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FACT SHEET

CHEMICAL WEAPONS I

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CHEMICAL WARFARE IN THE IRAQ-IRAN WAR

Allegations of the use of chemical weapons have been frequent during the Iraq-Iran War. One of the instances reported by Iran has been conclusively verified by an international team dispatched to Iran by the UN Secretary-General

Both Iran (1929) and Iraq (1931) are parties to the Geneva Protocol, which prohibits the use of asphyxiating, poisonous or other gases, and of all analogous liquids, materials or devices, as well as the use of bacteriological methods of warfare.

The UN Security Council has issued a statement condemning the use of chemical weapons during the Gulf War. It remains uncertain whether the sources of supply were indigenous or external. Export controls have been placed on certain chemicals that could be used in the production of mustard and nerve gases.

In this Fact Sheet, SIPRI provides background information on the international law which has been violated, the two poison gases which the UN team identified in its samples, and the possible origins of the chemical weapons used in the Iraq-Iran War.

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INTRODUCTION

Allegations

There have been reports of chemical warfare from the Gulf War since the early months of Iraq's invasion of Iran. In November 1980, Tehran Radio was broadcasting allegations of Iraqi chemical bombing at Susangerd. Three and a quarter years later, by which time the outside world was listening more seriously to such charges, the Iranian Foreign Minister told the Conference on Disarmament in Geneva that there had been at least 49 instances of Iraqi chemical-warfare attack in 40 border regions, and that the documented dead totalled 109 people, with hundreds more wounded. He made this statement on 16 February 1984, the day on which Iran launched a major offensive on the central front, and one week before the start of offensives and counter-offensives further south, in the border marshlands to the immediate north of Basra where, at Majnoon Islands, Iraq has vast untapped oil reserves. According to official Iranian statements during the 31 days following the Foreign Minister's allegation, Iraq used chemical weapons on at least 14 further occasions, adding more than 2 200 to the total number of people wounded by poison gas.

Verification

One of the chemical-warfare instances reported by Iran, at Hoor-ul-Huzwaizeh on 13 March 1984, has since been conclusively verified by an international team of specialists dispatched to Iran by the United Nations Secretary General. The evidence adduced in the report by the UN team lends substantial credence to Iranian allegations of Iraqi chemical warfare on at least six other occasions during the period from 26 February to 17 March.

The efficiency and dispatch with which this UN verification operation was mounted stand greatly to the credit of the Secretary General. His hand had presumably been strengthened by the announcement on 7 March by the International Committee of the Red Cross (ICRC) that 160 cases of wounded combatants visited in Tehran hospitals by an ICRC team "presented a clinical picture whose nature leads to the presumption of the recent use of substances prohibited by international law". The casualties visited were reportedly all victims of an incident on 27 February. The ICRC statement came two days after the US State Department had announced that "the US Government has concluded that the available evidence indicates that Iraq has used lethal chemical weapons". Iraq had denounced the Washington statement as "political hypocrisy", "full of lies", a fabrication by the CIA; and had suggested that the hospital patients examined by the ICRC had "sustained the effects of these substances in places other than the war front". On 17 March, at almost the same moment as the UN team was acquiring its most damning evidence, the general commanding the Iraqi Third Corps, then counter-attacking in the battle for the Majnoon Islands, spoke as follows to foreign reporters: "We have not used chemical weapons so far and I swear by God's Word I have not seen any such weapons. But if I had to finish off the enemy, and if I am allowed to use them, I will not hesitate to do so".

Some consequences

On 30 March, the UN Security Council issued a statement condemning the use of chemical weapons during the Gulf War. Evidently none of the five permanent members used its veto power to block the condemnation. That same day the US government announced that it

was instituting special licensing requirements for exports to Iraq and Iran of particular chemicals that could be used in the manufacture of chemical weapons, and that it had urged other governments to do likewise. Other governments have since taken similar steps.

Reports of Iraqi chemical warfare have dwindled since the UN Security Council statement, but they have not stopped altogether. A British television team filming on the Iranian side of the Majnoon Islands front encountered evidence of a mustard-gas attack in mid-April. But Iranian media are no longer publicizing such reports, perhaps mindful now of potential negative impacts on their domestic audience.

