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CHEMICAL AND BACTERIOLOGICAL (BIOLOGICAL) WEAPONS

Report of the Secretary-General

1. In its resolution 35/144 C of 12 December 1980, the General Assembly decided to carry out an impartial investigation to ascertain facts pertaining to reports regarding the alleged use of chemical weapons and to assess the extent of the damage caused by the use of such weapons. It requested the Secretary-General to carry out such investigation with the assistance of qualified medical and technical experts.

2. In pursuance of resolution 35/144 C, the Secretary-General appointed the members of the Group of Experts to Investigate Reports on the Alleged Use of Chemical Weapons. 1/ By a letter dated 19 November 1981 the Chairman of the Group of Experts transmitted to the Secretary-General the report which is hereby submitted to the General Assembly.

1/ For the names of the experts, see the letter of transmittal below.

ANNEX

Report of the Group of Experts to Investigate Reports on the Alleged Use of Chemical Weapons

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FOREWORD BY THE SECRETARY-GENERAL

1. By its resolution 35/144 C of 12 December 1980, the General Assembly decided to carry out an impartial investigation to ascertain the facts pertaining to the reports regarding the alleged use of chemical weapons and to assess the extent of the damage caused by the use of such weapons. The Assembly, further, requested the Secretary-General to carry out such investigation, with the assistance of qualified medical and technical experts in order to: (a) seek relevant information from all concerned Governments, international organizations and other sources necessary; (b) collect and examine evidence, including on-site with the consent of the countries concerned, to the extent relevant to the purposes of the investigation.

2. In pursuance to the resolution, a group of qualified experts was appointed after consultations with Member States. The Group held three sessions between April and November 1981.

3. The experts, in their personal capacities, have submitted to the Secretary-General a report containing their considered views on the subject-matter and conclusions on their findings with regard to reports on the alleged use of chemical weapons as stipulated by the General Assembly in resolution 35/144 C.

4. The Secretary-General wishes to thank the experts for their report which, in pursuance of paragraph 5 of resolution 35/144 C, he hereby submits to the General Assembly for its consideration. It should be noted that the observations and conclusions contained in the report are those of the experts. In this connexion, the Secretary-General would like to point out that in the complex field of disarmament matters, in many instances he is not in a position to pass judgement on all aspects of the work accomplished by experts.

LETTER OF TRANSMITTAL

19 November 1981

Sir,

I have the honour to submit herewith the report of the Group of Experts to Investigate Reports on the Alleged Use of Chemical Weapons which was appointed by you in pursuance of paragraph 5 of General Assembly resolution 35/144 C of 12 December 1980.

The experts appointed by you were the following:

Major General Dr. Esmat A. Ezz, M.B., B.Ch., D.M., Ph.D.
Head of Scientific Research Branch
Egyptian Armed Forces,
Cairo, Egypt

Dr. Edward E. Ambeva, M.D., F.R.C.S.
Consultant Orthopaedic Surgeon
Coast Province General Hospital
Mombasa, Kenya

Lt. Col. Nestor C. Castillo, B.S., CH.E., M.B.A.
Deputy Chief and Executive Officer
Ordnance and Chemical Service
Armed Forces of the Philippines
Quezon City, Philippines

Dr. Humberto Guerra, M.D., Ph.D., Dr. Med.
Professor
Instituto de Medicina Tropical Alexander von Humboldt
Universidad Peruana Cayetano Heredia
Lima, Perú

The report was prepared between April and November 1981, during which period the Group held three sessions: from 20 to 24 April, from 13 to 28 July and from 20 October to 19 November 1981 in New York. During the latter period between 31 October and 10 November, the Group also undertook a visit to Thailand for the purpose of on-site collection and examination of evidence.

Mr. Kurt Waldheim
Secretary-General of the
United Nations
New York

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The members of the Group of Experts wish to express their appreciation for the assistance which they received from members of the Secretariat of the United Nations. They wish, in particular, to convey their thanks to Mr. Sohrab Kheradi, Senior Political Affairs Officer, Centre for Disarmament, who served as Secretary of the Group, to Mr. Wlodzimierz Wieczorek, Senior Political Affairs Officer, Centre for Disarmament, and to Professor Herbert Marcovich of the Pasteur Institute, Paris, who served as consultant to the Secretariat.

I have been requeted by the Group of Experts, as its Chairman, to submit to you on its behalf, its report which was unanimously approved.

(Signed) Esmat A. EZZ
Chairman of the Group of Experts to Investigate
Reports on the Alleged Use of Chemical Weapons

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I. INTRODUCTION

1. By its resolution 35/144 C of 12 December 1980, the General Assembly called upon all States parties to the 1925 Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous or Other Gases, and of Bacteriological Methods of Warfare, 1/ to reaffirm their determination strictly to observe all their obligations under the Protocol, and upon those States which had not yet done so to accede to the Protocol, and appealed to all States to comply with the principles and objectives of the Protocol. Further, the Assembly decided to carry out an impartial investigation to ascertain the facts pertaining to reports regarding the alleged use of chemical weapons and to assess the extent of the damage caused by the use of chemical weapons and requested the Secretary-General to carry out such investigation, inter alia, taking into account proposals advanced by the States on whose territories the use of chemical weapons had been reported, with the assistance of qualified medical and technical experts who shall: (a) seek relevant information from all concerned Governments, international organizations and other sources necessary; (b) collect and examine evidence, including on-site with the consent of the countries concerned, to the extent relevant to the purposes of the investigation. Finally, the Assembly invited the Governments of States where chemical weapons were used to provide the Secretary-General with all relevant information they might have in their possession, called upon all States to co-operate in this investigation and to provide any relevant information they might have in their possession regarding such reports, and requested the Secretary-General to submit a report on the matter to the Assembly at its thirty-sixth session.

2. Pursuant to that resolution, the Secretary-General sent to all the Member States a note verbale dated 26 January 1981 requesting any information that the respective Governments might deem appropriate to provide in that connexion, to which communications were received from 24 Governments. Further communications were received from the Government of the United States of America on 14 September and 12 November 1981.

3. The International Committee of the Red Cross (ICRC), the Office of the United Nations High Commissioner for Refugees (UNHCR) and the World Health Organization (WHO) sent their comments in accordance with operative paragraph 5 (a) of resolution 35/144 C.

4. The Group of Experts to Investigate Reports on the Alleged Use of Chemical Weapons, nominated by the Secretary-General, conducted its investigation during three sessions held between April and November 1981. The organization of work and the proceedings of the Group are summarized in section II of this report.

5. Section III describes briefly the background to the problem and the sources of information upon which the investigation was based.

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

6. Section IV contains general observations on the use of chemical weapons, and the question of definition and parameters of the investigation.

7. Section V sets forth an evaluation of written submissions.

8. Section VI deals with the question of mycotoxins which the Group examined, in some detail, in the course of its investigation, in connexion with the United States reports on the alleged use of such toxins as a chemical warfare agent.

9. Section VII contains information concerning the Group's visit to Thailand, which was undertaken with a view to collecting and examining evidence from victims and/or eye-witnesses of the alleged use of chemical weapons.

10. The conclusions arrived at by the Group appear in section VIII of the report.

11. The report also contains a number of annexes which are as follows: I. Questionaire sent by the Group of Experts to the Governments of Canada and the United States of America; II. Substantive parts of the communications by the international organizations; III. Trichothecenes; IV. Questionaire sent by the Group of Experts to the Government of the United States in connexion with its submission dated 14 September 1981; and V. Summary of the interviews conducted by the Group of Experts during its visit to Thailand.

II. ORGANIZATION OF WORK AND RECORDS OF PROCEEDINGS

12. The Group of Experts to Investigate Reports on the Alleged Use of Chemical Weapons, established by the Secretary-General pursuant to General Assembly resolution 35/144 C, held its first session from 20 to 24 April 1981 at United Nations Headquarters in New York.

13. The session was attended by Major General Dr. Esmat A. Ezz of Egypt and Dr. Edward E. Ambeva of Kenya as well as by the Consultant to the Group, Dr. Herbert Marcovich of the Pasteur Institute, Paris, France. The Group decided to defer the question of election of a Chairman until the second session, pending the completion of the Group.

14. The Group considered its mandate as contained in operative paragraphs 4 and 5 of the resolution according to which the Secretary-General was requested to carry out an impartial investigation to ascertain facts pertaining to the reports regarding the alleged use of chemical weapons and to assess the extent of the damage caused by the use of chemical weapons, and to carry out such investigation.

15. At its first session, the Group carried out a preliminary examination of the following material: 2/

2/ Regarding a detailed discussion of sources of information, see sect. III.

(a) Replies received from Governments to the note verbale from the Secretary-General, dated 26 January 1981, pursuant to resolution 35/144 C. 3/

(b) Relevant documents of the thirty-fifth a thirty-sixth sessions of the General Assembly.

16. The Group also took note of the existence of other General Assembly documents from previous years which might be of relevance to its work.

17. After the preliminary examination of the material, the Group felt that in order to ascertain the facts and with a view to reaching scientific conclusions, it was important that a questionnaire, as formulated by the experts, should be addressed to the Governments which had submitted substantive information in response to the note verbale of the Secretary-General, requesting them to furnish further details which might clarify areas of uncertainty concerning the reports where alleged use of chemical agents were mentioned. 4/ Accordingly, at the request of the Group, the questionnaire was transmitted to Canada and the United States of America and the replies 5/ received were available to the group at its second session.

18. Upon the completion of nominations by the Secretary-General, the Group of Experts held its second session from 13 to 28 July 1981. The Group elected Major General Dr. Esmat A. Ezz as its Chairman.

19. During its second session, the Group, after having once again taken note of its mandate as contained in paragraphs 4 and 5 of resolution 35/144 C, undertook an examination of the new material on the alleged instances of the use of chemical weapons. 6/

20. Further, the Group noted that in pursuance of paragraph 5 (a) of resolution 35/144 C, the Secretariat, in a communication dated 1 May 1981, had requested the following organizations to provide any information that they might deem appropriate; the International Committee of the Red Cross, the Office of the United

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3/ Conference Room Papers No. 1 and 2 containing, inter alia, a compendium entitled "Reports of the Use of Chemical Weapons in Afghanistan, Laos and Kampuchea", and its up-date enclosed with the communication of the United States Government, dated 27 March 1981, in reply to the note verbale of the Secretary-General dated 26 January 1981.

4/ For the contents of the questionnaire, see annex I.

5/ Conference Room Papers Nos. 2 and Add.1.

6/ Conference Room Paper No. 1, Adds. 3 and 4; Confrence Room Paper No. 2 and Add.1; and documents A/36/81, 104, 121, 157, 173, 207, 229, 232-S/14473, 254 and 312.

Nations High Commissioner for Refugees and the World Health Organization. The Group studied the replies received from the International Committee of the Red Cross and the World Health Organization. 7/

21. In the course of its second session, the Group also considered questions related to the background to the problem of the alleged use of chemical weapons and took a decision on the parameters of its investigation in terms of the documentation on the basis of which the investigation should proceed. 8/

22. In addition, the Group of Experts discussed various issues related to the technical and medical aspects concerning the methods of its investigation, including the question of definitions and parameters of its investigation.

23. The third session of the Group was held from 20 October to 19 November 1981 in New York, with a concurrent visit to Thailand from 31 October to 10 Novmber 1981. During this period the Group examined new submissions referred to in paragraphs 62, 63 and 73 below and adopted its report to be submitted to the General Assembly at its thirty-sixth session. The visit to Thailand was made by the Group pursuant to the acceptance from the Government of Thailand to visit the holding centres for refugees from Indochina in pursuance of paragraph 5 (b) of Assembly resolution 35/144 C.

III. BACKGROUND TO THE PROBLEM OF THE ALLEGED USE OF CHEMICAL WEAPONS AND SOURCES OF INFORMATION ON THE SUBJECT

24. In the context of the United Nations, allegations concerning the use of chemical weapons have been made in the past from time to time, as reflected in the relevant documents of the General Assembly over the years. General Assembly resolution 35/144 C was, however, the first instance in which the Assembly decided to request the Secretary-General to carry out an investigation of reports concerning the alleged use of chemical weapons and to assess the extent of the damage caused by the use of these weapons.

25. In the course of discussing its mandate, the Group considered the parameters of its investigation in terms of the documentation on the basis of which it would conduct its investigation.

26. The Group of Experts was cognizant of the relevant discussion during the thirty-fifth session of the General Assembly concerning questions relating to a possible time frame within which reports of alleged use of chemical weapons would have to be investigated.

7/ Conference Room Paper No. 3. For the reply from UNHCR, see para. 50.

8/ See section III.

27. After an intensive exchange of views and elaborate consideration of the question of documentation to be addressed, the Group decided that, for practical reasons, it would be necessary to concentrate, in the first place, on the communications received from Governments by the Secretary-General, in pursuance of paragraphs 6 and 7 of resolution 35/144 C, in which the General Assembly invited the Governments of States where chemical weapons were used to provide the Secretary-General with all relevant information they might have in their possession, and called upon all States to co-operate in this investigation and to provide any relevant information they might have in their possession regarding such reports.

28. Communications were received from the following Member States: Australia, Belgium, Canda, Cuba, Denmark, Dominican Republic, Ecuador, France, German, Federal Republic of, Greece, Indonesia, Ireland, Italy, Japan, the Lao People's Democratic Republic, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Saint Vincent and the Grenadines, United Kingdom of Great Britain and Northern Ireland, United States of America and Viet Nam.

