UNITED
NATIONS

S

Security Council

Distr.
GENERAL

S/20063
25 July 1988
ENGLISH
ORIGINAL: ENGLISH/SPANISH

REPORT OF THE MISSION DISPATCHED BY THE SECRETARY-GENERAL TO INVESTIGATE ALLEGATIONS OF THE USE OF CHEMICAL WEAPONS IN THE CONFLICT BETWEEN THE ISLAMIC REPUBLIC OF IRAN AND IRAQ

Note by the Secretary-General

1. Following the dispatch of a mission of specialists to the Islamic Republic of Iran to investigate its recent allegation that chemical weapons had again been used against its forces, report of which has been circulated as document S/20060, the Government of Iraq, on 3 July 1988, alleged that Iranian forces had used chemical weapons against Iraqi forces on 20 June and 1 July 1988, causing a number of casualties. It said that it had also found a store of chemical weapons in a sector on the front from which Iranian forces had withdrawn. Iraq requested that the Secretary-General immediately dispatch a mission to Iraq to investigate the matter. 1/

2. In the circumstances, the Secretary-General requested the same mission of specialists, who were in the process of completing their investigation in Iran and preparing the report thereon, to proceed to Iraq to investigate the latter's complaint. Accordingly, the mission again consisted of the following two specialists:

Dr. Erik Dahlgren
Deputy Head, Department of NBC Defence
Swedish Defence Research Institute
Umeå, Sweden

Dr. Manuel Domínguez
Colonel, Army Medical Corps, and specialist in
nuclear, biological and chemical weapons injuries
Professor of preventive medicine
Universidad Complutense de Madrid
Madrid, Spain

Mr. Vicente Berasategui, Director, Department for Disarmament Affairs, United Nations Secretariat, again accompanied the specialists to co-ordinate their work and ensure appropriate liaison with the Government of Iraq. The specialists submitted their joint report to the Secretary-General on 13 July 1988.

3. The Secretary-General wishes to place on record his deep appreciation to the members of the mission for the exemplary dedication and efficiency with which they completed that further assignment, in spite of constraints in time and resources, and under strenuous and often dangerous conditions. He also wishes to express his appreciation to the Governments of Spain, Sweden and Switzerland for once again making available the services of the specialists and the facilities of their laboratories.

4. In transmitting to the Security Council the report of the specialist mission on its investigations in Iraq, the Secretary-General notes with regret that the evidence obtained by the specialists points to an ever increasing presence of different types of weapons associated with aggressive chemical agents in the conflict between Iran and Iraq. As stressed by the specialists, that presence has been leading unavoidably to the repeated use of chemical weapons in violation of the Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous or Other Gases, and of Bacteriological Methods of Warfare, signed at Geneva on 17 June 1925.

5. In the light of that painful experience, the Secretary-General fully agrees with the views expressed by the specialists that the findings of the present investigation add renewed urgency to the need for strict observance of the provisions of the Geneva Protocol, a need affirmed in no uncertain terms in paragraph 1 of resolution 612 (1988) of the Security Council, of 9 May 1988. In the view of the Secretary-General, the emergence of new ways of resorting to those weapons of mass destruction opens up new frightening possibilities of escalation in a conflict already responsible for unacceptable human losses and considerable material damage.

6. In stressing once more the necessity for restraint and compliance with universally recognized rules of international law, and bearing in mind the ongoing efforts being pursued in the Conference on Disarmament towards a multilateral convention on the complete and effective prohibition of the development, production and stockpiling of chemical weapons and on their destruction, the Secretary-General considers it important that all concerned focus their attention to the need to end a continuous vicious circle of development and use of those weapons.

7. It hardly needs repeating, of course, that the Secretary-General remains convinced that a swift end to this long and brutal war, through the full implementation of Security Council resolution 598 (1988), is ultimately the only way to put an end to the grievous loss of life and material destruction as well as to the ever present danger to the stability of the region. The Secretary-General once again appeals to both parties in the strongest terms to respond without delay to his efforts for peace.

Notes

1/ S/19982.

