awareness raising, and oversight in science.<sup>10</sup>

The final report of the Meeting of Experts, which later served as a basis for agreeing the final report of the Meeting of States Parties, reproduces the meeting's mandate, structure and participants. A list of official documents and a synthesis of lessons, recommendations and the like was annexed to the report, which supports the mandate of the 2008 meetings.<sup>11</sup> The report of the Meeting of States Parties notably provides a definition of bio-security and bio-safety in the context of the BTWC.<sup>12</sup>

### III. Chemical weapon control and disarmament

As of 31 December 2008, 185 states were parties to the CWC, the principal international legal instrument against chemical warfare; a further 4 states had signed but not ratified it; while 6 states had neither signed nor ratified the convention.<sup>13</sup> Guinea-Bissau, the Republic of the Congo and Lebanon became parties to the convention in 2008, and Iraq acceded to the CWC in January 2009. The Director-General of the Organisation for the Prohibition of Chemical Weapons (OPCW) stated that there are strong indications that the Bahamas and the Dominican Republic will join the CWC in

<sup>9</sup> See United Nations Office at Geneva, 'BWC compendium of national approaches to biosafety & biosecurity' and 'BWC compendium of national approaches to oversight of science, education and awareness raising', available at <<http://www.unog.ch/bwc>>.

<sup>10</sup> See UN Office at Geneva, 'BWC national implementation database' and 'Disarmament, meetings and documents' available at <<http://www.unog.ch/bwc>>.

<sup>11</sup> BTWC Meeting of States Parties, 'Report of the Meeting of Experts', document BWC/MSP/2008/MX/3, 8 Sep. 2008. See also BTWC Meeting of States Parties, 'Synthesis of considerations, lessons, perspectives, recommendations, conclusions and proposals drawn from the presentations, statements, working papers and interventions on the topics under discussion at the Meeting of Experts', document BWC/MSP/2008L.1, 31 Oct. 2008.

<sup>12</sup> The definitions are partly based on those agreed at the laboratory level by the World Health Organization. The Meeting of States Parties agreed that bio-safety in the BTWC context refers to 'the principles, technologies, practices and measures implemented to prevent the accidental release of, or unintentional exposure to, biological agents and toxins'. It also agreed that bio-security in the BTWC context refers to 'the protection, control and accountability measures implemented to prevent the loss, theft, misuse, diversion or intentional release of biological agents and toxins and related resources as well as unauthorized access to, retention or transfer of such material'. BTWC Meeting of States Parties, 'Report of the Meeting of States Parties', document BWC/MSP/2008/5, 12 Dec. 2008, pp. 4–5, para. 20.

<sup>13</sup> The states that have signed but not ratified the CWC are Bahamas, Dominican Republic, Israel and Myanmar. The states that have neither signed nor ratified the CWC are Angola, Egypt, Iraq, North Korea, Somalia and Syria.

the near future, while Egypt and Israel have agreed to host technical visits headed by the OPCW Technical Secretariat's Legal Advisor in 2009 in order to update them on the work of the OPCW and 'to elaborate on any matters of their interest relevant to the Convention' (i.e. achieving universality).<sup>14</sup> Only Myanmar and North Korea have not responded to letters from the OPCW's Director-General to their foreign ministries requesting contact to discuss accession to the CWC.<sup>15</sup> As in previous years, Iraq and Israel sent observers to the 2008 CSP.

The OPCW also continued efforts to encourage the full and comprehensive implementation of the national implementation measures of the CWC.<sup>16</sup> As of September 2008, 177 parties (96 per cent) had established or designated a national authority; 126 parties (68 per cent) had reported to the Technical Secretariat the adoption of legislative and administrative measures to implement the CWC; and 82 parties (45 per cent) had adopted and reported on national legislation covering all key areas required by the CWC.<sup>17</sup>

## The Second Review Conference

The Second Review Conference of the CWC was held on 7–18 April 2008.<sup>18</sup> The final report contains politically supportive text on the various CWC implementation issues, including chemical weapon destruction, industry verification, universality and effective implementation. The delegations considered the possibility of chemical weapon destruction deadlines not being met; industry verification; national implementation; and the relationships between non-proliferation and international cooperation and chemical terrorism, including whether the final report should refer to UN Security Council Resolution 1540.<sup>19</sup> As chemical weapon stockpiles are destroyed the relevance of verification of non-production of chemical weapons has gained greater prominence as reflected by the increased use of the term

<sup>14</sup> This is understood to include discussion of possible accession by these countries. The Iraqi law on accession to the CWC was published in the *Official Gazette of Iraq* on 29 Sep. 2008 and the Dominican Republic's parliament has apparently approved the bill ratifying the CWC. OPCW, 'Opening statement by the Director-General to the Conference of the States Parties at its thirteenth session', document C-13/DG.9, 2 Dec. 2008, p. 14, paras 85–86, 88.

<sup>15</sup> OPCW (note 14), p. 14, para. 90. See also OPCW, 'Note by the Director-General, annual report on the implementation of the action plan for the universality of the Chemical Weapons Convention during the period from 3 September 2007 to 25 September 2008', document C-13/DG.5, 29 Sep. 2008.

<sup>16</sup> CWC (note 3), Article VII.

<sup>17</sup> OPCW, 'Note by the Director-General, report to the Conference of the States Parties at its thirteenth session on the status of implementation of Article VII of the Chemical Weapons Convention as at 15 September 2008', document C-13/DG.6, 11 Nov. 2008, p. 7. Figures from prior years are given in the CBW chapters in previous editions of the SIPRI Yearbook.

<sup>18</sup> *CBW Events* produced daily briefing papers on the work of the review conference. See the *CBW Events* website, <<http://www.cbw-events.org.uk/cwc-rep.html>>.

<sup>19</sup> UN Security Council Resolution 1540, 28 Apr. 2004.

non-proliferation. The final report 'noted with satisfaction' that the OPCW has established an effective verification system 'with a view to achieving the non-proliferation and confidence-building aims' of the CWC.<sup>20</sup>

The conference began by considering a draft report by the chairman, Lyn Parker, (the 'Parker text') with no bracketed text that had been prepared by the OPCW Open-Ended Working Group for the Preparation of the Second Review Conference.<sup>21</sup> It took into account, among other things, the results of the work of the OPCW Academic Forum 2007, the OPCW Industry Protection Forum 2007 and a report by the OPCW Scientific Advisory Board.<sup>22</sup> Some delegations felt that a draft text with no brackets implied no work was expected of them except to approve it. Some also felt that the Parker text did not reflect their national positions and that they had not been actively involved in its drafting. Partly as a result of this dissatisfaction, the Non-Aligned Movement (NAM) and China group tabled a modified version of the Parker text that included numerous brackets.<sup>23</sup> On 17 April a group of approximately 20 delegations, known as the 'other meeting', met in parallel to the Committee of the Whole in an attempt to reach agreement on removing the remaining bracketed text. That meeting generated ill feeling among many of the delegations meeting in the Committee of the Whole, who felt excluded.<sup>24</sup>

Switzerland proposed text on incapacitants,<sup>25</sup> while Iran, without specifying which states it had in mind, stated: 'We deplore the recent use of such non-lethal weapons as means of warfare and stress that the States Parties have the obligation not to resort to these weapons for military purposes.'<sup>26</sup> The conference was unable to agree whether to include the word 'incapacitant' (or an equivalent term) in its final document. Some partici-

<sup>20</sup> OPCW, 'Report of the Second Special Session of the Conference of the States Parties to Review the Operation of the Chemical Weapons Convention (Second Review Conference)', document RC-2/4, 7-18 Apr. 2008, p. 6, para. 9.5.