VIOLATION OF INTERNATIONAL LAW

The use in war of poisonous, as well as asphyxiating or other gases, and of all analogous liquids, materials or devices was prohibited, along with the use of bacteriological methods of warfare, in the 17 June 1925 Geneva Protocol, which entered into force on 8 February 1928. The agreement was prompted by the experience of World War I, during which the battlefield use of chemical agents caused an estimated 1 300 000 casualties, including 90 000 deaths. In fact, the Protocol only re-affirmed a constraint on acts which were held in abhorrence and which had been condemned by the general opinion of the civilized world.

In the part dealing with chemical weapons, the Protocol reiterated a prohibition already contained in previously signed international documents. These included the 1899 Hague Declaration IV, 2, under which the contracting powers had agreed to abstain from the use of projectiles for the diffusion of asphyxiating or deleterious gases, as well as the 1907 Hague Convention IV, which prohibited the use of poison or poisonous weapons.

Since 1925 chemical weapons have been used on several occasions, but on each such occasion the extent of world-wide indignation and censure testified to the immutability of the standard of international law as embodied in the Geneva Protocol. It is, in great part, due to this international instrument that the history of chemical warfare since World War I has been one of relative restraint. The Protocol is now binding on as many as 106 parties, including all militarily important states.

Iran acceded to the Protocol on 5 November 1929, while Iraq acceded on 8 September 1931. The latter state did so with an express reservation that its government would not be bound by the prohibitions in question towards any state whose armed forces did not respect the provisions of the Protocol. Such a requirement of reciprocity was formulated by over 40 parties, including the great powers. Iran has not attached any condition to its accession, but since the reservations made by others have in essence turned the Protocol into a no-first-use treaty, it could now consider itself free from its obligations towards Iraq.

Neither the UN group of experts, which has established the fact of use of chemical weapons in the war between Iraq and Iran, nor the UN Security Council, which has condemned such use, have specified the party guilty of violation. However, the Geneva Protocol does not require that violators be internationally identified. Iran could thus claim the right to reprisal in kind on the basis of its

chemical warfare. Indeed, there can be no guarantee that the weapons banned by the Geneva Protocol will not be resorted to as long as there is no absolute prohibition on their very possession, subject to international control.

However, at the Committee on Disarmament at Geneva, Iran has declared that, due to humanitarian considerations, it would not embark on retaliatory action with chemical weapons against Iraq.

THE POISON GASES IDENTIFIED BY THE UN TEAM

Mustard gas

From an unexploded bomb found at an Iraqi-attack site, the UN team drew a sample which its analysts in Sweden and Switzerland later found to be high-quality mustard gas.

What is mustard gas?

Mustard is bis (2-chloroethyl) sulphide, an oily liquid with a garlic-like smell. Even in warm weather it evaporates slowly enough for an area over which it has been scattered to remain dangerous for many hours, even days, yet fast enough for the imperceptible vapour that it gives off also to cause casualties. Both in vapour and in liquid form its effect is to 'burn' any body-tissue which it touches. Taken into the body, it can act as a systemic poison deadlier, weight for weight, than hydrogen cyanide. Its burning effects are not normally apparent for some hours after exposure, whereupon they build up into the hideous picture of blindness, blistering and lung damage such as was displayed by the patients sent from Iran to hospitals in Austria, Belgium, Britain, France, FR Germany, Japan, the Netherlands, Sweden and Switzerland.

Mustard gas was first used as a chemical-warfare agent during World War I, when it was responsible for about 70 per cent of the million-plus gas casualties. Its most prominent use after that war was by Italy in Ethiopia during 1936. During World War II it was produced by Britain, Canada, France, Germany, Hungary, Italy, Japan, the Netherlands, Poland, South Africa, the USA and the USSR. It was the CW agent that was stockpiled in by far the largest quantity--on the order of hundreds of thousands of tons overall--but was used only by Japan in China. It is probably still the most heavily stockpiled CW agent today. Its last established use appears to have been by Egypt intervening in the (North) Yemeni civil war of the mid-1960s.

