



postnote

December 2001 Number 167

CHEMICAL WEAPONS

Chemical weapons (CW) have been used in both military and terrorist actions. Recent events have led to increased concern about the potential for further CW use by terrorists. This briefing complements POSTnote 166 on Bio-terrorism and considers the nature of various chemical agents, international efforts to stop proliferation and UK preparedness for attacks.

Background

Chemical weapons (CW) were first used on a large scale in the First World War, causing 1.3 million casualties including 90 thousand fatalities (see box opposite). While many countries subsequently developed large stockpiles of CW, there are few proven examples of their use; that by Iraq in the 1980-88 Iran-Iraq war being the most recent. Some countries still hold, or are suspected to hold, stocks of CW, raising concerns that they may choose to deploy them in war, or that they may fall into the hands of other states or terrorists. Two CW attacks in Japan in the 1990s (see box on chemical terrorism in Japan, page 2) demonstrated that terrorists can develop the capability to produce chemical agents and may choose to use CW over other methods.

Chemical weapons agents

Thousands of poisonous substances are known but only a few are considered suitable for chemical warfare, with the main categories described in the box on chemical weapons agents on page 2. Agents suitable for use in chemical weapons need to be highly toxic, easy to produce, stable, dispersible and able to be stored safely. Most CW agents are not difficult to produce although specialised containment facilities are needed.

Chemical agents may enter the body through inhalation, absorption through the skin, or ingestion. They tend to be fast acting, producing symptoms within minutes or hours. In this they differ from biological weapons where disease symptoms may not develop for days. Some agents are lethal while others cause injuries that

History of military CW use

CW have a long history of military use. Early attempts to renounce their use include the **Hague Declaration of 1899**, ratified by 27 states. There was, however, no method of enforcement and interpretation varied between countries.

August 1914 saw the first use of CW in **World War I** by the French. They used grenades containing irritants, which proved to be ineffective and were soon discarded. Other low potency agents were then tried by the Germans until the first large scale use of chlorine in April 1915 and phosgene in May 1915. September 1915 saw the first use of chlorine by the British. Mustard gas was deployed by the Germans from July 1917, and by the British in 1918. Early in the war, delivery relied on clouds of gas that drifted with the wind towards the enemy frontline. Later, artillery shells provided a more reliable delivery method.

The **Geneva Protocol of 1925**¹ was signed by 140 countries and prohibited the use (but not the stockpiling) of CW. However, Italy (one of the signatories) used mustard gas delivered by aircraft spray in **1935-36** in Ethiopia.

Nerve agents were first synthesised by German chemists in the **1930s**. By 1939, stockpiles of the nerve agents tabun and sarin were held by Germany, although CW were not used in **World War II**.

Several countries continued to develop and stockpile CW. Confirmed examples of their use include by Japan against Chinese forces (**1937-43**), Egypt against the Yemen (**1963-68**) and the US in Vietnam (**1965-75**). By the 1980s Iraq held stocks of CS, mustard, sarin, tabun and VX, which were deployed in the **1980-88** Iran-Iraq war and against civilians, notably in Halabja, 1988, where an estimated 5,000 died as immediate casualties of attacks involving nerve agents.

The UK abandoned its offensive CW capability in the 1950s and is a signatory to the **Chemical Weapons Convention, 1993**², which aims to ban CW.

incapacitate. In addition to the physical effects caused by CW, the threat, real or perceived, of chemical attack may create panic and fear on a large scale.

Chemical terrorism in Japan

The only known use of CW by a terrorist group involves the Aum Shinrikyo sect, which recruited scientists and technicians and launched a CW programme in 1993. This reportedly involved expenditure of \$30million and focused on the nerve agent sarin. In June 1994, an attack on a residential building in Matsumoto, a small town, killed seven people and injured over 300. Sarin vapour was disseminated by an improvised system involving a heater, fan and drip system venting from the window of a disguised delivery truck. In March 1995 a second, highly publicised, attack on the Tokyo subway system killed twelve people. A further 500 required hospital admission and over 5000 sought medical advice, most with psychosomatic symptoms. 242 medical staff also reported symptoms, caused by exposure to contaminated casualties. Sect members had placed sarin in double layered plastic bags onto 5 subway train floors, pierced the bags with sharpened umbrella tips and disembarked. The low purity (30%) and ineffective dissemination of the sarin meant that casualties were low, although the overall impact was high.

