

# The ASA Review

An interdisciplinary journal on research, development and policy formulation concerning aspects of NBC defense, disarmament and verification, including related areas of emergency and disaster medical treatment, industrial health and safety and environmental management and protection

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(This definitive paper on water dumped CW provides background, discussion and recommendations needed to start solving the many problems associated with a somewhat overlooked but very important area. The paper, originally prepared for the Conference: Chemical munition dump sites in coastal environments, University of Ghent 5/6 July 2001, was revised in mid-September 2001 and provided to the ASA Newsletter for publication.)

## Dealing with Chemical Weapons Dumped in Bodies of Water

by Dr. Jean Pascal Zanders

### Introduction

The Chemical Weapons Convention (CWC) was opened for signature in January 1993 and entered into force in April 1997. One important disarmament aim is the worldwide destruction of all chemical weapons (CW). To this end the CWC contains detailed instructions on how to destroy CW and related production facilities, imposes precise deadlines (including many interim deadlines) for the destruction

requirements. A party to the CWC is prohibited to eliminate its CW stockpile through open-pit burning, land burial or dumping in any body of water. In this way the convention sets environmental standards for the destruction methods. In addition, the latter two methods are also unacceptable on the grounds that the destruction process must be essentially irreversible.

Tonnes of chemical munitions have been disposed of in the seas and other bodies of water across the world after the end of both World Wars. Furthermore, munitions recovered from the former battlefields and even modern CW were sea-dumped. International awareness of the potential ecological consequences of these dumping operations has grown. Moreover, some of these once remote dumping sites are now being disturbed as a result of expanding economic activities, such as fishing, harbour expansions and the laying of deep-water cables and pipelines. The likelihood of human contact with dumped chemical munitions increases accordingly.

The CWC does not ignore the problem of CW dumped in water. However, it does not specifically encourage parties to the convention to remedy such situations. It also recognizes the problem of the haphazard retrieval of such munitions, and therefore it establishes a special framework for declaring and destroying these CW whereby it allows state party discretion over decisions to invoke the destruction obligations.

The paper introduces the concept of chemical weapon under the CWC and describes the different classes of CW and their respective declaration and destruction obligations. It then analyses how the CWC deals with CW dumped at sea and in internal waters and discusses some of the legal issues that may arise if such weapons are recovered. The paper concludes with some recommendations to remove ambiguities surrounding the status of recovered dumped munitions under the CWC.

#### **Chemical weapons in the Chemical Weapons Convention**

One of the central components of the CWC is the destruction of CW and the prevention of future (re)armament with such weapons. The verification regime of the treaty is geared towards these goals. It includes on-site inspections of CW stockpiles and CW destruction facilities by teams of international inspectors of the Technical Secretariat of the Organisation for the Prohibition of Chemical Weapons (OPCW) in The Hague. Inspectors also visit commercial industrial plants and facilities run by government agencies (including the military) that handle chemicals specified in the CWC in order to ascertain that no prohibited activities take place in them. The parties to the CWC must continuously collect information on activities of relevance to the convention occurring on their territory and report such information to the Technical Secretariat. In order to be able to implement this vast undertaking the CWC contains an elaborate definition of CW. This definition does not encompass every type of munition or agent that national military doctrines may have considered to be a means of chemical warfare; the definition serves the objectives of the CWC.<sup>1</sup> Article II of the CWC defines CW as follows:

'Chemical Weapons' means the following, together or separately:

- a. Toxic chemicals and their precursors, except where intended for purposes not prohibited under this Convention, as long as the types and quantities are consistent with such purposes;
- b. Munitions and devices, specifically designed to cause death or other harm through the toxic properties of those toxic chemicals specified in subparagraph (a), which would be released as a result of the employment of such munitions and devices;
- c. Any equipment specifically designed for use directly in connection with the employment of munitions and devices specified in subparagraph (b).<sup>2</sup>

Taking the history of chemical warfare into account, the CWC identifies three periods of CW production. The first period ends in 1924 and includes World War I. The second

one runs from 1925 until 1945, the year in which the Axis Powers were defeated in World War II. The third period begins on 1 January 1946 and continues until the present.