Annex

Report of the mission dispatched by the Secretary-General to investigate allegations of the use of chemical weapons in the conflict between the Islamic Republic of Iran and Iraq

CONTENTS

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LETTER OF TRANSMITTAL

Geneva, 13 July 1988

Sir,

We have the honour to submit herewith our report on the investigations you requested us to undertake concerning continued allegations by Iraq of the use of chemical weapons in the conflict between that country and the Islamic Republic of Iran.

In order to carry out the investigation, we visited Iraq between 9 and 11 July 1988 for the purpose of determining, to the extent possible, if chemical weapons had been used and, if so, the type, extent and circumstances of their use.

In preparing our report, we have taken into account the reports of investigations undertaken at your request in 1987 and earlier this year. These reports have served as useful background information for the present investigation.

The presence of yperite (mustard gas) was again confirmed both medically and by chemical analysis. It was also possible to determine the degradation components and impurities which that agent contained. Such presence has been, in the cases discussed in the present report, very limited in its intensity and effects.

However, it is clear that the evidence resulting from this and previous missions points to an ever increasing presence of different types of weapons associated with aggressive chemical agents in the Iran-Iraq conflict, which has been leading unavoidably to the repeated use of chemical weapons in violation of the Geneva Protocol of 1925. In our report of 8 July 1988 on the investigations in the Islamic Republic of Iran, we suggested the possibility of reviewing existing machinery for verification by United Nations teams of the use of chemical weapons in order to ensure the timely presence of experts at the site of alleged attacks. We should like now to add that the findings of the present investigation add renewed urgency to the need for strict observance of the provisions of that Protocol.

In undertaking this mission we received support from many institutions and individuals. In particular, we would like to express our appreciation to the Government of Iraq for the co-operation and assistance accorded to us in the fulfilment of our task.

We should like to express deep appreciation to the United Nations designated laboratories in Switzerland and Sweden, which assisted us effectively in the technical aspects of this mission.

We also wish to thank Mr. Vicente Berasategui, Director, United Nations Secretariat, who accompanied us to Iraq and assisted us in the preparation of the report, for his co-operation and advice.

We wish, Mr. Secretary-General, to express our gratitude to you for the confidence you have reposed in us.

Yours sincerely,

(Signed) Erik DAHLGREN

(Signed) Manuel DOMINGUEZ CARMONA

I. TERMS OF REFERENCE

1. The Secretary-General decided, in continuation of the investigations undertaken in 1987 and earlier in 1988, to dispatch a mission to Iraq to investigate allegations by its Government of the use by Iranian forces of chemical weapons in the conflict between that country and the Islamic Republic of Iran. He requested the mission to determine, to the extent possible, whether such weapons had been used and, if so, the type, extent and circumstances of their use. A senior United Nations official accompanied the mission to co-ordinate its work and ensure appropiate liaison with the Government of Iraq.

II. REVIEW OF DOCUMENTATION

2. In preparation for the drafting of the present report, we reviewed the following United Nations documents:

(a) Report dated 8 May 1987 of the mission dispatched by the Secretary-General to investigate allegations of the use of chemical weapons in the conflict between the Islamic Republic of Iran and Iraq; a/

(b) Report dated 25 April 1988 of the mission dispatched by the Secretary-General to investigate allegations of the use of chemical weapons in the conflict between the Islamic Republic of Iran and Iraq; b/

(c) Letters concerning chemical weapons from the Government of Iraq addressed to the Secretary-General; c/

(d) Letters concerning chemical weapons from the Government of the Islamic Republic of Iran since the issuance of the report dated 25 April 1988; d/

(e) Security Council resolution 612 (1988) of 9 May 1988.

3. We also referred, during the drafting of the report, to the Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous or Other Gases, and of Bacteriological Methods of Warfare, signed at Geneva on 17 June 1925. e/

III. METHODOLOGY

4. In order to carry out our task, we adopted, as required, the following approaches:

(a) Interviews with government officials in Baghdad in order to obtain information regarding the alleged use of chemical weapons;

(b) Visits to the war zone at As Sulaymaniyah, about 300 km north-east of Baghdad and to the Tariq military camp outside Baghdad in order to examine evidence of weapons used in the alleged chemical attack and to collect samples for chemical analysis in specialized laboratories;

(c) Clinical examinations of, and interviews conducted with, a number of patients who were allegedly exposed to attacks by chemical warfare agents, supplemented by briefings by the medical specialists. The clinical examinations were conducted in the military hospitals of As Sulaymaniyah and Rasheed, in Baghdad, to which patients had been evacuated.