Dispersal

The number of people affected by a CW attack will depend on how widely the agent is dispersed and on the persistence of the agent in the environment. Most chemical agents are liquids and can be dispersed as part of suitably modified conventional weapons, including bombs and missiles. Dispersal by spray from aircraft is also possible although less efficient because of the difficulties of generating a fine vapour.

Volatile agents, such as sarin, will evaporate to form a gas on release. Dispersal is difficult to control and will be determined by weather conditions and the terrain. On the other hand, dispersal within an enclosed area where the gas could accumulate might be particularly effective. However, the improvised method used in Japan to disperse sarin in subway trains, which is described in the box above and achieved limited effect, suggests that the development of effective dispersal methods may pose a technical challenge for terrorist groups.

Non-volatile agents, such as VX (see box opposite), remain largely in liquid form and their dispersal can be more controlled and localised. Decontamination of areas affected by these persistent agents is more difficult than for volatile agents, which evaporate and disperse harmlessly within a few days.

Preventing CW proliferation

The Geneva Protocol¹ of 1925 was introduced in reaction to the extensive use of CW during WWI. It was signed by over 140 countries and prohibited the use of CW, but not their acquisition or stockpiling. Several countries, including the UK, made reservations allowing a response with CW if they were first attacked with them. A more robust approach is taken by the Chemical Weapons Convention (CWC)², described in the box on page 3, which entered into force in 1997. This is the first treaty to provide a verifiable ban on an entire category of weapons of mass destruction and is monitored by the Organisation for the Prohibition of Chemical Weapons (OPCW)³.

Chemical weapons agents

Nerve agents include **tabun**, **sarin**, **soman** and the more potent **VX**. These agents interfere with normal nerve function and are lethal at low concentrations. They can be absorbed both as a liquid through the skin, which can be lethal within 20-30 minutes, or as a vapour through the lungs, where death may occur more quickly. Preventative medicine is available and, as it is most effective 2 hours after treatment, is most useful where there is warning of an attack. Antidotes are also available but these must be administered immediately following exposure.

Blister agents include **mustard** and **lewisite**, odourless volatile liquids. Exposure is rarely fatal if appropriate medical care is available to prevent infection. Skin contact with liquid agent causes most harm through blistering; inhalation of gas will damage lungs.

Choking agents include **phosgene** and **chlorine**. The inhaled gas irritates the lungs causing fluid to accumulate. These agents can be lethal.

Blood agents include **hydrogen cyanide**, a highly volatile liquid. These agents inhibit the ability of cells to use oxygen and can be lethal.

Irritants include **CS** (tear gas), which are dispersed as fine air borne particles (aerosols). Exposure causes pain to the eyes, airways and sometimes skin. Usually associated with civilian riot control, which is permitted under the CWC.

Psychotropic agents include **LSD** and **BZ**, which affect the central nervous system producing hallucinations and irrational behaviour.

Herbicides such as **Agent Orange** could be used to destroy food crops. Large quantities of chemical agent would be needed to have a significant effect on food supplies. Such agents are not covered by the CWC.

Chemical Terrorism

The CWC was drafted with a view to banning the use of CW by States. However, many of its provisions could also contribute to countering terrorist use of chemical weapons. OPCW circulated a paper to State Parties in November 2001 outlining how enforcement of the CWC could contribute to counter terrorist work.

For example, proper enforcement of export controls could deny terrorists access to chemicals that could be used as chemical weapons. The Royal Society of Chemistry has highlighted that there are currently different interpretations between States over the declaration requirements for trade in chemicals. This opens up the possibility of unauthorised and unknown acquisition of toxic chemicals. Further, the majority of State Parties have not put national legislation in place to implement the CWC. This means that, unlike in the UK, involvement with chemical weapons cannot be effectively prosecuted.

These measures could help counter terrorism, but so long as some States remain outside the ambit of the CWC their impact may remain limited.

Chemical Weapons Convention (CWC)

The CWC not only bans the use of CW, but also bans their development, production, stockpiling and transfer; requires that all existing stocks of CW be destroyed by 2007; and establishes an inspection regime to monitor the production, use and transfer of chemicals that could be associated with CW. The Organisation for the Prohibition of Chemical Weapons (OPCW), which is based in the Hague, is responsible for monitoring the CWC among the 143 States that have signed and ratified the convention (State Parties). DTI takes the lead in implementing the CWC in the UK, reporting to Parliament annually and working closely with FCO and MoD.