Based on these time delimitations Article II specifies two subcategories in addition to CW, namely 'old chemical weapons' (OCW) and 'abandoned chemical weapons' (ACW). There are two classes of OCW, namely (a) CW that were produced before 1925,<sup>3</sup> and (b) CW produced in the period between 1925 and 1946 that have deteriorated to such an extent that they can no longer be used as CW.<sup>4</sup>

ACW are CW left behind by one state after 1 January 1925 on the territory of another state without the latter's consent.<sup>5</sup> OCW produced before 1925 can thus never be considered as ACW. Chemical weapons produced between 1925 and 1946 can be ACW; CW produced after 1945 cannot be OCW because of the time specification.

#### **Obligations with respect to the elimination of chemical weapons**

A primary objective of the CWC is the worldwide elimination of CW stockpiles. A key requirement is the essential irreversibility of the destruction process so that the munitions and other devices can no longer be used.<sup>6</sup> The CWC also explicitly prohibits three methods for CW disposal: open-pit burning, dumping in any body of water, and land burial.<sup>7</sup> Ecological considerations obviously played a role in these exclusions. However, the CWC also contains specific provisions for dealing with CW dumped at sea and buried on land before certain dates (see below), which would be purposeless if dumping in water or land burial were permitted ways of CW disposal. In addition, any authorization of sea-dumping would have been in contravention of international environmental and maritime law, notably of the 1972 Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (the so-called London Convention) and the 1982 UN Convention on the Law of the Sea (UNCLOS).<sup>8</sup>

The CWC is primarily concerned about the CW that were produced after 1 January 1946, and the reporting and destruction requirements, and the verification procedures for these munitions (as well as for their production facilities and storage sites) are very detailed.<sup>9</sup> The reporting and destruction requirements for OCW are significantly different.<sup>10</sup> States parties must destroy OCW under the general destruction obligation in Article I of the CWC.<sup>11</sup> OCW manufactured before 1925 are subject to inspection by the Technical Secretariat, upon which they become toxic waste (which exempts them from the CWC definition of CW). The state party in question must destroy or otherwise dispose of this toxic waste in accordance with its national legislation.<sup>12</sup>

The reporting and destruction requirements for OCW produced between 1925 and 1946 are more elaborate as the Technical Secretariat must determine the non-usability of these CW. A state party must to the greatest extent possible submit information to the Technical Secretariat on a level of detail similar to that for CW produced after 1945.<sup>13</sup> If, following one or more inspections, the (cont. p. 18 - CW Sea)

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Technical Secretariat confirms their status based on the non-usability criterion, then the state party will destroy them as OCW, which offers the possibility of a more flexible destruction regime than for CW produced after 1945.<sup>xiv</sup> If, in contrast, the Technical Secretariat cannot confirm their non-usability, then the state party must destroy these CW according to the provisions for CW manufactured after 1945.<sup>xv</sup> It should be noted that the CWC definition of CW consists of three parts, so that the criteria apply to these parts together or separately. This signifies that the condition of non-usability must be determined for each part, as for instance, the agent may have retained much of its toxicity despite corrosion of the shell casing.<sup>xvi</sup> Those parts that do not meet with the non-usability specification must be destroyed in accordance with the CWC provisions for CW manufactured after 1945.

Under the CWC the disposal of ACW is the responsibility of the abandoning state.<sup>xvii</sup> However, the specific destruction requirements for the abandoning state party depend on whether the ACW meet the criteria for OCW or not. These criteria are the production the CW between 1925 and 1945 and the determination of their non-usability. This has two important implications. First, as the concept of ACW applies only to CW manufactured after 1 January 1925 the disposal of chemical munitions recovered from the World War I battlefields and dumps (as toxic waste) is the responsibility of the states that recover them (e.g., Belgium, France and Italy) and not of the countries that manufactured or fired them. Second, ACW produced after 1945 can never be considered as OCW even though their condition may have deteriorated to such an extent that they can no longer be used. They must be destroyed according to the requirements for CW manufactured after 1945. For the abandoning state party, the determination by the Technical Secretariat that ACW are OCW may significantly reduce the cost of verification and destruction.