5. We must point out that the intervals between the alleged attacks and our actual arrival in the areas to collect samples for chemical analysis resulted in the degradation and evaporation of chemical agents. In order to facilitate such analysis it is important that sampling be done as quickly as possible.

6. The same type of sampling, detection and protective equipment used by earlier missions (and described in the report of 1986) f/ was again used during the present mission. This equipment included the Chemical Agent Monitor (CAM) which was used for the first time in 1986.

7. Munition, claimed to be chemical munition of Iranian origin, was examined and samples for analysis were taken. The items were also documented by photographs.

8. The team spent two days in Iraq (for the chronology of activities, see appendix I). During our mission we were accompanied and assisted at all times by a representative from the Ministry of Foreign Affairs. In As Sulaymaniyah and Tariq we also had briefings with military authorities.

IV. MEDICAL ASPECTS

A. General information

9. The patients examined suffered, according to their statements received by us through Brigadier General Dr. Ihsan Al-Shamaa of the Medical Service of the Iraqi Army, the effects of chemical agents contained in a few mortar grenades launched against them during two separate attacks with conventional mortar munition at two locations near the front. Brigadier General Muhammad Aziz of the General Staff reported that mutual bombardment with mortars was very frequent in the frontline.

10. The officer responsible for briefing us said that the first attack took place against a position named "Peak 660" near As Sulaymaniyah. This is a position situated between 500 and 1,000 m from the frontline, close to Said Sadiq and Shandri. The attack had developed between 0230 and 0300 on 1 July 1988, the four soldiers mentioned in appendix II under medical cases Nos. 1 to 4 being affected shortly before the end of the attack. Those four soldiers indicated later that they had been attacked at 0400. The second attack had taken place in the Basra military sector at 1000 on 8 July 1988, affecting slightly five soldiers (appendix II, cases Nos. 5 to 9).

B. Medical information

11. Investigations carried out by the medical specialist are based on interviews and clinical examination of the nine patients who had been indicated as affected by

chemical weapons. Four of them were interviewed on 10 July 1988 at the As Sulaymaniyah military hospital and the other five at the Rasheed military hospital in Baghdad on 11 July 1988.

12. The nine patients interviewed by the medical specialist were the only ones who, according to the Iraqi physicians, had been affected during the above-mentioned attacks.

13. The patients' medical history, their names and ages, as well as the date and place of the alleged attack and the first symptoms that had led them to believe that they had been exposed to chemical agents, were obtained by questioning the patients. There may be slight errors or inconsistencies in the spelling of names and geographical locations, which varies frequently according to the maps used.

14. The typical casualty could be described as a male soldier, of Iraqi nationality, 20 to 38 years of age, the average being 29, who were said to have suffered the effects of chemical agents contained in mortar grenades exploding between 1 and 10 m away. Four among them did not have any protection, while four others used gas masks 30 minutes after the attack and another one wore a gas mask after 60 minutes.

15. The patients were examined three and nine days after being affected. All of them presented clear symptoms of having been victims of yperite (mustard gas) with an intensity ranging from superficial to average. The patients began to feel the effects of a chemical agent between 20 minutes to 6 hours after the attack. They noted a feeling of eye burns, sometimes with blurred vision, photophobia and lachrymation. There were also erythema, itching, nausea and vomiting.

16. After a few days - in some cases after hours - blisters appeared in different parts of the patients' bodies. Later those blisters opened and produced an injury such as that resulting from second-degree burns. The skin affected became red and later got darker until it was black. In the patients examined, the armpits, groins and genitals were little affected. Four of them had a leukopenia.