Each State Party must make a **declaration** to OPCW of past activities involving CW and detailed annual declarations on the production, use, import and export of specified chemicals and families of chemicals. These include the precursors to potential CW, the agents themselves and chemicals produced using facilities that could be easily used to make CW. About 150 companies and universities in the UK contribute to the UK declaration.

The declarations are verified by **routine inspections** conducted by the OPCW, of which over 1000 have been carried out so far. There is also a facility for **challenge inspections** that has not yet been used. It allows one State to request the inspection of another State's facilities at short notice where there is concern about non-compliance.

Trade in toxic chemicals and their precursors is controlled. The CWC places chemicals and families of chemicals that could be associated with CW into 3 groups based on their potential for use as a CW and the extent of commercial use. The most toxic chemicals that have little or no commercial use (schedules 1 and 2) can be traded only between State Parties. Schedule 3 chemicals have significant commercial uses and can be exported to any country so long as they are to be used only for purposes not prohibited under the CWC. An end user certificate is required. This third group includes the toxic chemicals phosgene and hydrogen cyanide.

The obligations under the CWC, including trade restrictions, are monitored through scrutiny, by both the OPCW and individual State Parties, of the declarations made to the OPCW. The UK has put questions to some 6 State Parties about their declarations.

Universal adoption of CWC

The aim of the OPCW is to see universal adoption of the CWC. Currently, 143 States⁴ have ratified the CWC and a further 31 have signed but not yet ratified, including Israel and Afghanistan. States that have not signed the Convention at all include Angola, Egypt, Iraq, Lebanon, Libya, North Korea, Somalia and Syria. Until these countries ratify the CWC suspicion will remain that they either hold CW or would be interested in developing such capability. Indeed, MoD believes that around 20 countries fall into one of these categories⁵.

One key lever to encourage countries to ratify the CWC is the trade restrictions on chemicals that could be associated with chemical weapons, many of which have legitimate civilian uses in industry, medicine and law enforcement. DTI sees scope for extending the trade controls under the CWC so that trade in schedule 3 chemicals (see box on CWC), which have significant commercial applications, is limited to State Parties.

Challenge inspections

The regime of routine and challenge inspections (see box on CWC) makes the CWC a far stronger tool than its counterpart, the Biological and Toxin Weapons Convention⁶. The UK considers that challenge inspections should be used as a means of verifying the CWC, a view that is supported by a number of State Parties. Others have concerns about inspectors' access to confidential or commercial information, although there are procedures in the CWC that enable such information to be protected. However, no challenge inspections have yet taken place.

CND and others have expressed particular concern over US legislation introduced in 1998 that enables the President to block any challenge inspection against the US on national security grounds. India has since introduced similar legislation and if other countries were to follow this example the CWC could become increasingly difficult to enforce. The more time that passes without any challenge inspections taking place, the more politically difficult it could become to use them.

Destruction of CW stockpiles

Of the four countries that declared stockpiles of CW to the OPCW, Russia and the US held the largest quantities at approximately 40,000 and 30,000 tonnes respectively. Russia has yet to start substantial destruction of CW under the CWC while the US, having destroyed over 20% of its stockpile, has so far met the targets for destruction stipulated in the CWC.

Safe destruction of CW is expensive and, in Russia's case, has been estimated at £4 billion. Until all declared stocks of CW have been destroyed there remains the concern that other countries may not feel obliged to implement the CWC fully and that CW could fall into terrorist hands.

Russia is receiving financial assistance from a number of countries, including the UK⁷, to build and equip destruction facilities. They recently put a proposal to the OPCW laying out a timetable to destroy their stock of CW by 2012 (the fallback date specified in the CWC) rather than 2007. The implementation of this plan is likely to depend on US contributions, which are planned to total some \$900 million for the building of a destruction facility. A decision on whether to accept the plan will be taken in autumn 2002 at the Conference of State Parties.

Assessing the risk of terrorist attack

With the exception of the Aum Shinrikyo sect, terrorists have not used chemical weapons in the past. In addition to the technical challenge of obtaining and dispersing chemical agents a number of other explanations for this have been put forward. These include that terrorists may want to avoid indiscriminate mass killing, concern that the use of chemical weapons may stimulate a particularly severe Government response and alienate supporters, and simply that they have no need because they can achieve their aims with conventional explosives.