29. Furthermore, the Group deemed it necessary to take account of the relevant documentation and official records of the thirty-fifth session of the General Assembly on the subject, as well as of the relevant documentation on this matter submitted in connexion with the thirty-sixth session of the Assembly. The following documents were considered by the Group:

I. Complaints regarding the alleged use of chemical weapons submitted at the thirty-fifth session of the General Assembly.

(a) Letter dated 22 January 1980 from the Chargé d'Affaires a.i. of the Permanent Mission of Viet Nam to the United Nations addressed to the Secretary-General (A/35/71);

(b) Letter dated 11 February 1980 from the Permanent Representative of Democratic Kampuchea to the United Nations addressed to the Secretary-General (A/35/96-S/13790);

(c) Letter dated 11 April 1980 from the Permanent Representative of Democratic Kampuchea to the United Nations addressed to the Secretary-General (A/35/173-S/13891);

(d) Letter dated 24 April 1980 from the Permament Representative of Democratic Kampuchea to the United Nations addressed to the Secretary-General (A/35/185-S/13906);

(e) Letter dated 12 May 1980 from the Permanent Representative of Viet Nam to the United Nations addressed to the Secretary-General (A/35/226);

(f) Letter dated 10 June 1980 from the Permanent Representative of Democratic Kampuchea to the United Nations addressed to the Secretary-General (A/35/288-S/13992);

(g) Note verbale dated 4 September 1980 from the Permanent Mission of Afghanistan to the United Nations addressed to the Secretary-General (A/35/430);

(h) Letter dated 17 September 1980 from the Permanent Representative of Democratic Kampuchea to the United Nations addressed to the Secretary-General (A/35/462-S/14178).

II. Official records of discussion at the thirty-fifth session of the General Assembly on the subject under agenda item 34.

III. Complaints regarding the alleged use of chemical weapons submitted at the thirty-sixth session of the General Assembly.

(a) Letter dated 26 January 1981 from the Permanent Representative of Democratic Kampuchea to the United Nations addressed to the Secretary-General (A/36/81);

(b) Letter dated 17 February 1981 from the Permanent Representative of Democratic Kampuchea to the United Nations addressed to the Secretary-General (A/36/104);

(c) Letter dated 9 March 1981 from the Permanent Representative of Democratic Kampuchea to the United Nations addressed to the Secretary-General (A/36/121);

(d) Letter dated 27 March 1981 from the Permanent Representative of Democratic Kampuchea to the United Nations addressed to the Secretary-General (A/36/157);

(e) Letter dated 6 April 1981 from the Permanent Representative of Democratic Kampuchea to the United Nations addressed to the Secretary-General (A/36/173);

(f) Letter dated 14 April 1981 from the Permanent Representative of Democratic Kampuchea to the United Nations addressed to the Secretary-General (A/36/207);

(g) Letter dated 27 April 1981 from the Permanent Representative of Democratic Kampuchea to the United Nations addressed to the Secretary-General (A/36/229);

(h) Letter dated 5 May 1981 from the Permanent Representative of Democratic Kampuchea to the United Nations addressed to the Secretary-General (A/36/232-S/14473);

(i) Letter dated 14 May 1981 from the Permanent Representative of Democratic Kampuchea to the United Nations addressed to the Secretary-General (A/36/254);

(j) Letter dated 8 June 1981 from the Permanent Representative of Democratic Kampuchea to the United Nations addressed to the Secretary-General (A/36/312);

(k) Note verbale dated 14 September 1981 from the Permanent Representative of the United States of America to the United Nations addressed to Secretary-General (A/36/509);

(l) Letter dated 22 September 1981 from the Permanent Representative of Viet Nam to the United Nations addressed to the Secretary-General (A/36/549);

(m) Letter dated 30 September 1981 from the Permanent Representative of Cuba to the United Nations addressed to the Secretary-General (A/36/566-S/14713);

(n) Letter dated 5 October 1981 from the Permanent Representative of Cuba to the United Nations addressed to the Secretary-General transmitting Inter-Parliamentary Conference resolutions (A/36/584);

(o) Letter dated 9 November 1981 from the Permanent Representative of Democratic Kampuchea to the United Nations addressed to the Secretary-General (A/36/664);

(p) Letter dated 13 November 1981 from the Permanent Representative of Democratic Kampuchea to the United Nations addressed to the Secretary-General (A/36/687);

(q) Letter dated 9 October 1981 from the Permanent Representative of Viet Nam to the United Nations addressed to the Secretary-General (A/C.1/36/5);

(r) Letter dated 12 November 1981 from the Permanent Representative of the United States of America to the United Nations addressed to the Secretary-General (A/C.1/36/10).

30. In addition, the Group noted that in the preambular paragraphs of resolution 35/144 C the General Assembly had taken note of the statements of various international organizations concerning certain reports of the alleged use of chemical weapons. Also, in paragraph 5 of that resolution, the Assembly requested that relevant information on the subject be sought, inter alia, from international organizations. Accordingly, as noted in paragraph 20 above, the Secretariat, in communications dated 1 May 1981, requested the International Committee of the Red Cross, the Office of the United Nations High Commissioner for Refugees and the World Health Organization to provide any information that they might deem appropriate. Replies were received from the ICRC, UNHCR and WHO and were examined by the Group. 9/

31. The Group recognized that in carrying out its task it could explore other necessary sources of information as stipulated in paragraph 5 (a) of resolution 35/144 C.

32. After a thorough examination of the relevant documentation, the Group found that various statements containing allegations of the use of chemical weapons in recent wars and in military operations were related to a number of areas of the world, but that in a majority of instances the claims were not pursued in the communications submitted in reply to the note verbale of the Secretary-General.

33. With regard to complaints by Viet Nam, the Group took note of the letter dated 22 January 1980 from the Chargé d'Affairs a.i. of the Permanent Mission of Viet Nam

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9/ For the text of the substantive parts of the replies, see annex II.

to the United Nations addressed to the Secretary-General (A/35/71), the annex to which contained a "Memorandum of the Ministry for Foreign Affairs of the Socialist Republic of Viet Nam on the U.S. criminal use of toxic chemicals in Viet Nam, Laos and Kampuchea". This stated, inter alia:

"In its war of aggression against the peoples of Viet Nam, Laos and Kampuchea, besides bombs and shells and war means of various kinds, the United States used systemically and on a large-scale toxic chemicals and gases to kill civilians and destroy the environment in the three Indochinese countries.

"The United States sprayed more than 100,000 tons of toxic chemicals on almost all provinces of South Viet Nam, where 13,000 km2 (43%) of land areas and 25,000 km2 (44%) of forests were targets for one to several sprayings.

"70% of coconut orchards, 60% of rubber plantations, 110,000 hectares of pine-woods along the coast and 150,000 hectares of mangrove forests were sprayed for defoliation, an amount of food enough to feed millions of people was destroyed as a result of this chemical warfare.

"There were 2,000,000 victims of toxic chemicals among whom 3,500 were dead.

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"Of late, in close collaboration with China and its henchmen, the United States has circulated fabrications and slanderous allegations about what is called 'Viet Nam's use of toxic chemicals in Laos and Kampuchea'.

"In so doing, the United States, obviously, tries to mislead public opinion, cover up and blot out its genocidal crimes in the Indochinese peninsula and shirk its responsibility for the crimes it committed against the peoples of Viet Nam, Laos and Kampuchea, and its responsibility towards

victims of chemical warfare who were U.S. servicemen and soldiers of U.S. allies engaged in the war of aggression against Viet Nam.

"While striving to stage this scene of 'Viet Nam's use of toxic chemicals', the United States deliberately conceals the war crimes against the Vietnamese people in February 1979 by Chinese troops including the use of toxic gas in some populated areas and the poisoning of drinking water sources in the areas they set foot in."

34. (a) Furthermore, the Group studied the reply of the Government of Viet Nam, dated 18 April 1981, to the note verbale by the Secretary-General dated 26 January 1981 the relevant part of which referred to the subject examined by the Group and stated the following:

"Of late, the United States has, in coordination with the Chinese ruling circles, slanderously charged Viet Nam of resorting to the so-called 'use of chemical weapons' in order to cover up the criminal U.S. chemical war waged against the Vietnamese people and the crime of genocide perpetrated by the Chinese ruling circles against the Kampuchean people through the hands of their henchmen, the Pol Pot clique of bourreaus.

"At the thirty-fifth session of the General Assembly, the delegation of the Socialist Republic of Viet Nam, together with many other delegations, rejected this vicious political design and voted against resolution 35/144 C.

"The Socialist Republic of Viet Nam, in co-operation with other countries, is making great efforts to correctly assess and gradually overcome the consequences of the use of U.S. chemical weapons caused to the people and the environment of Viet Nam. However the Socialist Republic of Viet Nam will not engage in any activities in the framework of the ill-intentioned resolution 35/144 C."

(b) The Group of Experts also took note of the reply by the Government of the Lao People's Democratic Republic dated 31 August 1981 to the note verbale of the Secretary-General dated 26 January 1981 in pursuance of resolution 35/144 C, the relevant part of which stated inter alia:

"During the debate in the First Committee on questions of arms limitation and disarmament at the thirty-fifth session of the General Assembly, the delegation of the Lao People's Democratic Republic vigorously refuted and condemned the totally unfounded allegatins brought against its country by the delegation of the United States on the subject of chemical weapons.

"While continuing its efforts, together with all countries which value peace and security, towards the conclusion of an international treaty on the banning of chemical weapons, the Lao People's Democratic Republic reaffirms its unmoving opposition to resolution 35/144 C and categorically rejects the so-called 'Group of Experts' envisaged in that resolution."

(c) Under the circumstances, the Group felt unable to undertake any investigation of the allegations concerning the use of chemical weapons on the territory of Viet Nam and Laos.

IV. GENERAL OBSERVATIONS ON CHEMICAL WEAPONS AND PARAMETERS OF THE INVESTIGATION

35. In its endeavours to examine impartially the reported allegations regarding the use of chemical weapons, the Group of Experts had to compare the material submitted for its consideration with the accessible body of available up-to-date information on such chemical weapons. Presented below is the background information on this subject as discussed by the Group during its proceedings.

A. Existing prohibitions on the use of chemical weapons

36. From a military point of view, chemical warfare is highly effective, but it has been considered an uncivilized and immoral form of warfare, especially since its use in World War I. Attempts to outlaw chemical warfare were made in the Brussels Declaration of 1874 and at the Hague International Peace Conference of 1899, which condemned the use of asphyxiating gases. When casualties of gas

attacks returned home after the First World War, their physical condition raised great concern and caused horror towards the use of chemical warfare agents. The Versailles Peace Treaty contained a section which outlawed the use of asphyxiating, poisonous or other gases and all analogous liquids. As a result of various efforts of the International Committee of the Red Cross and under the pressure of general public opinion, the Geneva Protocol for the Prohibition of the Use in War of Asphyxiating, Poisonous or Other Gases, and of Bacteriological Methods of Warfare 10/ was concluded in 1925. This Protocol is considered by many governments as prohibiting the first use of chemical weapons, since a number of signatories of the Protocol reserved the right to retaliate in kind. Other States consider that only States parties to the Protocol are entitled to benefit from its restrictions. The Protocol does not prohibit the production of chemical weapons, nor does it include verification provisions.

B. Combat characteristics of chemical weapons

37. Chemical weapons possess the following combat characteristics:

(a) Large area coverage;

(b) Penetration into shelters, bunkers, buildings, personnel carriers, tanks, interior of aircraft and ships;

(c) Covertness;

(d) Ability to pollute water and food supplies;

(e) Ability to continue to produce their effect for some time after their use, depending on the nature of the agent used;

(f) Wide range of optional effects extending from rates and degrees of incapacitation of various kinds to lethality, the onset of which may occur after varying periods following exposure;

(g) Ability not to destroy territory, buildings or equipments and to be utilized for neutralizing areas whose resources are to be kept completely intact for use after occupation;

(h) Ability to render areas temporarily impassable or untenable;

(i) Ability to render material and equipment temporarily unusable;

(j) Ability to produce panic and horror among troops, especially if they are not well trained, or equipped with protective means;

(k) Troops are forced to put on protective masks and clothes, which greatly reduce their combat effectiveness.

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

C. Methods of dissemination

38. Chemical agents are usually stored in liquid, powder or gaseous form. The agents can be loaded into most of the tactical and strategic munitions and delivery systems. Chemical munitions include artillery shells, mortar bombs, mines, aerial bombs, grenades, rockets and cannisters for aerial spraying. Some aerial bombs or missile warheads are filled with bomblets or submunitions which are scattered across the target area, exploding in mid-fall or by delayed action once they reach the ground. Chemical agents can be disseminated by aerial spraying, creating chemical clouds whose life span would depend on the particle size of the aerosal produced and also on the speed of the wind and other weather conditions. Chemical ammunitions pose great risks in storage, transport and handling; in addition some of these ammuhitions may leak when old. These considerations have led to the introduction of binary munitions, which contain two separate compartments, each containing an agent which by itself is practically non-toxic. After a projectile has been fired the two substances mix and thus generate the toxic agent while in flight. Such chemical ammunition is safer to handle and can be stored indefinitely.

D. Routes of entry

39. Chemical warfare agents gain access to the living organism through breathing and feeding or through the skin and/or mucous membranes. Plants can be toxic after absorbing herbicides or defoliants through their leaves or roots. Humans and animals can be injured or killed when they breathe the air, eat food or drink water which has been contaminated with a chemical warfare agent. Disease or death may also occur if such agents enter the body via cuts, wounds or the bare skin. Incapacitating or harassing agents are prone to produce their effect by entering the eyes and/or the respiratory tract.