V. CHEMICAL ASPECTS

17. On Sunday 10 July we travelled to As Sulaymaniyah by helicopter and visited the headquarters of the First Corps. There we examined munition parts from 60 and 81 mm mortar grenades. They were said to have been picked up after the alleged attack with chemical weapons on "Peak 660" between 0230 and 0300 on Friday 1 July. The Chemical Agent Monitor (CAM) indicated the presence of a blister agent on some of the fragments from 81 mm grenades. The 60 mm fragments were not claimed to be chemical munition.

18. Air samples as well as shrapnels from grenade parts were taken and subsequently sent to highly specialized laboratories in Sweden and Switzerland for analysis. The result from the analyses confirm the presence of yperite (mustard gas), bis-(2-chloroethyl)-sulphide.

19. On Monday 11 July the team visited the Tariq military camp outside Baghdad. After donning protective equipment supplied by the military authorities, as some grenades in the stockpile were leaking and were in bad condition, we went into a bunker containing 81 mm mortar grenades. The number of grenades was stated to be 141, and they were claimed to be chemical munition captured from Iranian forces in Salamcha, east of Basra. (The stockpile captured was also said to have included 40 mm G7 antitank munition and 60, 81 and 120 mm conventional mortar grenades.) We were also told by local military representatives that each grenade contained 190 ml mustard gas weighing about 240 g. Unopened grenades still in wooden crates were tested by means of the CAM in the H mode. A positive response was obtained, suggestive of the presence of a blister agent.

20. We selected randomly two of the grenades, which were taken to an open area in the surroundings. There were no signs that these grenades had been recently opened and, under close supervision of one of the team members, one grenade was opened and the liquid content was filled into glass vessels. These were also sent to the above-mentioned laboratories.

21. In the analysis no yperite (mustard gas) or any other identifiable chemical warfare agent could be detected. However, in extracts of the liquid, thiodiglycol (a decomposition product of mustard gas as well as a starting material for the production of mustard gas) was identified, as well as a large amount of water. A considerable part of the extracts (approximately 25 per cent) consisted of organic and inorganic compounds, which, owing to the severe time constraints, could not be identified before the submission of the present report.

22. No ready explanation of these findings can be suggested. It should however be noted that only the content of one grenade (selected at random) had been sampled. Furthermore, if mustard gas is produced from thiodiglycol and hydrochloric acid, a two-phase system is obtained before the purification step, the upper layer containing mainly water and thiodiglycol and the lower layer mainly mustard gas. It is theoretically possible that that grenade and others in the stockpile might by mistake have been filled with the water phase from the synthesis of mustard gas. The results from the AC Laboratory in Switzerland and those from the Swedish Defence Research Establishment, which are similar, are given in appendices IV and V.

VI. MUNITIONS ASPECTS

23. The munition parts that we examined in As Sulaymaniyah appeared to originate from the same type of grenades as examined by us in Baghdad (see above). The findings are therefore summarized.

24. By visual examination the alleged chemical grenades were compared with a conventional high explosive grenade shown to us, and were found to be identical except for an inserted middle-piece extension between the shell and the fuse. That extension had the same outer diameter as the top of the shell and the bottom of the fuse.

25. The extension had an inner steel tube, about three times the length of the outer cylinder, that reached about 70 mm into the shell. That tube, we were told, was filled with high explosives to fragmentate the shell when detonating. Between the extension and the shell there was a rubber or plastic sealing. Physical dimensions:

Diameter (calibre)	81 mm
Total length	405 mm
Shell thickness	8 mm
Outer diameter of extension, top of shell and bottom of fuse	53 mm
Length of extension	33 mm
Length of fuse	70 mm
Diameter of inner tube	28 mm
Length of inner tube (protruding from the extension)	70 mm

26. The dimensions have been calculated from photographs, except for the calibre that was measured on site. The military authorities claimed that Iraqi forces were not in possession of any 81 mm mortars, as their forces have 82 mm and other calibre mortars.

27. The alleged chemical grenades were, contrary to the high explosive type shown to us, partly rusty and some of them obviously leaking. One of the grenades examined, claimed to have been retrieved after the alleged chemical attack in the morning of 1 July 1988, had not exploded but was damaged in the front so that the inner tube of the extension was exposed. The surfaces were also rusty. During the inspections conducted by us, no inscriptions identifying the origin of the grenades alleged to contain chemical agents were noted.