<sup>21</sup> Brackets are used around text that has yet to be agreed.

<sup>22</sup> OPCW Academic Forum, <<http://www.opcwacademicforum.org>>; OPCW Industry Protection Forum, <<http://opcwipf.org>>; OPCW, 'Note by the Technical Secretariat, review of the operation of the Chemical Weapons Convention since the First Review Conference', document RC-2/S/1, 31 Mar. 2008; and OPCW, 'Note by the Director-General, report of the Scientific Advisory Board on developments in science and technology', document RC-2/DG.1, 28 Feb. 2008.

<sup>23</sup> Guthrie, R., 'The Second Chemical Weapons Convention Review Conference', *CBW Conventions Bulletin*, no. 79 (June 2008), pp. 1-5. For a list of members of the NAM see annex B in this volume.

<sup>24</sup> Guthrie (note 23).

<sup>25</sup> Swiss delegation to the OPCW, 'Switzerland: riot control agents and incapacitating agents under the Chemical Weapons Convention', document RC-2/NAT.12, 9 Apr. 2008. At the 13th CSP Switzerland stated that 'a debate on incapacitating agents' would be 'useful'. Swiss delegation to the OPCW, 'Statement by Ambassador Dominik M. Alder, Permanent Representative of Switzerland to the OPCW, general debate', The Hague, 2 Dec. 2008.

<sup>26</sup> Iranian delegation to the OPCW, 'Statement by H. E. Bozorgmehr Ziaran, Ambassador and Permanent Representative of the Islamic Republic of Iran to the OPCW before the Second Special Session of the Conference of the States Parties to Review the Operation of the Chemical Weapons Convention (the Second Review Conference of the CWC)', The Hague, 7-18 Apr. 2008, p. 7.

pants supported including text on scientific developments for the production of 'chemicals that can cause death, temporary incapacitation or permanent harm to humans or animals' and their possible impact on the CWC in the final document.<sup>27</sup> The underlying concern of some delegations and analysts is that parties might elect to develop biochemical agents for prohibited purposes, but ostensibly for domestic or other law enforcement. Agents for other, non-domestic law enforcement purposes do not have to be declared and are not subject to routine CWC verification. The conference report reaffirmed the understanding of the parties that riot control agents may not be used as a method of warfare.<sup>28</sup>

### The Conference of the States Parties

The 13th CSP to the CWC met on 2–5 December and, for the first time, was unable to agree a final document due to a series of developments on the final day involving the delegation of Iran. The chairman of the CSP issued a report under the terms of the general powers of the presiding officer (rule 50 of the CSP rules of procedure) in which all paragraphs of the report were approved by all delegations present at the CSP with the exception of subitem 9(c) ('Progress made in meeting the revised deadlines for the destruction of chemical weapons').<sup>29</sup> Thus, all other paragraphs have the force of CSP decisions. The difficulties in agreeing the final report were connected to: (a) agreeing language on the issues related to Article VII (national implementation measures) and Article XI (economic and technological development);<sup>30</sup> (b) consideration of which OPCW bodies are

<sup>27</sup> E.g. Pakistan later stated 'unfortunately the important question of incapacitating agents was suppressed'. Pakistani delegation to the OPCW, 'Statement by Ambassador Arif Ayub, Permanent Representative of Pakistan to the OPCW', Statement to the 13th CSP to the CWC, The Hague, 2–5 Dec. 2008, p. 4.

<sup>28</sup> OPCW, 'Report of the Second Special Session of the Conference of the States Parties to review the operation of the Chemical Weapons Convention (Second Review Conference), 7–18 April 2008', document RC-2/4, 18 Apr. 2008, p. 5, para. 9.2. For background see Sutherland, R. G., *Chemical and Biochemical Non-Lethal Weapons: Political and Technical Aspects*, SIPRI Policy Paper no. 23 (SIPRI: Stockholm, Nov. 2008).

<sup>29</sup> Subitem 9(c) reads: '9.6 Pursuant to a decision by the Conference at its Eleventh Session (paragraph 9.12(b) of C-11/5, dated 8 December 2006), the Conference considered and noted a status report by the Director-General on the progress made by those States Parties that have been granted extensions of deadlines for the destruction of their Category 1 chemical weapons (C-13/DG.7Rev.1, dated 28 November 2008). 9.7 Several proposals were made to complement the text of paragraph 9.6. None met the consensus. Under these circumstances a decision was taken not to include any of these proposals in the text of the report. After the adoption of paragraph 9.6 a proposal was made that the issue be reopened. This proposal was not supported by the Conference.' OPCW, 'Chairperson's report on the proceedings of the Conference of the States Parties at its Thirteenth Session, 2–5 December 2008', document C-13/5, 5 Dec. 2008, pp. 5–6.

<sup>30</sup> In past years there had been support among some delegations, including in the NAM, for agreeing an action plan on Article XI. However, there had been little discussion on what such a plan should include. Some parties have periodically expressed concern that the implementation of chemical transfer regulations impedes the economic development of chemistry for peaceful purposes,

policymaking organs and the extent to which some bodies should be permitted to reach common understanding in such areas as number and type of inspections; and (c) language tabled late on the final day of the conference by Iran that anticipated non-compliance by the USA in meeting its chemical weapon destruction deadline. The other parties were not willing to support language that anticipated non-compliance with the CWC.<sup>31</sup>

The Executive Council met in parallel to finalize the OPCW programme for 2009 and a budget of €74 499 600 (\$93 million), which the CSP subsequently approved.<sup>32</sup> The conference requested the Technical Secretariat to continue to provide, on request, technical assistance in a ‘tailor-made and systematic manner’ to meet the needs of the parties in order to address their practical national implementation issues and concerns and encouraged the members to continue to offer implementation assistance, including by providing expertise as part of national offers.<sup>33</sup>

### **Destruction of chemical weapons**

As of 30 November 2008, of approximately 71 328 agent tonnes of chemical weapons that have been declared by the CWC parties, about 30 130 agent tonnes had been verifiably destroyed; of approximately 8.67 million declared items, about 3.1 million munitions and containers had been destroyed. As of the same date, 12 states had declared 65 chemical weapon production facilities (CWPFs) of which 42 have been destroyed and 19 converted to peaceful purposes.<sup>34</sup> One CWPF in India will be destroyed once its temporary use as a chemical weapon destruction facility (CWDF) has been completed. A CWPF in Russia and two in Libya have not yet been fully converted to non-prohibited peaceful purposes.<sup>35</sup>

The states that have declared chemical weapon stockpiles to the OPCW are Albania, India, South Korea, Libya, Russia and the USA. On 10 July 2008 South Korea became the second chemical weapon possessor state to

while others point to the importance of effectively implementing the CWC provisions that prohibit the use of dual-purpose chemicals for chemical warfare purposes.

<sup>31</sup> For a fuller consideration of the CSP see Hart, J., ‘The 13th Conference of the States Parties to the Chemical Weapons Convention: background and results’, *ASA Newsletter*, no. 130 (20 Feb. 2009), pp. 1, 10–11.

<sup>32</sup> The sum of €37 156 900 (\$46 million) is dedicated for verification costs. OPCW, ‘Decision, programme and budget of the OPCW for 2009’, document C-13/DEC.5, 5 Dec. 2008. The principal difficulty in approving the budget was reaching a decision on how many inspections of ‘other chemical production facilities’ (OCPF) the OPCW should carry out. The final agreement was to include 1 extra inspection of a Schedule 3 plant site and 7 extra OCPF inspections.