E. Effects of the use of chemical weapons from the point of view of medical signs and symptoms

40. The following generally recognized effects of the commonly known chemical warfare agents on the major organs and systems of the body were taken into account by the Group in its investigation, drawing on th publicly accessible sources of professional literature, notably: the report of the Secretary-General entitled "Chemical and Bacteriological (Biological) Weapons and the Effects of their Possible Use," 11/ the WHO Report on Health Aspects of Chemical and Biological Weapons, 12/ Stockholm International Peace Research Institute and others, such as military manuals and military journals.

1. Effects on the eyes

41. Practically all chemical warfare agents affect the eyes to some extent, dependent on the nature of te agent and its concentration.

11/ United Nations publication, Sales No. E.69.I.24.

12/ Health Aspects of Chemical and Biological Weapons, report of a WHO Group of Consultants (World Health Organization, Geneva, 1970).

(a) Vesicants (mustard, nitrogen mustard and lewisite), if brought into contact with the eyes, cause great damage. The symptoms begin with redness and oedema of conjunctiva, a severely painful gritty sensation, swollen eyelids and blepharospasm, and increase to include photophobia, excessive lacrimation and ulceration of the cornea. In severe cases the pupil may be slightly constricted but light reflex is still present. The effects of lewisite occur immediately after exposure, while those of mustard are delayed for several hours and may not reach their peak except after 2 to 3 days after initial contact.

(b) Nerve agents in vapor or liquid form cause constriction of the pupil (pin-point) which is nonreactive. They cause redness of the conjunctiva, pain behind the eye and dimness of vision.

(c) Phosgene may produce some lacrimation, but the respiratory symptoms overshadow this effect.

(d) Sternutators irritate the eyes and cause lacrimation but they are mainly recognized by the concomitant sneezing and coughing.

(e) Lacrimators cause irritation of the eyes, pain, redness, photophobia, pelepharospasm and profuse lacrimation.

(f) Cyanogen chloride vapor causes irritation of the eyes and lacrimation.

2. Effects on the nose and throat

Such effects include the following:

(a) Sternutators cause violent sneezing, pain, a feeling of fullness of the nose and rhinorrhea.

(b) Vesicants cause local irritation and severe pain, followed by swelling, discharge and local ulceration. These symptoms are more severe when lewisite is involved; the effects of the use of this agent occur immediately after exposure.

(c) Nerve agents produce no local action on the nose and throat but as a part of their general action they produce watery discharge, excessive salivation and a feeling of tightness in the throat.

(d) Lacrimators cause local irritation lasting during the period of exposure only.

(e) Cyanogen chloride vapor, if inhaled, caused nasal irritation and rhinorrhea.

(f) Diphenylcyanorsine (DC) may produce bleeding through the nose and mouth.

3. Effects on the respiratory system

(a) Lacrimators, if inhaled in high concentration, produce local irritation and tightness of the chest.

(b) Sternutators, if inhaled, cause local irritation and pain, and besides sneezing, cause violent coughing.

(c) Inhalation of cyanogen chloride causes irritation of the respiratory system, coughing, choking and tightness of the chest.

(d) Inhalation of hydrocyanic acid causes deepeningr of the respiration at first, followed by dyspnea, gasping and cessation of respiration.

(e) Inhalation of phosgene causes tightness of the chest, excessive coughing, choking, increasing dyspnea, frothy sputum and cyanosis and finally lung oedema.

(f) Vesicants, inhalation of mustard and nitrogen mustard cause a slowly developing irritation, tightness of the chest, cough and hoarseness of the voice and dyspnea. When lewisite is used the symptoms develop and progress very rapidly.

(g) Nerve agents, if inhaled, do not produce local action, but they are rapidly absorbed. As a part of their general effects they produce bronchorrhea bronchospasm, cough and dyspnea. Secretions may become so excessive that the casualty may be drawn in his own secretions. At lethal levels, respiratory failure due to paralysis of the respiratory muscles may occur.

4. Effects on the gastrointestinal tract

Such effects include the following:

(a) Sternutators may produce excessive salivation.

(b) Cyanogen chloride may produce nausea.

(c) Phosgene may cause nausea, but this is usually overshadowed by the respiratory effects.

(d) Vesicants, if ingested, cause severe vomiting and diarrhea.

(e) Nerve agents affect the gastrointestinal tract through their general effects. They cause excessive salivation, abdominal cramps, heartburn, eructation diarrhea, tenesmus and involuntary defecation.

5. Effects on the cardiovascular system

Such effects include the following:

(a) Phosgene has effects on the cardiovascular system that are secondary to those it exerts on the respiratory system and to the development of lung oedema.

(b) Vesicants may induce shock, owing to loss of body fluids through the damaged skin. As vesicants cause depression of the bone marrowafter systemic absorption they cause anaemia and haemorrhages.

(c) Nerve agents may cause pallor and elevation of the blood pressure. Later, shock may occur with the development of respiratory failure.

6. Effects on the urinary system

Nerve agents may cause incrased freuqency of micturition and in severe cases involuntary micturition may occur.

7. Effects on the skin

Such effects include the following:

(a) Lacrimators and sternutator may produce mild stinging in the skin of the face. When the skin is not healthy, dermatitis may occur. Blisters do not arise.

(b) When phosgene produces respiratory embarrassment, it causes cyanosis of the skin.

(c) Hydrocyanic acid makes the skin more pink than normal, because of the inability of the tissues to remove oxygen from the blood. However, the skin becomes cyanotic when respiration stops.

(d) Vesicants cause redness, burning, blisters and, later, necrosis at the sites exposed. Mustard and nitrogen mustard produce delayed and less pronounced discomforts, while arsenical vesicants such as Lewisite and phosgene oxime produce immediate pain and irritation.

(e) Nerve agents, although readily absorbed through the skin, do not have irritant local effect. As a part of the general effects of a nerve agent, increased sweating and muscular twitches may occur at the site of absorption. When the case progresses, profuse perspiration and extensive muscle tightening may be noted.

8. Effects on the skeletal muscles:

Of all the chemical warfare agent agents only the nerve agents affect the skeletal muscles. Muscle twitches may occur at the sites of skin absorption. Besides easy fatigability and progresive general weakness, systemic nerve agent poisoning causes muscle cramps and twitches. Generalized convulsions occur before death.

9. Effects on the central nervous system

Such effects include the following:

(a) Exposure to lacrimators may be followed by a headache.

(b) Sternutators may cause headaches and slight mental depression.

(c) Phosgene may cause malaise, headache and depression in severe cases.

(d) Vesicants can produce mental depression after severe exposure.

(e) Depending on the dose absorbed, nerve agents may have effects on the central nervous system. These start with giddiness, headache, drowsiness, insomnia, incoherence and a loss of memory. Severe effects include confusion, slurring of speech, ataxia, generalized muscular weakness including respiratory muscles, coma, loss of reflexes, convulsions and death.

F. Question of definition and parameters of the investigation

42. The group addressed itself to th question of definition of chemical weapons so as to be able to evaluate the allegations presented. In the course of its deliberations it, inter alia, considered the definitions of chemical weapons contained in the report of the Secretary-General on chemical and biological weapons in the World Health Organization report on health aspects of chemical and biological weapons, as well as discussions held in the Conference of the Committee on Disarmament and the Committee on Disarmament on a ban on chemical weapons.

43. In the report of the Secretary-General 13/, chemical agents of warfare were defined as "chemical substances, whether gaseous, liquid, or solid, which might be employed because of their direct toxic effects on men, animals and plants" (para. 17). This report considers toxins as chemical warfare agents because, although they are produced by living organisms, they themselves do not multiply.

44. Similarly, the World Health Organization Report entitled "Health Aspects of Chemical and Biological Weapons" contains a similar approach to the definition of chemical warfare agents. Besides the definition, it addresses certain criteria regarding the categories of chemical warfare agents. It provides the following:

(a) Chemical agents of warfare include all substances having harmful toxic effects on men, animals or plants;

(b) A lethal agent is one intended to cause death when man is exposed to concentrations well within the capability of delivery for military purposes;

(c) An incapacitating agent is one intended to cause temporary disease or to induce temporary mental or physical disability, the duration of which greatly exceeds the period of exposure;

(d) A harassing agent (or short-term incapacitant) is one capable of causing a rapid disablement that lasts for little longer than the period of exposure. Furthermore, the report proceeds to point out that no sharp line of demarcation can be drawn between lethal and incapacitating agents used in chemical warfaree, because incapacitating agents can be lethal or permanently disabling under certain circumstances (e.g., in the presence of malnutrition or pre-existing diseases, in infants or the aged, or when there is exposure to unusually high doses, as in enclosed spaces or in close proximity to functioning chemical weapons). For similar reasons, no sharp demarcation line can be drawn between harassing agents and other anti-personnel chemical agents. Furthermore, harassing agents may be used in war in conjunction with high-explosive, fragmentation or other weapons to increase the lethal effectiveness of the latter, as distinct from their employment in riot control in order to reduce injuries and to save lives.

13/ See foot-note 11.

45. The definitions proposed in the Conference of the Committee on Disarmament and in the Committee in Disarmament included different points of view dealing with evaluation of toxicity, single and dual purpose agents precursors, binary weapons and other areas that the group felt have no direct bearing on the current investigation. Besides, no consensus has emerged as yet on any one single definition.

46. In view of the above considerations, the group, in defining the parameters of its investigation, took into account, inter alia, the following:

Delivery systems

(a) The chemical weapon system includes a delivery system for chemical warfare agents;

(b) Any delivery system can be used for this purpose;

(c) The design of delivery systems of chemical weapons can also be specific. Thus, for example, the thickness of the wall of the chemical projectile is usually less than that of a highly explosive projectile. On the other hand, a standard highly explosive projectile can also be filled with chemical agents. In any case, perhaps the only way to determine whether a projectile used in warfare is a chemical weapon or not is by having access to such projectile or its remnants and to conduct a technical examination and, if necessary, even laboratory tests for chemical agents or degradation products that might be present;

(d) Perhaps, the binary chemical ammunition would be the only type which could be exclusively used for chemical warfare. The presence of remnants of such ammunitions would probably yield conclusive evidence of a chemical attack;

(e) Aerial spraying can only be used in the case of chemical and biological warfare and hence incidents where such a method is being used can be taken as evidence of such types of warfare. The only way to differentiate between such types of warfare, besides studying the effects and their onset, would be laboratory analysis. It is known that whereas in the case of chemical attack the effects produced occur either immediately or shortly thereafter, in the case of biological warfare, a much longer period of incubation is involved.

Chemical agents

47. The group decided to take into account the chemical agents which were considered in the reports of the Secretary-General and WHO and decided that the agents to be considered were the groups and types of chemical agents which are commonly known to include lethal agents, incapacitants, and harassing agents. Toxins were also considered, in this context because they are poisonous chemicals regardless of methods ofe production, be they biological or synthetic: it is known that some toxins which are normally produced by micro-organisms can be synthesized without the benefit of any living organism. 14/

14/ For further elaboration regarding the chemical agents under consideration, see section VI and annex III.

V. EVALUATION OF WRITTEN SUBMISSIONS

A. Methods

48. To investigate an allegation of chemical attack, the ideal approach for experts would be to conduct an on-site examination of the alleged attack as soon as possible. This would enable a thorough and technical examination of the site, particularly of any remnants of alleged chemical ammunitions. This would also allow the collection of samples of contaminated soil, vegetations, water and objects for laboratory analysis for any chemical agent or its degradation products. Being on the site immediately after the alleged attack would permit examination of the alleged casualties while there are still some fresh signs and symptoms produced by the chemical agent. It would also afford the opportunity to question the medical staff who attended such casualties and examine the medical records and laboratory investigations which were conducted and the type of treatment which was given. Such on-site investigation would enable post-mortems to be carried out and the possible collection of samples for further investigation. Furthermore, being on the site shortly after an alleged chemical attack would make it possible to question eye-witnesses while facts are still fresh in their minds. All these procedures would help in deciding, with a good degree of certainty, whether a chemical warfare agent was used or not and, perhaps, even the nature of the alleged agent involved.

49. The actual situation with which the group was confronted was, however, a different one. The allegations submitted referred only to incidents which were said to have occurred some time ago. However, despite the constraints involved as a result of having to base itself initially only on documentary material and the general constraints involved in an ad hoc exercise of this type, the group worked out certain modalities for a careful investigation of the allegations presented. After a preliminary examination of the material, the group decided that the first step should be to transmit a questionnaire, which the group prepared, to those States which had submitted substantive information in reply to the note verbale of the Secretary-General, namely Canada and the United States. The purpose of the said questionnaire was to seek further clarification and amplification of some of the data presented. The replies received underlined the fact that the previous submissions had included as much detail as possible and the United States specifically urged the Group of Experts to visit refugee camps as well as the areas of reported attacks in order to obtain testimony and evidence first hand from the relevant sources.

50. After studying the communications received from ICRC, UNHCR and WHO, the group decided that further approaches should be made to ICRC and UNHCR with a view to eliciting additional information and co-operation, as relevant. After considering the replies from these organizations, the Group felt that further co-operation from them would be appreciated.

51. In view of the above, the following method of study was employed:

(a) The first step was to evaluate the degree of reliability of the source and the credibility of the information. In this respect, it was decided to give greater attention to information provided by eye-witnesses of the alleged attack or

by the victim of such an attack. Greater attention was also given to information gathered by technical people, such as medical and military personnel.

(b) The second step in examining the allegations of chemical attacks was to evaluate the information with respect to alleged methods of attack in terms of the generally accepted tactics and practices of chemical warfare. In this connexion, the Group agreed to devote special attention to attacks which were found to be allegedly conducted in conformity with such tactics and practices.