#### **Chemical weapons dumped at sea or in other bodies of water**

In the last century dumping at sea, in deep lakes and other waters or land burial were fairly common and cheap ways of eliminating CW. Especially after both World Wars the former belligerents applied these methods on a large scale in order to discard huge quantities of chemical munitions from the battlefields, storage sites and production facilities. They were also economic disposal modes for obsolete or deteriorated CW, or chemical munitions recovered from former battlefields.<sup>xviii</sup> However, growing environmental awareness led to doubts concerning the soundness of these disposal methods. The 1958 Convention on the High Seas, which included some provisions regarding marine pollution, proved inadequate.<sup>xix</sup> Sea-dumping, however, first became illegal in a regional setting with the entry into force of the 1972 Convention for the Prevention of Marine Pollution by Dumping From Ships and Aircraft in April 1974.<sup>xx</sup> Although Article 9 permits exceptions in the case of force majeure or extreme emergency, it cannot be invoked lightly.<sup>xxi</sup> A similar global regu-

lation followed with the entry into force of the London Convention in 1975. A protocol to the convention expounds the notion of dumping and after its entry into force it will extend the prohibition to dumping in internal waters.<sup>xxii</sup> UNCLOS, which entered into force in 1994, obliges parties to take measures to prevent, reduce and control pollution of the marine environment by means of, inter alia, dumping.<sup>xxiii</sup> As noted earlier, the CWC totally prohibits such disposal methods (in addition to open-pit burning).

Regarding past CW disposal operations, the CWC distinguishes between CW buried on land and CW dumped at sea. As many states have a legacy of CW disposal, the CWC has created certain exemptions for both categories. While practical considerations guided the formulation of relevant provisions (e.g., incomplete historical records, or the impossibility to recover munitions), the overriding concern is the assurance that all CW remain unusable. Consequently, the specific modalities for land-buried and sea-dumped CW differ.

A party to the CWC is not required to submit national declarations or destroy CW buried on its territory, provided that these weapons were buried on its territory before 1 January 1977 and that they remain buried. The exemption applies to OCW and CW manufactured before 1977.<sup>xxiv</sup> At the First Conference of the States Parties, held on 6–24 May 1997 following the entry into force of the CWC, the term 'territory' was defined as including the land territory and all internal waters of a state party.<sup>xxv</sup> Internal waters include rivers and mouths of rivers, lakes, canals, ports and permanent harbour systems and (under specific conditions) embayments.<sup>xxvi</sup> If CW are thus recovered from such internal waters, they will have to be assessed against the criteria for OCW in order to determine which section of Part IV of the Verification Annex applies. However, the clause 'buried on its territory' indicates that the paragraphs in Articles III and IV of the CWC regarding land-buried CW do not apply to ACW. The declaration and destruction obligations for ACW, which depend on their production dates, remain even in the case that such CW were buried before 1977. As explained in the previous section, the criteria for ACW do not apply to CW manufactured before 1925. Thus, the disposal of World War I CW dumped in the waterways near the frontlines would be the responsibility of the state party that recovers them.

Sea-dumped CW are also the subject of exemptions. States parties are not required to submit declarations or destroy CW that were dumped at sea before 1 January 1985.<sup>xxvii</sup> The term 'sea' is understood to include the high sea, the territorial sea and archipelagic waters of a state party. The border line between the territorial sea and the land territory (with its internal waters) of a state party is determined in accordance with the relevant rules of international maritime law.<sup>xxviii</sup> The territorial sea starts at baseline on the land mass, which in most cases corresponds with the low-water line on the coast or straight lines connecting two base points across estuaries, deeply indented coasts, and so on.<sup>xxix</sup>

Sea-dumped CW fall under a different regime than land-buried ones. The relevant passages in the CWC do not

contain clauses like 'in its territorial sea' or 'which remain dumped'. This has some important consequences. The exemption of declaration and destruction requirements is extended to sea-dumped CW that have been recovered for whatever reason. As an immediate consequence, the time delimitations regarding CW production to distinguish between CW and OCW are without object. Furthermore, sea-dumped CW can never be considered as ACW, even if they were dumped in the territorial sea of another state. The opposite case would have led to legal tangles, as the producer or former possessor of the sea-dumped CW is not necessarily responsible for their disposal at sea. Especially after World War II, the Allied Powers conducted or coordinated the dumping of Axis chemical munitions in the Baltic and Adriatic Seas. If a coastal state wishes to clear a dump site, then under the CWC it is solely responsible for the financial costs and the disposal of the munitions (which might be storage on land, as there are no destruction requirements). A former possessor or a state responsible for the dumping operations may contribute financial and technical assistance on a voluntary basis, but is not obliged to do so under the CWC. Sea-dumped CW may also be destroyed under water. This occurs as part of ordnance-clearing operations at undersea dump sites with mixed high-explosive and toxic munitions. As the CWC remains silent on the destruction of sea-dumped CW, such operations are constrained only by the relevant provisions regarding the preservation of the marine environment under international maritime law and safety considerations for the divers.<sup>xxx</sup>