<sup>33</sup> OPCW, ‘Decision on the implementation of Article VII obligations’, document C-13/DEC.7, 5 Dec. 2008.

<sup>34</sup> The 12 states are Bosnia and Herzegovina, China, France, India, Iran, Japan, South Korea, Libya, Russia, Serbia, the United Kingdom and the USA.

<sup>35</sup> OPCW (note 14), p. 4, para. 25.



complete the destruction of its stockpile.<sup>36</sup> As of 31 October 2008 the OPCW had verified the destruction of 97 per cent of India's Category 1 chemical weapons.<sup>37</sup> India, which is obliged to destroy its chemical weapon stockpile by 28 April 2009, had already completed the destruction of its Category 2 and 3 chemical weapons.<sup>38</sup> Libya had not started destroying its Category 1 chemical weapons. However, it had destroyed all of its Category 3 chemical weapons, including 3563 unfilled bombs, and 39 per cent of its Category 2 chemical weapons.<sup>39</sup> Libya will operate a CWDF at Rabta that will receive further chemical warfare agents and their precursors from a chemical reloading facility at Ruwagha.<sup>40</sup> The Russian chemical weapon stockpile is stored at six locations.<sup>41</sup> On 2 September 2008 destruction operations started at Leonidovka, while destruction operations continued at Kambarka and Maradykovsky. On 12 September Russia issued a revised destruction plan.<sup>42</sup> Russia has destroyed all of its Category 2 and 3 chemical weapons and, as of 2 December 2008, the OPCW had verified the destruction of 11 942 tonnes (30 per cent) of its Category 1 chemical weapons.<sup>43</sup>

<sup>36</sup> Albania was the first to complete the destruction of its chemical weapon stockpile on 4 July 2007. South Korea's name does not appear in official published OPCW documentation because it has requested that it not be formally identified by the organization as having chemical weapons. OPCW, 'Note by the Director-General, status report on the progress made by those states parties that have been granted extensions of deadlines for the destruction of their Category 1 chemical weapons', document C-13/DG.7, 14 Nov. 2008, p. 2, para. 8. For further information on chemical weapon stockpiles (e.g. cost, type and quantity) see CBW chapters in previous editions of the SIPRI Yearbook.

<sup>37</sup> The CWC places chemical weapons in 3 categories. Category 1 chemical weapons are defined as those based on chemicals appearing in Schedule 1 of the CWC's Annex on Chemicals and their parts and components (toxic chemicals and their precursors appearing in Schedule 1 are judged to pose the highest risk to the object and purpose of the CWC). Category 2 chemical weapons are those weapons based on all other chemicals and their parts and components. Category 3 chemical weapons consist of unfilled munitions and devices, and equipment specifically designed for use directly in connect with the employment of chemical weapons.

<sup>38</sup> India's remaining chemical weapons essentially consist of solidified sulphur mustard 'heels' inside bulk storage containers. OPCW (note 36), p. 3, paras 11–13.

<sup>39</sup> OPCW (note 36), p. 3, paras 14–17. See also Hart, J. and Kile, S. N., 'Libya's renunciation of NBC weapons and longer-range missile programmes', *SIPRI Yearbook 2005: Armaments, Disarmament and International Security* (Oxford University Press: Oxford, 2005), pp. 629–48.

<sup>40</sup> Pakistani delegation to the OPCW (note 27), p. 4, para. 24.

<sup>41</sup> The locations are Kambarka, Udmurtia Republic; Kizner, Udmurtia Republic; Maradikovsky, Kirov oblast; Pochev, Bryansk oblast; Leonidovka, Penza oblast; and Shchuchye, Kurgan oblast. For background on Russian chemical weapon destruction see [Destruction of chemical weapons in the R[ussian] F[ederation]], *Rossiiskaya Gazeta*, <<http://www.rg.ru/ximiya.html>>; the chemical disarmament journal *Khimicheskoe Razoruzhenie: Otkrytye Elektronny Zhurnal*, <<http://www.chemicaldisarmament.ru/>>; and Mirzayanov, V. S.. *State Secrets: An Insider's Chronicle of the Russian Chemical Weapons Program* (Outskirts Press: Denver, CO, Jan. 2009).

<sup>42</sup> Russian Government, decision no. 679, 12 Sep. 2008, <<http://www.chemicaldisarmament.ru/article/2/1367.html>>.

<sup>43</sup> Some observers believe this percentage to be too high. This is partly because of differences of opinion regarding the endpoint of destruction, such as whether a single-stage hydrolysis is sufficient to meet the CWC's requirement that destruction be 'essentially irreversible', and agreeing sampling and analysis protocols to ensure that the destruction efficiency percentage is 99.99% or higher. Russia has begun adding reagents directly into several million artillery shells and there has been some discussion on how to optimize sample taking from bulk storage containers in order to confirm



Russia has covered 84 per cent of the cost of the destruction of its stockpile.<sup>44</sup> As of 10 December 2008 the USA had destroyed 58 per cent of its stockpiled chemical weapons, stored at four locations.<sup>45</sup> In 2008 destruction operations at Newport, Indiana, were completed. The USA has completed the destruction of its Category 3 chemical weapons and has not declared any Category 2 chemical weapons.

*Old, abandoned and sea-dumped chemical weapons*

As of December 2008 three countries had declared that abandoned chemical weapons (ACWs) were present on their territories, and 13 countries had declared that they possessed old chemical weapons (OCWs).<sup>46</sup> OCWs continue to be recovered periodically and in 2008 the OPCW received declarations or notifications of OCWs from seven parties.<sup>47</sup>

China and Japan continued to prepare to destroy chemical weapons abandoned by Japan during World War II at Nanjing, China, and preliminary preparations have been carried out for the construction of a fixed (i.e. not mobile) CWDF at Haerbaling in north-east China. Approximately 45 000 ACWs have been recovered and stored in various locations in China. Bidding for the construction of a mobile destruction facility for use at Nanjing began on 14 November, and Japan expects destruction operations using mobile CWDFs at this location to begin by early 2010.<sup>48</sup>

destruction efficiency. Reagent must be evenly distributed within the storage tanks and further reagent added as necessary to maintain the reaction in the desired direction. OPCW (note 14), p. 3, para. 20.

<sup>44</sup> Russian delegation to the OPCW, 'Statement by Mr. Grigory A. Rapota, Head of the Russian Delegation at the Thirteenth Session of the Conference of the States Parties to the Chemical Weapons Convention', The Hague, 2–5 Dec. 2008, p. 2 (unofficial translation distributed by Russian delegation).

<sup>45</sup> Chemical weapon stockpiles are located at Tooele, UT (75%); Anniston, AL (55%); Umatilla, OR (37%); and Pine Bluff, AR (16%). The numbers in parentheses indicate the percentage of the stockpile that has been destroyed. US Army Chemical Materials Agency, 'Agent destruction status', <<http://www.cma.army.mil/>>.