VII. SUMMARY OF FINDINGS

28. At the specific request of the Secretary-General, we visited Iraq on 10 and 11 July 1988 in order to conduct an investigation into the alleged use of chemical weapons in the Iraq-Iran conflict.

29. The experience, knowledge and results obtained during investigations conducted in 1987 and earlier in 1988 were used to support the present investigations.

30. Casualties were seen in hospitals in As Sulaymaniyah and Baghdad and munition parts were examined in the same areas. Samples from these parts have been analysed.

31. Summary comments in relation to the present investigation are as follows:

(a) It has been possible to determine without any doubt that, between the end of June and the beginning of July, nine Iraqi soldiers were affected by yperite (mustard gas), four of them in a military position named "Peak 660" near As Sulaymaniyah, and the other five in the military sector of Basra. All of them had at least one of the following types of injury typical of exposure to yperite: erythema, darkening of the skin, conjunctivitis, blisters and injuries common to those found in second-degree burns and, in some cases, leukopenia;

(b) Symptoms and clinical signs shown by the patients were similar to those observed in previous missions, a/ b/ although in general they were less serious;

(c) Samples from 81 mm grenades and grenade fragments, allegedly used by or captured from Iranian forces, which were collected by us at two locations in Iraq, were analysed by two highly specialized laboratories in Sweden and Switzerland. In the samples from grenade fragments taken in As Sulaymaniyah, the presence of mustard gas was confirmed. While the CAM gave positive indication of the presence of a blister agent during the inspection of the stockpile in the Tariq military camp, in the liquid samples taken from one 81 mm alleged chemical mortar grenade from that stockpile no chemical warfare agents were detected. However, thiodiglycol, a decomposition product of mustard gas as well as a starting material for its production, was found;

(d) The shells of the 81 mm alleged chemical grenades were in appearance very similar to demonstrated conventional high explosive shells, but it was possible to fill them with a liquid instead of an explosive, and they were equipped with an inserted middle-piece extension between the shell body and the fuse. The extension was said to contain an explosive by which, upon detonation, the shell would be opened. The grenades were in such a bad condition that their use as munition would, for safety reasons, be precluded;

(e) To our knowledge, no earlier allegations of the use of 81 mm chemical mortar grenades have been made.

VIII. CONCLUSIONS

32. The following are the conclusions from our present investigation:

(a) On the basis of the clinical examinations of nine Iraqi soldiers, we were able to determine conclusively that their injuries had been produced by yperite (mustard gas);

(b) In an examination of fragments of mortar grenades found after an alleged Iranian attack in As Sulaymaniyah, these fragments were confirmed to contain yperite (mustard gas);

(c) The CAM gave positive indication of the presence of a blister agent in the crates where the grenades, said to have been captured from Iranian forces at Salamcha, east of Basra, were kept, but the analysis of the liquid samples from one of them could not confirm the presence of any chemical warfare agent;

(d) The examination of mortar ammunition claimed to have been captured from Iranian forces confirmed that they were 81 mm mortar grenades, designed to be filled with solid or liquid material, which could include chemical warfare agents. It should also be noted that 81 mm grenades can be fired with 82 mm mortars;

(e) On the basis of the present investigation, the number of casualties and the extent of their injuries seemed less extensive than in previous investigations.

Notes

a/ S/18852 and Add.1.

b/ S/19823 and Corr.1 and Add.1.

c/ S/19948, S/19982, S/20013.

d/ S/19892, S/19902, A/43/410-S/19942, S/19943, S/19946, S/19954, S/19967.

e/ League of Nations, Treaty Series, vol. XCIV (1929), No. 2138, p. 65.

f/ S/17911 and Corr.1 and Add.1 and 2.