The First Conference of the States Parties decided that CW buried on land after 1976 or dumped at sea after 1984 fall under the strict declaration requirements for CW. In addition, the declaration could include supplementary information to facilitate the Technical Secretariat's evaluation of the submission, such as the exact date of the burial or dumping, the way in which the CW were buried or dumped, the present condition of these CW, and an assessment of the risks they might pose to the environment.<sup>xxxi</sup> Following a decision by the Third Conference of the States Parties in November 1998, it was clarified that the Technical Secretariat shall inspect CW buried on land after 1976 or dumped at sea after 1984 on the basis of these declarations, provided that the CW are accessible. Challenge inspections, which according to Article IX of the CWC any state party may request in case of a serious non-compliance concern, also apply to such weapons.<sup>xxxii</sup>

To date there are no confirmed cases of burial or sea disposal of CW after the specified dates. The CWC (including decisions by the annual Conference of the States Parties) does not address the question of the destruction of CW buried on land after 1976 or dumped at sea after 1984, although it can be expected that, should such a case be declared by a state party or be confirmed by means of a challenge inspection, the Executive Council and the Conference of the States Parties of the OPCW will take the necessary decisions.

#### Discussion

The CWC does not specifically encourage states parties to recover CW that were dumped in internal waters or at sea. In the eventuality of such recoveries there are different declaration and destruction requirements.

For CW dumped at sea before 1985 there are no declaration or destruction obligations. Even if a state party decides to declare sea-dumped CW to the OPCW, there are no other responsibilities that automatically follow from this declaration. The distinctions between CW, OCW and ACW are irrelevant. In contrast, a state party must submit detailed declarations about its disposal of CW at sea after 1984. However, in the absence of confirmed cases of such dumping activities there are as yet no specified follow-on obligations for states parties (with the exception of those relating to inspections by the Technical Secretariat). Any future OPCW decision on remediation will have to take the physical ability to recover these weapons into account.

Chemical weapons dumped in internal bodies of water fall under the provisions of land-buried CW. States parties are not required to declare or destroy any CW that were disposed of in internal waters before 1977 as long as they are not recovered. (This exemption from the declaration and destruction obligations does not apply to ACW.) If CW dumped in internal waters are recovered, they must be declared. The follow-on obligations regarding their destruction depend on the determination by the Technical Secretariat of their status as OCW or CW. Chemical weapons dumped in internal waters after 1976 must be declared in detail. As with CW dumped at sea after 1984, there are no specific follow-on obligations regarding remediation, although it is conceivable that in the eventuality of such a declaration the Executive Council will take a decision in line with the obligations regarding land-buried CW. The physical ability to recover these weapons (e.g., from deep lakes) will also influence the decision.

It was noted that CWC prohibits three methods of CW disposal: open-pit burning, dumping in any body of water, and land burial. The prohibition is contained in the Verification Annex, Part IV (A),<sup>xxxiii</sup> which means that it applies to CW manufactured after 1945, CW produced between 1925 and 1945 that do not meet the non-usability criterion, and ACW. Old chemical weapons that were produced before 1925 or between 1925 and 1946 provided they meet the non-usability criterion are considered to be toxic waste. As such, they are exempted from the definition of CW. It is at the discretion of a state party to decide how it disposes of toxic waste. Depending on its national legislation, open-pit burning, dumping and burial may be conceivable options. The dumping at sea of toxic waste may be restricted under international environmental or maritime law, but these international agreements focus mainly on minimizing the consequences of marine pollution or contain an emergency clause. Stricter regulations have not entered into force. In addition, some of these international agreements have attracted the ratification or accession of only a small subset of parties to the CWC.