(c) The third step in the evaluation of the allegations was to study the signs and symptoms reported to have been experienced by casualties, following exposure to the alleged chemical attacks, and to try in each case to find out if such signs and symptoms could be produced by any particular known chemical agent. In this evaluation, the group agreed to use as a reference the generally accepted signs and symptoms produced by various individual chemical warfare agents on different organs in the body as described in paragraph 41 above.

52. Various environmental and individual factors which could modify the clinical picture were taken into consideration, for example, weather conditions, temperature, humidity and also the general health of the victim, as well as his or her age and sex.

B. General evaluation of the written submissions

1. The reliability of information

53. After reviewing the material before it, the Group addressed itself to the reliability of the information. The Group did not find any reason to doubt the integrity of those who reported on the chemical attacks. On the other hand, it could not overlook the fact that it was difficult to determine the objectivity of alleged victims or witnesses.

2. Technical aspects

54. In reviewing the reports, certain allegations of the use of chemical weapons could not be accepted outrightly, e.g., the supposed dissemination of chemical agents by aircraft flying at an altitude of 7,000 feet, since at that altitude such agents would be dispersed by the wind and diluted to such an extent that no effective concentration could reach a target. Similarly, such aerial spraying could not possibly affect - as it was alleged to have done - water supplies to produce toxicity and death, produce holes in the leaves of the trees or destroy soft tissues down to the bone. There was also repeated mention of the colours of the chemical agents used. Most chemical warfare agents are colourless, however, and, although different colours may be added to some of the harassing agents, it was the judgement of the Group that it was difficult to consider colour as a factor in identifying the nature of chemical agents. Some mention of grenades or remnants of chemical ammunition was reported, but no elaboration was provided of such samples which could have contributed to the identification of the alleged chemical attack.

3. Medical aspects

55. The Group found it dfficult, in most cases, to pinpoint any chemical agent as being the probable cause of alleged signs and symptoms mentioned, the reason being that in most of t cases in question the signs and symptoms described could not possibly have been produced by a single chemical agent, even after the individual variations in responses to a chemical insult and the modifying effects of the constitution or general health and the degree of tolerance of each individual involved have been taken into consideration.

56. This evaluation is based on an assessment of the medical aspects of each case as reported. The clinical accuracy depends very much on the way the information was collected. In some instances this collection was done by a medically trained person, and the reliability is therefore greater. However, since the data were obtained by people with limited knowledge of chemical agents used in warfare, many signs and symptoms could have been ignored or described incompletely and subjectively, specially since the alleged victims might have biased their reports.

57. A simplified description of symptoms attributable to chemical warfare agents has been established to systematize the reported symptomatology. Death and non-specific symtoms such as dizziness, headache or unconsciousness could not be systematized. In view of the imprecision of many reports, no conclusion could be reached from them.

58. The specific identification of the chemical agents, because of vagueness of the whole symptomatology and also because of the lack of full medical assessment and investigations as well as any chemical analysis, is impossible. The only conclusion which could be drawn would be to ascribe a given symptomatology to a type of agent.

59. Diphenylcyanoarsine (DC) was used as a harrassing agent against the Chinese during the Chinese-Japanese war of 1934-1945. Some seriously affected persons bled through their noses and mouth and died from asphyxiation. This might explain some of the symptomatology in some of the cases described in the United States submission with similar signs and symptoms.

60. The following is a classification of the cases, in terms of the possible agents which could allegedly have produced the signs and symptoms as presented in the Canadian and United States submissions. The cases have been considered one by one but are grouped according to their common symptomatology for this summary.

A. No correlation with chemical agents (no symptoms given, imprecise reports, serious inconsistencies) 15/

Afghanistan (United States submission):

Cases 15/ 1, 4, 5, 6, 9, 9b, 10, 11, 12, 13, 15, 16, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32.

15/ The numbers correspond to those appearing in the submissions of the United States and Canada.

Afghanistan (United States update):

Cases 1, 2, 3, 4, 5, 6, 8, 10, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 24, 25, 26, 27, 28B, 31, 32, 33.

Laos (United States submission):

Cases 1, 3, 4, 8, 10, 12, 15, 16, 17, 18, 22, 25, 26, 27B, 30, 34, 36, 36B, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 52, 58, 60, 61, 63, 65, 66, 67, 68B, 70, 71, 72, 73, 74, 75, 80, 84, 85, 86, 88, 89, 92, 93, 94, 96, 97, 98, 99, 101, 102, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114.

Laos (United States update):

Cases 1, 3, 4, 5, 6.

Laos (Canadian submission):

Cases 4, 5, 6, 7.

Kampuchea (United States submission):

Many of the reported cases lack any reference to symptoms. The following is the list of symptoms which are most often referred together in the submission. This list does not fit any known chemical warfare agent: dizziness, weakness, headache, dyspnea, suffocation, nausea and vomiting, and sometimes bloody diarrhea and/or skin lesions described as "burns"

Submissions by Democratic Kampuchea:

The submissions by Democratic Kampuchea contained allegations of use of chemical warfare agents which are claimed to have caused casualties, but no significant clinical data were provided which could have helped in reaching an adequate assessment of the situation.

B. Harassing agents

(1) Possibly adamsite, characterized by upper respiratory tract irritation, nausea and vomiting, eye irritation and in some cases death.

Afghanistan (United States submission):

Cases 2, 8, 20, 23.

Afghanistan (United States update):

Cases 11B, 29.

Laos (United States submission):

Cases 9, 11, 13, 14, 19, 20, 21, 24, 31, 37, 49, 50, 51, 54, 55, 61, 76, 79, 81, 83, 87.

Laos (United States update):

Cases 2, 7, 9B, 9C.

Laos (Canadian submission):

Cases 1, 2, 3, 9, 10.

(2) Possibly tear gas, characterized by eye irritation, coughing, upper respiratory tract irritation, rhinorrhoea (runny nose).

Afghanistan (United States submission):

Cases 3, 14, 17.

Afghanistan (United States update):

Cases 7A, 11, 12, 28A, 29A, 30.

Laos (United States submission):

Cases 2, 5, 7, 23, 27, 28, 32, 35, 36A, 37B, 53, 56, 57A, 57B, 62, 64, 69, 77, 78, 82, 90, 91.

Laos (United States update):

Cases 8, 9A.

Laos (Canadian submission):

Case 8.

C. Blistering agents

Not specifically identified

Afghanistan (United States update):

Cases 7B, 8B, 9B.

D. Nerve Gas

Not specifically identified

Laos (United States submission):

Cases 6, 100, 103.

61. It was the feeling of the Group that the above classification of the cases, in terms of the alleged signs and symptoms suggestive of the most probable chemical agent which could have produced a particular clinical picture, in no way establishes that the Group was in a position to suggest that such agents might have actually been used.

VI. THE QUESTION OF MYCOTOXINS

62. As referred to in paragraphs 10, 12, and 18 above, after consideration of the reply by the Government of the United States of America to the note verbale of the Secretary-General and the replies of Canada and the United States to the questionnaire prepared by the Group (see annex I), the Group considered a note verbale dated 14 September 1981 from the Permanent Representative of the United States to the United Nations addressed to the Secretary-General. This contained a new submission involving the question of the alleged use of mycotoxins and was considered although this submission was received during the concluding stages of the Group's work. This submission stated, inter alia, as follows:

> "For several years, the United States has been concerned about reports that lethal and incapacitating chemical weapons are being used in the conflicts in Laos and Kampuchea and, since the Soviet invasion in December 1979, in Afghanistan. As a result of this concern, the United States has actively endeavoured, as have other concerned members of the international community, to obtain information which might enable us to ascertain the facts pertaining to these reports.
>
> "Since 1979, the United States has been reviewing and carefully analysing information and evidence obtained relating to alleged chemical attacks in these regions. We now believe we have information which will answer some of the questions raised by the reports.
>
> "Reports about exposure to the cloud describe bizarre effects which, in rapid sequence, caused dizziness, nausea, coughing of blood-tinged material, choking, vomiting of massive amounts of blood, bloody diarrhea, formation of multiple small hard blisters, followed by shock and death in those directly under the sprays. For those on the periphery of the attacks or who ate or drank contaminated food, or water, symptoms took longer to develop (days, rather than minutes to hours) and usually led to death within two weeks if no treatment was given.
>
> "United States experts have studied and evaluated the symptoms described in these reports in an effort to form a judgement about what agent or agents might have caused such effects. The conclusion reached was that no known traditional chemical warfare agent alone or in combination with others could produce all of the symptoms described or cause death to occur as rapidly as has been reported.
>
> "Recent analysis of a leaf and stem sample from the area of a reported chemical attack in Kampuchea has revealed the presence of substances which are not traditional chemical warfare agents, but which cause the specific symptoms and effects which have been described. Specifically, tests on the sample identified abnormally high levels of three potent mycotoxins of the trichothecene group: nivalenol, deoxynivalenol, and T-2 toxin. Levels of deoxynivalenol and nivalenol detected were up to 20 times greater than that reported to occur as a result of natural intoxication. A report on the tests is annexed to this letter.

"Symptoms associated with trichothecene poisoning include the rapid onset of vomiting, multiple hemorrhaging of mucous membranes, bloody diarrhea and severe itching or tingling of the skin with formation of multiple small hard blisters. All of the trichothecenes produce similar symptoms; however, there are some differences in the degree of severity: nivalenol and deoxynivalenol produce fewer skin irritative effects than T-2; nivalenol is a slightly stronger hemorrhagic than either deoxynivalenol or T-2; deoxynivalenol (also known as vomitoxin) causes very severe vomiting."

63. As a result of a preliminary analysis of the United States submission, the Group of Experts was of the opinion that further clarifications were required. The Chairman of the Group, in consultation with the other members, prepared a detailed questionnaire which was transmitted to the United States Government. 16/ The reply to this questionnaire was received from the United States in a letter from the Deputy Permanent Representative of the United States of America to the United Nations dated 20 October 1981. In its reply, the United States also requested that United States experts on the question of the use of chemical weapons appear before the Group of Experts in order to supplement the information conveyed in the written United States submissions (Conference room paper No. 6). Pursuant to that request, the Group met with the United States experts on 21 October 1981. The American experts, inter alia, pointed out the following:

(a) Many of the signs and symptoms of the allegation in the United States submissions were consistent with trichothecene intoxication;

(b) In cases of death within one hour, some other chemical warfare agent might be involved;

(c) LD_{50} for mycotoxin was not known;

(d) They had more samples which were being analysed;

(e) Estimations of the required amount of trichothecene used in aerial attack was not calculated;

(f) Mixture of nivalenol and T_2 was perhaps meant to increase the percutaneous absorption of the trichothecene via the skin.

64. The Group took note of the letter dated 22 September 1981 from the Permanent Representative of Viet Nam to the United Nations addressed to the Secretary-General (A/36/549) transmitting a statement by the spokesman of the Ministry of Foreign Affairs, in which the Government of Viet Nam rejected the United States charges concerning the alleged use of Soviet-supplied toxic chemicals in Laos and Kampuchea. The Group also considered the letter dated 9 October 1981 from the

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16/ For the text of the questionnaire, see annex IV.

Permanent Representative of Viet Nam to the United Nations addressed to the Secretary-General (A/C.1/36/5) transmitting an article by a Vietnamese authority on the subject of chemical warfare. In this connexion, the Group felt that some substantive questions in this article had already been raised by the Group in the questionnaire addressed to the Government of the United States in relation to its submission of 14 September 1981.

65. The Group decided to address itself to the question of mycotoxins in accordance with the discussion of this subject as reflected in paragraph 43 above, specifically in view of the fact that toxins are poisonous chemicals regardless of methods of production, be they biological or synthetic. At the same time the Group was aware of the limits of its mandate with regard to the relevant provisions of the Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons and on their Destruction.

66. In its study of the United States submission of 14 September 1981, the Group considered the responses of the United States Government to the questions submitted by the Group in light of the background information about mycotoxins which was collected from various scientific sources including discussions with some experts of the International Register of Potentially Toxic Chemicals in the World Health Organization and the United Nations Environment Programme in Geneva. 17/

67. The Group felt that, whereas on an a priori basis it would not wish to question that the samples were collected from an area in Kampuchea which was alleged to have been exposed to a chemical attack, it nevertheless was of the opinion that the optimum procedure in this respect would be for a competent impartial party to have immediate access to the area of the alleged chemical attack and to be able to collect samples which are to be sent to impartial laboratories where the necessary investigations can be conducted. Furthermore, such an impartial party would be able, being on-site, to collect any relevant information on the alleged attack and observe any effects on human, animals or plants.

68. With respect to sampling, the Group was of the opinion that since there had been access to the area, besides vegetation, samples from soil and water should have been obtained. In this respect, it was later pointed out by the United States experts that such samples had in fact been acquired and the results of their analysis would be provided subsequently to the Group.

69. With respect to the analysis of the leaf and stem sample, the Group felt that it was necessary to prove definitively whether or not the sample contained any mycotoxin-producing fungi, in order to exclude the possibility that the mycotoxins found were of natural origin. Likewise the soil should be tested for the presence of mycotoxin-producing fungi and the presence of mycotoxins in order to rule out the possibility of translocation of the mycotoxins to the leaf via the roots of the plant.

17/ See annex III for background information on trichothecenes.

70. Again, the Group felt that morphological study of the leaf in question was necessary in order to ascertain the effects of mycotoxins on the structure of the leaf, especially since these mycotoxins had remained on the leaf for some time before it was picked.