Effectiveness of mustard gas

Mustard gas can be spread from munitions deliverable by virtually any type of weapon, including the mortars, artillery and aircraft with which Iraqi forces are reported to have used it. Among the many air-deliverable mustard munitions which Britain produced during World War II, one report judged the most cost-effective to be no more than a 5-gallon oil drum filled with mustard and fitted with a simple burster charge. The munition from which the UN team retrieved its sample in Iran appears to have been a light-case 250-lb white-phosphorus bomb, such as might otherwise be used for

smoke-screening or incendiary purposes. Published eye-witness accounts suggest that Iraqi practice was for eight such bombs to be carried per ground-attack jet aircraft, dropped from a height of 200-300 metres. There may well be an international trade in such munitions. It would be relatively easy, though hazardous, to exchange the phosphorus payload for mustard gas.

Manufacture

Mustard gas may be made in different ways according to whether ethylene, vinyl chloride or thiodiglycol is chosen as the starting material. Published UN findings suggest that the Iraqi mustard had been made from the last of these precursors. Thiodiglycol is a quite widely used industrial commodity, finding application as an antioxidant, as a vulcanizing agent, as an intermediate for other commodities, and as a solvent for dyes used in the textile industry. Its conversion to mustard gas is very simple indeed, the only technological problem being that of preventing its manufacturers from becoming its first casualties. That, however, is not a small problem. When Britain first manufactured mustard gas, there were, over a six-month period during 1918, 1.27 cases of mustard illness per person employed.

The quantity of thiodiglycol needed to produce enough mustard gas to fill eight of the bombs sampled by the UN team would be about 350 kg. A hundred tons could yield sufficient mustard to arm maybe 300 aircraft sorties or to keep a medium-artillery battalion firing nothing but mustard shell for a fortnight.

Tabun

The second poison gas identified by the UN team was the nerve-gas tabun. This was found in a sample which the team was assured by Iranian authorities had been drawn by an Iranian soldier from a dud bomb. The bomb was said to have had the same appearance as the one from which the UN team had drawn mustard gas.

Iranian authorities told the UN team that about 400 people had been affected by chemical weapons during the attack from which the tabun sample was said to have originated. The attack purportedly happened on 17 March, while the UN team was in Tehran, and was said to have been delivered by four Iraqi aircraft. Forty of the casualties were in a field hospital which the UN team was taken to visit the following day. The signs and symptoms in the six cases which the UN team had time to examine were quite different from those associated with the mustard-gas sample. The UN team concluded from them that the patients had been exposed to an anticholinesterase agent.

What is tabun?

Tabun, or ethyl NN-dimethylphosphoramidocyanidate, otherwise known as GA, is such an agent. It is a liquid that evaporates only half as fast as mustard gas, but so powerful a poison is it that even short exposure to small concentrations of its vapour can result in almost immediate symptoms, felt first in the eyes (as a persistent contraction of the pupil) and chest (as a tightness or asthma-like constriction). If a lethal dosage has been taken up, either from inhalation of the vapour or by absorption of the liquid through the

some of great violence, including running nose, sweating, involuntary urination and defaecation, vomiting, twitching, convulsions, paralysis and unconsciousness. Prior to the observations made by the UN team at the field hospital, such signs had apparently not been seen in hospitalized chemical-warfare casualties, although one or two of the earlier Iranian communiqués (as from the northern front in October 1983) had referred briefly to "nervous system" effects. And since mid-March, Iranian publications have been stating that 'nerve gas' had been used on at least 10 occasions during 1980-83.

Effectiveness of tabun

Because tabun acts much more rapidly than mustard, it could be thought capable of stopping massed infantry assaults on the move, at least when dropped in large air-burst bombs. In static situations, it would probably not, in warm weather, be significantly more effective than mustard gas as a weapon of attrition. The chief significance of the tabun reports is twofold. First, if the reports are true, they may well be describing the first ever use of nerve gas in combat operations, thus providing lessons which military authorities around the world may be eager to absorb. Second, if resort to tabun has been motivated by the military consideration just outlined, there may well be powerful incentives operating upon the Gulf War belligerents to introduce those even deadlier nerve gases that offer still more potential for rapid mass-destruction: agents such as the sarin, VX and, reportedly, soman stockpiled by the USA, France and the USSR. Against unprotected people an aircraft armed with sarin could be as destructive as the nuclear bomb dropped on Hiroshima.