A similar vagueness exists with (cont. p. 20 - CW Sea)

(CW Sea - from p. 19)

respect to retrieved CW that were dumped at sea before 1985. These weapons, irrespective of their date of production or origin, are fully exempted from declaration and destruction requirements. As a consequence, a state party may dispose of these weapons without notification of the Technical Secretariat and might thus consider open-pit burning, land burial (including dumping in internal waters) or re-dumping at sea, or even storage on land. Re-dumping at sea might be subject to international environmental and maritime law (especially if the weapons were first moved onto land, e.g., for repackaging). Dumping in internal waters is not yet subject to an international prohibition as the 1996 Protocol to the Convention on the Prevention of Marine Pollution has not yet entered into force.<sup>xxxiv</sup>

Nevertheless, the issue raises some legal questions under the CWC. If such recovered sea-dumped CW were to be buried on land or dumped in internal waters or at sea, this would necessarily have happened after the dates specified in the CWC that determine the exemptions for land-buried or sea-dumped CW. In other words, bearing in mind that the mere act of retrieval does not generate new responsibilities for states parties, can items that were totally exempt from the declaration and destruction obligations under the CWC become the subject of CWC regulations?

In the case of a negative answer, how does this affect the decisions taken at sessions of the Conference of the States Parties with respect to CW that have been buried after 1976 or dumped at sea after 1984? A negative answer would raise the far more fundamental question whether the sea-dumped CW still fall within the purview of the General Purpose Criterion (GPC) of the CWC. It will be recalled that Article II, para. 1 considers *all* toxic chemicals and their precursors, as well as the munitions designed for their employment on the battlefield as CW, unless they are intended for *purposes* that are not prohibited under the convention.<sup>xxxv</sup> The negative answer would thus amount to stating that a munition loses its characterization as chemical weapon by the mere fact of having been dumped into a sea. This clearly cannot have been the intention of the negotiators of the CWC.

In the case of a positive answer, will state parties face the detailed declaration requirements for CW disposed after the CWC-specified dates, and which follow-on responsibilities will govern their destruction? Particularly regarding land-buried recovered sea-dumped CW, will the specific declaration and destruction requirements for OCW and CW then become applicable (especially in view of the possibility that recovered sea-dumped CW might fail the non-usability criterion)? Furthermore, will a state party then be in a position to declare such weapons as ACW, as the fresh obligations might entail considerable costs with respect to the destruction operations and verification of CW? If a state party decides to store the recovered sea-dumped CW, does this act make it a CW possessor (again, especially in the light of the non-usability criterion), perhaps requiring a fundamental change in its original declarations and leading to the assumption of totally new

and costly destruction obligations? If storage of retrieved sea-dumped CW does not lead to a disposal obligation, how can this outcome be compatible with the core obligations in Article I of the CWC not to acquire or stockpile CW and to destroy CW in the possession of a state party?

### Recommendations

These and possibly many other questions highlight the uncertainties regarding the status of CW dumped in bodies of water. Many of the issues raised in this paper may appear academic and of secondary importance in the light of the current difficulties in implementing the CWC. Indeed, no legal problems will surface as long as these weapons remain untouched. However, it cannot be assumed that the present situation will not change. The continuing development of economic activities affecting the seabed will increasingly disturb dump sites and require their remediation. Furthermore, there are concerns about the impact of the deteriorating munitions on the marine environment and on human safety. Initiatives to remedy munition disposal sites in the Baltic Sea are being set up in the context of the NATO Partnership for Peace programme, scientific programmes to assess the condition of sea-dumped CW in European waters are in progress of being coordinated internationally and may eventually lead to policy recommendations, and Italy has indicated that it wants to clear CW from the Southern Adriatic. Additional similar initiatives may will be developed for other parts of the world.

In the light of these developments, it is recommended that the OPCW considers the status of recovered sea-dumped CW under the CWC. It is clear that the categorization of such munitions as chemical weapons in the full sense of Article II of the CWC will stifle any initiative to remedy the marine dump sites. Hence, it may be advisable to create a separate status for these weapons, perhaps analogous to the exemption as toxic waste, but supplemented with more stringent declaration and verification conditions, especially with regard to CW that might still be usable. In this context, the OPCW may wish to treat all recovered sea-dumped CW uniformly and discard the distinction between classes of CW based on their production date. This would not 'penalize' a state party for recovering sea-dumped CW, but merely require it to destroy the weapons in accordance with its national legislation and require the Technical Secretariat to certify their destruction.