<sup>46</sup> The countries that have declared ACWs to the OPCW are China, Italy and Panama. The countries that have declared OCWs to the OPCW are Austria, Australia, Belgium, Canada, France, Germany, Italy, Japan, the Marshall Islands, Russia, Slovenia, the UK and the USA. ACWs are defined as chemical weapons that were abandoned by a state after 1 Jan. 1925 on the territory of another state without the latter's permission. CWC (note 3), Article II, para. 6. OCWs are defined as chemical weapons that were produced before 1925 or chemical weapons produced between 1925 and 1946 that have deteriorated to such an extent that they are no longer usable in the manner in which they were designed. CWC (note 3), Article II, para. 5. For information on countries not discussed in this chapter see CBW chapters in previous editions of the SIPRI Yearbooks; and Hart, J., 'Looking back: the continuing legacy of old and abandoned chemical weapons', *Arms Control Today*, vol. 38, no. 2 (Mar. 2008), pp. 55–59.

<sup>47</sup> OPCW (note 14), p. 5, para. 30.

<sup>48</sup> No ACWs have been destroyed. The CWC requires that all recovered ACWs must be destroyed by 29 April 2012. ACWs must be declared to the OPCW within 180 days after recovery. ACWs recovered after 2012 will be destroyed according to annual destruction plans submitted by the parties to the OPCW. Japanese delegation to the OPCW, 'Statement by Mr Masanori Nishi, Director-General, Abandoned Chemical Weapons Office and Deputy Director-General, Minister's Secretariat,

On 31 October 2008 the Modelling of Ecological Risks Related to Sea-Dumped Chemical Weapons (MERCW) project, valued at €2.25 million (\$2.8 million) and funded by the European Community Framework Programme for Research, Technological Development and Demonstration (Sixth Framework Programme), was completed. Its purpose was to study chemical weapon munition dump sites in the Baltic Sea and Skagerrak area in order to assess the environmental risks posed by such weapons to humans and the environment.<sup>49</sup>

Starting in 2010 Nord Stream AG, a German–Russian business consortium, plans to operate a 1200-kilometre gas pipeline, worth an estimated €5 billion (\$6.25 billion), which will link Viborg, Russia, and Greifswald, Germany. The consortium is currently screening the sites over which the pipeline would run to ensure that it does not disturb munition dump sites and sites of historical importance. On 12 December the consortium submitted the German application documents for permission to construct the pipeline along an 81-km segment of the route that passes through the German Exclusive Economic Zone.<sup>50</sup> Concern has been expressed that the detonation of a munition may be sufficient to rupture the pipeline, and it is possible that munitions or munitions-filled ships may be disturbed.

The US Army announced that it would implement a pilot programme to remove conventional, and possibly chemical, munitions dumped in shallow water off the coast of Oahu, the third largest of the Hawaiian Islands, following a comprehensive study of past dumping in the area.<sup>51</sup>

#### IV. Allegations of CBW activities and related developments<sup>52</sup>

In 2008 Israel stated that ‘certain elements’ in the Middle East region ‘continue to acquire and develop WMD [weapons of mass destruction] and the means to delivery them. Moreover, these states regard the use of chemical

Ministry of Foreign Affairs at the Thirteenth Session of the Conference of the States Parties of the OPCW, The Hague, 2 Dec. 2008, p. 4.

<sup>49</sup> The project developed an integrated geophysical, geo- and hydrochemical, hydrographical and hydrobiological site investigation and aimed to model the release, migration and degradation of toxic compounds and their degradation products. See the MERCW website, <<http://mercw.org/>>.

<sup>50</sup> Nord Stream, ‘Application documents for Nord Stream pipeline in Germany submitted’, 12 Dec. 2008, <<http://www.nord-stream.com/>>.

<sup>51</sup> Cole, W., ‘Army taking closer look at ordnance dumps off Oahu: deep-water study off isle’s south coast “most comprehensive” ever’, *Honolulu Advertiser*, 30 Oct. 2008. See also Decarlo, E. H., Cox, E. and Overfield, M., *Ordnance Reef, Wai’ane, Hawaii: Remote Sensing Survey and Sampling at a Discarded Military Munitions Sea Disposal Site* (National Oceanic and Atmospheric Administration: Silver Springs, MD, Mar. 2007).

<sup>52</sup> For information about states not mentioned see previous editions of the SIPRI Yearbook.

weapons as a viable option and rely on its possible use in conflict situations with alarming lightness'.<sup>53</sup>

The US Director of National Intelligence, Mike McConnell, stated:

We assess that Tehran maintains dual-use facilities intended to produce CW agent in times of need and conducts research that may have offensive applications. We assess that Iran maintains a capability to weaponize CW agents in a variety of delivery systems. We assess that Iran has previously conducted offensive BW agent research and development. Iran continues to seek dual-use technologies that could be used for biological warfare.<sup>54</sup>

In July 2008 Midhat Mursi al-Sayid Umar (also known as Abu Khabab al-Masri), an Egyptian characterized as one of al-Qaeda's 'leading experts in the quest' for chemical and biological weapons, was killed by a US air-strike in Pakistan's Federally Administered Tribal Areas.<sup>55</sup>

The US Director of National Intelligence stated that al-Qaeda affiliates would continue to try to acquire chemical, biological, radiological and nuclear (CBRN) material and that some chemical and biological material and crude weapon designs are 'easily accessible'.<sup>56</sup> McConnell also warned that:

A virulent virus from . . . an emerging pandemic also has the potential to be used as a weapon by a terrorist group or a technically experienced lone actor . . . While we do not currently see this level of technical sophistication in terrorist groups—isolating a virulent strain is difficult—the possibility cannot be ruled out; therefore, we will continue to use our intelligence resources to try to help detect any such preparations to use a virus as a terrorist weapon.<sup>57</sup>

Partly through the implementation of the UK's Academic Technology Approval Scheme (ATAS), the British Security Service (MI5) reportedly 'intercepted up to 100 potential terrorists' posing as postgraduate students, including from Iran and Pakistan, who apparently attempted to acquire entry to laboratories in the United Kingdom in order to gain access to material and expertise to develop CBRN weapons.<sup>58</sup> MI5 has stated that the

<sup>53</sup> Israeli observer delegation to the OPCW, 'Statement by Ms Tamar Rahamimoff-Honig, Deputy Director Arms Control Department, Ministry of Foreign Affairs, Jerusalem, Israel, Statement to the 13th CSP to the CWC', The Hague, 3 Dec. 2008.

<sup>54</sup> McConnell, J. M., *Annual Threat Assessment of the Director of National Intelligence for the Senate Select Committee on Intelligence*, Washington, DC, 5 Feb. 2008, <<http://intelligence.senate.gov/080205/mcconnell.pdf>>, p. 14.

<sup>55</sup> Commission on the Prevention of Weapons of Mass Destruction Proliferation and Terrorism, *World at Risk* (Vintage Books: New York, 2008), p. 4; and 'Dogged pursuit', *The Economist*, 2–8 Aug. 2008, p. 58.

<sup>56</sup> McConnell (note 54), p. 7.

<sup>57</sup> McConnell (note 54), pp. 44–45.