While these points may still apply to many terrorist groups, the CW attacks in Japan in 1994/95 demonstrate that they will not apply to all. In addition, the response to these attacks showed that a small-scale CW release, that causes few deaths, can produce a significant and disruptive response in the population. This could prove attractive to some terrorist groups.

There are a number of CW agents that a terrorist group might use. Nerve and blister agents are the CW that have been most widely used and stockpiled in the past and the World Health Organisation⁸ suggests that this could used be a guide to future use. Additional risks will come from chemicals such as chlorine that have extensive commercial applications and, while less toxic and less feared, could be easier for terrorists to obtain.

The Home Office, supported by intelligence from the security services, assesses the actual risk of terrorist CW attack occurring in the UK as remaining low. This is set against the fact that any such attack could have severe individual, economic and social consequences.

Contingency planning

Prevention

The UK has had well-tested plans in place for dealing with the threat of terrorist CW attack for some 20 years. The details remain classified information but include specific guidance for Government departments and their agencies on handling the threat of a CW attack. The Home Office takes the lead in this area.

To test the ability of police forces to respond to a threat of chemical, biological, radiological or nuclear (CBRN) attack a number of exercises, both desktop and simulation, are carried out around the country each year. The Home Office sees scope for more exercises of this nature, particularly ones engaging all the emergency services, both to the develop co-ordination between partners and to enable the contingency plans to be revised and up-dated based on experience.

Managing the consequences

Where the measures described above do not prevent terrorist action, or an incident occurs without warning, responsibility for managing the consequences falls to the Civil Contingencies Secretariat (CCS), established within the Cabinet Office following the 2001 General Election.

There is no single agency in the UK that has all the skills and resources to respond to a CW attack, or indeed any other disaster. The arrangements for handling any emergency are made on a local level, with support, training and specialist advice co-ordinated through CCS. This approach, using the expertise of local emergency services, is in line with advice from the World Health Organisation⁸.

Police, fire and ambulance services would all play key roles in the event of a CW attack. Fire fighters are equipped and trained to work in contaminated areas and, since 1999, a programme has been in place to ensure

that ambulance and A&E staff in England also have access to protective equipment. On an individual level, some people may choose to buy gas masks. However, experience in Israel, where more than a dozen deaths have been caused by the improper use of gas masks, and the absence of an early warning system, suggest that this may not be the best method of protection.

Guidance on responding to the deliberate release of chemical and biological agents was issued to local authorities by the CCS in October 2001. It emphasises that the consequences of deliberate release would need to be handled in much the same way as accidental release, of which there is some experience. However, legislation⁹ currently requires local authorities to have emergency plans in place only for the event of war. A recent consultation carried out by the Cabinet Office proposed new legislation that would give Local Authorities a key role in drawing together emergency services, privatised utilities and others in planning for peacetime disasters. The timing for the drafting of this new legislation has not been decided but is likely to be influenced by recent events.

Overview

The risk of a terrorist attack involving chemical weapons attack remains low but could have severe consequences. Even if there were a small number of casualties, subsequent reaction could cause widespread disruption. Response to a terrorist CW attack would be led by the local emergency services, with specialist support from Government departments.

Production, use and transfer of toxic chemicals is monitored through the Chemical Weapons Convention. However, concerns remain over the CW capabilities of some States.

Endnotes

- 1 Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous or Other Gases, and of Bacteriological Methods of Warfare, 1925.
- 2 UN Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on their Destruction, signed in Paris on 13 January 1993; ratified in the UK by the Chemical Weapons Act 1996.
- 3 OPCW: www.opcw.nl
- 4 189 countries are members of the United Nations.
- 5 Defending against the threat from biological and chemical weapons. MoD. 1999.
- 6 See POSTnote 166 on Bio-terrorism for further information on the Biological and Toxin Weapons Convention.
- 7 MoD is contributing up to £12million over 3 years from 2001.
- 8 Health aspects of biological and chemical weapons. Final document will be published in December 2001, draft can be viewed at: http://www.who.int/emc/pdfs/BIOWEAPONS_FULL_TEXT2.pdf
- 9 Civil Defence Act, 1948.

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