Related to the issue of sea-dumped CW, the OPCW may wish to study the interconnection between the CWC and international environmental and maritime law beyond the mere definitional aspects of terms. Similarly, it may wish to explore opportunities of collaboration with the international bodies created under the relevant agreements.

Furthermore, the OPCW may wish to support initiatives at environmental remediation of CW dump sites through Article XI of the CWC. The UNCLOS, the Oslo and London Conventions and the 1996 Protocol to the London Convention contain provisions on global and regional cooperation and on scientific and technical assistance and exchanges with respect to the marine environment that may serve as exam-

ples.<sup>xxxvi</sup> In this way the OPCW would invest in a small, but visible way in the long-term public stakes in the CWC, while contributing to the strengthening of international norms regarding environmental protection.

#### Footnotes:

<sup>i</sup> Incendiary, smoke and anti-plant agents have been, and in some cases still are, considered to be chemical weapons by some countries. In some instances, the body within the military responsible for chemical warfare also developed and/or operated these other weapon categories.

<sup>ii</sup> CWC, Article II, para. 1. Some of the core terms, such as 'toxic chemical' and 'precursor' are further defined in other paragraphs.

<sup>iii</sup> This period essentially covers CW manufactured during World War I and in the years immediately following the Armistice. 1925 is a symbolic date; it is the year of the conclusion of the Geneva Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous or other Gases, and of Bacteriological Methods of Warfare.

<sup>iv</sup> CWC, Article II, para. 5.

<sup>v</sup> CWC, Article II, para. 6.

<sup>vi</sup> CWC, Verification Annex, Part IV (A), para. 12.

<sup>vii</sup> CWC, Verification Annex, Part IV (A), para. 13.

<sup>viii</sup> Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (the so-called London Convention), adopted on 29 Dec '72 and entered into force on 30 Aug '75. Article 12, para. e explicitly refers to 'agents of chemical and biological warfare'. For more information, see URL <<http://sedac.ciesin.org/entr/register/reg-067.rnr.html>>, version current on 4 Jul '01. United Nations Convention on the Law of the Sea, adopted on 10 Dec '82 and entered into force on 16 Nov '94, URL <<http://www.un.org/Depts/los/unclos/UNCLOS-TOC.htm>>. The sea-dumping prohibitions are in Part XII 'Protection and preservation of the marine environment'. The term 'dumping' is defined in Article 1. In addition, there are several regional agreements with stricter obligations regarding marine pollution and dumping, such as the Convention for the Prevention of Marine Pollution by Dumping from Ships and Aircraft (the so-called Oslo Convention), adopted on 15 Feb '72 and entered into force on 7 Apr '74, URL <<http://sedac.ciesin.org/pidb/texts/marine.pollution.dumping.ships.aircraft.1972.html>>; and the Convention on the Protection of the Marine Environment of the Baltic Sea Area (the so-called Helsinki Convention), adopted on 22 Mar '74 (revised convention adopted in Apr '92) and entered into force on 2 May '80, URL <<http://www.oceanlaw.net/texts/helcom.htm>>.

<sup>ix</sup> CWC, Article IV and Verification Annex, Part IV (A). For a detailed discussion of these obligations, see Hart, John, 'Chemical weapon destruction requirements of the CWC', in Hart, John and Miller, Cynthia D. (eds.), *Chemical Weapon Destruction in Russia: Political, Legal and Technical Aspects*, SIPRI Chemical & Biological Warfare Studies, no. 17 (Oxford University Press: Oxford, 1998), pp. 47-54.

<sup>x</sup> CWC, Article III, para. 1 (b) (i) and Article IV, para. 1.

<sup>xi</sup> CWC, Article I, 2: Each State Party undertakes to destroy chemical weapons it owns or possesses, or that are located in any place under its jurisdiction or control, in accordance with the provisions of this Convention.

<sup>xii</sup> CWC, Verification Annex, Part IV (B), para. 6.

<sup>xiii</sup> CWC, Verification Annex, Part IV (B), para. 3. The information must be submitted in accordance with CWC, Verification Annex, Part IV (A), paras. 1-3.

<sup>xiv</sup> CWC, Verification Annex, Part IV (B), paras. 5 and 7.