71. With respect to the area from which the sample was collected, it was important to have detailed information about the survivors of the alleged chemical attack including their present place of residence and any available medical records. Such information would be necessary to determine whether or not a chemical attack had occurred as well as the possible agent that might have been used.

72. Subsequent to the receipt of the new United States submission of 14 September 1981, the Group felt that it was necessary once again to review the allegations previously submitted by the United States and Canada with a view to determining whether the signs and symptoms reported could be co-related to the possible use of mycotoxins. In this respect, it should, however, be pointed out that the available literature on mycotoxins referred only to cases of sub-acute and chronic effects in humans resulting from oral intake. In experimental work on animals, acute and chronic toxicity studies have been carried out but none of the studies covered inhalation toxicity as would be the case in chemical warfare activity.

73. The Group also examined the note verbale dated 12 November 1981 submitted by the Permanent Representative of the United States to the United Nations and took note of the following: the latest submission provided answers to some of the inquiries of the Group, as presented in its questionnaire pertaining to the issue of mycotoxins and in the interview with the United States experts, namely (a) control samples collected from the region outside the area of alleged chemical attack were obtained and found not to contain mycotoxins; (b) sample of water collected from the area of alleged chemical attack was tested and found positive for trichothecenes. The Group points out that the following questions could still be raised with respect to the United States submissions:

(a) The question of attempting the isolation of mycotoxin-producing fungi in the samples which were collected, to discard the possibility that the mycotoxin detected originated from a natural source;

(b) The question of the presence of mycotoxin-producing fungi in the soil to discard the possibility of translocation from the soil to the stem and leaf;

(c) The question of the effect of trichothecenes on the leaf sample, since at least 10 days passed between the alleged chemical attack and the collection of the leaf;

(d) The question of the climate of South-East Asia as related to the geographical distribution of mycotoxin-producing fungi and the biosynthesis of trichothecenes, many scientific publications report production of these mycotoxins at temperatures of 20-30° C, and in warm areas;

(e) The question of the development of a hemorrhagic syndrome through exposure to T_2 toxin and some other trichothecenes is currently controversial,

since there is experimental evidence according to which these toxins were unable to cause a hemorrhagic syndrome by oral administration (chronic and acute);

(f) The question of the time intervals between alleged attacks and the dates of collection of the samples, which related to the matter of stability of these compounds. For example, the latest submission states that sample F was collected from the site of an alleged attack occurring 2 April 1981, but does not provide the date of collection.

VII. ON-SITE COLLECTION AND EXAMINATION OF EVIDENCE

74. At the end of its second session, on 28 July 1981, the Group, having examined the submissions containing reports of the alleged use of chemical weapons, decided that on-site investigation in accordance with its mandate would be necessary in order to collect and examine evidence. The object of such visits would be to collect and examine evidence, including on-site, with the consent of the countries concerned, to the extent relevant to the purposes of the investigation, and more specifically, to examine the areas where the chemical attack had allegedly occurred; to collect remnants of any chemical ammunitions and to collect samples of any chemical agents that might have been used; to collect any contaminated objects like foliage, soil and water; to interview and conduct full medical examinations and investigations on the alleged victims of chemical attack; to interview alleged witnesses of chemical attack; to interview medical personnel who had attended the alleged victims and examine the pertinent medical records, where available; to gather other observations and data from other sources, as appropriate and to assess the extent of the damage caused by the chemical attack.

75. Accordingly, the Group requested that approaches concerning respective visits be made to the Governments of those countries where alleged use of chemical weapons had taken place, as well as of those where victims of alleged attacks were hosted in refugee camps.

76. In a letter dated 9 October 1981, the Group received an acceptance from the Government of Thailand to visit the holding centres for refugees from Indochina in pursuance of paragraph 5(b) of General Assembly resolution 35/144 C. On this occasion, the Government of Thailand declared its understanding that no on-site inspection would be conducted on Thai territory, as such weapons had not been used in Thailand itself. The Group, holding at that moment its final session at United Nations Headquarters in New York, with the purpose of drafting its report to the General Assembly, decided to visit Thailand for the purposes stated above.

77. In a letter dated 23 October 1981, the Group was informed by the Permanent Representative of Pakistan to the United Nations of its Government's willingness to accord the necessry co-operation for the purpose of on-site investigations in accordance with paragraph 5(b) of the above-mentioned resolution. After considering the reply of the Government of Pakistan, the Group of Experts took the following decision concerning the matter which was transmitted to the Government of Pakistan:

(a) The Group acknowledged receipt of the above-mentioned letter and expressed deep gratitude to the Government of Pakistan for its offer to co-operate with the request of the Group of Experts to visit Pakistan in connexion with the implementation of resolution 35/144 C.

(b) However, in considering this matter, the Group of Experts was also cognizant of: (a) the stipulation in resolution 35/144 C which required that the report of the Group of Experts be submitted to the Assembly at its thirty-sixth session, which imposed definite time-constraints for the completion of the exercise; (b) the reply of the Government of Pakistan was formally received after the decision of the Group of Experts to accept the offer of the Government of Thailand to comply with the Group's request to visit Thailand in connexion with the implementation of resolution 35/144 C and after the various necessary arrangements had already been initiated in that respect, including the specific time-frame involved.

(c) Accordingly, the Group of Experts was of the opinion that in view of the above, the Group initially should proceed to complete its visit to Thailand for the purpose mentioned above and that it would consider the question of a possible visit to Pakistan at a later stage.

78. The Group of Experts visited Thailand from 31 October to 10 November 1981. The members of the Group of Experts were Major General Dr. Esmat E. Ezz (Chairman), Mr. Edward Ambeva, Dr. Humberto Guerra and Colonel Nestor Castillo. The Group of Experts was also accompanied by members of the Secretiariat staff: Mr. Sohrab Kheradi, Senior Political Affairs Officer (Secretary of the Group); Professor Herbert Marcovich (Consultant); Mr. Wlodzimierz Wieczorek, Senior Political Affairs Officer and Ms. Margaret Headley (secretary to Mr. Kheradi). In addition, the officials from the Economic and Social Commission for Asia and the Pacific (ESCAP) provided all the necessary facilities and assistance to the Group during its visit in Thailand. The local officers of the United Nations High Commissioner for Refugees assisted the Group during its visits to the refugee camps at Nong Khai and Ban Vinai.

79. At each stage of its work in Thailand, the Group was accorded all the necessary assistance from the Government of Thailand and the local authorities, including means of transportation and security. Upon arrival the Group had a briefing by officials of the Ministries of Foreign Affairs and the Interior, and of the National Security Council.

80. During the period of its visit to Thailand, the Group carried out collection and examination of evidence in the two refugee camps of Nong Khai and Ben Vinai, close to the territory of Laos, and one refugee processing centre at Panatnikhom, closer to Kampuchea. The Group made every effort to interview the available witnesses of the alleged use of chemical weapons coming from Kampuchea, and underscored the importance of reaching Kao I Dang Camp, near the border between Thailand and Kampuchea, where it expected to interview more refugees from the area

of Kampuchea, according to the schedule initially prepared by the Thai authorities. The Group was told that the visit to this camp could not be carried out because of security reasons, and that the refugees would be brought to the processing centre instead. However, no refugees came from Kháo I Dang to Panatnikhom.

81. The Group interviewed, in person, alleged victims and eye-witnesses of alleged chemical attacks. Summaries of the statements made during interviews are presented in annex V, and a general evaluation of the interviews appears in paragraphs 85 to 92 below.

82. During its visits to the above-mentioned refugee centres, the Group also interviewed medical personnel. The Group collected some blood samples and received, as well, other samples of blood, alleged chemical powder, and leaf and stem samples which came from an area allegedly subjected to a chemical attack.

83. In addition, the Group had access to some other sources of information as reflected in annex V.

84. In the course of its on-site investigation, the Group was handicapped by various shortcomings with respect to data collection, of which the most significant were the following:

(a) The time factor was an important element which first appeared in the planning stage. The Group had to undertake the visit at short notice without benefit of optimal preparation. Further, in the execution stage, the limited time allocated to each camp precluded more thorough interviews and exploration and the time schedule was further reduced by circumstances beyond the Group's control, including weather and security conditions, as well as time spent on travelling.

(b) The difficulty of conducting meaningful interviews through interpreters, e.g. from Hmong to Thai and from Thai to English and vice-versa, compounded by the lack of medical and technical training of interpreters, adversely affected the efficiency and accuracy of the interviews.

(c) In most cases, the interviews were conducted after a considerable lapse of time following an alleged chemical attack, thereby resulting in the disappearance of most of the signs and symptoms which might have been present and adversely affecting the accurate recollection of the events.

(d) The Group noted that given their particular background, some of the people interviewed were not fully oriented towards providing quantifiable information such as time and distance, which could assist the Group in reaching accurate assessments.

(e) Although the Group availed itself of the help of the representative of the United Nations High Commission for Refugees in Bangkok and the authorities of the refugee centres visited, it was unable to locate in the camps that the Group visited any of the alleged victims whose names appeared in the United States submissions.

A. General evaluation of the interviews

1. The reliability of information

85. The Group did not find any reason to doubt the integrity of those who were interviewed. On the other hand, it could not overlook the fact that it was difficult to determine the objectivity of alleged victims or witnessess.

2. Technical aspects

86. Some of the descriptions given by the refugees on the technical aspects of alleged chemical attacks in general did not conform with the known practices for the dissemination of chemical warfare agents. Most instances involved dissemination of agents by aerial spray from high altitude, against small-sized targets. It is the feeling of the group that most probably the alleged victims or eyewitnesses sometimes did not have proper appreciation of space and time because they mentioned different periods of time for the settling of the chemicals. Varying sizes have been described for apparently the same "yellow substance": dry powder, sugar grains, pollen, corn flour, and even rice.

87. In the instances where bombs or rockets were mentioned, no samples of the remnants of such delivery systems, which could have helped in the identification of the types of chemical weapons used, were provided.

3. Medical aspects

88. The signs and symptoms described by the refugees being interviewed were similar to those found in the reports on alleged chemical attacks submitted by the United States and Canada.

89. The main symptomatology described to us, as may be seen in annex V consists of coughing, occasional eye irritation, nausea, intense vomiting and diarrhea sometimes mixed with blood. These sypmtoms appeared from less than an hour to several hours after the alleged exposure, sometimes correlated with eating or drinking "contaminated" food or water. Deaths of people were often reported, as occuring from within 30 minutes to several hours or days, most commonly those exposed in the open. Skin lesions variously described as rashes, blisters of different sizes, and ulcerations were also reported to occur. Extensive animal deaths were also reported and less often, damages to leaves and crops. Most of the refugees interviewed stated that opium mixed with garlic was an effective curative agent, not only alleviating the symptomatology but also preventing death.

90. Although some of the above-mentioned signs and symptoms could be caused by one or another of the known chemical warfare agents, the Group was not in a position to reach a final conclusion due to lack of hard evidence. As an example of the evaluation process, the Group wishes to cite the cases of the six alleged victims (see annex V) who had supposedly been exposed to the "yellow powder" as recently as 23 days prior to being interviewed.

91. This group of six people, a girl and five men, had a common history of alleged exposures to the "yellow powder" while they were fleeing in Laos. They reported having walked on a field covered with this material for about 50 meters before noticing it, then turning around and leaving the area, whose dimensions could not be determined with any degree of precision. Four reported having had dizziness and diarrhea which occurred about five to nine days after the exposure, and three displayed skin lesions which they attributed to the same exposure, in the lower limbs. The remaining two refugees, a girl (18) and a boy (17), reported on what they claimed to have been different occasions of exposure to chemicals. About a month before the interview, the girl ate some leaves which had had some yellow material on them, after having washed them in the stream, and had dizziness, coughing, and vomiting: the boy referred to an episode in his childhood, which, in turn, had been recounted to him, and to a second one about a year previously, in which he had dizziness, headache, vomiting and diarrehea, and had developed some lesions ("weeping wounds") on his skin. The general clinical appearance of the six was acceptable. The most remarkable findings were a goiter and an enlarged spleen in the girl, and several skin conditions in both the girl and several of the men, which were compatible with scabies, superficial pyogenic infections, and contact dermatitis. Some scars were also noticed. Blood and urine analyses, performed by the laboratory of the military hospital provided no evidence of salient abnormalities, except for a moderate leucocytosis (16,200 WBC per MM) in one man and eosinophilia (18 per cent) in another of the men.

92. The Group felt that these persons, if exposed to a chemical agent at all, had minimal contact with it and that none of the symptomotology described can be attributed to this "yellow powder".

VIII. CONCLUSIONS

93. In pursuance of General Assembly resolution 35/144 C, the Group of Experts addressed itself to the submissions at hand and, in the course of assessing the individual cases presented therein, found itself unable to reach a final conclusion as to whether or not chemical warfare agents had been used.

94. Since the symptomatology in some of the cases as presented in the submission could suggest a possible use of some sort of chemical warfare agents, the Group, therefore, expressed the desire to carry out investigations on the territories where chemical attacks had allegedly occurred and also in the territories where alleged victims and eyewitnesses of such attacks were being hosted. Up to the time of the submission of this report, however, the Group had only been able to visit some refugee camps in Thailand.

95. During its visit to the refugee camps in Thailand, the Group made an effort to meet the particular individuals who were mentioned in the United States submissions but was unable to locate them in those camps. The medical personnel interviewed in the refugee camps stated that they did not come across cases which could be attributed to chemical warfare agents. The refugees who were interviewed by the Group related stories similar to those appearing in the submissions of Canada and the United States, which reflected some aspects of their problems as persons

displaced from their respective homelands, as well as those more pertinent to the issue of the alleged chemical attacks on which most were able to report.