<sup>58</sup> Townsend, M., 'Terrorists try to infiltrate UK's top labs', *The Observer*, 2 Nov. 2008; and British Foreign and Commonwealth Office, 'Academic Technology Approval Scheme (ATAS)', <<http://www.fco.gov.uk/en/fco-in-action/counter-terrorism/weapons/atas/>>. ATAS requires non-

UK is monitoring approximately 2000 individuals who are planning about 30 acts of terrorism at any given time.<sup>59</sup> One group apparently considered the idea of using a dirty bomb. It is reasonable to suppose that a small fraction of such individuals are seriously planning or capable of using chemical or biological material, while most are probably planning to use explosives or firearms.<sup>60</sup>

In February a man was hospitalized in Las Vegas, Nevada, USA, after being exposed to ricin. Investigators subsequently learned that he had been attempting to extract ricin from castor beans in a hotel room using an 'anarchist cookbook' with no evident intent to use the ricin as a weapon. In August he pled guilty to one count of violating the US Criminal Code prohibiting the possession of a biological toxin and two firearms violations.<sup>61</sup>

British criminal investigators travelled to Bulgaria to seek further information about the 1978 killing of a dissident Bulgarian writer, Georgi Markov, in London. They requested access to archives and permission to interview approximately 40 witnesses.<sup>62</sup>

Scientific evidence was published in 2008 that demonstrates a causal linkage between a variety of ill health effects that have been reported among veterans of the 1991 Gulf War and have been attributed to factors associated with the campaign.<sup>63</sup>

EU citizens to be screened by the FCO's Counter-Proliferation Department in order to study certain scientific disciplines at postgraduate level in the UK.

<sup>59</sup> National Terror Alert Response Center, 'UK is monitoring 30 terror cells and 2000 suspects', 16 July 2007, <<http://www.nationalterroralert.com/updates/2007/07/16/uk-monitoring-30-terror-cells-2000-suspects/>>. See also chapter 12, section II, in this volume.

<sup>60</sup> Norton-Taylor, R., 'Opening up, but not lifting the lid', *The Guardian*, 7 Jan. 2009.

<sup>61</sup> US Code, Title 18, Crimes and criminal procedure, Part I, Crimes, Chapter 10, Biological weapons, Section 175, Prohibitions with respect to biological weapons, para. (b). See also *United States of America vs Roger von Bergendorff*, US District Court, District of Nevada, Criminal complaint no. 2:08-mj-00246-PAL, 15 Apr. 2008; and US Department of Justice, 'Man who illegally possessed ricin and unregistered firearm silencers in Las Vegas hotel room pleads guilty', News release, 4 Aug. 2008, <<http://www.usdoj.gov/usao/nv/press/aug2008/vonbergendorff08042008.htm>>. For background on ricin and previous bio-incidents involving the toxin see James Martin Center for Nonproliferation Studies, 'Special report on ricin', Monterey, CA, 29 Feb. 2008, <[http://cns.miiis.edu/stories/pdfs/080229\\_ricin.pdf](http://cns.miiis.edu/stories/pdfs/080229_ricin.pdf)>. See also Osborne, T. B., Mendel, L. B. and Harris, I. F., 'A study of the proteins of the castor bean, with special reference to the isolation of ricin', *American Journal of Physiology*, vol. 14, no. 3 (1 Sep. 1905), pp. 259-86.

<sup>62</sup> The killing occurred when a passer-by jabbed Markov in the leg with an umbrella which was apparently used to inject a 1.52-millimetre metal pellet into which 2 holes had been drilled and then sealed after being filled with ricin. There is information suggesting that the attack was carried out by the Bulgarian secret services with Soviet technical support. A 2005 report stated that the assassin was a Dane of Italian origin who is still alive. Hamilton, J. and Walker, T., 'Dane named as umbrella killer', *The Times*, 5 June 2005. See also Owen, J., 'Secret documents say Markov's killer was given a medal', *The Independent*, 7 Sep. 2008.

<sup>63</sup> The report concludes that such illnesses among the 697 000 US veterans who participated in the war do occur and display multiple concurrent symptoms, including persistent difficulty with concentration and memory, widespread and chronic pain, and gastrointestinal problems. It also concludes that 'evidence strongly indicates' the use of pyridostigmine bromide pills and exposure to pesticides are 'causally associated' with so-called Gulf War Illness, that US veterans suffer statistically higher rates of amyotrophic lateral sclerosis (also known as Lou Gehrig's disease) than those

## V. CBW prevention, response and remediation

At the international level the variety and overlap of efforts to prevent the misuse of chemical and biological material are reflected in the types of activity and the wide variety of actors involved in implementing the BTWC, the CWC, UN Security Council Resolution 1540 and the UN Global Counter-Terrorism Strategy.<sup>64</sup> Efforts to prevent such misuse can also be considered in terms of: (a) determining how and what type of information to collect and use, including declarations submitted to the OPCW; (b) providing verification by states that shipments of toxic chemicals and their precursors are used by purchasing bodies for declared purposes in accordance with the provisions of the CWC; and (c) utilizing the procedures and guidelines developed by the World Customs Organization, and by environmental and human health regulatory regimes. The control and oversight of chemical and biological materials are also incorporated under the heading of 'counterterrorism' for measures involving transport security (e.g. port security and air shipping) and those to ensure that the Internet is not misused for terrorist purposes.<sup>65</sup> Although the broad policy guidelines and programmes are generally publicly available, much of the specific detail is classified or made available between states only.

The 2006 UN Global Counter-Terrorism Strategy provides a common strategic framework based on four pillars, measures to: (a) address conditions conducive to the spread of terrorism, (b) prevent and combat terrorism, (c) build the capacities of states to prevent and fight terrorism and to strengthen the UN system in this regard, and (d) ensure the respect of human rights and the rule of law. Twenty-four UN offices, agencies and international organizations, including Interpol, collaborate in the Counter-Terrorism Implementation Task Force. The International Civil Aviation Organization has drafted two treaties that are designed to update an existing aviation security convention by addressing new and emerging threats, including the use of nuclear, biological and chemical (NBC) substances.<sup>66</sup>

On 25 April 2008 the UN Security Council unanimously passed Resolution 1810 which extended the temporary committee established under

who have fought in other wars and that veterans 'potentially exposed to nerve agents' have died from brain cancer at elevated rates. Research Advisory Committee on Gulf War Veteran's Illnesses, *Gulf War Illness and the Health of Gulf War Veterans: Scientific Findings and Recommendations* (US Government Printing Office: Washington, DC, Nov. 2008), <<http://www1.va.gov/RAC-GWVI/>>, pp. 1-2.

<sup>64</sup> See BTWC (note 2); CWC (note 3); UN Security Council Resolution 1540 (note 19); and UN Global Counter-Terrorism Strategy (note 1).

<sup>65</sup> See e.g. Tucker, J., *Trafficking Networks for Chemical Weapons Precursors: Lessons from the Iran-Iraq War of the 1980s*, Occasional Paper no. 3 (James Martin Center for Nonproliferation Studies: Monterey, CA, Nov. 2008).

<sup>66</sup> UN General Assembly, 'United Nations Global Counter-Terrorism Strategy: activities of the United Nations system in implementing the Strategy', A/62/898, 7 July 2008, para. 29.