<sup>xv</sup> CWC, Verification Annex, Part IV (B), para. 5.

<sup>xvi</sup> For example, an agent such as Adamsite hardly deteriorates over time. Mustard agent may also retain its toxicity for a very long period. Krutzsch, Walter and Trapp, Ralf, *A Commentary on the Chemical Weapons Convention* (Martinus Nijhoff Publishers: Dordrecht, 1994), p. 34.

<sup>xvii</sup> CWC, Article I, 3.

<sup>xviii</sup> For overviews of such operations, see the contributions in Stock, Thomas and Lohs, Karlheinz (eds.), *The Challenge of Old*

*Chemical Munitions and Toxic Armament Wastes*, SIPRI Chemical & Biological Warfare Studies, no. 16 (Oxford University Press: Oxford, 1997). Technical reports about sea-dumping operations in the Baltic Sea after World War II were produced by the Baltic Marine Environment Commission, Helsinki Commission, Ad Hoc Working Group on Dumped Chemical Munition (HELCOM CHEMU) in the early 1990s. Details of US operations after World War II are contained in Brankowitz, William R., *Chemical Weapons Movement History Compilation* (Office of the Program Manager for Chemical Munitions (Demilitarization and Binary) (Provisional): Aberdeen Proving Ground, Maryland, 12 June 1987), available from URL <<http://www-pmed.apgea.army.mil/NSCMP/IP/R/cwmove/>>.

<sup>xix</sup> Convention on the High Seas, adopted on 29 April 1958 and entered into force on 30 September 1962, URL <<http://www.un.org/law/ilc/texts/hscas.htm>>.

<sup>xx</sup> See note 8.

<sup>xxi</sup> Belgium, for example, faced stiff international criticism for the way it invoked Article 9 in order to dump an accumulated stock of 225 tonnes of World War I toxic munitions in the Gulf of Biscay in 1980. Zanders, Jean Pascal, 'The destruction of old chemical munitions in Belgium', in Stock and Lohs (note 18), p. 211.

<sup>xxii</sup> Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, adopted on 7 November 1996, Article 1, para. 4 and Article 7. Document available from URL <<http://www.fletcher.tufts.edu/multi/texts/dumping.txt>>. The protocol has not yet entered into force, but will supersede the convention as between contracting parties to the protocol that are also party to the convention (Article 23). For further information on international maritime law, see the International Maritime Organization. URL <<http://www.imo.org>>.

<sup>xxiii</sup> UNCLOS (note 8), Part XII, in particular Articles 194, 210 and 216.

<sup>xxiv</sup> CWC, Article III, para. 2 and Article IV, para. 17. The respective paragraphs refer to the totality of Part IV of the Verification Annex (Section A covers CW and Section B OCV and ACW).

<sup>xxv</sup> OPCW, First Conference of the States Parties, 'Understanding with respect to the terms "buried by a State Party on its territory" and "dumped at sea"', document C-I/DEC.31, 16 May 1997.

<sup>xxvi</sup> Convention on the Territorial Sea and the contiguous Zone, adopted on 29 April 1958 and entered into force on 10 September 1964, URL <<http://www.un.org/law/ilc/texts/terrsea.htm>>. The definitions are expanded in the UNCLOS (note 8), Section 2.

<sup>xxvii</sup> CWC, Article III, para. 2 and Article IV, para. 17.

<sup>xxviii</sup> OPCW document C-I/DEC.31 (note 25).

<sup>xxix</sup> UNCLOS (note 8), Section 2, Articles 5 and 7.

<sup>xxx</sup> This issue was debated at the Partnership for Peace Coastal Maritime Operations Seminar, organized by the Headquarters of the Commander-in-Chief East Atlantic (CINCEASTLANT) and Commander Allied Naval Forces North (COMNAVNORTH) in Riga, 17-19 October 2000.

<sup>xxxi</sup> OPCW, First Conference of the States Parties, 'Declaration requirements for chemical weapons buried by a State Party on its territory after 1976 or dumped at sea after 1984', document C-I/DEC.30, 16 May 1997. The basic declarations must be made in accordance with Article III, para. 1(a) and the relevant provisions of Verification Annex, Part IV (A).