96. It must be pointed out that all the cases interviewed related alleged chemical attacks which occurred several months earlier, and consequently the Group was unable to detect signs and sypmtoms which would be suggestive of exposure to chemical warfare agents. The only alleged victims of recent exposure (23 days prior to the interviews) to alleged chemical warfare agents claimed that they walked through an area contaminated by "yellow powder". No clear characteristic physical findings of exposure to chemical agents could be recorded, and routine blood biochemical, hematological, and urine analyses obtained by the Group yielded no significant abnormalities. Nevertheless, blood samples were taken to test for any chemical warfare agents or their degradation products.

97. In the course of its interviews, the Group was given some physical samples, supposedly related to the alleged use of chemical weapons. These samples have been handed over to the United Nations for analysis by qualified and impartial laboratories. Since the Group cannot ascertain the actual source of these samples it cannot base its final conclusions on the results of such analyses. The Group expresses the hope that appropriate procedures will be devised in the future for the impartial collection and analysis of any samples that might be involved in this context.

98. Finally, in the opinion of the Group, this report is inconclusive. Any investigation designed to lead to definitive conclusions regarding the alleged use of chemical weapons and to an assessment of the extent of the damage caused by such chemical weapons would require timely access to the areas of alleged use of chemical warfare agents in order to establish the true facts. Such an exercise has so far not been possible.

ANNEX I

Questionnaire sent by the Group of Experts to the Governments of Canada and the United States of America

I. If you have personally witnessed the use of chemical weapons:

1. (a) Can you specify whether it was by means of air delivery, bombs, cannisters or sprays, artillery ammunitions, air bursts or impacts?

(b) What were the features of the attack with the chemical agent with respect to the color, if any, and the prevailing weather conditions?

(c) If there were clouds of gas, how long did they last before complete dissipation?

(d) Were you in the open air or under cover?

2. (a) If you were exposed to the attack, what was the distance between you and the site of detonation?

(b) What was your immediate reaction?

(c) After how long a period of time did the first symptoms begin to appear, what was the sequence of the various symptoms and how long did they last?

(d) Did you receive any medical treatment and if so, where and how soon was it given?

(e) What was the nature of the treatment and how long did it take before you completely recovered?

3. (a) If there were other casualties, how far from the site of detonation were they located?

(b) What signs and symptoms did you observe in such cases and what was the sequence in which they occurred?

(c) Did you witness any fatalities and if so, how many?

(d) Did you notice any correlation between the age, sex and general health of the victims and the intensity of the symptoms involved?

(e) How long were the victims exposed to the chemical agent?

(f) Was any treatment administered?

(g) How long did it take for the victim to recover?

(h) Have you spoken to any of the attending medical staff and what were their comments?

II. If the information that you have reported was of a hearsay nature, can you identify your sources and indicate their reliability?

ANNEX II

Substantive parts of communications received from international organizations

1. Reply from the World Health Organization dated 1 June 1981

We have not received any information directly from WHO Member States concerning the use of chemical weapons. The information at our disposal is that reproduced by the United Nations from certain Governments and I believe, therefore, the United Nations already has more information available on this question than WHO.

2. Reply from the International Committee of the Red Cross dated 19 June 1981

In conclusion, the nature of ICRC's work and the extent of its involvement in the conflicts which have occurred since the Second World War do not provide it with sufficient evidence to conclude that chemical weapons have or have not been used. The only evidence it can offer - which is not, of course, conclusive from a wider standpoint - is that, in the places where its delegates have been able to operate, they have not by themselves established the flagrant and massive use of chemical weapons.

3. Reply from the Office of the United Nations High Commissioner for Refugees dated 30 July 1981

Our Office is gravely concerned by this issue. However, owing to its eminently humanitarian and non-political character, UNHCR would not be in a position to participate actively in such an investigation.

ANNEX III

Trichothecenes

A. Introduction

1. Outbreaks of fatal toxicity in man and animals have long been correlated to consumption of mouldy grain and other agricultural products. In general, these products were harvested under wet conditions and not properly stored. They were found to be contaminated with toxin-producing moulds. High concentration of Fusarium mycotoxins were found in many of these products.

2. The biggest recorded outbreak of such toxicity was in Orenburg, Union of Soviet Socialist Republics (1942-1943) 1/ 2/ where eating of bread made of over-wintered grain produced a disease called alimentary toxic aleukia, characterized by gastrointestinal disorders, haemorrhage, skin lesions, neurological disturbances, leucopenia and septic angina. In 1965-1966 similar conditions were recorded in Canada, the United States of America and Belgium due to contamination of beer and the disease was called cobalt beer cardiomyopathy. 3/ 4/ In Wisconsin, the United States of America, an outbreak of toxicity occurred among cattle which consumed mouldy maize in 1968. The cases were charactered by gastroenteritis an haemorrahage and were called haemorrhagic diathesis. 5/ 6/ In Hokkaido, Japan, mycotoxins were detected in bean hulls used as feed for horses and caused great losses in 1970. 7/ In Scotland, Petrie et al in 1977 detected mycotoxins in mouldy brewer's grain which were used as feed for dairy cattle and caused haemorrhagic diathesis. 8/

1/ Joffe, A. Z. in Mycotoxic Fungi, Mycotoxins, Mycotoxicoses: An Encyclopedic Handbook, Wyllie, T. D. & Morehouse, L. G., eds., Vol. 3, pp. 21-86 (Marcel Dekker, New York, 1978).

2/ Gajdusek, D. C. "Acute Infectious Hemorrhagic Fevers and Mycotoxicoses in Union of Soviet Socialist Republics", Washington Medical Science Publication, No. 2 (1953) (Army Medical Service Graduate School).

3/ Morin, Y. L. and Daniel, P. Canadian Medical Association Journal: 97 (1967), pp. 926-928.

4/ Morin, Y. L. and Folly, A. R. Martineau, G. and Roussel, J. Canadian Medical Association Journal :97 (1967), pp. 881-883.

5/ Bamburg, J. R., Riggs, N. V. and Strong, F. M. Tetrahedron: 24 (1968), pp. 3329-3336.

6/ Hsu, L. C., Smalley, E. B., Strong, F. M. and Rebelin, W. E. Applied Microbiology: 24 (1972), pp. 684-690.

7/ Ueno, Y., Ishii, K. Sakai, K., Kanaeda, S., Tsunada, H. Tanaka, T. and Enomoto, M. Japanese Journal of Experimental Medicine: 42 (1972), pp. 187-203.

8/ Petrie, L. Robb, J. and Stewart, A. F. Veterinary Review: 101 (1977), p. 326.

B. Trichothecenes

3. These are a chemically related group of low molecular weight, metabolically active metabolites of fungi. They are produced in the culture of the following genera:

(1) Fusarium

(2) Cephalosporium

(3) Myrothecin

(4) Trichothecium

(5) Trichoderma

(6) Stachybotrys

They are reported to be the cause of the following diseases:

(a) Low temperature mouldy corn intoxication (haemorrhagic disease);

(b) Mouldy cereal emesis;

(c) Alkabibo toxicosis;

(d) Alimentary toxic aleukia;

(e) Mouldy bean hull intoxication;

(f) Stachybotryotoxicosis;

(g) Dendrodochiotoxicosis (myrotheciotoxicosis);

(h) Fusariotoxicosis.

4. All these diseases are considered primarily tricothecene intoxications. Trichothecenes were divided into two groups with respect to solubility: Group A, which is highly soluble in most aprotic solvents such as ethyl acetate, acetone, chloroform and diethyl ether. T2 toxin belongs to this group. Group B comprises the highly hydroxylated trichothecenes, which are relatively polar and are soluble in either very polar solvents or protic solvents such as methanol and ethanol. The members of this group may be extracted with methanol, aqueous ethanol or water. Nivalenol and deoxy-nivalenol are members of this group.

C. Natural occurence of trichothecenes

5. Mycotoxin-producing fungi are widely distributed all over the world, and in recent years with advancement in analytical methods various mycotoxins have been

isolated from fungus-infected grains and other vegetable products all over the world. Although it is generally accepted that cold and humid weather is optimal for the production of most trichothecenes, various authors have demonstrated the presence of mycotoxin-producing fungi and the production of mycotoxins in rather warm climates. 9/ 10/ 11/ In particular, it appears that the trichothecenes nivalenol, deoxynivalenol and T2 toxins are worldwide in distribution as natural contaminants. 12/ The natural occurrence of trichothecenes in feedstuff was reported by different authors to reach high values; deoxynivalenol was up to 1800 g/kg in sample from Michigan and 1000 g/kg in samples from Iowa, Indiana and Minnesota. 13/ It was also reported by Vesonder et al in 1973 that F. roseum No. 117 strain from infected barley-produced deoxynivalenol in large quantities at high temperature. 14/ It is important to mention that fungi may produce in laboratory culture, toxins which are different from those produced in field crops because the nutrient supply and the ecology of the fungi under laboratory conditions are quite different from those found in field conditions due to the action of micro-organisms and/or living plants. 14/ It was also reported that toxins in the soil can be translocated via the root to other parts of the plant 11/ and that some trichothecenes are taken up, chemically modified and stored by some higher plants. 15/

D. Production of trichothecenes in the laboratory

6. Using a sterile corn seed medium with low incubation temperatures, Ikediobi et al 16/ obtained a yield of 1515 mg.T2 toxin per kg. of dried corn when

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9/ Rikmini, C. and Bhat, R. V. Journal of Agricultural Food Chemistry: Vol. 20 (1978), No. 3, p. 647.

10/ Ghosal, S., Chakrabarti, D. K. and Basu Chaudhary, K. C. Experientia: 33 (1977), No. 5, pp. 547-575.

11/ Chakrabarti, D. K., Basu Chaudhary, K. C. and Ghosal, S. Experientia: 32 (1976), No. 5, pp. 608-609.

12/ Jemmali, M., Ueno, Y., Ishii, K., Frayssinet, C., and Ettienne, M. Experientia: 34 (1978), No. 10, pp. 1333-1334.

13/ Pathre, S. V. and Mirocha, C. J. in Mycotoxins in Human and Animal Health (Pathotox, 1977) pp. 239-253.

14/ Yoshizawa, T. and Morooka, N. in Mycotoxins in Human and Animal Health, pp. 309-319.

15/ Jarvis, B. B., Midiwo, J. O. and Tuthill, D. Science: 214 (1981), p. 460.

16/ Ikedoibi, C. O., Hsu, I. C., Bamburg, J. R. and Strong, F. M. Analytic Biochemistry: 43 (1971), p. 327.

F. tricinctum was incubated at 8°C 30 days. Bamburg 17/ achieved 900mg T2 toxin/kg of dried corn in F. tricinctum cultures incubated for 2 weeks at 8°C.

7. Burmeister 18/ produced 9g T2 toxin from culture of F. tricinctum after three weeks at 15°C on 1200g of white corn grit. At 20°C only 6.24g T2 toxin was produced, while at 25°C and 32°C only 1.40g and 0.01g were produced respectively. Isolates which produce T2 toxin at low temperatures produce another toxin (HT-2) at higher temperatures.

E. Stability

8. Trichothecenes are remarkably stable to a variety of environmental conditions: moderate variation of temperature, exposure to light, air and moderate changes in pH. They are not destroyed under conditions to which foods or feeds are normally exposed, either in storage or during cooking. 19/ Some claim that at least some trichothecenes are sensitive to sunlight.

F. Biological properties of trichothecenes

9. Fate: using isotopic labelled trichothecene, Ueno 7/ showed that these compounds are distributed in the various organs of the body. Maximum concentrations occurred in the liver, then in the kidney and the intestine. It was shown that trichothecenes are completely eliminated from the body within 12 hours.

10. The oral and IP LD_{50} in young mice or rats is below 10 mg/kg. 20/ The oral LD_{50} in non-ruminant calves for T2 toxin is 0.6 mg/kg but these levels are nonlethal in older animals. For young rats, the oral LD_{50} of T2 was found by

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17/ Bamburg, J. R., "Mycotoxins of the Trichothecene Family Produced by Cereal Molds", Ph.D. Thesis, University of Wisconsin, Madison (1969).

18/ Burmeister H. R., Applied Microbiology: 21 (1971), No. 4, pp. 739-742

19/ Bamburg, J. R. and Strong, F. M. in Kadis, S., Giegler, A. and Ajl, S. J. Microbiolical Toxins: Vol. 7 (Academic Press, New York, 1971).

20/ Hsu, I. C., Smalley, E. B., Strong, F. M. and Rebelin, W. E. Applied Microbiology: 24, p. 684.

Kosuri et al. 21/ to be 3.80 mg/kg while Yates 22/ found the IP LD_{50} for mice to be 3.04 mg/kg.

11. All naturally occurring trichothecenes induce non-specific dermal reactions in humans and laboratory animals, which consist of severe local irritation, inflammation and desquamation when applied locally. 17/ 19/ This effect has been used for semiquantitative estimation in purification studies of T2 toxin and to detect trichothecenes in naturally toxic feeds. 20/

12. Most trichothecenes are cytotoxic to plant and animal tissue cultures. There is correlation between cytotoxicity, dermal toxicity and phytotoxicity. Marsas et al. 23/ and Burmeister et al. 24/ 25/ have suggested the use of plant systems to detect low levels of trichothecene contamination of food and feed.