Appendix I

CHRONOLOGY OF ACTIVITIES

Saturday, 9 July 1988

Departure from Geneva (1445)

Sunday, 10 July 1988

Arrival in Baghdad (0100)

Briefing by Mr. Wadji Anwar Mardan, representative of the Ministry of Foreign Affairs (0100-0200)

Departure for As Sulaymaniyah (0845)

Arrival in As Sulaymaniyah (1110)

Briefing at First Corps headquarters (1130)

Examination of, and interviews with, patients at the As Sulaymaniyah military hospital

Inspection at First Corps headquarters of mortar 81 mm munition alleged to contain chemical agents

Departure for Baghdad (1500)

Arrival in Baghdad (1700)

Working dinner with Ambassador Rahim Al Kutal, Director-General for International Conferences at the Ministry of Foreign Affairs (2030)

Monday, 11 July 1988

Departure for Tariq military camp (0820)

Arrival in Tariq military camp (0910)

Briefing by staff officers on chemical weapons' stockpile allegedly captured at Salamcha (0930-1000)

Inspection of chemical weapons' stockpile (1020-1050)

Inspection and opening of 81 mm mortar grenade selected at random from the stockpile (1100-1130)

Departure from Tariq military camp (1230)

Arrival in Rasheed military hospital in Baghdad (1315)

Examination of, and interviews with, patients in Rasheed military hospital

Departure from Rasheed military hospital (1430)

Preparation of report (1545-1800)

Departure from Baghdad (2345)

Tuesday, 12 July 1988

Arrival at Geneva (0825)

Preparation of report

Wednesday, 13 July 1988

Preparation of report

Thursday, 14 July 1988

Finalization of report. Mission concluded.

Appendix IV

NC-Laboratory Spiez

Spiez, 13 July 1988

Analysis of samples from Iraq for CW-agents

(handed over in Geneva on 12 July 1988)

1. Samples

- Brown liquid with brown sediment
- Sample No. 2: Adsorption tube (XAD-2 7, 200 ml/min, 2 min)
- Sample No. 4: approx. 100 mg of dark-brown solid material (marked as shrapnels)
- Sample No. 6: approx. 500 mg of light-brown solid material (marked as shrapnels)

2. Extraction

- The liquid sample seemed to be insoluble in dichloromethane or chloform. 0.5 ml of the liquid was diluted with 2.5 ml of water, poured onto an extraction-column (Merck, Extrelut 3), extracted with 6 ml of dichloromethane and analysed without concentrating.

  For a quantitative estimation, an equal amount was extracted with 75 ml of dichloromethane. After evaporation of the solvent the residual thiodiglycole was weighed.

  For a selective test on S-mustard by GC/MC (SIM-Mode), an extract of 6 ml was concentrated to a volume of 1 ml.

- The content of the adsorption tube (Sample No. 2) was extracted twice with 1.5 ml of dichloromethane. The extracts were analysed by GC/FID (HP 5780A) and GC/MS (HP 5988A) without concentrating.

- 37 mg of the sample No. 4 were extracted with 0.5 ml of dichloromethane for about 30 min (magnetic stirrer). The extract was analysed like sample No. 2.

- 230 mg of the sample No. 6 were extracted with 1 ml of dichloromethane for about 30 min (magnetic stirrer). The extract was analysed like sample No. 2.

3. Results

3.1 Liquid sample

The main component of the dichloromethane-extract is thiodiglycole (see copy of TIC-chromatogram and mass-spectrum). According to H-NMR-analysis water is present in large quantities.

The composition is roughly estimated as follows:

- thiodiglycole: 5 per cent
- water: 70 per cent
- not identified organic compounds and anorganic salts: 25 per cent

S-mustard could not be detected at significant concentrations.

A more detailed analysis was not possible.

A comparison to mustard-samples, analysed earlier, does not seem to be possible.

3.2 Sample No. 2 (adsorption tube)

According to GC/MS analysis (see copy of TIC-chromatogram and mass-spectrum) S-mustard is identified unequivocally (approx. 30 µg/tube).

3.2 Sample No. 4

According to GC/MS analysis (see copies of TIC-chromatogram and mass-spectra) the following compounds could be identified:

- bis-(2-chloroethyl)-sulfide (S-mustard, peak 1)
- 2-chloroethyl-2-hydroxyethyl-sulfide (hemi-mustard, peak 2)
- bis-(2-chloroethyl)-disulfide (peak 3)
- bis-(2-chloroethyl)-sulfoxide (peak 4)
- bis-(2-chloroethyl)-trisulfide (peak 5) (assumed)
- 1,2-bis-(2-chloroethylthio)-ethane (sesqui mustard, peak 6)
- 2,2'-bis-(2-chloroethylthio)-diethylether (oxygen mustard, peak 7)

Various additional chlorinated compounds are present in traces.