UN Security Council Resolution 1540 (the 1540 Committee) for three years and reaffirmed that the proliferation of NBC weapons and their means of delivery constitutes a continuing threat to international peace and security.<sup>67</sup>

In April 2008 the UN Office for Disarmament Affairs (ODA) started to develop a software platform for the Biological Incident Database, as envisaged under the UN Global Counter-Terrorism Strategy, in order to provide a secure, Internet-based data-entry platform for the reporting of biological incidents. The system was made available to UN member states for pilot-scale testing and evaluation.<sup>68</sup> As part of the Global Counter-Terrorism Strategy, the UN member states and UN system were requested to develop a single comprehensive database on biological incidents which was to be 'complementary' to the planned Interpol Biocrimes Database. The ODA is responsible for developing the Biological Incident Database. In 2008 it made further updates to the roster of experts and laboratories and to the technical appendices of the guidelines and procedures that are available to the UN Secretary-General for investigating alleged CBW use.<sup>69</sup>

The trend towards more comprehensive international reporting and tracking of information on the activities of non-state actors, including within the framework of the Global Counter-Terrorism Strategy, continues. Recommendations have been made that the Financial Action Task Force shut down terrorist financing, that further port and airport security be developed and that the International Maritime Organization should develop a new mandatory long-range tracking and identification system to follow and register ships globally.<sup>70</sup>

Interpol continued to implement its Bioterrorism Prevention Programme which began in 2004 and is scheduled to continue until 2011.<sup>71</sup> In Malaysia in August 2008 Interpol carried out a second International Table-Top Exercise on Preventing Bioterrorism. Interpol is also developing a Bioterrorism Preparedness Curriculum to be used by national police academies and is rotating police officers through its Bioterrorism Prevention

<sup>67</sup> UN Security Council Resolution 1540 (note 19) imposed binding obligations on all states to establish domestic controls to prevent the proliferation of NBC weapons and their means of delivery, including by establishing 'appropriate controls over related materials'. On the 1540 Committee see <<http://www.un.org/sc/1540/>>. See also Scheinman, L. (ed), *Implementing Resolution 1540: The Role of Regional Organizations* (United Nations Institute for Disarmament Research: Geneva, 2008).

<sup>68</sup> UN General Assembly (note 66), para. 35.

<sup>69</sup> UN General Assembly (note 66), para. 36.

<sup>70</sup> UN General Assembly (note 66), paras 31, 34; and Financial Action Task Force, *Proliferation Financing Report* (OECD: Paris, 18 June 2008).

<sup>71</sup> The programme's purpose is to: (a) raise awareness of bioterrorism by law enforcement agencies, (b) promote cooperation between public health and law enforcement agencies, and (c) assist in training police to identify bioterrorism risks.

Unit to promote bioterrorism prevention and response expertise among its members.<sup>72</sup>

### **Research and facility security**

The term 'bio-security' has different meanings for those involved in human, animal or plant health. For example, in the agricultural field, bio-security is generally understood as the protection of plants from invasive species. Within the BTWC context, the term is broadly understood as the maintenance of security and oversight of pathogenic microorganisms and toxins.<sup>73</sup> Given the increasing overlap between chemistry and biology, the term may also be understood to include any biologically active chemicals (i.e. bio-chemicals). Although the definitions vary, there are two main underlying motivations: to ensure the safety of humans, animals and plants (this aspect includes bio-safety and 'laboratory bio-security'); and to prevent the application of biological material for hostile purposes.

On 14 April the European Union (EU) adopted a joint action in support of the World Health Organization (WHO) activities in the area of laboratory bio-safety and bio-security. It provides €2.1 million (\$2.7 million) to be spent over two years on a project to promote bio-risk reduction management through regional and national outreach activities and a project on strengthening the security of laboratory management practices against biological risks.<sup>74</sup>

In 2008 the European Commission completed taking comments on a draft Green Paper on bio-preparedness that it had issued in July 2007.<sup>75</sup> The paper was tabled in order to initiate a process of consultation throughout Europe on how to reduce biological risks and to enhance Europe's bio-preparedness capacity, including proactive measures, emergency management of bio-related events and establishing investigative capabilities. It also posed the question whether sensitive biological research should be published. In April the Commission formed a working group to develop a bio-preparedness strategy, and an initial meeting was held on 15–16 May. The group consists of representatives from the Directorate-General for Justice, Freedom and Security (JLS) and from the EU member states.

<sup>72</sup> Interpol, 'Message to the 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', Geneva, 2 Dec. 2008, available at <<http://www.unog.ch/bwc>>.

<sup>73</sup> See also note 12.

<sup>74</sup> Council Joint Action 2008/307/CFSP of 14 April 2008 in support of the World Health Organization activities in the area of laboratory bio-safety and bio-security in the framework of the European Union Strategy against proliferation of weapons of mass destruction, *Official Journal of the European Union*, L106, 16 Apr. 2008.

<sup>75</sup> European Commission, 'Green Paper on bio-preparedness', Brussels, COM(2007) 399, 11 July 2007, p. 13 (draft).



In 2008 the US National Research Council issued a report on bioterrorism risk assessment by the Department of Homeland Security which concludes that the bioterrorism threat is growing, the USA has ‘little ability to prevent or defeat’ a biological weapon attack and the US response system remains ‘unproven’.<sup>76</sup> On 8 August 2008 the UK’s Cabinet Office issued its first assessment ranking national threats, which concluded that pandemic influenza, rather than CBRN attacks, is the most serious risk to the British public.<sup>77</sup>

Efforts to harmonize bio-safety and bio-security procedures and practices continued, although, for example, standardized certification of training for staff working at high-containment laboratories does not exist, including training that is facility specific. To help address such issues the directors of most North American biosafety level 4 (BSL-4) laboratories met in 2008 and agreed a framework for training of research and laboratory staff on, among other things, bio-containment principles.<sup>78</sup>

Russia approved the ‘National system of chemical and biological security of the Russian Federation (2009–2013)’ in October 2008. Under the direction of the Ministry of Health and Social Development and with the participation of the Ministry of Defence, the programme aims to minimize threats posed to public health from hazardous chemical and biological facilities (partly by modernization of their equipment and infrastructure), develop inherently safer technologies, and promote integrated analysis and monitoring of bio-security and chemical security.<sup>79</sup>

### **The 2001 anthrax letter attacks**

The official investigation into the 2001 US anthrax mailings came to a close in 2008. On 27 June the Department of Justice officially exonerated Dr Steven J. Hatfill and paid him \$5.8 million in compensation for damaging his reputation and career after the Department of Justice publicly iden-

<sup>76</sup> National Research Council, *Department of Homeland Security Bioterrorism Risk Assessment: A Call for Change* (National Academies Press: Washington, DC, 2008), p. 2.

<sup>77</sup> Twelve ‘high consequence risks’ are graphically represented according to relative impact and relative likelihood: major transport accidents, major industrial accidents, animal disease, attacks on critical infrastructure, non-conventional attacks using CBRN weapons, inland flooding, coastal flooding, severe weather, electronic attacks, attacks on crowded places, attacks on transport and pandemic influenza. Non-conventional attacks are placed in the centre, while inland flooding is placed directly above non-conventional attacks (i.e. inland flooding has a higher relative impact but equal relative likelihood). Animal disease, and major transport and industrial accidents are deemed less likely to occur than CBRN attacks. British Cabinet Office, *National Risk Register* (Cabinet Office: London, 2008), p. 5.

<sup>78</sup> Le Duc, J. W. et. al, ‘Framework for leadership and training of biosafety level 4 laboratory workers’, *Emerging Infectious Diseases*, vol. 14, no. 11 (Nov. 2008), pp. 1685–88.

<sup>79</sup> Russian Government, [On the Federal Target Programme ‘National system of chemical and biological security of the Russian Federation (2009–2013)’], Decision no. 791, 27 Oct. 2008, <<http://www.government.ru/content/governmentactivity/rfgovernmentdecisions/archive/2008/10/27/>>.

tified him as a 'person of interest'. On 29 July reportedly just before the Department of Justice was to file charges against him, Bruce E. Ivins, a microbiologist with over 28 years of service at the US Army Medical Research Institute for Infectious Diseases (USAMRIID) at Fort Detrick, Maryland, committed suicide.<sup>80</sup> Ivins was a suspect early in the investigations and, on 31 October 2007, the Federal Bureau of Investigation (FBI) and the US Postal Inspection Service filed a probable cause affidavit against him, providing the preliminary circumstantial evidence.<sup>81</sup> That affidavit accuses Ivins of possessing a flask containing anthrax spores having a genetic mutation consistent with that of the letter spores and of not being able to provide a convincing explanation for his working during late hours at the time of the mailings. Ivins also reportedly provided false samples to the investigators to divert suspicion from himself. The FBI later admitted that it had received two sets of samples from Ivins, of which the first in 2002 had not met its standards of evidence and was destroyed. However, a duplicate was retained at a university laboratory participating in the investigation. A motive suggested in the affidavit was Ivins's involvement in a private company, which had lost its Food and Drug Administration approval to produce anthrax vaccines for the US Army.