<sup>xxxii</sup> OPCW, Third Conference of the States Parties, 'All aspects of the issue of chemical weapons buried by a State Party on its territory after 1976 or dumped at sea after 1984, including a possible challenge inspection, and its implications for the Technical Secretariat's responsibilities', document C-III/DEC.12, 20 November 1998.

<sup>xxxiii</sup> See note 7.

<sup>xxxiv</sup> See note 22.

<sup>xxxv</sup> See note 2.

<sup>xxxvi</sup> UNCLOS (note 8), Part XII, in particular Articles 197-203; Oslo Convention (note 8), Article 12; London Convention (note 8), Article 9; and Protocol to the Convention on the Prevention of Marine Pollution (note 22), Articles 13 and 14.

\*\* The author wishes to note that the positions in this paper are those of the author and do not necessarily reflect the views of the SIPRI. He wishes to thank Julian Perry Robinson, Thomas Stock and Ralf Trapp for their constructive comments on an earlier draft.

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editor: Colonel Richard Price

For the Professional in Government, Industry and Academia with an interest in Nuclear, Biological and Chemical Defense, Disarmament and Verification; Chemical and Biological Terrorism; Emergency and Disaster Medical Planning; Industrial Health and Safety; and Environmental Protection.

Because of recent events and the fact that there is so much misinformation being provided to the public from all sources, ASA suggested to Prof. Meselson that we reprint this article with an update from him to precede the reprint. The original article received outstanding comments from scientists around the world.

## Note Regarding Source Strength

by Professor Matthew Meselson

The "Note Regarding Source Strength" reproduced below is the same as that published in the ASA Newsletter of June 8, 1995, except for the correction of a typographical error (the omission of "pi") in the equation for dose in Table I.

Note that source strength is defined as "the number of viable spores released at the source that travel in the atmosphere as particles small enough to initiate inhalation anthrax". Using this definition, the source strength estimates in Table IV are given in milligrams, taking the number of spores per milligram, as stated, as  $10^9$ . The question of whether the aerosol released at Sverdlovsk consisted only of viable spores or also contained inviable spores and other material is obviously not addressed in the present estimates. These estimates should be regarded only as what they are: estimates of source strength, as defined in the note, that follow from the stated assumptions regarding atmospheric dispersion and regarding dose-response relations for the infectious aerosol and the human population exposed to it.

Although the present estimates follow from the assumptions made, the most relevant dose-response data available are for non-human primates, not for any human population, and none of it is for the low attack rates observed in the Sverdlovsk outbreak. Neither do we know if the virulence of anthrax spores in the aerosol released at Sverdlovsk was like that in aerosols employed in published experiments with monkeys. And even the well done experiments at Fort Detrick and Porton with monkeys gave  $ID_{50}$  values covering a more than twenty-fold range -- from 2,000 to 45,000 respirable spores. These uncertainties are only imperfectly addressed by considering a number of different dose-response relations, as is (cont. p. 10 - Source Strength)

An ASA Book Review by:

## Professor John Ellis van Courtland Moon Germs: Biological Weapons and America's Secret War

by Judith Miller, Stephen Engleberg  
and William Broad

New York: Simon and Schuster, 2001.  
ISBN 0-684-87158-0. Bibliography. Index.  
Pp. 381. \$27.00.

Germs, a fascinating account and analysis of the bioterrorist threat, was written and released before the horrific events of 11 September 2001 and the subsequent anthrax incidents. The accidental timing of its publication has contributed to placing it on the New York Times best seller list. The narrative is largely chronological, stretching from the end of World War II to the present. While the authors convey a sense of simultaneous developments, each chapter is skillfully focused. Chapter 1 describes a little publicized event: the 1984 poisoning with salmonella (cont. p. 13 - Germs)

From the ASA House in beautiful Maryland  
all of us wish for all of you  
a very successful and happy New Year 2002

*We note with sadness that for many of our  
closest friends in the US and throughout the  
world, this past year 2001 has been most  
tragic. For all that have been touched by these  
events, and that does include almost all, our  
hearts and our minds are with you.*

*We stand as one.*

The ASA family of professionals can be found  
in 115+ countries and they are what the  
ASA Newsletter is all about.  
Have a great and have a safe 2002

ASA Numbers:

tel: 1-410-638-9480

fax: 1-410-638-9481

e-mail: info@asanltr.com

web site: www.asanltr.com