13. Trichothecenes produce cell degeneration in bone marrow, lymph node, intestine and other organs. Post mortem examination shows engorgement of capillaries around the wall of intestinal tract and ecchymotic haemorrhages in the peritoneal surfaces of small and large intestines. The lungs are congested and the livers show fatty degeneration. 21/ 26/

21/ Kasuri, N. R., Smalley, E. B. and Nicolis, R. E. American Journal of Veterinary Research: 32.

22/ Yates, S. G., Tokey, H. L., Ellis, J. J. and Burkhardt, H. J. Phytochemistry: 7 (1968), p. 139.

23/ Marasas, W. F. O., Smalley, E. B., Bamburg, J. R. and Strong, F. M. Phytopathology: 61 (1971), p. 1488.

24/ Burmeister, H. R., Ellis, J. J. and Yates, S. G. Applied Microbiology: 21 (1971), p. 673.

25/ Burmeister, H. R. and Hesseltine, C. W. Applied Microbiology: 20 (1970), p. 437.

26/ Ueno, U., Ueno, I., Itoi, Y., Tsunoda, H., Enomoto, M. and Ohtsubo, K. Japanese Journal of Experimental Medicine: 41 (1971), p. 521.

G. Signs and symptoms

14. After administration of an oral lethal dose, the animal becomes listless and inactive, its hair erects, and its respiration rate increases. At a later stage it may develop diarrhea which may be bloody, the body temperature may fall and the respiration becomes shallow and difficult. In sublethal doses necrotic lesions may develop in the mouth. 27/ 28/

15. Erosion of the mucous membrane of the gastrointestinal tract may lead to severe haemorrhagic gastro-enteritis. 21/ 26/

16. Emesis occurs to a degree depending on the toxin and the experimental animal. 26/

17. Although haemorrhage was reported frequently in relation to consumption of food polluted with mycotoxin-producing fungi, and it was attributed to the presence of T2 toxin, several authors reported the failure of pure trichothecenes and whole cultures to produce experimental haemorrhagic syndrome in calves and pigs. 29/ 30/

27/ Wyatt, R. D., Weeks, B. A., Hamilton, P. B., and Burmeister, H. R. Applied Microbiology: 24 (1972), p. 251.

28/ Marsas, W. F. O., Bamburg, J. R., Smalley, E. B., Strong, F. M., Regland, W. L., and Degurse, P. E., Toxicology and Applied Pharmacology: 15 (1969), p. 471.

29/ Patterson, D. S. P., Matthews, J. G., Shreeve, P. J., Roberts, B. A., Macdonald, S. M. and Hayes, A. W., The Veterinary Record: 105 (15 September 1979), p. 11.

30/ Weaver, G. A., Kurtz, H. J., Mirocha, C. J., Bates, F. W., Behrens, J. C., Robinson, T. S. and Swanson, S. P., Canadian Veterinary Journal: 21 (1980), pp. 210-213.

ANNEX IV

Questionnaire sent by the Group of Experts to the Government of the United States of America in connexion with its submission dated 4 September 1981

The Group of Experts to Investigate Reports on the Alleged Use of Chemical Weapons wishes to submit the following questions with a view to seeking clarification on some of the points contained in the note of the Permanent Representative of the United States of America to the United Nations dated 14 September 1981.

I. Questions with respect to the samples collected

1. With respect to the site from which the samples were collected:

(a) From what area exactly were the samples collected?

(b) When was this particular area exposed to the alleged chemical attack?

(c) What was the time-lapse between the alleged chemical attack and the collection of the sample? Was there any rainfall during this interval?

(d) What was the temperature at the site at the time?

2. With respect to the method of sampling:

(a) Were there any particular precaustions taken in obtaining and handling the samples? If not, have any persons who handled them experienced any dermal reaction?

(b) Were the leaf and stem sample, mentioned in the report, the only samples collected? If more samples were available, why was the analysis limited to the single leaf and stem sample?

(c) Was the sample leaf picked from a living plant and was it itself fresh and living, or was it dry and dead? Was it collected from the ground?

(d) What was the species of the plant from which the sample was collected?

(e) Were there any other samples collected from the area, particularly from the soil or water?

(f) What was the time-lapse between the obtaining of the samples and their laboratory examination?

3. With respect to the laboratory tests:

(a) Have any tests been conducted to discover the presence of any mycotoxin-producing fungi in the samples?

(b) have any morphological and/or histological studies been conducted on the samples to detect any effect which could have been produced by the mycotoxin as it is known to affect higher froms of plant life?

(c) What was the method of assay of the mycotoxins? What was the exact amount of each individual mycotoxin found in the samples in terms of mg/kg of dry weight of the sample?

II. Questions with repect to the area from which the samples were collected

1. With respect to the people living in the area:

Were there any casualties in the area following the alleged chemical attack? If so, what were the signs and symptons experienced by such casualties? Are there any medical records? Is it possible to give names of the refugee camps where they can be located? Any information that can help to locate the casualties or eyewitnesses to the attacks will be most appreciated.

2. With respect to animal life in the area:

Were any animals in the area affected in any way after the alleged chemical attack? If so, what were the signs and symptoms displayed by the animals and when did they start?

III. General Questions

1. It would be appreciated if some clarification were given concerning the information contained in the last four lines of page 1 of the note dated 14 September 1981. Can this be taken to mean that the agent(s) produced its/their effect in the central area of attack within minutes/hours?

2. Page 4, paragraph 5:

"Levels of deoxynivalenol and nivalenol detected were up to twenty times greater than that reported to occur when vegetation is naturally contaminated by tricothecene toxins"

Does this mean that the vegetation in the area could be naturally contaminated?

ANNEX V

Summary of statements made during interviews conducted by the Group of Experts during its visit to Thailand

A. Nong Khai Refugee Holding Center

Medical personnel

Dr. Charles Weldon, Medical Director of the Center:

He has been at the camp for five months and is the longest-serving medical officer at the camp. He has had no experience with alleged victims of chemical attack. He stated that his predecessor (Dr. Townsend) claimed to have had some experience with toxic-agent victims.

Common diseases seen in the refugees are upper-respiratory-tract infections, gastrointestinal diseases, tuberculosis (resistance to standard therapy is not a big problem in the camp; the diagnoses were done by acid-fast stains of sputum and chest x-rays; some sputum cultures were sent to Bangkok for processing). Other diseases worth mentioning: paragonimiasis, scabies, other skin diseases.

Medical records of hospitalized patients go back only to March 1980. Outpatients carry their own OPD cards and no copies are kept in the hospital.

Alleged victims

1. Vang Xai Lu; male; married; age 45
Residence: Ban Pu Huat, Xiang Khwang
Occupation: soldier, formerly with the Royal Lao Army

Place of exposure: Pou Bia Noy Village in Laos
Date of exposure: November 1980
Mode of delivery: airplane sprayed "yellow rain"
Effect: after 30 minutes' dizziness, tears, blurring of vision, coughing, chest pain, generalized itching, nausea.
Duration of recovery: about seven months, until he was treated at the camp.
Present condition: generalized body stiffness, blurred vision, generalized itching.
Physical examination: not significant.
Further information: out of 14 people with him in the rice field, 4 reportedly died later. Animals that ate "contaminated" material died. Young leaves fell off during the following week.

2. Yang Poo; female; married; age 40 (wife of Vang Xai Lu)
Residence: Ban Pu Huat, Xiang Khwang
Occupation: housewife

Place of exposure: Pou Bia Noy Village, in Laos
Date of exposure: November 1980 (two attacks, seven days apart)

Mode of delivery: not described, "yellow rain" mentioned
Effect: irritation of the eyes, with no tears, intense coughing, later vomited two to three times. after a week, had bloody diarrhea for three or four days
Duration of recovery: about 10 days
Present condition: complained of physical weakness and numbness of both legs
Medical records available: out-patient department card showed she had received treatment as having "peripheral neuritis".
Further information: her two children, aged 8 and 10, became sick earlier than their parents. Two other people in the field were also sick. Chickens died within 10 days, two or three a day.

3. Tang Yea Yang; male; married; age 60
Residence: Huey Kan, Phou Bie, Laos
Occupation: village head man

Date of exposure: February 1981
Mode of delivery: airplane sprayed powder
Effect: coughing and diarrhea for two days, generalized itching for five days. The symptoms appeared after drinking water the day after it had rained.
Duration of recovery: took opium and diarrhea stopped in two days
Present condition: no complaints
Physical examination: not significant
Further information: people becoming sick with coughing and diarrhea were cured with opium; some people in the village died one or two days after the attack.

B. Ban Vinai Refugee Holding Center

Medical personnel

Dr. Gideon Regalado, Medical Officer:

He has been Medical Officer of the camp since February 1980. When questioned, he mentioned respiratory diseases (common cold, bronchial asthma, chronic bronchitis, tuberculosis) as the most common, together with gastrointestinal disorders. Other endemic diseases worth mentioning were lung and liver flukes; among skin diseases, scabies and pyogenic infections (abscesses), which he attributed to crowding.

Asked to expand on the subject of alleged victims of chemical attacks, he indicated there were no means to confirm their allegations. No set of signs and symptoms were suggestive of abnormalities associated with chemical warfare agents. There were no consistent laboratory data, either. The refugees, he said, arrived in the camp anywhere from two to eight months or more after alleged attacks, having walked for 20 to 30 days in the jungle. Dr. Regalado expressed the opinion that since there is a considerable time lag between the alleged exposure and arrival of refugees in Thailand, it may be that only the "survivors" make it. He cited as an example the case of a particular refugee who was sent to a lung specialist in the town of Udon (Thailand), and whose report established no relation between his

condition and exposure to chemical agents. Although mothers attribute the death of several new-born children to after-effects of "gassing" during pregnancy, no conclusion could be reached on the matter because no study has been done to clarify the issue.

The four doctors in the camp see about 300 patients a day. Medical records are kept for only three months after a particular refugee leaves camp, and are then disposed of.

Alleged victims

4. Pha Cher Pao; male; married; age 53
Residence: Pa Pai Village, Xiang Hong District, Xiang Kwang Province, Laos
Occupation: soldier, lieutenant in the "resistance army" of General Van Pao

Place of exposure: Pha Nam Khaot
Date of exposure: 18 August 1978, 3 p.m.
Mode of delivery: following artillery attack, a low-flying airplane sprayed smoke at resistance fighters.
Effect: he was hiding in a cave; he suffered eye irritation, coughing, became dizzy and had stomach pain. He took opium and had no vomiting or diarrhea. Those outside the cave (about 200 people) died within five minutes. They coughed and afterwards vomited blood. The youngest died sooner, some with convulsions. Pha developed lesions on his legs where impregnated foliage had brushed them.
Physical examination: two light-coloured, pale scars on the anterior (bony) aspect of each leg, from 1/2 to 1 cm in diameter.

5. Vang Yia Poa; male; married; age 40
Residence: Pao Koa Kwai, Van Bang Heng, Twakom; Vientiane, Laos
Occupation: village head man under Kraison Promirharm's Government

Alleged witness to two attacks, alleged victim of a third attack
Dates of attack: June 1977, September 1980, January 1981
Mode of delivery: aerial spray
Effect: (similar each time) The victims coughed up blood, later developed bloody diarrhea and a skin rash. Some symptoms were prevented by opium. 18 people died in first attack, 30 in second and 81 in third.
Further information: he stated that, having been interviewed four times, he was not going to testify again.

6. Her Mor; male; married; age 35
Residence: Poo Bia Ya Village, Vang Xia District, Xiang Kwang Province, Laos
Occupation: resistance soldier in General Van Pao's army

Place of attack: Long Xang Village, Hong District, Vientiane
Date of attack: 17 October 1980
Mode of delivery: a slow airplane sprayed a yellow powder
Effect: dizziness, eye irritation, vomiting, bloody diarrhea. Later developed blisters of different sizes on the skin. Many people and animals died.

Duration of recovery: had not felt well until treated in the hospital at the camp in February 1981.
Physical examination: multiple small, pale scars on proximal third of leg, on anterior-lateral and -medial aspects, several sizes but about 1/2 cm in diameter. He attributes these scars to blisters he developed after brushing his legs against "impregnated" foliage.

7. Her Ge; male; married; age 36
Residence: Mon Lon, near Mnang Hong, Vientiane Province, Laos
Occupation: farmer

Date of attack: 29 December 1980
Mode of delivery: an airplane flew over the village and he heard "like a soft rain" on the roof of his house.
Effect: He was dizzy next morning, and lay down; lost consciousness from noon until midnight. His wife and mother, who had remained in the house, did not develop symptoms. The same was true of two of his children who did not come out of the house. The children who had gone out to see the airplane vomited profusely and developed a skin rash. One of them received opium and was cured, while the other died. Other families had similar experiences. The animals were unaffected. Leaves became yellow and developed holes.
Further information: was interviewed by foreigners on an earlier occasion.

8. Mang Chang; female; single; age 18
Residence: Pha Hoi, Vientiane Province, Laos
Occupation: farmer

Date exposed: October 1981 (about the 10th), and 17 October 1981
Mode of delivery: heard airplane (day was cloudy) make several passes over rice field; while the airplane could still be heard, she saw yellow powder on leaves and ground.
Effect: one hour after she ate some plants, which she had washed free of the yellow powder in a stream, she "became like drunk", with a headache, dizziness, some cough with pain, had difficulty breathing or speaking, passed sticky sputum and had to lie down; she vomited and the vomitus contained bile. The symptoms cleared after she slept in her home. No other member of the family (nine persons) who also ate the vegetables had any illness.
On 17 October 1981, as a member of a group that was fleeing from Laos, she walked through a field covered with "yellow powder" for about 50 meters and then turned back as soon as the group noticed it.
Present condition: she complains of "some fever" which was not confirmed (her temperature was 36.8°), and of some skin lesions on her arms where "impregnated" leaves brushed them.
Physical examination: General condition good. Has a goiter (about 10 x 10 cm palpable splenomegaly; scars and superficial infections on the legs and arms
Laboratory findings: nothing abnormal detected.