The FBI's Weapons of Mass Destruction Directorate was established in 1996 to deal with CBRN events, and the FBI Laboratory's Chemical Biological Sciences Unit (CBSU) employs forensic scientists with advanced degrees in NBC fields to develop forensic techniques for investigating biological events.<sup>82</sup> The routine application of microbial forensics was initiated following the creation of the WMD Directorate and was tested after the 2001 anthrax mailings. The first priority for the investigators was to identify the specific strain of anthrax spores that had been used. Initial tests in 2002 identified the anthrax as belonging to the Ames strain by identifying variable number tandem repeats (VNTR) in the genomes—a technique described in a 2000 publication by Paul Keim, a professor at Northern Arizona University.<sup>83</sup> The Ames strain was originally isolated from a cow in Texas in 1981 and is commonly used in laboratories in the

<sup>80</sup> Johnson, C., Leonnig, C. D. and Wiber, D. Q., 'Scientists set to discuss plea bargain in deadly attacks commits suicide', *Washington Post*, 2 Aug. 2008; and Willman, D., 'Apparent suicide in anthrax case', *Los Angeles Times*, 1 Aug. 2008.

<sup>81</sup> US Department of Justice, 'Amerithrax court documents', Application and affidavit for search warrant of residence of Bruce Edwards Ivins, Case no. 07-524-M-01, filed by Postal Inspector Thomas F. Dellafera, US District Court for the District of Columbia, 31 Oct. 2007, <<http://www.usdoj.gov/amerithrax/>>.

<sup>82</sup> See the FBI's 'Weapons of mass destruction' website, <[http://www.fbi.gov/hq/nsb/wmd/wmd\\_home.htm](http://www.fbi.gov/hq/nsb/wmd/wmd_home.htm)>; and the FBI Laboratory's CBSU website, <<http://www.fbi.gov/hq/lab/lab2006/labannual2006.htm>>.

<sup>83</sup> Keim, P. et al., 'Multiple-locus variable-number tandem repeat analysis reveals genetic relationships within *Bacillus anthracis*', *Journal of Bacteriology*, vol. 182, no. 10 (May 2000), pp. 2928–36.

USA and abroad. Investigators coordinated their investigation with bio-defence experts experienced in identifying *Bacillus anthracis* strains, including Keim.

Among the techniques used in analysing the spores were scanning and transmission electron microscopy to view the morphological (i.e. physical) attributes of the spores. Early speculation mentioned the existence of additives in the spores sent to US senators Tom Daschle and Patrick Leahy, which was interpreted as meaning that the spores had been deemed 'weapon-grade'.<sup>84</sup> The FBI used the term 'refined' to describe the quality of the spores.<sup>85</sup> In 2006 Douglas Beecher, a microbiologist in the FBI's Hazardous Materials Response Unit, published a paper stating that the idea of weapon-grade spores having been produced using additives (silica) and sophisticated engineering was a widely circulated misconception.<sup>86</sup> Beecher was criticized by some in the scientific community for not providing evidence for his claims.<sup>87</sup> Other analytical techniques used were: energy-dispersive X-ray analysis for chemical characterization of the samples, carbon dating and isotope ratio analysis by mass spectrometry; and optical emission spectrometry for the identification of impurities of low atomic number elements, such as calcium and magnesium. However, isotopic analyses were inconclusive given the variability of the growth process that resulted in different chemical signatures (i.e. relative ratios of silicon, oxygen, iron, tin and other elements).

A problem following the identification of the spores was the genetic homogeneity of all the Ames strains. The FBI achieved a breakthrough when a laboratory technician, Terry Abshire, observed differences in the morphology of the letter anthrax colonies when grown *in vitro*. The morphological differences were the result of genetic differences and by 2004 five mutations were identified. Genetic sequencing analysis was partially performed by the Institute for Genomic Research (TIGR),<sup>88</sup> and a total of 1072 Ames strain samples from 15 US laboratories and 3 from abroad (in Canada, Sweden and the UK) were collected for the repository established by the FBI at Fort Detrick, Maryland, at the end of 2006. Five unique mutations had been identified from the letter anthrax spores, and four of these were matched to eight of the samples received for the repository—all belonging to a subgroup called RMR-1029. The second sample

<sup>84</sup> Isikoff, M., 'The case still isn't closed', *Newsweek*, 9 Aug. 2008.

<sup>85</sup> Ember, L. R., 'Anthrax sleuthing', *Chemical & Engineering News*, 4 Dec. 2006.

<sup>86</sup> Beecher, D. J., 'Forensic application of microbiological culture analysis to identify mail intentionally contaminated with *Bacillus anthracis* spores', *Applied and Environmental Microbiology*, vol. 72, no. 8 (Aug. 2006), pp. 5304–10.

<sup>87</sup> Beecher was constrained by his position, which did not allow him to reveal information pertinent to an ongoing investigation.

<sup>88</sup> TIGR is a non-profit genomics research institute that was founded in 1992 by Craig Venter. It is now a part of the J. Craig Venter Institute in Rockville, MD.

provided by Ivins did not carry the mutations. However, the original sample that did not meet the FBI standards of evidence and samples from a flask labelled 'RMR-1029' (taken during an FBI search of Ivins's laboratory) matched four of the mutations.

On 6 August 2008 the US Attorney for the District of Columbia, Jeffrey Taylor, presented the evidence against Ivins during an FBI press conference stating: 'We consider Dr Ivins was the sole person responsible for this attack'.<sup>89</sup> Taylor also stated that Ivins alone controlled the anthrax flask labelled RMR-1029, it was 'created and solely maintained' by Ivins and no one else could have had access to it without Ivins's knowledge.<sup>90</sup> Questions continued to be raised whether only Ivins had access to the anthrax preparation.

After the allegations against Ivins were made public, former colleagues and experts expressed doubts about the evidence presented and the conclusions drawn by the FBI. The former chief of bacteriology at USAMRIID, Kenneth Hedlund, stated that Ivins lacked the expertise to weaponize the anthrax used in the 2001 attacks.<sup>91</sup> Ivins's former supervisor, Jeffrey Adamovicz; former USAMRIID division chief, Gerry Andrews; and former UN weapon inspector, Richard O. Spertzel expressed similar views.<sup>92</sup> On 7 August Senator Charles Grassley sent a letter to the US Attorney General, Michael Mukasey, and the FBI Director, Robert Mueller, asking how the government became focused on Ivins alone and how the possibility of additional suspects had been ruled out.<sup>93</sup> Mueller stated on 8 August 2008 that it is erroneous 'to say there were mistakes'.<sup>94</sup>

On 7 August the US Army initiated a 'bio-surety' programme review at USAMRIID.<sup>95</sup> On 16 September Mueller announced that he would seek an independent review by the National Academy of Sciences (NAS) of the scientific work and the evidence gathered by the FBI that led to the

<sup>89</sup> National Public Radio, 'Transcript: D[epartment]O[f]J[ustice] news conference on Bruce Ivins', 6 Aug. 2008, <<http://www.npr.org/templates/story/story.php?storyId=93415845>>.