Manufacture

Tabun, like sarin, was a secret discovery of Germany's at the time of World War II. Germany manufactured about 12 000 tons of it during 1943-44, and also, in 1944, manufactured sarin on a small pilot plant scale. Soman was not manufactured by Germany. For filling into munitions--artillery shell and bombs--the German tabun was left diluted with up to 20 per cent of the solvent that had been used during its synthesis, namely monochlorobenzene. The sample analysed by the UN team contained a comparable proportion of monochlorobenzene, suggesting it had been made by the original German method.

That method used the simplest of a number of possible routes to tabun. It started from phosphoryl chloride in a two-stage chemical process, both stages of which were conducted within the same reactor. Advanced containment measures were used to protect plant workers from the tabun, but even they were insufficient to prevent at least ten deaths and innumerable lesser exposures.

The quantity of physphoryl chloride needed to produce enough tabun to fill, undiluted, eight of the bombs examined by the UN team would be about 500 kg. Also needed would be about 120 kg of sodium cyanide, 150 kg of ethyl alcohol and 65 kg of dimethylamine (synthesizable from ammonia and methyl alcohol). A hundred tons of phosphoryl chloride could yield sufficient tabun to arm maybe 200 sorties by MiG, Mirage or Sukhoi aircraft.

ORIGIN OF THE CHEMICAL WEAPONS

The UN report provides only negative evidence of the origin of the mustard gas sample. The absence in the sample analysed in Sweden and Switzerland of polysulphides and of more than a trace of sulphur indicates that it is not of past US-government manufacture, for all US mustard was made by the Levinstein process from ethylene and mixed sulphur chlorides. That process is also said to have been the one used by the USSR. From similar reasoning, British-made mustard, too, can probably be ruled out, even though substantial stocks were once held at British depots in the Middle East. For more positive evidence other sources of information must be used. Over the years since the mid-1960s quite a lot of information has been published purporting to describe Iraqi chemical weapons, but much of it is contradictory and all of it is of a reliability which SIPRI is in no position to judge. A major caveat must be entered: chemical warfare is such an emotive subject that it lends itself very readily to campaigns of disinformation and 'black' propaganda, campaigns which the politics both of the Gulf War and of the current chemical-weapons negotiations have unquestionably stimulated to no small degree.

We may look first at the nature of the chemical-weapons technology which Iraq has been reported to have acquired.

In addition to bulk-filled free-fall aircraft bombs, at least two other categories of chemical munition have reportedly been employed: artillery shell and air-to-ground rockets. Iranians sent for hospital treatment in London who were suffering from what must almost certainly have been mustard-gas burns have attributed their injuries to all three categories of munition. There is no evidence that mustard-filled air-to-ground rockets have ever been stockpiled by Western countries. The rockets whose use was described by one of the Iranians apparently had submunition warheads, a relatively sophisticated design.

Other agents reported to have been used

Tear gas: In August 1982, US officials were quoted in the press as being "confident" that the Iraqis did not possess any "deadly chemical weapons", only tear gas.

Choking gas: Chlorine,, the archetypal war gas, is included in at least one of the lists of Iraqi chemical-warfare agents published this year by Iranian authorities.

Arsenicals: Iran informed the UN Secretary-General last year that "compounds containing arsenic" had been used in Iraqi chemical weapons. Speaking to reporters, one of the Swedish specialists treating Iranian gas casualties said he thought it probable that the latter had been exposed to a mixture of mustard gas and lewisite. Such mixtures were standard munition-fills in the arsenals of Japan, the USSR and probably other states too during World War II.

Nitrogen mustard: Official Iranian sources have several times stated that an agent of this type had been identified by Iranian military experts in samples from Iraqi chemical munitions. "Knowledgeable" but unidentified US officials have also been reported as speaking of Iraqi nitrogen mustard.

Germ-warfare agents: Israeli intelligence sources have been cited for reports that anthrax had been found in hospitalized Iranians. Iranian sources have referred to Iraqi use of "microbic" and "bacteriological" weapons.