9. Ko Chang; male; single; age 17
Residence: Phu Pieng, Vientiane Province, Laos
Occupation: farmer

Place and date of attack: in his village when he was a small child; a second time in October 1980, lastly an alleged third exposure on the afternoon of 17 October 1981.
Mode of delivery: (attack of 1980) he saw an airplane while he was in the field with his family harvesting rice; saw yellow powder which looked like pollen grains fall on leaves, the ground, himself and his family.
Effect: half an hour after exposure he felt dizzy and developed a headache; others had vomiting and diarrhea approximately three hours later; some developed "weeping wounds" on the legs.
17 October 1981 incident: with five other members of the group fleeing Laos, he walked on a yellow powder for about 50 m and then turned back. It produced a "wound" on his foot and he also had diarrhea and abdominal pain on the evening of the same day. He recovered in two days.
Physical examination: not significant.
Laboratory abnormalities: eosinophilia: 18 per cent.

10. Vang Yee Thao; male; single; age 18
Residence: Ban Dom, Vientiane Province, Laos
Occupation: student (third grade primary school)

Place and date of incident: while fleeing from Laos, 17 Ocotber 1981
Mode of delivery: unknown, but believes an airplane which the group saw was responsible. The yellow material was dry, with grains the size of ground flour. The group walked for 50 m on the powder, then turned back.
Effect: nine days after exposure to the powder, he felt dizzy and, for a short while, had difficulty breathing.
Physical examination: not significant.
Laboratory abnormalities: leucocytosis: 16,200 WBC per mm3

11. Kia Pao Chang; male; married; age 37
Residence: Phu Peang, Vientiane Province, Laos
Occupation: soldier and farmer

Place and date exposed: near his village, 17 October 1981
Description: similar to those above
Effect: Five days after alleged exposure, he became dizzy and developed numbness in his feet. He experienced diarrhoea six days after alleged exposure.
Physical examination: has some lesions on legs and feet which were very superficial small exulcerations, crusted over with yellowish material.
Clinical impression: possibly eczematous lesions.
Laboratory findings: nothing abnormal noted.

12. Xiong Leng Chang; male; married; age 50
Residence: Phu Peang, Vientiane Province, Laos
Occupation: farmer

Exposure: same incident referred to above on 17 October 1981. He heard an airplane before the incident of the group's walking on the "yellow rain"; he he was by himself at that time. The powder was spread over a rice and corn field.
Effect: he felt dizzy at the time of the alleged exposure; this feeling worsened with the heat at noon the next day. He continued to feel ill for several days. He had diarrhoea nine days after exposure and recovered after three days.
Physical examination: not significant.
Laboratory findings: nothing abnormal detected.

13. Chia Xang Change; male; married (two wives); age 36
Residence: phu Peang
Occupation: farmer

Exposure: same incident referred to above on 17 October 1981.
Effect: sore throat and mild diarrhoea, seven days after alleged exposure. Has developed a "wound" on the sacral and perineal areas, which he attributes to having slept on leaves and without a shirt, on the night of 17 October.
Physical examination: dermatitis of the sacral and perineal areas.
Clinical impression: contact dermatitis.
Laboratory findings: nothing abnormal detected.

Alleged eyewitnesses

14. Lor Nao Pao; male; married; age 33
Residence: Pu Hea
Occupation: soldier (first lieutenant) in General Van Pao's army

Date of attack: February 1979
Mode of delivery: airplane sprayed something like smoke, which reached the ground within 30 minutes and appeared to be yellow in color.
Effect: dizziness, vomiting (after one hour) first food, then blood; diarrhoea in those that didn't vomit (after an hour). Out of 600 people exposed, 2 died. Those inside houses did not develop symptoms but left the village and returned a week later.
Further information: He has taken photographs of skin conditions attributed by the villagers to the attack, five months after it occurred. He has also collected some yellow material from a rock in a rice field, with a stick and protecting his arms and face with a cloth, while fleeing from Laos. He says he has heard of several attacks in the area where he made the collection from, but did not witness any. He has turned in both his pictures and the yellow powder he collected to the Group.

15. Kue Yoo Kan; male; married; age 35
Residence: Phou Bia Ya Village, Xiang Hong District, Xiang Kwang Province, Laos
Occupation: soldier under General Van Pao

Place of attack: Ban Nam Kiang, Xiang Kwang Province
Date of attack: 1 April 1978 and 2 October 1978
Mode of delivery: aerial spray
Effect: Those who drank water from the pool were affected. They vomited and had diarrhoea. His daughter, age 1, was sick after drinking unboiled water and her teeth became "spoiled". The leaves in the area developed black spots after the attack.
Present condition: he now complains of pain in the joints.

16. Thao Chang Teng; male; married; age 55
Residence: Keo Yai, Laos
Occupation: village group leader

Place of attack: the rice field of his village, rice field for 30 families
Date of attack: September 1980
Mode of delivery: Believes a slow-flying plane which made two passes over the rice field delivered the yellow powder (granules the size of sugar granules) which was seen next day on the rice field.
Effect: The woman (age 60) who looked after the rice was found dead on the day following the sighting of the airplane. She lay in the hut, face down, holding her stomach, with frothy discharge from the nose and saliva drooling from the mouth. Three watchdogs lay dead with outstretched legs, near the hut, with their heads in the water of the rice field.

17. Yang Chao; male; married; age 25
Residence: Phou Yer, Vientiane Province, Laos
Occupation: farmer

Place of attack: Pha Neng Village
Date of attack: December 1980
Mode of delivery: airplane sprayed smoke on the village when the people went out to look at it.
Effect: coughing, vomiting and diarrhoea developed in his wife and child "after dinner". His wife took opium and was cured, while his child, who was too young to be given opium, died. Other families had similar experiences; those who did not take opium (for example, young children) died. All animals in the village died.
Spots developed on the leaves, which, however, did not fall off
Further information: He was interviewed by two foreigners on an earlier occasion.

18. Vue Nhia Ka; male; married; age 40
Residence: Long Cheng, Laos
Occupation: soldier in the Royal Lao Army
Place of attack: Hoi Zao, Xieng Khwang, Laos
Date of attack: June 1980
Mode of delivery: two airplanes launched two rockets, which exploded in mid-air. A yellow cloud appeared and a powder settled all around.
Effect: all families (14) except one (four members) hid in special covered

"bunkers". all the members of the family who were exposed (ages 15-60) had vomiting with some blood and diarrhoea; blisters appeared on their skin. They all died overnight.

All animals in the village died, with much salivation and swollen abdomens. Leaves in the area became yellow and developed holes.

C. Panatnikhom Refugee Processing Center

Medical personnel

Dr. Sorapipatana Chamras, one of nine doctors working at the Center

Dr. Chamras has never treated any case of alleged exposure to chemical warfare agents. The diseases most commonly seen in the Centre include upper respiratory tract infections and gastrointestinal disorders, especially diarrhoea. Questioned about epistaxis, he reported that he saw a few cases each year, and only in children; asked to comment about diarrhoea and bleeding, he said he met the problem at times, and that he thought it was usually dysentery, possibly amebic.

Alleged eyewitnesses

19. Do Hong San; male; married; age 21
Residence: Saigon, Viet Nam
Occupation: soldier (private) in the Vien Hong Regiment (sent to Kampuchea) of the Vietnamese National Army

Place of incident: Phanom Malai (mountain in Kampuchea)
Date of incident: September 1979
Description: He saw a Russian soldier firing a weapon shaped like a rocket, which exploded and emitted smoke that killed people.
Further information: This witness has been interviewed by journalists and an article was published in Bangkok newspapers in which he described the death of both Vietnamese and Kampuchean troops which were fighting against each other.

20. Sam Sotha; male; married; age 29
Residence: Battambang City, Kampuchea
Occupation: Catholic Relief Services worker at Bishop's house

Place of incident: 15 kms from Thailand-Kampuchea border
Date of incident: June 1980
Description of incident: saw two soldiers come on stretchers from battlefield and was told these were paralyzed by a gas used in combat. He was told the soldiers recovered in 24 hours.

21. Chhiv Nguon; male; married; age 35
Residence: Kampong Cham Province, Kampuchea
Occupation: soldier (sergeant major) with Lon Nol régime

Place of incident: Premveng Province, Kampuchea
Date of incident: 1972

Description of incident: during combat, he had to send back soldiers who were "sick" because of a white-coloured smoke used by the Viet Cong in Kampuchea. Those affected were "paralysed" (unconscious?) unless protected by mask or by a rag wet with urine and rubbed with onions held against nose and mouth. Sometimes 20-30 soldiers from his battalion (512 men) had to leave combat; they returned one week to one month after exposure. Sometimes a little blood came from the nose.

22. Yang Phon; male; married; age 55
Residence: Battambang City, Kampuchea
Occupation: soldier (sergeant major) of the Khmer Republic Army (Lon Nol régime), 1954-1975

Place of incident: Dam Nak Kakos Village, Kampuchea
Description of incident: he was travelling on foot and encountered a combat situation; he saw three civilians lying "paralysed" on the road. He smeared their noses and mouths with onion and urine and did the same to himself, and soon the civilians recovered. He did not see how the agent reached the people, but the combat sounds came from about 100-500 m.

23. Quan Nguyen; male; married; age 36
Residence: Codo Bavi Hasonbinh, North Vietnam
Occupation: soldier (captain), commanded an artillery unit in the North Vietnamese Army

Place of incident: Vietnam and later Kampuchea
Date of incident: from 1967 until 20 January 1980 (when he crossed the border)
He says he knows of three types of chemical weapons: tear gas, dissolving chemical and stronger, destroying chemical. He had used only tear gas.

Witnesses presenting hearsay information

24. Manivanh Kham Phiou; male; married; age 35
Residence: Vientiane, Laos
Occupation: pilot in the Royal Lao Air Force

Place of incident: Wattai airport
Date of incident: October 1976, 2 p.m.
Description: a wooden box containing plastic bags of some Soviet product broke and a powder came out which smelled like chlorine. The spill was cleaned and then decontaminated with no special precautions. However, his friends (Pathet Lao soldiers) commented on dangerous poisons being shipped from the Soviet Union for the use of the Vietnamese armed forces.
Effect: mild coughing, lacrimation, sneezing and headaches in the workers who did the cleaning.

25. Vang Neng; male; married; age 39
Residence: Ban Phou Mang, Xiang Khouang Province, Laos
Occupation: soldier (lieutenant) in the Royal Lao Army; presently Hmong Leader in Ban Vinai Refugee Holding Center
He has been hearing of the attacks since 1976.

26. Hô Tâ'n Cu'u; male; single; age 20
Residence: Qua'ng Nam da Nang, South Vietnam
Occupation: soldier (private) serving in artillery unit, Vietnamese Army in Nimit, Kampuchea
Just heard stories from soldiers.

27. Ul Saem; male; married; age 55
Residence: Takeo City, Takeo Province, Kampuchea
Occupation: court clerk in Takeo City 1967-1970; in Phnom Pehn 1970-1979
Description: his son told him of combat situations in which "gas" was used, which he heard as stories from other soldiers in 1974.

28. Le Van Luong; male; married; age 69
Residence: 13 c/27 Kydong, Ho Chi Minh City, Vietnam
Occupation: professor in Saigon University, Department of History
Has only hearsay information.

D. Other sources of information

The Group consulted with two representatives of the United Nations High Commissioner for Refugees, Mr. Alan Simmance, Regional Representative and Dr. Arcot G. Rangaraj, Health Officer, who provided information regarding general conditions of the refugee camps; health conditions among the refugees and local pathology. Questioned as to whether they had seen cases attributable to chemical warfare agents, they said they had no report at all on the subject. The UNHCR promised to contribute whole-heartedly with the Group in its efforts to implement its mandate. This assistance included help in locating the refugees whose names appear in the United States submissions and in the provision of an interpreter.

In the course of the interviews, several witnesses referred to a certain Dr. Amos Townsend, who had previously interviewed some of the refugees. Consequently, the Group decided to meet with Dr. Townsend in order to seek any relevant data at his disposal. Dr. Townsend is a retired colonel of the United States Air Force and currently health co-ordinator of various relief agenciers including the International Rescue Committee.

Dr. Townsend stated that he himself was convinced that chemical warfare agents are being used against the Hmong people. He believed that an effort is underway either to destroy the Hmong, to scare them off, or to experiment with various new chemical warfare agents. Dr. Townsend turned over to the Group two samples of vegetation (one leaf, one stem) reportedly collected by a Hmong refugee from an area of alleged attack on 3 October 1981. These samples had been delivered to him with an anonymous note. In this respect, the Group felt that it was not in a position to verify the accuracy of the report that the samples did in fact come from the area alleged to have come under attack. As indicated in paragraph 48 above, whereas on an a priori basis the Group would not wish to question that samples were collected from areas of alleged chemical attack, the Group, however, cannot base its final judgement on the results of the analysis of samples collected through other than impartial procedures. He also turned over to the Group several photographs of some refugees, one girl and five men, as well as whole blood (heparinized) and clotted blood collected from the girl. Finally, he stated that

he had sent all evidence that he had allegedly collected to the United States through the United States Embassy in Bangkok.

The Group was also approached by members of the Canadian Embassy in Bangkok, who met with the Group and provided some background information on the Canadian submission and their own activities. It was the impression of the Group that there was no additional data that the Group could take into account.