<sup>90</sup> National Public Radio (note 89).

<sup>91</sup> Abuzzese, S., 'Anthrax suspect's death is dark end for a family man', *New York Times*, 2 Aug. 2008.

<sup>92</sup> Isikoff (note 84); Andrews, G., 'Open questions on a closed case', *New York Times*, 9 Aug. 2008; Spertzel, R., 'Bruce Ivins wasn't the anthrax culprit', *Wall Street Journal*, 5 Aug. 2008; and Warrick, J., Thompson, M. W. and Davis, A. C., 'Scientists question FBI probe on anthrax', *Washington Post*, 3 Aug. 2008.

<sup>93</sup> Grassley, C. E., 'Grassley seeks answers to FBI's Amerithrax investigation', Press release, 7 Aug. 2008, <[http://grassley.senate.gov/news/Article.cfm?customel\\_dataPageID\\_1502=16233](http://grassley.senate.gov/news/Article.cfm?customel_dataPageID_1502=16233)>; and Meyer, J., 'Anthrax investigation should be investigated, congressmen say', *Los Angeles Times*, 8 Aug. 2008.

<sup>94</sup> Broad, W. J. and Shane, S., 'Anthrax case had costs for suspects', *New York Times*, 9 Aug. 2008.

<sup>95</sup> Martin, K. L., "'Biosurety program" review comes after government says Frederick-based microbiologist removed anthrax spores from Fort Detrick', *Gazette.Net*, 14 Aug. 2008, <[http://www.gazette.net/stories/08142008/newmnew185922\\_32457.shtml](http://www.gazette.net/stories/08142008/newmnew185922_32457.shtml)>. US military standards for biological surety are contained in US Department of the Army, *Nuclear and Chemical Weapons and Materiel: Biological Surety*, Army Regulation 50-1 (unclassified) (Department of the Army, Headquarters: Washington, DC, 28 July 2008), <[http://www.army.mil/usapa/epubs/50\\_Series\\_Collection\\_1.html](http://www.army.mil/usapa/epubs/50_Series_Collection_1.html)>.

identification of Ivins as the sole perpetrator of the 2001 anthrax letter mailings.<sup>96</sup> On 16 October Representative Rush Holt, chairman of the House of Representatives' Select Intelligence Oversight Panel, sent a letter to the NAS requesting that it investigate whether the FBI scientific data was 'inconsistent with the FBI's conclusions'.<sup>97</sup>

The anthrax letter attacks prompted costly, wide-ranging bio-preparedness and response programmes and heightened concern about scientific research and bioterrorism.<sup>98</sup> Following the release of the report by the Commission on the Prevention of Weapons of Mass Destruction Proliferation and Terrorism, which considers bioterrorism risks to be a serious continuing threat,<sup>99</sup> Jane Harman, chair of the Homeland Security Subcommittee on Intelligence, Information Sharing and Terrorism Risk Assessment nevertheless cautioned: 'Much in this report . . . is important. However, it's time to retire the fear card. We need to educate and inform the American people, not terrify them with alarming details about possible threats'.<sup>100</sup>

## VI. Conclusions

Preventing the misuse of chemical and biological materials is a complex challenge. Threat scenarios are increasingly more open ended because they routinely include non-state actors, and the materials they may use are more varied than those typically used for a traditional state military programme. Traditional arms control and disarmament verification measures focus on preventing the diversion of militarily significant quantities of a small number of toxic chemicals and their precursors for prohibited purposes. Thus, the BTWC and the CWC were negotiated mainly with a view towards confirming the absence of prohibited state programmes. However, thousands of toxic industrial chemicals and infectious pathogens (some of which have negligible effects) can theoretically be used for hostile purposes. Scientific and technological developments are also increasing the number of biochemical substances and their types of effect (e.g. on physio-

<sup>96</sup> Frieden, T., 'FBI director seeks outside review of anthrax investigation', CNN, 17 Sep. 2008, <<http://edition.cnn.com/2008/POLITICS/09/17/congress.anthrax/index.html>>.

<sup>97</sup> Holt, R., 'Holt requests National Academy of Sciences review of letter on scientific methods used by the FBI during anthrax investigation', 1 Oct. 2008, Press release, <[http://holt.house.gov/press\\_2005-2008/101608.html](http://holt.house.gov/press_2005-2008/101608.html)>.

<sup>98</sup> For background on the development of anthrax as a method of warfare and analysis of the anthrax letter attacks see Pita, R. and Gunaratna, R., [The causative agent of pathogenic anthrax as a biological weapon and its possible use for terrorist attacks: the case of the Amerithrax crisis of 2001], *Athena Intelligence Journal*, vol. 3, no. 3 (2008), pp. 21–55.

<sup>99</sup> Commission on the Prevention of Weapons of Mass Destruction Proliferation and Terrorism (note 55), p. 4.

<sup>100</sup> Office of US Congresswoman Jane Harman, 'Harman comments on Graham–Talent WMD report', Press release, 2 Dec. 2008, <[http://www.house.gov/apps/list/press/ca36\\_harman/12\\_2\\_WMB.shtml](http://www.house.gov/apps/list/press/ca36_harman/12_2_WMB.shtml)>.

logical mechanisms and processes). Therefore the security of chemical and biological material and the licensing and oversight of scientific research are increasingly being considered within a security, including counter-terrorism, context.

The variety and type of actors involved in threat assessments, emergency preparedness and response are large—both in terms of mitigating the effects of their use and preventing individuals and groups from carrying out acts. Risk assessment (quantitative and qualitative), the intention and capability of actors, risk mitigation and post-incident response capacity are also increasingly being assessed. Much of this has been done in a security context which lacks resonance with many states: some states do not feel directly threatened by chemical and biological warfare and have limited resources and different national priorities. This is partly reflected in differences in understanding of the term ‘bio-security’.

CBW prevention strategies include the establishment of effective national implementation, codes of conduct and chemical and pathogen security regulations, and awareness-raising activities. This has been reflected by an increasing number of regional activities, workshops and training workshops where the BTWC and the CWC are viewed as part of the CBW counterterrorism ‘toolbox’. While the conventions are moving closer to achieving universality, some states continue to refuse to join.<sup>101</sup> The increase in membership reflects the increased recent focus on establishing and implementing national legislation to prohibit chemical and biological warfare as a means of raising barriers against CBW terrorism. These efforts have been carried out partly under the auspices of UN Security Council Resolution 1540, various OPCW action plans, EU joint actions, government-to-government contacts, and regional workshops and seminars on effective national implementation of laws prohibiting CBW.

Positive outcomes from the various bio-threat-related initiatives include the focus on laboratory and institutional bio-security and bio-safety, the education of researchers on security issues surrounding the life sciences and the collective will to standardize best practices for bio-security—while acknowledging that no ‘one size fits all’. The increasing awareness in the context of the BTWC and the CWC that facility safety and security procedures are an important part of the prevention of the misuse of the chemistry and life sciences will also move policies in a positive direction. However, achieving absolute security is not possible and uncertainty regarding chemical and biological threats will continue.

<sup>101</sup> See e.g. Feakes, D., ‘Getting down to the hard cases: prospects for CWC universality’, *Arms Control Today*, vol. 38, no. 2 (Mar. 2008), pp. 12–17.