The estimated concentration of S-mustard is 1 mg/g (GC/FID). The less volatile byproducts are present in similar concentrations.

(Due to different vapour pressures more S-mustard than byproducts may have been evaporated before the sample has been taken.)

3.3 Sample No. 6

According to GC/MS analysis (see copies of TIC-chromatogram and mass-spectra) S-mustard, hemi-mustard (hydrolysis-product) and S-mustards-sulfoxide are present in traces.

NC-Laboratory Spiez
(Signed) Dr. A. NIEDERHAUSER

Appendix V

Swedish Defence Research Establishment

1988-07-14

REPORT ON ANALYSES OF SAMPLES FROM IRAQ

The samples were received in Umeå, Sweden, at 5 p.m., 13 July 1988.

The samples consisted of:

- One screw-capped glass vessel wrapped in aluminium foil, containing an adsorbent tube (XAD-2). The glass vessel was labelled number 1 and dated 880710.

- Two glass containers with plastic lids, wrapped in aluminium foil. The containers were labelled "scrapings", number 3 and 5 respectively and dated 880710.

- One 100 ml screw-capped vessel wrapped in aluminium foil, containing approx. 35 ml of a dark turbid liquid. The glass vessel was labelled number 7 and dated 880711.

The samples were packed in a 1 litre plastic box filled with charcoal.

CHEMICAL ANALYSIS

Result

In the di-isopropyl ether extract of the adsorbent tube, mustard gas (bis-(2-chloroethyl)-sulfide) was identified by means of gas chromatographic retention data and by comparison with mass spectra of authentic mustard gas.

In dichloromethane extracts of samples number 3 and 5, mustard gas was identified by means of gas chromatography retention data and comparison of mass spectrum of authentic mustard gas. Sample number 5 contained only traces of mustard gas. Furthermore, in sample number 3 the following compounds were tentatively identified, mainly on the basis of mass spectral data:

bis(2-chloroethyl)disulfide

bis(2-chloroethyl)sulfoxide

1,2-bis(2-chloroethylthio)ethane (sesquimustard gas)

In sample number 7 thiodiglycol (bis-(2-hydroxyethyl)-sulfide) was identified by means of chromatography retention data and by comparison with mass spectrum of an authentic sample. The amount of thiodiglycol was approx. 30 mg/ml. The pH of the

solution was approx. 3.5. The sample also contained a high amount of chloride ions which indicated the presence of inorganic salts.

TOXICITY TESTING

The acute toxicity of sample number 7 was tested according to the recommendations given in OECD GUIDELINE FOR TESTING OF CHEMICALS no 401 "Acute oral toxicity" with the following exceptions

(a) Males only were used

(b) The sample was administered subcutaneously in the neck region.

The test was performed as a "limit test". If the sample shows high toxicity in the limit test, the examination will be extended to a complete LD_{50} test. The sample was given at the dose levels 2,000, 200 and 20 mg/kg s.c. Necessary dilutions were made with NaCl 0.9 per cent. Controls were injected with saline. Male CBA mice with body weight 32-35g were used. Two animals as controls and two mice at each dose level.

Result

Already 40 min after the injection one of the two mice given 2,000 mg/kg showed marked sedation, impaired respiration and piloerection. Later the same animal showed paralysis of one hindleg and the animal died about 3 hours after the sample administration. Autopsy showed no specific lesions but a yellowish secretion in the injection area subcutaneously. No other animal showed any signs of toxicity up to 5 hours after the administration of the sample. However, the observations will be continued for seven days.

It may be concluded preliminary that the sample examined has a low toxicity. Roughly LD_{50} in male mice should be more than 200 mg/kg but less than or equal to 2,000 mg/kg.

Division of Chemistry

(Signed) Gustav ANDERSSON

(Signed) Martin NYGREN

Divison of Biomedicine

(Signed) Sven-Åke PERSSON