Mycotoxins: A Belgian forensic toxicologist has claimed that his laboratory has found mycotoxins (T2, HT2, nivalenol and verrucarol) in addition to mustard gas in samples of blood, urine and faeces taken from Iranian gas victims hospitalized in Vienna, but this claim currently remains unverified and open to question. There are reports of similar findings from patients hospitalized in Belgium, France, FR Germany, Sweden and Switzerland, but these too still remain open to doubt, especially since, in the Swedish case, the Swedish authorities concerned have expressly repudiated the report. The UN team inspected cadavers returned to Tehran from Swedish and Austrian hospitals, but its report makes no mention of any post-mortem tissue samples having been taken for analysis. Mycotoxins were sought but not found in the chemical samples analyzed by the UN team. The search method used had a detection limit of 0.00005 per cent: i.e., capable of finding mycotoxins at loadings greater than a third of a gram per 250-lb bomb.

Novel unidentified agent: There has been speculation in the press about Iraqi use of a toxic agent unknown in the West. This was excited by reports early in March from the Gzaiel sector, just to the north of Basra, of groups of Iranian corpses having been seen that were said to bear no external trace of injury--looking as though they had fallen asleep in their foxholes.

Indigenous or external sources of supply?

With the exceptions, maybe, of the last two of these different categories of putative Iraqi agent, sources of supply might as well be indigenous as external to Iraq, given the technology implied. Involvement of the last three categories would, in some circles, implicate the USSR as supplier, for the reason that the USSR is said, on evidence that has yet to be solidly substantiated but which has nonetheless attracted some firm believers, to have weaponized all three of them in recent years. For its part, the USSR has expressly denied supplying Iraq with toxic weapons. Reports of Soviet supply attributed to US and other intelligence sources have nonetheless recurred. The earliest predate reports of Iraqi use of chemical weapons in the Gulf War.

Official Iranian commentaries, too, have pointed to the USSR as a supplier of the Iraqi weapons. These sources have also accused Brazil, France and, most conspicuously, Britain of supplying the weapons. No basis for any of these Iranian accusations has been disclosed. France, alongside Czechoslovakia and both Germanies, is reportedly also rumoured, among "foreign military and diplomatic sources" in Baghdad, to have supplied Iraq with chemical precursors needed for an indigenous production effort. Unofficial published sources have cited Egypt as a possible supplier of actual chemical weapons. In the mid-1960s, when Iraq was alleged to be using chemical weapons against insurgent Kurdish forces, Swiss and German sources of supply were reported in the Western press.

Production capability in Iraq

Increasingly persuasive evidence is now emerging in published sources that, whether Iraq has or has not been receiving chemical weapons from abroad, it has been acquiring a development and production capability for them of its own. An official Iranian commentry dates the beginning of this effort back to 1976, claiming that information to that effect had been provided to Iran by West German intelligence officials. Unidentified US intelligence sources have been quoted as saying that Iraq began making mustard gas in the early 1970s. Such sources have been quoted as believing that Iraq is now attempting to produce sarin nerve gas. Associated with this belief is the assessment, it was reported in the US press at the end of March, that, while Iraq has already been using nerve gas in the Gulf War, this has been on an experimental scale using stocks accumulated during the development programme; supplies of nerve gas from large-scale production facilities were expected--the reporting continued--to be available within a matter of months, even weeks. Further, the press has reported US government sources as having identified three, possibly five, chemical-agent production sites in Iraq. The locations that have been specified in the press are Samawa, Ramadi, Samarra and Akashat. The last of these has, however, been toured by foreign correspondents, including a British journalist who has reported finding only contra-indicative evidence of a nerve gas plant being there.

Technological capacity

Other than the need for elaborate safety measures, there seems to be nothing about the technology of producing mustard gas or tabun--or lewisite or nitrogen mustard--that would obviously be beyond the capacities of the Iraqi chemical industry: an industry which has been growing rapidly in size and sophistication since the early 1970s. However, if nerve gases of a type whose production would necessitate the technically demanding and comparatively specialized processes of phosphorus-fluorination and/or phosphorus-alkylation--i.e. nerve gases such as sarin, soman and VX--foreign technology might very well have to be imported. There is strong public evidence (but by no means conclusive yet) that Iraq has been endeavouring to acquire these or related technologies from private corporations in the USA, Britain, FR Germany and Italy since 1975; and that it has been dissembling these endeavours under the guise of acquiring production capacity for organophosphorus pesticides.

The search for materials

Any need to import special chemical-process plant and associated know-how could be lessened by importing, instead, some of the chemical intermediates needed to produce chemical-warfare agents, rather than attempting to manufacture those intermediates from indigenous raw materials (of which the Iraqi mining, petroleum and related industries appear to provide the full range needed for mustard and nerve gases, with the possible expection for some of the latter of fluoride minerals). Certain intermediates can be identified which could reduce the requirements for chemical plant to processing equipments of standard off-the-shelf or easily improvised types. Iraq has not concealed the fact that it is in the market for chemicals which do indeed fall within this category. This has been most conspicuous in Iraq's search in America for

phosphonate. These two chemicals do, however, have certain civil applications. But at least in the former case they are not ones which, in the normal course of events, Iraq might obviously be expected to exploit.

Export controls

On 30 March, the US government announced the imposition of 'foreign policy controls' on the export to the Gulf-War belligerents of five chemicals that could be used in the production of mustard and nerve gases. US officials told the press that this had been done in response to an unexpected volume of recent orders from Iraq for those chemicals. They also said that Japan, FR Germany and other unspecified European countries had been exporting the chemicals to Iraq. The British government took action similar to that of Washington on 12 April, adding three more chemicals to the control list (see table). Since then, other European governments have also announced embargoes of varying scope, and on 15 May the Foreign Ministers of the European Community agreed in principle on a common and complementary policy. There are Western press reports of suspicions in 'Western diplomatic circles in the Middle East' that the USSR is shipping intermediates to Iraq through Jordan.

Postscript

The origin of the chemical weapons used in the Gulf War is a matter which warrants more attention than space in this Fact Sheet permits--it has an immediate bearing on the negotiations in Geneva for a Chemical Weapons Convention: a treaty which, among other things, must be designed so as to place effective constraints on the proliferation of the weapons.

'able of export-controlled chemicals

'hemical	Chemical-warfare utility[c]
'hiodiglycol[a,b]	Convertible into mustard gas simply by contact with hydrogen chloride.
'hloroethanol[b]	Essential to one of the ways for making thiodiglycol (see above).
'h· ·horyl chloride[a,b]	Essential to tabun production. Can also be converted, with some difficulty, into methylphosphonyl dichloride (see below).
)imethylamine[b]	Like phosphoryl chloride (see above), essential to tabun production, but much easier to make.
1e ·lphosphonyl ifluoride[a,b]	Convertible into sarin-family nerve gases simply by contact with any of many alcohols.
1ethylphosphonyl ichloride[b]	Convertible into sarin-family nerve gases by carefully controlled reaction with an alcohol and a fluoride such as potassium fluoride (see below). Convertible into methylphosphonyl difluoride (see above) by heating with a fluoride such as potassium fluoride.
)imethyl ethylphosphonate[a,b]	One of many methylphosphonyl compounds from which methylphosphonyl dichloride (see above) can be made quite easily.
'otassium fluoride[a,b]	One of many fluorine compounds that could be used in the production of sarin-family nerve gases. Insignificant in the absence of a supply of methylphosphonyl or ethylphosphonyl compounds.

Cor picuously absent from the list

Sodium fluoride	A fluorinating agent more common than potassium fluoride.
1ethylphosphonous ichloride	Essential precursor in most of the better routes of VX-family nerve gases. Easily convertible into methylphosphonyl dichloride (see above.
)-alkyl ethylphosphonothioates	Precursors for VX-family nerve gases, also convertible into sarin-family nerve gases.
)ther methylphosphonyl compounds	See dimethyl methylphosphonate above.
P-ethyl homologues of all the methylphosphorus compounds above	Precursors for ethylphosphonate-family nerve gases.

[a] Subjected to 'foreign policy controls' by the US government on 30 March 1984.

[b] Subjected to special export-licensing requirements by the British government on 12 April 1984.

[c] Except for methylphosphonyl difluoride, all of the controlled chemicals have significant civil applications.